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Flow measurement made easy
A solution for every application

Power and productivity
for a better world™

ABB

Expertise in technology

More than a century of experience

To operate any process efficiently, it is essential to measure, control, actuate and record. With ABB's measurement and analytics products and solutions, you receive the best technology combined with the most reliable products available on the market.

ABB offers a broad range of life cycle services for optimum product performance. A global network of measurement product specialists delivers local service and support.

Research and development is a vital source of ABB's technology leadership. It builds on the foundation of existing technologies for new applications, and continues to develop the breakthrough technologies needed to meet future challenges.

ABB and its heritage companies have been leaders in innovation and technology for more than 100 years.

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ABB Measurement & Analytics

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World-class measurement solutions

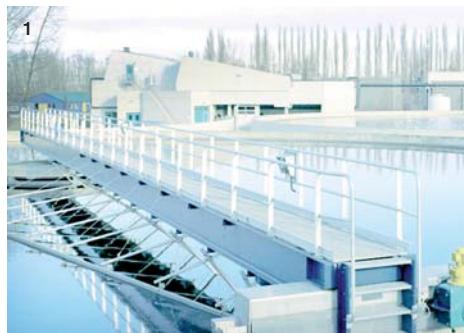
ABB measurement and analytics products provide world-class measurement solutions for any industry, utility or municipality. Latest innovations deliver technological solutions to make it easier for you to run your plant. ABB's measurement and analytics products are based on common technology, providing a common look and feel and method of operation. This results in products that are easy to configure, easy to integrate, and easy to maintain.

For more information please visit:
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ABB's measurement and analytics products portfolio:

- Analytical measurement
- Flow measurement
- Natural gas measurement
- Valve automation
- Pressure measurement
- Temperature measurement
- Recorders and controllers
- Level measurement
- Device management
- Force measurement
- Service

1 Water and waste water | 2 Power and industrial steam | 3 Chemical and petrochemical | 4 Oil and gas | 5 Pulp and paper | 6 Minerals | 7 Metals
8 Food and beverage | 9 Pharmaceuticals



Flow measurement expertise

Making measurement easy

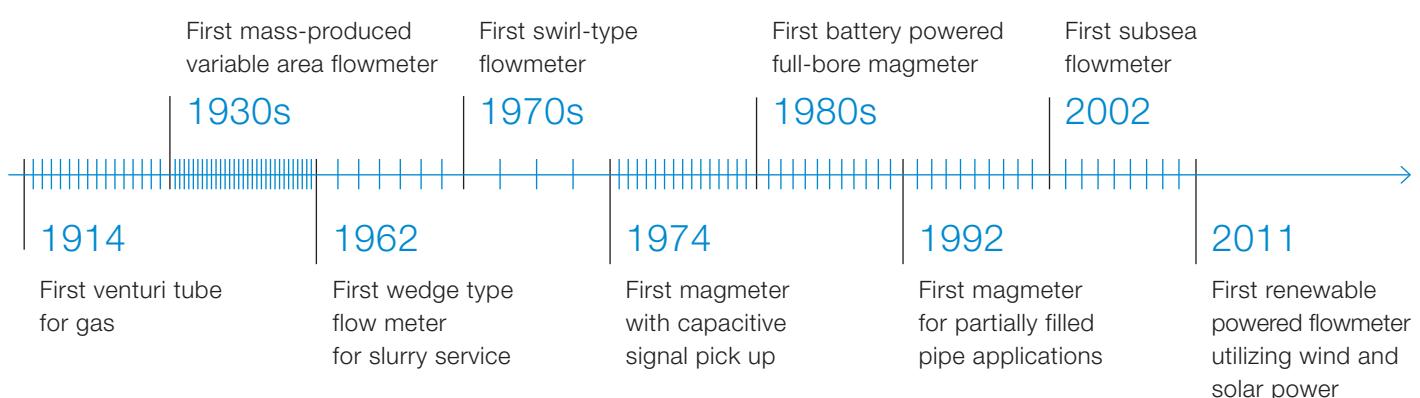
For more than 100 years, ABB's flow measurement products deliver reliability, accuracy, repeatability and easy maintenance to customers worldwide.

Getting the best levels of efficiency and performance from your production process requires reliable, accurate flow measurement. Choosing ABB flow measurement solutions for your application means to decide for high-quality measurement. ABB offers one of the world's largest and most innovative product ranges, unrivalled in its breadth and scope.

A common HMI platform (human machine interface platform) enables you to easily configure, integrate and maintain ABB measurement products.

For more information please visit www.abb.com/flow

Some of ABB's innovations in flow measurement



Flowmeters for liquids, gases and steam

A quick application guide

Application, product features	Electro-magnetic	Vortex/Swirl	Thermal mass	Coriolis mass	Variable area	Differential pressure	Flow computers
Liquids							
Conductive	•	•		•	•	•	
Non-conductive		•		•	•	•	
Solids content	•	•		•	•	•	
Pulsating	•	•			•		
Viscosity > 10 cSt	•	•		•		•	
Liquid calculations							
Custody liquid measurement	•						•
Gas/oil well optimization							
Gases							
Dry/clean		•	•	•	•	•	
Moist		•	•	•	•	•	
Corrosive				•		•	
Contaminated		•	•	•	•	•	
Gas calculations							
Custody gas measurement				•			•
Steam*		•		•	•	•	•
Fluid temperature	-40...180 °C -40...356 °F	-55...400 °C -67...752 °F	-25...300 °C -13...572 °F	-50...200 °C -58...392 °F	-20...400 °C -4...752 °F	-50...500 °C -58...932 °F	
Ambient temperature	-25...60 °C -13...140 °F	-55...70 °C -67...158 °F	-25...70 °C -13...158 °F	-40...60 °C -40...140 °F	-25...60 °C -13...140 °F	-40...85 °C -40...185 °F	-40...60 °C -40...140 °F
Accuracy	0.2% of rate	0.5% of rate	1% of rate	0.1% of rate 1 g/l	1.6 per VDI/VDE 3513	0.7% of max.	0.075% of DP/SP span Flow-X: 0.008%
Partially filled pipelines	•						
Size range	DN 1...2400 [1/2...96"]	DN 15...400 [1/2...16"]	DN 25...3000 [1...120"]	DN 1.5...150 [1/16...6"]	DN 15...100 [1/2...4"]	DN 15...8000 [1/2...320"]	
Typical up-/downstream sections	3D/2D	15D/5D 3D/2D	15D/5D	0D/0D	0D/0D	10D/4D	
Standard pressure ratings	PN10...250 CL150...2500 JIS7.5...20K	PN 10...64 CL 150 CL 300	PN 40 CL 150 CL 300	PN 16...100 CL 150...600	PN 16...100 CL 150...600	PN 10...400 CL 150...2500	
Hygienic/sterile certifications	EHEDG 3A, FDA		CIP/SIP	EHEDG FDA			
Certified calibrations	•	•	•	•	•	•	•
Ex-approvals	ATEX, IEC FM, CSA NEPSI, GOST	ATEX, FM CSA	ATEX, FM CSA GOST	IEC, ATEX FM, CSA NEPSI	ATEX, FM CSA	ATEX, FM CSA	ATEX CSA
Communication	FF, HART PA, DP	FF, HART, PA	HART, DPV1	HART, PA FF	HART	FF, HART PA	Totalflow, Serial MODBUS TCP/IP, HART

* e.g. saturated steam, superheated steam

Flow measurement sizing and selection made easy

ABB provides an excellent tool for sizing and selection of flow meters – including quick and simple flow calculation and a unique feature to compare different flow technologies.

The tool is available online or offline, to give a freedom of choice for various user groups.

Find out more at www.abb.com/flow-selector

Global availability

A partner to rely on, wherever you are



ABB's calibration facilities are available around the world



Providing recalibration service and fast response times

Did you know that ABB is manufacturing in your area? This leads to quick response times and enables market leading delivery times. ABB focusses on your local needs in terms of certifications by local approval agencies for electrical, mechanical, operating environment, and calibration certifications.

ABB has flowmeter calibration facilities located in Australia, China, Germany, India, the UK and the USA. The wet calibration rigs are built in accordance with ISO standards and certified to meet key international standards bodies, such as SIMT, UKAS, NIST, DAkkS, NVLAP and NATA. The ABB flow calibration certification laboratories are recognized by the International Laboratory Accreditation Cooperation (ILAC). The flow rigs are some of the largest in the world based on their constant flow capability.

Looking for a service partner to support you during the entire product lifecycle? ABB offers you reliable service and support from planning, commissioning and training to after sales service.

Information whenever you need it

Easy device management and industry standard communication protocols

ABB's instrumentation devices feature the latest in onboard diagnostics and intelligence to help you run your business more effectively. Just as important, ABB gives you the choice to decide which communication protocols you want to use to access this information. You can choose from a family of tools and from different ways to manage the lifecycle of the devices in order to get the most out of your investment.

ABB's device management product range includes

- Fieldbus and wireless solutions
- Handheld terminals
- Device management software Asset Vision



Electromagnetic flow measurement

For the process industry

ProcessMaster: for efficient plant operation and constant product quality

The first choice for demanding process industry applications, ProcessMaster electromagnetic flowmeter is tough, reliable, incredibly easy to work with. It helps save resources at every stage of the lifecycle.

The solution

Its modular design offers the industry's widest range of liners, electrodes and sizes to meet the needs of even the most demanding process applications. The powerful transmitter is easy to use and provides the output signal that meets your needs. With ProcessMaster you get a versatile, reasonably priced, most accurate flow meter tailored for your applications.



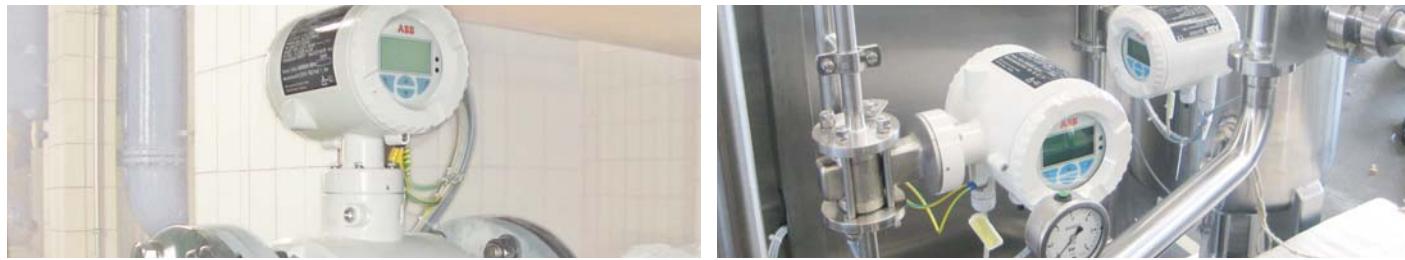
FSM4000: your robust flowmeter for conductive fluids in heavy duty applications

It masters your critical applications and conserves valuable resources with highly accurate measurement of process parameters in a wide range of industries.

The solution

FSM4000 provides a highly stable output signal in challenging applications such as slurries within the mining industry – even with large pieces of rock. Its measurement performance is unsurpassed in applications with – high content of solids (e.g. pulp stock in pulp and paper industry), – pulsating flows or – any other high signal noise application.





HygienicMaster: your first choice for demanding hygienic applications

It provides best levels of performance, flexibility and control in the most demanding hygienic applications, resulting in better product quality and highest reliability.

The solution

HygienicMaster is designed specifically for the food and beverage, pharmaceutical and biotechnology industries. Manufactured from FDA approved materials and certified in accordance with EHEDG and 3A, HygienicMaster sets a benchmark. The sensor is fully CIP/SIP cleanable. Variable process connections simplify installation and reduce inventory as well as replacement costs.



General specifications

Product	ProcessMaster	FSM4000	HygienicMaster
Nominal diameter	DN 3...DN 2000 (1/10...80")	DN 3...DN 000 (1/10...40")	DN 1...DN 100 (1/25...4")
Nominal pressure	PN 10...PN 100, CI 150...CI 2500	PN 10...PN 40, CI 150...CI 300	PN 10...PN 40, CI 150...CI 300
Process connection	Flanges in accordance with DIN/EN, ASME, JIS and others		Weld stubs, threaded pipe connections, Tri-Clamps, wafer-type, flanges in accordance with DIN/EN, ASME, JIS
Lining	Hard rubber, soft rubber, PTFE, PFA, ETFE		PFA, vacuum stable
Protection class	IP 67 or IP 68	IP 67 or IP 68	IP 67 or IP 68
Fluid temperature	Up to 180 °C (356 °F)	Up to 180 °C (356 °F)	Up to 180 °C (356 °F)
Ex approvals	ATEX, IEC zone 1 and zone 2, FM, CSA Div 1 and Div 2, NEPSI zone 1 and zone 2, GOST	–	ATEX, IEC zone 1 and zone 2, FM, CSA Div 1 and Div 2, NEPSI zone 1 and zone 2, GOST
Certificates	–	–	3A, EHEDG, FDA approved materials
Inputs/outputs	Analog output (4...20 mA), pulse output, contact input/output		
Communication	HART protocol (standard), PROFIBUS PA, FOUNDATION Fieldbus		
Verification tool	ScanMaster software	–	ScanMaster software

Electromagnetic flow measurement

For the water industry

WaterMaster enables easy flow measurement for water industry applications

It sets the standard for water, wastewater, sewage and effluent flow measurement and management. WaterMaster helps to efficiently manage precious water resources by accurately measuring water volumes consumed from production processes.

The solution

The modular design concept offers flexibility and reliability while providing a long service life and exceptionally low maintenance costs. WaterMaster's self-monitoring and diagnostic functions increase the plant availability and reduce downtime. The flowmeter is accurate and easy to use, offering in-situ verification as well as advanced self-calibration.



AquaMaster: For billing, survey and leak detection in remote locations

Providing economic and reliable water measurement, it saves energy and cost, naturally. It is a direct result of ABB's worldwide experience in the water industry and targeted at resolving environmental and industry specific requirements.

The solution

The AquaMaster is designed specifically for clean water applications. Its versatile power management options , 5-year battery or energy efficient wind and solar power, allow it to be placed remotely in the field; it can be buried and flooded. It measures flow and pressure accurately, provides logged data and can communicate remotely. AquaMaster is the perfect tool for irrigation, abstraction, distribution and revenue metering.





AquaProbe: The flowmeter for probe-based in-situ flow measurement

Maximum performance with easy, low-cost installation. Whatever the location or installation requirements, AquaProbe provides a cost-effective insertion flowmeter solution. Both the FEA200 flow sensor and the transmitter are fully submersible, enabling installation in flooded chambers.

The solution

AquaProbe is an insertion type electromagnetic flowmeter; used as a permanent flow measurement solution or a portable survey tool. Assisting in the building of an accurate network model, locating leaks to check the operation of installed, full-bore meters. The sensor can be installed in pipelines without the need for major excavations or alterations to pipework.



General specifications

Product	WaterMaster	AquaMaster	AquaProbe
Application	Water, waste water and sludge	Clean water	Clean water
Meter body style	Flanged	Flanged	1 in. BSP/1 in. NPT
Line sizes	10 to 2,400 mm (3/8 to 96 in.)	15 to 600 mm (1/2 to 24 in.)	200 to 8,000 mm (8 to 320 in.) nominal bore
Flow ranges	0...200,000 m³/h	0...7,875 m³/h	0...5 m/s (insertion size dependent)
Typical pressure loss	< 0 bar	< 0.63 bar	< 0.63 bar
Operating pressure	Nominal 16 bar	Nominal 16 bar	Nominal 16 bar, max. 20 bar
Accuracy	0.4% of rate standard or 0.2% optional	0.5% battery or 0.25% mains	± 2% of rate or ± 2 mm/s (± 0.08 in./s) whichever is the greater
Transmitter output	4...20 mA or 4...12/20 mA, galvanically isolated	Pulse output – 50 Hz maximum, 50% nominal duty cycle	Pulse output – 50 Hz maximum, 50% nominal duty cycle
Transmitter mounting	Remote/integral	Remote/integral	Remote
Agency approvals	OIML/MID/FM/ATEX/FMc/IECEx	OIML/MID	Drinking water (WRAS) approved
Digital communications	Profibus/HART/Modbus	SMS/GPRS	SMS/GPRS/Profibus/HART/Modbus
Power supply	Mains 85 to 265 V AC @ < 7 VA, DC 24 V ± 30% @ < 0.4 A	Battery/renewable/mains	Battery/renewable/mains
Wetted material	–	–	PEEK/stainless steel
Liner material	Elastomer/polypropylene/PTFE (size dependent)	Elastomer	PEEK
Electrode material	Stainless steel/Hastelloy C	Stainless steel	Stainless steel

Coriolis mass flow measurement

From accurate dosing of single drops to filling ocean-going tankers

CoriolisMaster flowmeters offer high precision and lowest pressure drop

They help you save on installation costs due to a compact design, and save on lifetime costs due to minimum pressure drop, no moving parts and no wear-out of wetted parts in most applications. Measure flow rate (mass and volume), density, temperature and concentration in one meter.

The solution

The FCB300 is a general purpose mass flow meter for all industries, ideal for high precision filling and for process or well monitoring under tough conditions. Its wide variety of connections and software options allow flexibility for various applications. The FCB100 version is made for system integration, offering full access Modbus communication and fast pulse/frequency outputs.





CoriolisMaster Hygienic flowmeter: mass flow measurement for hygienic applications

The CoriolisMaster Hygienic is a general purpose meter for hygienic applications where polished wetted materials are required: from high precision filling to process monitoring under tough conditions. Its certified cleanability enables safe use in all hygienic flow measurement applications.

The solution

The CoriolisMaster FCH300 is one of the most cost saving meters on the market with minimal installation space requirements and lifetime costs. Plus it is suitable for hygienic applications. The CoriolisMaster FCH100 series is ideal for system integration with a simple to use transmitter interface.



Coriolis mass flow measurement

From accurate dosing of single drops to filling ocean-going tankers

Coriolis FCM2000 is your flowmeter for many industries and applications

The Coriolis FCM2000 MS2 meter series features a bent single tube meter, designed for very low flow rates. It can measure single drops of liquid with high precision.

The Coriolis FCM2000 MC2 meter's unique S-shape tube and modular design makes it the ideal instrument for tough measurement requirements.

The solution

The MS2 series is a low flow meter for all industries and various applications. It is easy to install and offers unrivalled measurement performance. The MC2 series is a general purpose meter delivering excellent results under tough conditions such as fast changing fluids, proven in thousands of applications worldwide.



General specifications sensors

Product	FCBxxx	FCHxxx	FCM2000 MC2/MS2
Application	O&G, chemicals, marine, P&P, power, ...	F&B and pharma	All industries
Sensor design	Bent twin tube sensor	Bent twin tube sensor	MC2: double bent twin tube sensor MS2: bent single tube meter
Meter sizes	15...150 mm (1/2" ... 6")	25...80 mm (1" ... 3")	MC2: 20...150 mm (3/4" ... 6") MS2: 1.5...6 mm (1/16" ... 1/4")
Flow ranges	0...860 t/h	0...250 t/h	MC2: 0...600 t/h MS2: 0...1 t/h
Accuracy flow	FCBx30: 0.25% of measure value FCBx50: 0.1% of measured value	FCHx30: 0.25% of measure value FCHx50: 0.1% or measured value	MC2: 0.1% or measured value MS2: 0.15% or measured value
Accuracy density	FCBx30: 0.01 kg/m ³ FCBx50: up to 0.0005 kg/m ³	FCH330: 0.01 kg/m ³ FCH350: up to 0.0005 kg/m ³	MC2: 0.001 kg/m ³ MS2: 0.01 kg/m ³
Wetted material	Stainless steel or Ni-Alloy	Stainless steel or Ni-Alloy	Stainless steel or Ni-Alloy

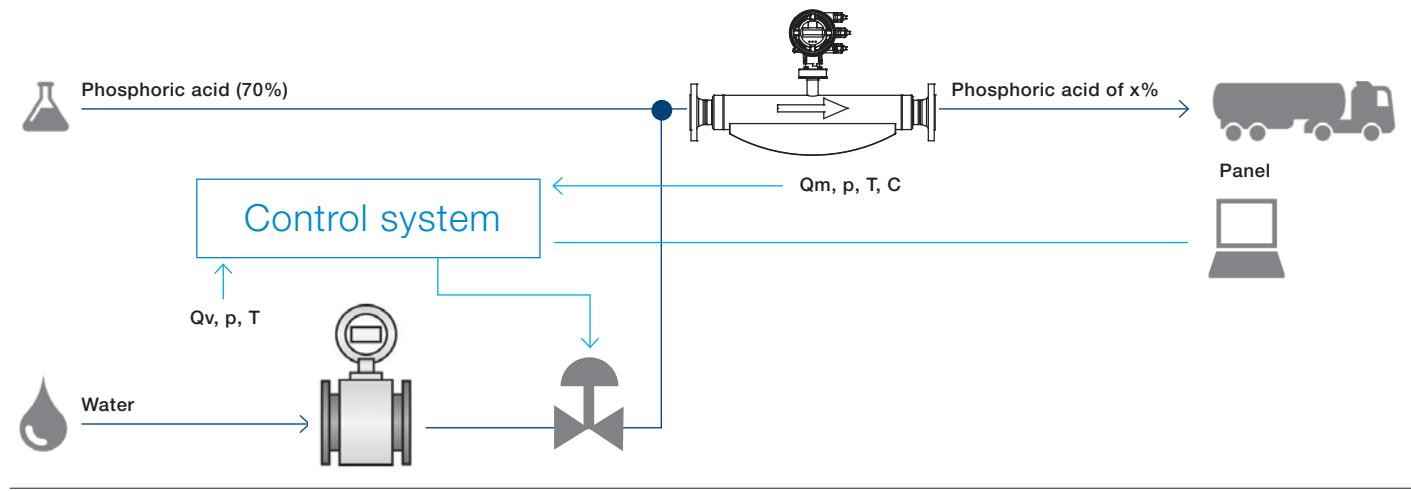
General specifications electronics

Product	FCx300	FCx100	FCM2000 ME2
Transmitter output	2 x mA, 1 pulse, 1 digital out, 1 digital in, HART	MODBUS RS485, 2 digital outputs (pulse, frequency, contact)	2 x mA, 1 pulse, 1 digital out, 1 digital in HART, Profibus PA, FF
Display	Yes	No	Yes
Power supply	110...240 V or 24 V	11...30 VDC	110...240 V or 24 V
Special features	Diagnostics DensiMass concentration measurement	Diagnostics, verification DensiMass concentration measurement FillMass batch software	Diagnostics DensiMass concentration measurement



Saving resources made easy – flowmeters in filling applications

Whether filling road tankers, containers or blending liquids – ABB flow measurement products help saving resources, for example in the chemical industry.



The solution

In the process of a chemical plant shown above, phosphoric acid in varying quantities and varying concentrations is produced. The operator selects two parameters: the quantity in kilos and the concentration of phosphoric acid. The control system then operates the blending and filling automatically, dosing water according to the concentration required.

In the past, the operator would have initially filled a calculated volume of highly concentrated acid into the tank and then added water to create the required concentration level. This lead to inaccuracies of the volume filling. Either trucks were not loaded to 100 percent of their capacity, or had to be reloaded after controlling the weight. Using Coriolis meters solves these issues.

The meters read the massflow directly with a filling accuracy of approximately 0.1% and supply a highly accurate density or concentration measurement as required, to provide a highly accurate online blending process of acid and water. An electromagnetic flowmeter may be used as a cross-reference. Using CoriolisMaster in this application, the filling time for each truck is reduced by 20 minutes. With approximately 3000 trucks being loaded per year, CoriolisMaster helps to accomplish great savings in both time and cost.

Differential pressure (DP) flowmeters

Simplifying complex measurements

Orifice plates and carriers for all applications

Orifice plates are available with different profiles for applications from clean to dirty fluids and from low to high viscosity liquids. They are usually supplied with a data tab welded to (or integral with) the circumference. Designs available include square edged, quarter circle, conical entrance, eccentric and segmental.

The solution

Orifice plates are an incredibly versatile flow metering technology and are used in a wide range of flow measurement applications, including:

- Clean liquids, gases and steam
- Fluids containing solids
- High viscosity fluids
- Fluids at low flowrates
- Flow monitoring
- Gas and utility flows to combustion plants
- Steam consumption
- Pilot plants



Compact DP flowmeters for improved reliability and economic installation

Improved reliability and economy are achieved by reducing or eliminating the impulse piping between transmitter and restriction element. The complete flowmeter is comprised of the primary element, manifold and transmitter – in a one-piece assembly, leak tested and ready to use.

The solution

Compact DP flowmeters are used for flow monitoring and flow control loops, measuring liquids, gases and steam in small to medium sized pipelines or ductwork, with averaging pitot model. Integral DP and multivariable transmitters are available and sizing/configuration is facilitated by ABB's CompactMaster software.





Wedge meters: extremely robust flowmeters for difficult applications

Wedge meters are bi-directional and are particularly suitable for fluids which have a high solids content, are erosive/abrasive or have a high viscosity.

The solution

The V shaped restriction element design allows solids to pass through the restriction without accumulating. The meter characteristic remains constant down to very low Reynolds Numbers, making it suitable for high-viscosity liquids. Flanged or chemical tee remote seal versions offer use of large sensing surfaces to improve performance in otherwise difficult applications.



General specifications

Product	Orifice	Compact DP	Wedge meters
Application	Liquids, gases and steam in circular pipes	—	Flow measurement
Function	Flow measurement, flow restriction, pressure reduction	Flow measurement	Flow measurement
Mounting	To fit between RF, FF or RTJ flanges	To fit between RF, FF or RTJ flanges	To fit between RF, FF or RTJ flanges
Line sizes	Typically 25 to 1200 mm (1 to 48 in.) nominal bore	15 to 600 mm (1/2 to 24 in.) depending on meter type	15 to 600 mm (1/2 to 24 in.) and above
Typical pressure loss	35 to 95% of generated DP	1 to 95% of generated DP	20 to 60% of generated DP
Typical accuracy	± 0.5% of rate (based on uncertainty of coefficient)	± 1.5 to 2% of rate	± 0.5% of rate when calibrated
Operating pressure	As flange rating	Up to 100 bar g (1450 lbf/in 2 g)	As flange rating [chemical tee models are limited to 20.6 bar (300 lbf/in 2 g)]
Operating temperature	538 °C (1000 °F) for 316 SS, higher temperatures possible for other materials	Liquids and gases: 121 °C (250 °F) Saturated steam: 230 °C (446 °F)	538 °C (1000 °F) for 316 SS, higher temperatures possible for other materials
Element types	Concentric, eccentric, conical entrance, quarter circle, segmental	Concentric Orifice, Integral Orifice, Averaging Pitot, Wedge	Wedge
Design standards	ISO5167, R W Miller, AGA-3	ISO5167	ABB proprietary device
Plate thickness	Typically 1 to 25 mm (0.04 to 1 in.) dep. on function and design standard	—	—
Wetted material	316/316L, CrNi steel (other steels, alloy steels & specialist alloys available)	316L	Carbon steel, 316/316L, CrNi steel, (other steels, alloy steels & specialist alloys available)
Transmitter output	4...20 mA or Digital	4...20 mA or digital	4...20 mA or digital
Transmitter mounting	Optional – remote	Integral – direct on element	Optional – remote or integral
Digital communications	Hart, Profibus, FF and Modbus	HART, Profibus, FF and Modbus	Hart, Profibus, FF and Modbus
Tapping options	To suit corner or flange taps	Varies with device	Pipe taps, remote seals (flanged branches or chemical tees)
Body material Wedge element material	—	—	Carbon steel, 316/316L stainless steel (other steels, alloy steels & specialist alloys available)

Differential pressure flowmeters

Simplifying complex measurements

Torbar averaging pitot tubes: the multiport self-averaging flow meter

Torbars are suitable for flow measurement of gases, liquids and steam. Some of the many typical applications include water, natural gas, flue gas, nitrogen, combustion gases, ventilation air, sea water, cooling water, crude oil, saturated and superheated steam.

The solution

The Torbar design is based on the classical pitot tube concept of fluid flow measurement. Since its design and launch, thousands of Torbar flowmeters have been installed. The withdrawable versions can be easily retracted from the pipeline even under flowing pressure.



Venturi tubes for low pressure loss and high accuracy

Metering liquids, gases and steam in oil and gas, chemical, power and general industry, venturi tubes offer significantly lower permanent pressure losses leading to reduced pumping/compression costs.

The solution

The Venturi tube is a robust device, designed for use where low pressure-loss is required.

- Reduce energy costs by typically 20 to 25%
- Reduce greenhouse gas emissions
- Can be designed for elevated pressures and/or temperatures
- Full data dossiers available covering manufacture, materials and testing
- Flow calibration available for enhanced performance





Flow nozzles for high velocity flow measurement

The flow nozzle offers excellent long-term accuracy with less wear and reduced possibility of distortion as it does not rely on a sharp edge (which can degrade over time) for maintaining its accuracy. It therefore measures higher flow rates than an equivalent orifice plate at the same differential pressure.

The solution

Nozzles are primarily used where their high velocity and erosion-resistant characteristics are required. These include power industry applications including metering of boiler feed water and superheated steam, including verifying the performance of turbine generator sets in accordance with design code ASME PTC-6.



General specifications

Product	Torbar	Venturi tubes	Flow nozzles
Application	Liquids, gases and steam in circular or rectangular conduits	Liquids, gases and steam in circular pipes	Clean and contaminated liquids, gases and steam in circular pipes
Mounting	Insertion via threaded or flanged tapping, direct in line (for small line sizes)	Flanged or welded-in	Flanged or welded-in
Line sizes	15 to 8000 mm (1/2 to 315 in.)	50 to 1200 mm (2 to 48 in.)	50 to 630 mm (2 to 25 in.) 60 to 600 mm (2 to 24 in.)
Typical pressure loss	< 0.1 bar	5 to 20% of generated DP	35 to 95% of generated DP
Operating pressure	Up to ASME class 2500 flange rating	As flange rating	As flange/pipe rating
Operating temperature	Typically up to 1200 °C, depending on fittings and materials	538 °C (1000 °F) for 316 SS, higher temperatures possible for other materials	
Typical accuracy	± 0.75 to 1% of rate (based on uncertainty of coefficient)	± 0.8 to 1% of rate (based on uncertainty of coefficient)	
Probe diameters	12, 25 or 60 mm (0.5, 1 or 2.36 in.) diameter probes, opt. with end supports	N/A	N/A
Wetted material	316/316L CrNi steel (other steels, alloy steels and specialist alloys available)		
Versions and Design standards	In-line, fixed insertion, withdrawable	Classical, long pattern	Long radius, ISA1932, ASME PTC-6

Differential pressure flowmeters

Simplifying complex measurements

StackFlowMaster for stack emission control

StackFlowMaster offers stack gas flow metering solutions that, when combined with a CEMS analyzer, form a complete CEMS package for the measurement of the mass flowrate of pollutants into the environment. It is based on the Torbar multi-port self-averaging pitot flow meter and offers ultra-low pressure loss coupled with options of auto zero / span and purging.

The solution

- New stack gas installations
- Add flow measurement to existing stack gas installations that lack flow metering, either to meet the legislation or for process information.
- Maintenance/repair/overhaul of existing stack gas installations, replacing the old flow meters to bring the installation up to the standards required by current legislation.



General specifications

Product	StackFlowMaster
Application	Combustion exhaust gas metering in circular or rectangular stacks
Mounting	Full- or partial-insertion across stack via flanged branches
Stack diameters	1 to 8 meters (1.1 to 26.25 ft)
Typical pressure loss	< 0.1 bar
Operating pressure	As mounting flange rating (but typically these are low pressure systems)
Operating temperature	Maximum 1200 °C (2192 °F) depending on probe material
Typical accuracy	± 2% typically
Probe types	25 or 60 mm (1 or 2.36 in.) diameter probes, optionally with end supports
Probe material	316L and 321H stainless steel or UNS N06625 alloy
Mounting	Insertion via flanged branch with optional end support
Variants	Probe and tx only, optionally with MCERTS interface, meter purging or automatic zero/span checking
Transmitter output	4...20 mA
Transmitter mounting	Remote, direct on probe or within enclosure
Agency approvals	MCERTS/TUV to EN 14181 and EN 15267-3
Digital communications	HART or Modbus

Multiphase flowmeters

The radioactive-free solution

VIS Multiphase flowmeter for produced oil, gas and water

ABB VIS (VEGA Isokinetic Sampling) multiphase flowmeter is the ideal solution for flowmetering in upstream applications close to the wellhead. Based on a unique and patented technology, VIS provides the same accuracy of conventional test separators with no time delay and a much lower investment cost in a product sized radioactive-free device.

The solution

- Unique and patented technology
- Based on conventional instrumentation only (easy to commission and maintain)
- Radioactive-free, no gamma source involved
- Portable solution in a skid-mounted configuration for well-testing applications
- Tailored for gas storage applications
- Customizable according to specific requirements in terms of size, material and rating



General specifications

Product	VIS Multiphase
Operating envelope	80-100% gas volume fraction
Accuracy for liquid flow rate	± 3% of reading
Accuracy for gas flow rate	± 3% of reading
Accuracy for water flow rate	± 5% of reading
Gas turndown	6:1 standard, 30:1 and 100:1 with special engineered solutions
Liquid turndown	Unlimited
Process connections	ANSI, API, UNI or according to project specifications
Nominal diameter	DN 50 (2")...DN 300 (12"), larger sizes available on customer request
Material	Carbon steel, duplex steel or according to customer specification or process requirements
Design pressure	100 bar (1450 psi) and 230 bar (3300 psi) in standard configurations, Special configurations available according to process requirements
Process temperature	-40 °C (- 40 °F)...300 °C (572 °F)
Ex approvals	ATEX CE Ex II 1 G Ex, US Class1 division1&2, IEC zones 1&2 Exd, other approvals can be provided on request
Communication	Analog (4...20 mA), Modbus (Ethernet or serial), other standards available on request
Pressure drop	0.3...1 bar
Size and weight	Footprint 0.5 x 0.8 mt, height 1.2 mt, 390 kg (for 4" ANSI 1500)
Flow direction	Vertical downward
Output signals	Gas, liquid and water flowrates, liquid and water density, pressure and temperature

Vortex and swirl flow measurement

Precise and cost effective

SwirlMaster – the flowmeter with a twist – uniquely available at ABB

The SwirlMaster FSS430/450 combines excellent measuring performance and enhanced flow calculation capability with flexibility in installation, due to low required inlet and outlet sections. Save 75% straight pipe run by employing SwirlMaster instead of traditional vortex meters, turbines or orifice plates.

The solution

SwirlMaster is used in almost every industry. In particular in chemical or petrochemical, oil and gas applications or power generation, especially in steam applications and energy measurement. SwirlMaster helps to reduce measurement uncertainty by 50% or more and offers significantly lower pressure loss compared to vortex meters with reduced bore.



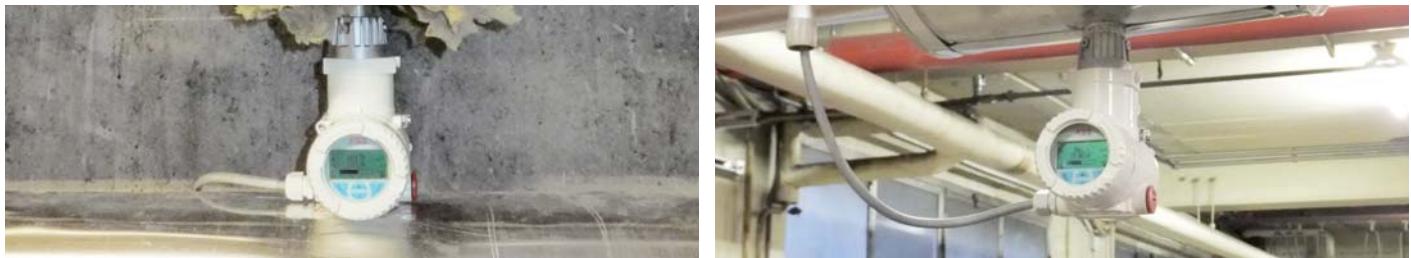
VortexMaster – accurate measurement of non-conductive fluids

It offers simplicity in installation and operation, excellent measuring performance and enhanced flow calculation capability. The VortexMaster FSV430/450 provides accurate and reliable flow measurement data and is able to compensate for vibrations as well as pressure and temperature effects.

The solution

Whether chemical or petrochemical, oil and gas industry or power generation, vortex flowmeters are used in almost every industry. The integral flow computer function allows direct mass and energy measurement with one device especially for steam applications and energy measurement.





Vortex/Swirl measurement for extremely dynamic flow measurement with high accuracy

- Simple, compact in-line installation
- The integral flow computer function in combination with the connectivity of remote sensors for pressure, temperature or density allows direct mass and energy measurement with one device
- Internal temperature compensation saves investment and installation effort
- Increased plant availability, no moving parts, no wear, no maintenance



General specifications

Product	SwirlMaster	VortexMaster
Application	Liquid, gas and steam flow measurement directly in volume, mass or energy units	
Meter body style	Flanged design	Flanged or wafer design
Line sizes	Flange: 15 to 400 mm (½ to 16 in.)	Flange: 15 to 300 mm (½ to 12 in.) Wafer: 25 to 150 mm (1 to 6 in.)
Flow ranges	Liquids: 0.5...2500 m³/h Gases/steam: 3.7...21500 m³/h	Liquids: 1...2600 m³/h Gases/steam: 7...23500 m³/h
Flow turndown	Typically 1:30, depending on application	Typically 1:20, depending on application
Operating pressure	Up to PN160/900 lb	Up to PN160/900 lb
Accuracy	0.5%	0.65% for liquids, 0.90% for gases and steam
Transmitter output	Pulse output, contact output and frequency output	Pulse output, contact output and frequency output
Transmitter mounting	Remote/integral	Remote/integral
Agency approvals	IECEx, ATEX, FM, NEPSI	IECEx, ATEX, FM, NEPSI
Digital communications	HART and analog (4...20 mA)	HART and analog (4...20 mA)
Power supply	12...42 V (DC)	12...42 V (DC)
Wetted material	Stainless steel, optionally Hastelloy C, Duplex	Stainless steel, optionally Hastelloy C, Duplex

Thermal mass flow measurement

Consistent mass measurement of gases

Sensyflow FMT400-VTS/FMT500-IG – intelligent and versatile

Sensyflow direct gas mass flowmeters operate within the widest flowrange. Highly accurate, even at low pressure and/or low flow rates, they improve process quality and provide easy installation and commissioning, low maintenance costs and short response times.

The solution

Direct gas mass flowmetering solutions succeed in a variety of industries and are essential at key stages across the process industry, where direct mass flow measurement combined with high accuracy, short response times, reliability and easy installation is required. Sensyflow saves you up to 30% set up time and 10% in gas consumption.



Sensyflow FMT200-ECO2 – compact, dynamic and universal

Sensyflow FMT200-ECO2 is used for pneumatics, paint robot control, compressed air systems, gas dosing and burner control. It features compact and arbitrary mounting. Its highly modular process connections allow a universal machine integration and test set up.

The solution

The Sensyflow FMT200-ECO2 is a compact, dynamic and universal meter. It is easy to integrate in OEM solutions or other stationary dosing equipment. The fast response time of less than 25 milliseconds, its low weight and a great variety of process adapters allow for flexible integration. User-friendly system integration into customer-specific machines and the individual control loops are very easy to realize.





Sensyflow FMT700-P – highly dynamic and precise

It combines perfect precision, sensitivity and fast response time with user friendly intuitive system handling. The Sensyflow FMT700-P is the reference system for engine test benches, quality control and development applications worldwide.

The solution

At motor test benches it monitors the intake air measurement as a very important measure for the burning process of piston engines. Other applications include emission tests, quality control of flow components and homologation tests.



General specifications

Product	Sensyflow FMT400-VTS/FMT500-IG	Sensyflow FMT200-ECO2	Sensyflow FMT700-P
Application	All technical gases	Pneumatic, compressed air, gas dosing, OEM	Engine test benches, reference class air mass flowmeter
Meter body style	Flanged, insertial w/o pipe	Highly modular process connections	Flanged, compact quick fit setup
Line sizes	25...3000 mm (1"...120")	8...25 mm (0,31...1 in.)	DN 25...DN 200 mm (1..."..8")
Flow ranges	Gases, 0...3,000,000 kg/h / 0...6,600,000 lb/h, e.g. for atmospheric air, N2, all common norm/standard-volume flow units	0...100 kg/h / (0...220 lb/h), e.g. for atmospheric air, N2, all common norm/standard-volume flow units	0...4000 kg/h / 0...1000 g/s, air
Flow turndown	Up to 1:150	Up to 1:100	Up to 1:40
Typical pressure loss	Very low / < 10 mbar / < 0,145 psi	Low / < 100 mbar / < 10 kPa / < 1,45 psi	Very low / < 20 mbar / < 0,290 psi
Operating pressure	Up to nom. 40 bar/40*10 ⁵ Pa/580psi	10 (16) bar/10 (16)*10 ⁵ Pa/145(232)psi	0,6...2,5 bar abs./60...250 kPa/8.7...36 psi
Accuracy	0.9% (1.85%) o.R./gas & setup dep.	< 3% o.rdg	< 1% o.rdg.
Transmitter output	4 (0)...20 mA/HART	0...5 V, 0...10 V, 4 (0)...20 mA	0...10 V, 4 (0)...20 mA
Agency approvals	ATEX zone 0,1 & 2, FM Cl1 Div1/2	ATEX zone 2 and 22	-
Transmitter mounting	Remote/integral	Integral	Remote
Digital communications	HART, Profibus DPV1, Totalizer	Totalizer pulse or frequency, adjustable	RS232
Power supply	110...230 V AC, 24 V AC/DC	24 V DC ±10%	110...230 V AC
Wetted material	Stainless steel, ceramic sensor	Aluminium body/connections, glass sensor	Aluminium body, glass sensor
Others	Hygienic version: FMT400-VTCS	Test kit available	Pefect quick fit pipe setup
Response time	< 500 ms	< 25 ms	Extremely fast, typ. ~ 12 ms

Variable area flow measurement

Low cost measurement for gases, liquids and steam

PurgeMaster for optimum flexibility with a minimum number of components

PurgeMaster A6100 flowmeters are low capacity variable area flowmeters for both liquid and gas with an excellent selection of material and scale lengths in a single product family design. They feature a corrosion resistant, high strength stainless steel body, quick, easy snap-in tube construction and a safety tested operator protection shield.

The solution

PurgeMasters are ideal for applications such as the purging of control lines and instrument enclosures. Their use is easily extended into fluid sampling, liquid specific gravity, level measurement and similar services.



FGM1190 flowmeter for a high degree of reproducibility

The wide variety of float weights and meter tubes allows the glass tube flowmeter FGM1190 to be matched exactly to the required flow range. The three ribs, parallel to the center axis of the meter tube, guide the float over the entire flow range. This enables a high degree of reproducibility because the float is absolutely centered in the meter tube.

The solution

Designed for flowrate measurements in many industries including system manufacture, food, water treatment plants and chemical. Aggressive fluid applications are possible because the fluid wetted parts can be made from a wide variety of different materials.





10A2235 RatoSight: stable and reliable

The RatoSight is a rugged, low cost glass tube meter providing stable and reliable operation. Its materials selection and outstanding installation flexibility make it the solution for visual indication of moderate viscosity liquids. It can be suited with fully adjustable, vibration-proof magnetic switches and relays.

The solution

Suitable for automatic shutdown of heavy equipment with forced lubrication control, extremely resilient on marine uses, desalination RO systems and high corrosion exposure environments.



General specifications

Product	PurgeMaster A6100	FGM1190	10A2235
Application	Clean, low viscosity liquids and gases	Clean, low viscosity liquids and gases	Clean liquids and gases
Mounting	Vertically, in line, wall/surface or back of panel	Vertically, in line	Vertically, in line
Connections	1/4 in. NPT or BSPP female, vertical or horizontal	1/4 to 2 in. threaded, DN10 to DN50 flanged, SC15 to SC50 hygienic (DIN11851), vertical	1/2 to 2 in. threaded NPTI – horizontal/vertical
Seals	Buna N, Viton®, EPR, Kalrez™	BUNA N, Viton®, EPDM	BUNA N, Viton®
Flow range	Full scale water flows from 0.53...2200 cm³/min	Water flows from 0.002...17600 l/h	Water flows: up to 50 gpm Air: up to 110 SCFM
Flow turndown	Typically 10:1	Typically 10:1	Typically 10:1
Operating pressure	Up to 18 bar (261 lbf/in 2 g)	Up to 18 bar (261 lbf/in 2 g)	Up to 12 bar-g (175 PSIG or lbf/in 2 g)
Operating temperature	Up to 120 °C (248 °F)	Up to 180 °C (356 °F)	Up to 121 °C (250 °F)
Nominal scale lengths	38, 76, 125 or 250 mm (1½, 3, 5 & 10 in.)	100, 130 or 250 mm (4, 5 and 10 in.)	–
Accuracy	Class 1.6 to class 10, depending on tube diameter and scale length	Class 1.6 to Class 6, depending on tube diameter and float type	Standard 2-10% Calibrated 3-5%, size dependent
Flow control: - Alarms - Regulation	Proximity sensors, up to 2 off SS needle valve option, brass or SS flow regulator option	Inert gas switches, up to 2 off –	Reed Switch – min/max/both –
Tube/end con. materials	Glass/brass, 316SST or KYNAR™	Stainless steel, PVC or PVDF	Glass/brass
Float materials	Glass, Sapphire, Carboloy, Tantalum and Stainless steel	St. steel, Glass, Sapphire, Carboloy, PVC, Tantalum, Hastelloy™, Aluminium, PTFE	Brass: Liquids, Aluminum: Gases
Chassis	Stainless steel	Stainless steel	Bronze

Variable area flow measurement

Low cost measurement for gases, liquids and steam

VA Master 10A4500 – the one for all solution

The VA Master is one of the highest quality and versatile variable area flowmeters on the market and is proven over a long history. Fully retrofittable with several float and tube designs for practically any clean liquid or gas process. Its wide view angle visibility, highly stable stainless steel frame and alarming capabilities make the VA Master the one for all solution.

The solution

The 10A4500 is suitable for gas and liquid applications. Beneficial for processes with low to no pipe run availability and low pressure loss limitations. It is particularly useful for aggressive and corrosive liquid measurement with the use of PTFE float and PVC fitting options.



FAM3200 flowmeter for small gas and liquid flows

The FAM3200 is an armored purgemeter designed to meter small gas and liquid flows. This meter is especially suited for applications with cloudy, opaque or aggressive fluids in chemical and pharmaceutical industries, gas analyzers, process systems, well systems and wherever glass metering tubes cannot be used for safety reasons.

The solution

- Water purification
- Gas sampling systems, nitrogen generators
- Burner control
- Chemical injection
- Food and beverage applications





FAM540 flowmeter – first choice for oil rigs and chemical plants

Provided with a digital display, the all-metal variable area flowmeter is ideal for tough industrial flow measurement of liquids, steam and gases. It is resistant against salt spray and other external influences, reliable and precise.

The solution

Proven in many applications even under hardest conditions
FAM540 flowmeter is suited where high pressure and/or high temperature operating conditions exist.

- Deionization, water purification, waste water treatment
- Gas sampling systems, nitrogen generators
- Power utility applications, cooling water, burner control
- Corrosive liquids, chemical injection
- Food and beverage applications



General specifications

Product	VA Master 10A4500	FAM3200	FAM540
Application	Clean, low viscosity liquids and gases	Clean, low viscosity liquids and gases	Clean liquids, gases and steam
Mounting	Vertically, in line	Vertically, in line or wall-mounted	Vertically, in line
Connections	½ to 2 in. threaded NPT/flanged CL150 – horizontal/vertical	¼ in. to 1 in. threaded, vertical or horizontal	½ in. to 4 in., flanged, hygienic (DIN, SMS), vertical
Flow ranges	Water flows: 0.2...90 GPM Air: 1...160 SCFM	Water flows: 1...3000 l/h	Water flows: 0.028...120 m³/h
Flow turndown	Typically 10:1	Typically 10:1	Typically 10:1
Operating pressure	Up to 18 bar (261 lbf/in 2 g)	Up to 100 bar (1450 lbf/in 2 g)	Up to 100 bar (1450 lbf/in 2 g)
Operating temperature	Up to 121 °C (250 °F)	Up to 180 °C (356 °F)	Up to 400 °C (752 °F)
Nominal scale lengths	Standard: 250 mm (10 in)	–	–
Accuracy	Standard: 2%, Calibrated: 1 % full scale	Class 6	Class 1.6 (Class 2.5: PTFE lined tube opt.)
Repeatability	0.5% full scale	–	–
Flow control: - Alarms - Regulation	Inert gas switches, up to 2 off –	Slot sensors, up to 2 off SS needle valve option, brass or SS flow regulator option	Slot sensors, up to 2 off –
Alarm amplifier power	24 DC, 110 VAC, 230 VAC	24 VDC, 110 VAC, 230 VAC	24 VDC, 110 VAC, 230 VAC
Transmitter option	–	4...20 mA, 2-wire	4...20 mA, 2-wire
Tube/end con. materials	Stainless steel, PVC	–	–
Tube material	Borosilicate glass	Stainless steel	Stainless steel, optional PTFE lined
Float material	Stainless steel, HastelloyTM, PVC, PTFE	Stainless steel	St. steel, opt. PTFE lined/float damping
Chassis	Stainless steel	–	–

Flow computers

Spirit IT Flow-X Series

Flow-X flow computers offer the most advanced measurement technology, combined with powerful and flexible computation and communication capabilities.

Flow-X calculates and controls liquid and gas flows, according to the highest measurement standards. The core element is the Flow-X module that can be combined in various enclosures for single or multi-stream solutions. Each module offers real-time digital and analog signal processing, and advanced control features, such as: Proving, sampling, batching, valve control and PID logic.

The solution

- Flexible, compact and modular design to suit any gas or liquid application
- Compatible with most flow meters, transmitters and other field equipment
- Speed and power: Modern hardware to ensure the highest accuracy (0.002% at 20 °C) and to enable advanced software features
- High level of security and traceability: personal user-login with historical log of user activity
- User-friendly touch-screen
- Remote access through web server interface



General specifications per Flow-X/M module

Input	Analog inputs (4...20 mA) 4-wire PRT inputs HART loop inputs Pulse inputs (up to 1 MHz) Density inputs (100 µs - 5000 µs) Digital inputs Sphere detector inputs	6 2 4 1 4 16 4	Total number of analog inputs + HART inputs = 6 Total number of digital inputs + digital outputs + pulse outputs + density inputs + sphere detector inputs = 16
Output	Digital outputs Pulse outputs (max. 10Hz) Analog outputs (4...20 mA) Prover bus outputs (1MHz) Frequency outputs (max 10 KHz)	16 4 4 2 4	
Interfaces	RS485/RS232 RJ45	2 2	
Power supply	24 V DC - 32 V DC, normal 24 V DC		
Processors	32-bit microprocessor with math coprocessor and FP GA		
Memory	1 GB on-board memory for time-stamped data, report archive and audit trail		

General specifications per Flow-X enclosure

Flow-X/P	max. 4 Flow-X/M modules	approx. max. 14 kg	354.8 x 482 x 135 mm (h x w x d)	13.9 x 18.98 x 5.31 inch (h x w x d)
Flow-X/R	max. 8 Flow-X/M modules	approx. max. 7kg	237.5 x 139 x 294 mm	9.3 x 5.5 x 11.6 inch
Flow-X/C	1 Flow-X/M module	approx. max. 3kg	237.5 x 139 x 145 mm	9.3 x 5.5 x 5.7 inch
Flow-X/S	1 Flow-X/M module	approx. max. 2.5kg	250 x 142 x 164.1 mm	9.8 x 5.6 x 6.46 inch

Flow computers

Spirit IT eXLerate supervisory software

eXLerate is a software platform developed specifically for flow metering supervisory systems within the oil and gas industry. With eXLerate we make flow measurement systems better, smarter and more accurate.

eXLerate provides an automation solution for many oil and gas applications: Local or corporate flow measurement systems, crude gathering, meter calibration facilities, truck or ship loading and tank terminal automation. eXLerate offers comprehensive HMI tools to control and manage measurement data. In the critical process of oil and gas custody transfer, reliability is essential. eXLerate offers fully synchronized and integrated redundancy, guaranteeing a consistent environment.

The solution

- Accurate and flexible communication with field equipment
- Searchable measurement and audit historical data
- Sophisticated and flexible oil and gas production reports
- Extensive set of flow and fluid property calculations
- Embedded Virtual Flow Computing (VFC) functionality
- Integrated instrument validation & calibration functionality



Flow computers

Totalflow

Flow computers and RTUs for accurate and reliable flow measurement and automation of natural gas.

All ABB flow computers and RTUs comply with API, AGA, and ISO standards for custody-transfer electronic measurement devices and for flow rate, volume and energy calculations. In addition, all calculations are performed once per second and historical flow volumes and data logs can be stored for more than 40 days.

The solution

- Automate and control right from the office
- Measure in compliance with AGA/API standards
- Cost savings and increased revenues
- Multi-tube capabilities for control of large sites
- Explosion-proof, cast aluminum models available



General specifications

Flow computers	Enclosure type/size	Approximate weight (without battery)	Maximum input/output modules	Maximum battery capacity	Supports automation applications	Integrated multivariable transducer
Differential flow computers						
XFC ^{G4} 6410	Small enclosure	13.5 lbs	0	26AH	•	•
XFC ^{G4} 6413	Medium enclosure	15 lbs	3	26AH	•	•
XFC ^{G4} 6713	Large enclosure	29 lbs	6	52AH	•	•
μFLO ^{G4} 6213	Medium enclosure	15.1 lbs	4-Point I/O opt. expansion card	26AH		•
XFC ^{G4} 6200	EX explosion-proof enclosure	16.5 lbs	12-Point I/O opt. expansion card	Internal battery not supported	•	•
Linear flow computers						
XFC ^{G4} 6411	Small enclosure	11.5 lbs	0	26AH	•	•
XFC ^{G4} 6414	Medium enclosure	12 lbs	3	26AH	•	•
XFC ^{G4} 6714	Large enclosure	27 lbs	6	52AH	•	•
μFLO ^{G4} 6213	Medium enclosure	15.1 lbs	4-Point I/O Opt. expansion Card	26AH		•
XFCG4 6201	EX explosion-proof enclosure	16.5 lbs	12-Point I/O Opt. expansion card	Internal battery not supported	•	•
RTUs						
XRC ^{G4} 6490	Small enclosure	15 lbs	3	26AH	•	
XRC ^{G4} 6790	Medium enclosure	29 lbs	6	52AH	•	
XRC ^{G4} 6890	Large enclosure	45 lbs	14	140AH	•	
XRC ^{G4} 6895*	X-Large enclosure	60 lbs	22	Internal battery not supported	•	
XRC ^{G4} 6990	Panel mount	12 lbs	6 per board (max. 2 boards)	26/30AH	•	

*XRCG4 6895 also has 20 fused power terminals (DIN rail mounted) and 259 mini terminal connections (mini DIN rail mounted).

Flow computers

Universal measuring computer FCU

FCU200 and FCU400 for various signal processing applications

The FCU is a universal measurement computer that combines the very latest communication methods with many years of expertise in the field of measurement technology. Reliable microelectronics, developed in line with standards DIN EN ISO 1434-1...6 and OIML75. The physical "density" and "enthalpy" values of steam and water are calculated in accordance with the latest version of industry standard IAPWS-IF 97.

The solution

- FCU200-W: Heat quantity, cold quantity computer for water and brine
- FCU400-S: Steam, saturated steam computer (flow, heat)
- FCU400-G: Gas flow computer, gas translator
- FCU200-T: 2-channel current-pulse converter
- FCU400-P: Signal combination, highly-precise ΔT measurement, totalizing, leakage measurement, boiler water-level measurement, etc.
- FCU400-IR: Contactless temperature monitoring



General specifications

Product	Universal measuring computer FCU200/400
Application	Heating-, cooling-, steam-, gas-calculation, temperature monitoring
Calculation	Of density/enthalpy for water/steam with industry standard IAPWS-IF 97
Input	4...20 mA inputs and 2-wire transmitter supply, precision inputs for 4-wire Pt100 Pulse/frequency input (0...10 kHz)
Output	Active mA-outputs/passive pulse outputs
Display	Three-line display with background lighting
Basic board	Electrically isolated I/Os, infrared interface
Communication	M-BUS, MODBUS, PROFIBUS communication (converter)
Degree of protection	IP 65, IP 40 (only in the case of FC400-IR)
Power supply	24 V DC, 24 V AC, 110 V AC, 230 V AC
Calibration error	< 0.2% of end value
Accuracy	Accuracy class of calculator EN 1434-1, OIML 75 class 2
Certification	PTB (Germany) EN1434 for custody transfer by Water, GOST approval
Mounting	DIN rail mounting or wall mounting 144 mm x 72 mm x 183 mm, panel mounting 144 mm x 72 mm x 117 mm

Control systems

Scalable systems for the entire plant

A reliable, cost effective and easy to use process automation system is one of the most important success factors for a production facility.

ABB delivers the right level of control and safety solutions for all kinds of process and power automation needs with the best lifecycle support to protect client investment and maximize the return on asset investments already made.

Our offering consists of

- System 800xA – the automation flagship for control and monitoring, instrumentation, electrical integration, safety and maintenance for process industries
- Freelance – the easy-to-use distributed control system for process applications
- Compact Product Suite – process control components for PLC/SCADA automation solutions
- Safety Systems – complete TÜV certified safety system that complies with IEC 61508 and IEC 61511 standards
- Totalflow products include pre-programmed and/or user-designed software applications that allow remote reporting, automation, and control of oil and gas custody transfer. AGA calculations are included

These automation solutions are available all over the world via ABB's offices and selected authorized value providers.

ABB's automation solutions integrate the intelligence embedded in today's field devices into the control system, thus making it available for plant and business processes. The result streamlines work to achieve lower deployment costs, better process and product quality, and improved availability. These industrial automation solutions provide you with the technology needed to achieve a sustainable competitive advantage in today's challenging business environment. They lay the foundations for continuous improvement in life cycle and operations, providing a new dimension in information flow and resulting in time savings, better engineering and a real increase in productivity.



As the world's largest supplier of process control systems, ABB's automation systems give you the best platform to optimize your plant and safely operate your industrial processes.



Services for flow measurement products

Performance optimization solutions



Dedicated to optimizing your plant productivity and performance, ABB's services enable improved utilization and performance of your equipment, processes, and personnel. ABB's service specialists are strategically located to support all products and systems globally. ABB's broad scope of services lays the foundation for end-to-end support for your enterprise.

Flow calibration and verification services

- Utilizing ABB's strategically located flow calibration facilities
ABB offer calibration services for all ABB products and third party products including control valves
- To check the performance of products installed in the field ABB offer a range of services from flow profiling and site surveying to in-situ calibration using invasive or non-invasive flow measurement techniques.
- ABB service provide verification services using a suite of verification tools and experience to ensure your product continues performing

Full list of ABB's performance optimization services

- Consulting
- Installation and commissioning
- Maintenance and field services
- Asset management systems
- Fieldbus and wireless solutions
- Project execution
- Migration and upgrades

- Repairs and calibration
- Spare parts and consumables
- Support, remote service, and training
- Maintenance support agreements
- In the field meter verification
- Meter recalibration



Life-cycle services

- ABB service specialists are available to assess the condition of your equipment. Providing advice on the optimum time for replacement, or extending the life of your asset by upgrading, refurbishing or recalibrating
- To ensure products always operate correctly ABB service specialists can take care of installation and commissioning and provide annual maintenance and verification services
- To allow a company's maintenance personnel to respond to all situations now and in the future, ABB provide suitable training options.
- If a problem does occur ABB can provide spare parts, ensuring the right spare part is delivered and fitted quickly and within the agreed timeframe

ABB service – value added services for bottom-line results.

Contact us

To find your local ABB contact visit:
www.abb.com/contacts

For more product information visit:
www.abb.com/flow



Note:

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ProcessMaster FEP300 Electromagnetic flowmeter

The process industry's first choice

Measurement made easy



One solution for all your needs

- The versatile product tailored to meet all your process applications

Versatile and simple configuration

- Through glass configuration eliminating the need to remove the cover and reducing commissioning time
- Soft key based functionality
- “Easy Set-up” function

State-of-the-art memory technology

- Revolutionary data storage enables transmitter interchange without the need for reconfiguration

ScanMaster in situ verification software option

- Allows the customer to perform in situ verification of the flowmeter and plant

Advanced diagnostics for real-life situations

- Simplified plant trouble shooting increases productivity and process safety
- Status messages in accordance with NAMUR
- Help texts in the display

Unparalleled service ability

- Fault finding help texts in the display
- Minimized down time with replaceable electronics cartridge
- Universal transmitter reduces spare parts inventory costs and storage costs

Approvals for explosion protection

- In accordance with ATEX, IECEx, FM, cFM, NEPSI and GOST

HART, PROFIBUS PA, FOUNDATION fieldbus

- Access to all status information

The Company

ABB is an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications. As a world leader in process automation technology our worldwide presence, comprehensive service and application oriented know-how make ABB a leading supplier of flow measurement products.

Introduction

Setting the standard for the process industry

ProcessMaster is designed specifically to meet the increased requirements on advanced flowmeters. The modular design concept offers flexibility, cost-saving operation and reliability whilst providing a long service life and exceptionally low maintenance.

Integration into ABB asset management systems and usage of the selfmonitoring and diagnostic functions increase the plant availability and reduce downtimes.

ScanMaster - the diagnostic tool

Can I rely on the measured values?

How can I determine the technical condition of my device? ScanMaster can answer these frequently asked questions.

And ScanMaster allows you to easily check the device for proper functioning either through its Infra-red service port or through the HART commands.



Advanced diagnostic functions

Using its advanced diagnostic functions, the device monitors both its own operability and the process.

Limit values for the diagnostic parameters can be set locally. When these limits are exceeded, an alarm is tripped.

For further analysis, the diagnostic data can be read out via an advanced DTM. Critical states can, thus, be recognized early and appropriate measures can be taken.

As a result, productivity is increased and downtimes are avoided. The status messages are classified in accordance with the NAMUR recommendations.

In the event of an error, a diagnostic-dependent help text appears on the display which considerably simplifies and accelerates the troubleshooting procedure. This gives maximum safety for the process.

Flow performance

Using a higher excitation frequency for the transmitter, ProcessMaster is a flowmeter with an especially short response time. With its advanced filtering methods, the device improves accuracy even under difficult conditions by separating the noise from the measuring signal. This leads to a maximum measuring error of 0.2 % of rate. Self-cleaning, double-sealed polished measuring electrodes enhance the device's reliability and performance.

Easy and quick commissioning

Advanced data storage inside the sensor eliminates the need to match sensor and transmitter in the field. The on-board sensor memory automatically identifies the transmitter. On power-on, the transmitter self-configuration function is run, and replicates all sensor data and TAG specific parameters into the transmitter. This eliminates the opportunity for errors and leads to an increased startup speed and reliability.

Intuitive, convenient navigation

The factory-set parameters can be modified quickly and easily via the user-friendly display and the non-contact buttons, without opening the housing.

The "Easy Set-up" function reliably guides unpracticed users through the menu step by step.

The softkey-based functionality makes handling a breeze - it's just like using a cell phone. During the configuration, the permissible range of each parameter is indicated on the display and invalid entries are rejected.

Universal transmitter - powerful and flexible

The backlit display can be easily rotated without the need for any tools. The contrast is adjustable and the display fully configurable. The character size, number of lines and display resolution (number of decimals) can be set as required. In multiplex mode, several different display options can be pre-configured and invoked one after the other.

The smart modular design of the transmitter unit allows for easy disassembly without the need to unscrew cables or unplug connectors.

Whether count pulses, 20 mA signals or the status output are active or passive, the universal transmitter always delivers the correct signal. HART is used as the standard protocol. Optionally, the transmitter is available with PROFIBUS PA or FOUNDATION fieldbus communication.

The universal transmitter simplifies the spare parts inventory and reduces the stockholding costs.

Assured quality

ProcessMaster is designed and manufactured in accordance with international quality procedures (ISO 9001) and all flowmeters are calibrated on nationally-traceable calibration rigs to provide the end-user with complete assurance of both quality and performance of the meter.



ProcessMaster - always the first choice

ProcessMaster sets the standard for the process industry. It meets the various requirements of NAMUR. ProcessMaster is a universal device according to the Pressure Equipment Directive. In compliance with the requirements of NAMUR, the devices are categorized under category III for pipelines. As a result, ProcessMaster can be used universally. This reduces costs and increases safety.

Overview of the ProcessMaster series

ProcessMaster is available in two series. ProcessMaster 300, which sets the standard in Process Flow measurement and ProcessMaster 500 with best in class extended functionality and options. The following table gives an overview.

	ProcessMaster	
	FEP300	FEP500
Measuring accuracy 0.4 % (optionally 0.2 %) of rate	X	-
Measuring accuracy 0.3 % (optionally 0.2 %) of rate	-	X
Batch functions Presetting counter, overrun correction, external start/stop, batch end contact	-	X
Other software functions Mass units, editable counter,	X	X
Two measuring ranges	-	X
Graphic display Line recorder function	X	X
Diagnostic functions Detection of gas bubbles or deposits on electrodes, conductivity monitoring, temperature monitoring, finger print, trend	-	X
Partially filled Recognition through partial filling electrode (TFE)	X	X
Hardware options Versions for extremely abrasive fluids:	-	X
• Ceramic carbide liner, • Wolfram carbide electrodes, • Double layer electrodes		
Startup functions Grounding check	-	X
Fieldbus PROFIBUS PA, FOUNDATION fieldbus	X	X
Verifications / Diagnostic tool ScanMaster	X	X

This data sheet describes ProcessMaster 300.

For ProcessMaster 500 refer to data sheet DS/FEP500

Overview - models

Integral mount design

FEP311 (without explosion protection)				FEP315 (Zone 2 / Div.2)			FEP315 (Zone 1 / Div.1)	
1), 3)	2), 3)	2), 4)	2), 5)	G01082-02	1), 3)	2), 3)	2), 4)	G00487-02

Measured value error	Standard: 0.4 % of rate, Optional: 0.2 % of rate
Nominal size range	DN 3 ... 2000 (1/10 " ... 80 ")
Process connection	Flange in accordance with DIN 2501 / EN 1092-1, ASME B16.5 / B16.47, JIS, AS2129
Nominal pressure	PN 10 ... 100, ASME CL 150, 300, 600, 900, 1500, 2500
Lining	Hard rubber (DN 15 ... 2000), Soft rubber (DN 50 ... 2000), PTFE (DN 10 ... 600), PFA (DN 3 ... 200), ETFE (DN 25 ... 600), Linatex (DN 50 ... 600)
Conductivity	> 5 µS/cm (20 µS/cm for demineralized water)
Electrodes	Stainless steel, Hastelloy B, Hastelloy C, Platinum-iridium, Tantalum, Titanium, Tungsten carbide
Process connection material	Steel, stainless steel
IP rating	IP 65, IP 67
Measuring medium temperature	-25 ... 180 °C (-13 ... 356 °F)
Power supply	100 ... 230 V AC (-15 / +10%), 24 V AC (-30 / +10%), 24 V DC (-30 / +30%)
Current output	4 ... 20 mA, active or passive
Pulse output	Can be configured locally as active or passive
Contact output / Contact input	Optocoupler, programmable function
Display	Graphical display, configurable
Housing	Integral mount design, choice of single-compartment housing or dual-compartment housing
Communication	HART protocol (standard), PROFIBUS PA, FOUNDATION fieldbus (option)
Explosion protection approvals	<ul style="list-style-type: none"> • ATEX / IECEx zone 1, 2, 21, 22 • NEPSI zone 1, 2 • FM / cFM CI 1 Div 1 (\leq DN 300), CI 1 Div 2 • GOST zone 1, 2
Pressure Equipment Directive 97/23/EC	Conformity assessment in accordance with category III, fluid group 1
CRN (Canadian Reg. Number)	On request

1) Single-compartment housing

2) Dual-compartment housing

3) Sensor Design Level „B“

4) Sensor Design Level „B“, All stainless steel Version

5) Sensor Design Level „C“, DN 25 ... 600

Remote mount design

Flowmeter sensor					
FEP321 (without explosion protection)	FEP325 (Zone 2 / Div. 2)	FEP325 (Zone 1 / Div. 1)			
 G01083-02	 G00489-01	 G00489-01			
Transmitter					
FET321 (without explosion protection)	FET325 (Zone 2, Div. 2)	FET321 (without explosion protection)	FET325 (Zone 1, Div. 1)	FET325 (Zone 2, Div. 2)	FET321 (without explosion protection)
 G01084-02	 G01084-02	 G01084-02	 G00863-02	 G01084-02	 G01084-02
Flowmeter sensor					
Measured value error	Standard: 0.4 % of rate, Optional: 0.2 % of rate				
Nominal size range	DN 3 ... 2000 (1/10 " ... 80 ")				
Process connection	Flange in accordance with DIN 2501 / EN 1092-1, ASME B16.5 / B16.47, JIS, AS2129				
Nominal pressure	PN 10 ... 100, ASME CL 150, 300, 600, 900, 1500, 2500				
Lining	Hard rubber (DN 15 ... 2000), Soft rubber (DN 50 ... 2000), PTFE (DN 10 ... 600), PFA (DN 3 ... 200), ETFE (DN 25 ... 600), Linatex (DN 50 ... 600)				
Conductivity	> 5 µS/cm (20 µS/cm for demineralized water)				
Electrodes	Stainless steel, Hastelloy B, Hastelloy C, Platinum-iridium, Tantalum, Titanium, Tungsten carbide				
Process connection material	Steel, stainless steel				
IP rating	IP 65, IP 67, IP 68, (NEMA 4X)				
Measuring medium temperature	-25 ... 180 °C (-13 ... 356 °F)				
Transmitter					
Power supply	100 ... 230 V AC (-15 / +10%), 24 V AC (-30 / +10%), 24 V DC (-30 / +30%)				
Current output	4 ... 20 mA, active or passive				
Pulse output	Can be configured locally as active or passive				
Contact output / Contact input	Optocoupler, programmable function				
Display	Graphical display, configurable				
Housing	Field-mount housing: choice of single-compartment housing or dual-compartment housing				
Communication	HART protocol (standard), PROFIBUS PA, FOUNDATION fieldbus (option)				
Approvals					
Explosion protection approvals	<ul style="list-style-type: none"> • ATEX / IECEx zone 1, 2, 21, 22 • FM / cFM CI 1 Div 1 (\leq DN 300), CI 1 Div 2 • NEPSI zone 1, 2 • GOST zone 1, 2 				
Pressure Equipment Directive 97/23/EC	Conformity assessment in accordance with category III, fluid group 1				
CRN (Canadian Reg. Number)	On request				

- 1) Sensor Design Level „B“
 2) Sensor Design Level „C“, DN 25 ... 600
 3) Single-compartment housing
 4) Dual-compartment housing

Specification - general

Reference conditions

According to EN 29104

Fluid temperature	20 °C (68 °F) ± 2 K
Ambient temperature	20 °C (68 °F) ± 2 K
Supply power	Nominal voltage acc. to name plate $U_n \pm 1\%$, frequency $f \pm 1\%$
Installation conditions	- Upstream $>10 \times DN$, straight section - Downstream $>5 \times DN$, straight section
Warm-up phase	30 min.

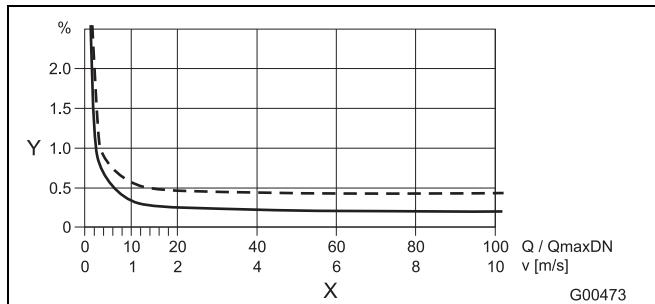


Fig. 1

Y Accuracy ± of measured value in [%]

X Flow velocity v in [m/s], Q / Qmax_{DN} [%]

Maximum measuring error

Impulse output

- Standard calibration:
± 0.4 % of measured value,
± 0.02 % Qmax_{DN} (DN 3 ... 2000)
- Optional calibration:
± 0.2 % of measured value,
± 0.02 % Qmax_{DN} (DN 10 ... 600, 800)

Qmax_{DN}: See table in Section „Flowmeter sizes, flow range“ on page 7.

Analog output effects

Same as pulse output plus ± 0.1 % of measured value
± 0.01 mA

Reproducibility, response time

Reproducibility	≤ 0.11 % of measured value, $t_{meas} = 100 \text{ s}, v = 0.5 \dots 10 \text{ m/s}$
Response time of current output with damping of 0.02 seconds	As step function 0 ... 99 % 5 $\tau \geq 200 \text{ ms}$ at 25 Hz excitation frequency 5 $\tau \geq 400 \text{ ms}$ at 12.5 Hz excitation frequency 5 $\tau \geq 500 \text{ ms}$ at 6.25 Hz excitation frequency

Flowmeter sizes, flow range

The flow range end value can be set between $0.02 \times Q_{\max}DN$ and $2 \times Q_{\max}DN$.

Nominal diameter DN	"	Min. flow range end value $0.02 \times Q_{\max}DN$ (≈ 0.2 m/s)	$Q_{\max}DN$ $0 \dots \approx 10$ m/s	Max. flow range end value $2 \times Q_{\max}DN$ (≈ 20 m/s)
3	1/10	0.08 l/min (0.02 US gal/min)	4 l/min (1.06 US gal/min)	8 l/min (2.11 US gal/min)
4	5/32	0.16 l/min (0.04 US gal/min)	8 l/min (2.11 US gal/min)	16 l/min (4.23 US gal/min)
6	1/4	0.4 l/min (0.11 US gal/min)	20 l/min (5.28 US gal/min)	40 l/min (10.57 US gal/min)
8	5/16	0.6 l/min (0.16 US gal/min)	30 l/min (7.93 US gal/min)	60 l/min (15.85 US gal/min)
10	3/8	0.9 l/min (0.24 US gal/min)	45 l/min (11.9 US gal/min)	90 l/min (23.78 US gal/min)
15	1/2	2 l/min (0.53 US gal/min)	100 l/min (26.4 US gal/min)	200 l/min (52.8 US gal/min)
20	3/4	3 l/min (0.79 US gal/min)	150 l/min (39.6 US gal/min)	300 l/min (79.3 US gal/min)
25	1	4 l/min (1.06 US gal/min)	200 l/min (52.8 US gal/min)	400 l/min (106 US gal/min)
32	1 1/4	8 l/min (2.11 US gal/min)	400 l/min (106 US gal/min)	800 l/min (211 US gal/min)
40	1 1/2	12 l/min (3.17 US gal/min)	600 l/min (159 US gal/min)	1200 l/min (317 US gal/min)
50	2	1.2 m3/h (5.28 US gal/min)	60 m3/h (264 US gal/min)	120 m3/h (528 US gal/min)
65	2 1/2	2.4 m3/h (10.57 US gal/min)	120 m3/h (528 US gal/min)	240 m3/h (1057 US gal/min)
80	3	3.6 m3/h (15.9 US gal/min)	180 m3/h (793 US gal/min)	360 m3/h (1585 US gal/min)
100	4	4.8 m3/h (21.1 US gal/min)	240 m3/h (1057 US gal/min)	480 m3/h (2113 US gal/min)
125	5	8.4 m3/h (37 US gal/min)	420 m3/h (1849 US gal/min)	840 m3/h (3698 US gal/min)
150	6	12 m3/h (52.8 US gal/min)	600 m3/h (2642 US gal/min)	1200 m3/h (5283 US gal/min)
200	8	21.6 m3/h (95.1 US gal/min)	1080 m3/h (4755 US gal/min)	2160 m3/h (9510 US gal/min)
250	10	36 m3/h (159 US gal/min)	1800 m3/h (7925 US gal/min)	3600 m3/h (15850 US gal/min)
300	12	48 m3/h (211 US gal/min)	2400 m3/h (10567 US gal/min)	4800 m3/h (21134 US gal/min)
350	14	66 m3/h (291 US gal/min)	3300 m3/h (14529 US gal/min)	6600 m3/h (29059 US gal/min)
400	16	90 m3/h (396 US gal/min)	4500 m3/h (19813 US gal/min)	9000 m3/h (39626 US gal/min)
450	18	120 m3/h (528 US gal/min)	6000 m3/h (26417 US gal/min)	12000 m3/h (52834 US gal/min)
500	20	132 m3/h (581 US gal/min)	6600 m3/h (29059 US gal/min)	13200 m3/h (58117 US gal/min)
600	24	192 m3/h (845 US gal/min)	9600 m3/h (42268 US gal/min)	19200 m3/h (84535 US gal/min)
700	28	264 m3/h (1162 US gal/min)	13200 m3/h (58118 US gal/min)	26400 m3/h (116236 US gal/min)
760	30	312 m3/h (1374 US gal/min)	15600 m3/h (68685 US gal/min)	31200 m3/h (137369 US gal/min)
800	32	360 m3/h (1585 US gal/min)	18000 m3/h (79252 US gal/min)	36000 m3/h (158503 US gal/min)
900	36	480 m3/h (2113 US gal/min)	24000 m3/h (105669 US gal/min)	48000 m3/h (211337 US gal/min)
1000	40	540 m3/h (2378 US gal/min)	27000 m3/h (118877 US gal/min)	54000 m3/h (237754 US gal/min)
1050	42	616 m3/h (2712 US gal/min)	30800 m3/h (135608 US gal/min)	61600 m3/h (271217 US gal/min)
1100	44	660 m3/h (3038 US gal/min)	33000 m3/h (151899 US gal/min)	66000 m3/h (290589 US gal/min)
1200	48	840 m3/h (3698 US gal/min)	42000 m3/h (184920 US gal/min)	84000 m3/h (369841 US gal/min)
1400	54	1080 m3/h (4755 US gal/min)	54000 m3/h (237755 US gal/min)	108000 m3/h (475510 US gal/min)
1500	60	1260 m3/h (5548 US gal/min)	63000 m3/h (277381 US gal/min)	126000 m3/h (554761 US gal/min)
1600	66	1440 m3/h (6340 US gal/min)	72000 m3/h (317006 US gal/min)	144000 m3/h (634013 US gal/min)
1800	72	1800 m3/h (7925 US gal/min)	90000 m3/h (396258 US gal/min)	180000 m3/h (792516 US gal/min)
2000	80	2280 m3/h (10039 US gal/min)	114000 m3/h (501927 US gal/min)	228000 m3/h (1003853 US gal/min)

Specifications - sensor

IP rating

According to EN 60529

IP 65, P 67, NEMA 4X

IP 68 (for remote mount design only)

Pipeline vibration

According to EN 60068-2-6, applies to aluminium transmitter housing only

- In the 10 ... 58 Hz range with max. 0.15 mm (0.006 inch) deflection
- In the 58 ... 150 Hz range with max. 2 g acceleration

Installation length

The flange devices comply with the installation lengths specified in VDI/VDE 2641, ISO 13359, or according to DVGW (process sheet W420, design WP, ISO 4064 short).

Signal cable

For remote mount design only

A 5 m (16.4 ft) cable is supplied.

If you require more than 5 m (16.4 ft), a signal cable can be separately purchased (for ordering informations see the following table or section 0 "Accessories" on page 67).

	Signal cable	
Application	D173D031U01	D173D027U01
Non-Ex. (< DN15)	✗	✓
Non-Ex. (≥ DN15)	✓	✓
Zone 2 / Div. 2 (< DN15)	✗	✓
Zone 2 / Div. 2 (≥ DN15)	✓	✓
Zone 1 / Div. 1 (all nominal diameter)	✗	✓

✗ Application not permissible ■ Standard on delivery
✓ Application permissible

For the transmitter designed for use in zone 1, Div 1 (model FET325), 10 m (32.8 ft) of signal cable is permanently connected to the transmitter.

Signal cable length and preamplifier

A preamplifier is required for cables > 50 m (164 ft).

Maximum signal cable length between flowmeter sensor and transmitter:

Preamplifier	Signal cable length
Without	Max. 50 m (164 ft) for conductivity ≥ 5 µS/cm
With	Max. 200 m (656 ft) for conductivity ≥ 5 µS/cm

Temperature data

The temperature range of the device is dependent upon a number of factors which influence the specification. These factors include - fluid temperature, ambient temperature, operating pressure, lining material and hazardous area classification.

Storage temperature

-40 ... 70 °C (-40 ... 158 °F)

Minimum permissible pressure as a function of fluid temperature

Lining	Nominal diameter	P operating at mbar abs.	T operating 1)
Hard rubber	15 ... 2000 (1/2 ... 80")	0	< 90 °C (194 °F) < 80 °C (176 °F) ²⁾
Soft rubber	50 ... 2000 (2 ... 80")	0	< 60 °C (140 °F)
PTFE	10 ... 600 (3/8 ... 24")	270 400 500	< 20 °C (68 °F) < 100 °C (212 °F) < 130 °C (266 °F)
Thick PTFE, high-temp. design	25 ... 80 100 ... 250 300	0 67 27	< 180 °C (356 °F) < 180 °C (356 °F) < 180 °C (356 °F)
PFA	3 ... 200 (1/10 ... 8")	0	< 180 °C (356 °F)
ETFE	25 ... 600 (1 ... 24")	100	< 130 °C (266 °F)
Linatex ²⁾	50 .. 600 (2 ... 24")	0	< 70 °C (158 °F)

1) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to the table titled "Maximum permissible cleaning temperature".

2) Only China production site.

Liner approvals upon request, please contact ABB.

Maximum permissible cleaning temperature

CIP cleaning	Sensor lining	T _{max}	T _{max} minutes	T _{amb.}
Steam cleaning	PTFE, PFA	150 °C (302 °F)	60	25 °C (77 °F)
Fluids	PTFE, PFA	140 °C (284 °F)	60	25 °C (77 °F)

If the ambient temperature is > 25 °C, the difference must be subtracted from the max. cleaning temperature. T_{max} - Δ °C (Δ °C = Tamb - 25 °C).

Maximum ambient temperature as a function off measuring medium temperature

Note

When using the device in potentially explosive areas, the additional temperature specifications in the section titled must be observed.

Integral mount design (standard sensor design)

Lining	Flange material	Ambient temperature		Measuring medium temperature	
		Minimum	Maximum	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Soft rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	60 °C (140 °F)
Soft rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
PTFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
PFA	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
PFA	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
Thick PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
Thick PTFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
ETFE	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
ETFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
Linatex ¹⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	70 °C (158 °F)
Linatex ¹⁾	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-4 °F)	70 °C (158 °F)

Integral mount design (high-temperature sensor design) ³⁾

Lining	Flange material	Ambient temperature		Measuring medium temperature	
		Minimum	Maximum	Minimum	Maximum
PFA	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
PFA	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-20 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-20 °C (-13 °F)	180 °C (356 °F)
ETFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-20 °C (-13 °F)	130 °C (266 °F)

1) Only China production site

2) For (optional) low-temperature version, only

3) Available with sensor design level "B"

Note

When using the device in potentially explosive areas, the additional temperature specifications in the section titled must be observed.

Remote mount design (standard sensor design)

Lining	Flange material	Ambient temperature		Measuring medium temperature	
		Minimum	Maximum	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Soft rubber	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14 °F)	60 °C (140 °F)
Soft rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
PFA	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
PFA	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
Thick PTFE	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
Thick PTFE	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
ETFE	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
Linatex ¹⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	70 °C (158 °F)
Linatex ¹⁾	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-4 °F)	70 °C (158 °F)

Remote mount design (high-temperature sensor design) ³⁾

Lining	Flange material	Ambient temperature		Measuring medium temperature	
		Minimum	Maximum	Minimum	Maximum
PFA	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
PFA	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	180 °C (356 °F)
ETFE	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)

1) Only China production site

2) For (optional) low-temperature version, only

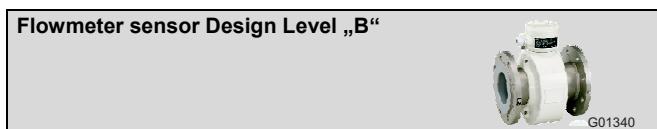
3) Available with sensor design level "B"

Materials for flowmeter sensors

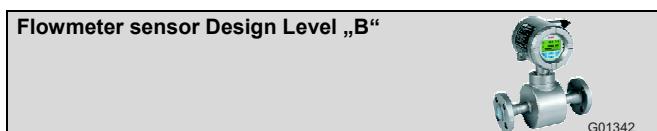
Wetted parts

Part	Standard	Option
Lining	PTFE, PFA, ETFE, hard rubber, soft rubber	Linatex
Measurement and grounding electrode for:		
- Hard rubber	Stainless steel 1.4571 (AISI 316Ti)	Hastelloy B-3 (2.4600), Hastelloy C-4 (2.4610), Titanium, Tantalum, Platinum-iridium, 1.4539 (AISI 904L), Tungsten carbide
- Soft rubber		
- Linatex		
- PTFE, PFA, ETFE	Stainless steel 1.4539 (AISI 904L)	Stainless steel 1.4571 (AISI 316Ti) Hast. C-4 (2.4610) Hast. B-3 (2.4600) Titanium, Tantalum, Platinum-iridium
Grounding plate	Stainless steel	On request
Protection plate	Stainless steel	On request

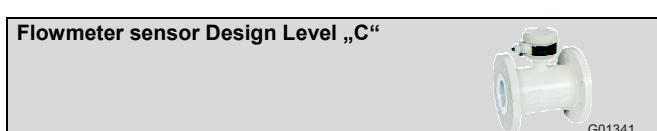
Non-wetted parts (process connection)



Nominal diameter	Standard	Option
DN 3 ... 15 (1/10 ... 1/2")	Stainless steel ¹⁾	-
DN 20 ... 400 (3/4 ... 16")	Steel (galvanized) ²⁾	Stainless steel ¹⁾
DN 450 ... 2000 (18 ... 80")	Steel (painted) ²⁾	-



Nominal diameter	Standard	Option
DN 25 ... 400 (1 ... 16")	Stainless steel (AISI 316, 316L)	-



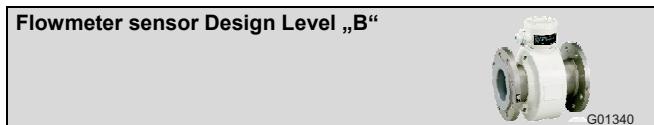
Nominal diameter	Standard	Option
DN 25 ... 600 (1 ... 24")	Steel (painted) ²⁾	-

The process connections are made of one of the materials listed below:

- 1) 1.4301 (AISI 304), 1.4307, 1.4404 (AISI 316L) 1.4435 (AISI 316L), 1.4541 (AISI 321) 1.4571 (AISI 316Ti), ASTM A182 F304, ASTM A182 F304L, ASTM A182 F316L, ASTM A182 F321, ASTM A182 F316Ti, ASTM A182 F316, 0Cr18Ni9, 0Cr18Ni10, 0Cr17Ni13Mo2, 0Cr27Ni12Mo3, 0Cr18Ni10Ti

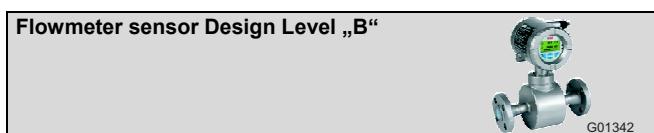
- 2) 1.0038, 1.0460, 1.0570, 1.0432, ASTM A105, Q255A, 20#, 16Mn

Flowmeter sensor housing



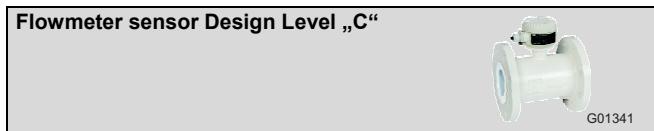
G01340

Housing	Dual-shell casing, cast aluminum, painted, paint coat, ≥ 80 µm thick, RAL 9002
DN 3 ... 400 (1/10 ... 16")	Welded steel design, painted, paint coat, ≥ 80 µm thick, RAL 9002
Terminal box	Aluminum alloy, painted, ≥ 80 µm thick, light gray, RAL 9002
Meter tube	Stainless steel ³⁾
Cable gland ⁴⁾	Polyamide
	CrNi steel (in the case of hazardous area design for ambient temperature of -40 °C (40 °F))



G01342

Housing + Meter tube	Stainless steel (AISI 316, 316L)
Cable gland ⁴⁾	Polyamide



G01341

Housing + Meter tube	Steel, painted, paint coat, ≥ 80 µm thick, RAL 9002
Terminal box	Aluminum alloy, painted, ≥ 80 µm thick, light gray, RAL 9002
Cable gland ⁴⁾	Polyamide

The meter tube is made of one of the materials listed below:

- 3) 1.4301, 1.4307, 1.4404, 1.4435, 1.4541, 1.4571
ASTM materials:
Grade TP304, TP304L, TP316L, TP321, TP316Ti, TP317L, 0Cr18Ni9, 00Cr18Ni10, 0Cr17Ni14Mo2, 0Cr27Ni12Mo3, 0Cr18Ni10Ti
4) Cable Gland with M20x1,5 thread or NPT thread with plug to be specified through modelcode

Overview sensor design level "C"

Sensor Size	Pressure rating	Carbon steel flange	PTFE	Hard rubber	Electrode design: Standard	Sensor temp. Range: Standard Ambient temp. range: -20 ... 60 °C
DN 25 (1")		X	X	—	X	X
DN 32 (1 1/4")		X	X	—	X	X
DN 40 (1 1/2")		X	X	X	X	X
DN 50 (2")		X	X	X	X	X
DN 65 (2 1/2")		X	X	X	X	X
DN 80 (3")		X	X	X	X	X
DN 100 (4")		X	X	X	X	X
DN 125 (5")		X	X	X	X	X
DN 150 (6")		X	X	X	X	X
DN 200 (8")		X	X	X	X	X
DN 250 (10")		X	X	X	X	X
DN 300 (12")		X	X	X	X	X
DN 350 (14")		X	X	X	X	X
DN 400 (16")		X	X	X	X	X
DN 450 (18")		X	X	X	X	X
DN 500 (20")		X	X	X	X	X
DN 600 (24")		X	X	X	X	X

Material load

Limits for the permissible fluid temperature (TS) and permissible pressure (PS) are calculated on the basis of the lining and flange material used in the device (refer to the name plate on the device).

Flowmeter sensor design level "B"

DIN flange stainless steel up to DN 600 (24")

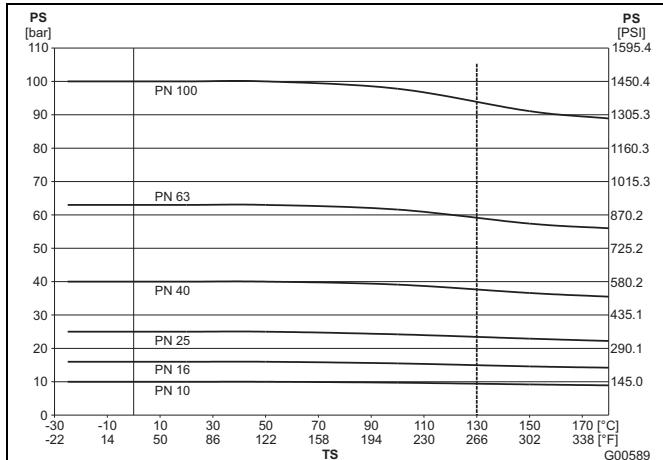


Fig. 2

ASME flange, stainless steel, up to DN 400 (16") (CL150/300) up to DN 1000 (40") (CL150)

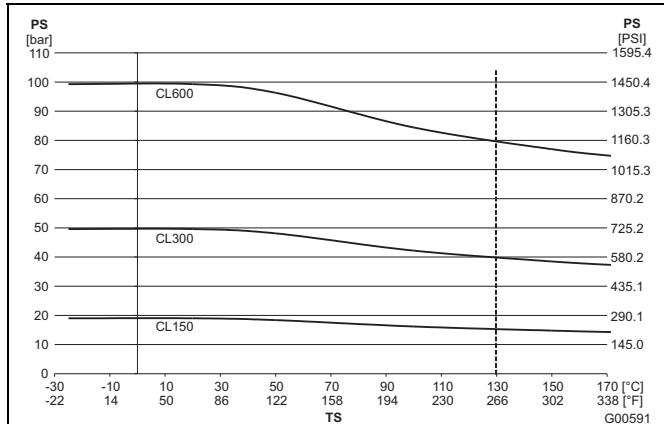


Fig. 3

DIN flange, steel, up to DN 600 (24")

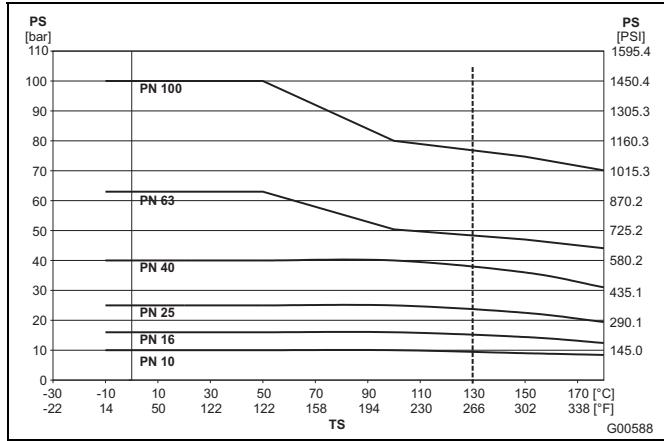


Fig. 4

ASME flange, steel, up to DN 400 (16") (CL150/300); up to DN 1000 (40") (CL150)

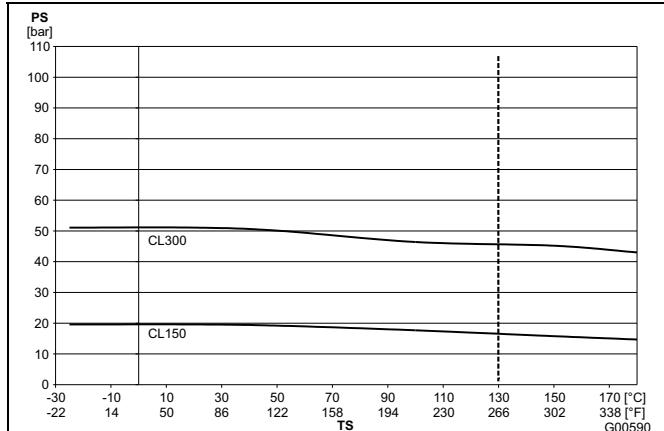


Fig. 5

JIS 10K-B2210 flange

Nominal diameter	Material	PN	TS	PS
32 ... 400 (1 1/4 ... 16")	Stainless steel	10	-25 ... 180 °C (-13 ... 356 °F)	10 bar (145 psi)
32 ... 400 (1 1/4 ... 16")	Steel	10	-10 ... 180 °C (14 ... 356 °F)	10 bar (145 psi)

DIN flange, stainless steel, DN 700 (28") up to DN 1000 (40")

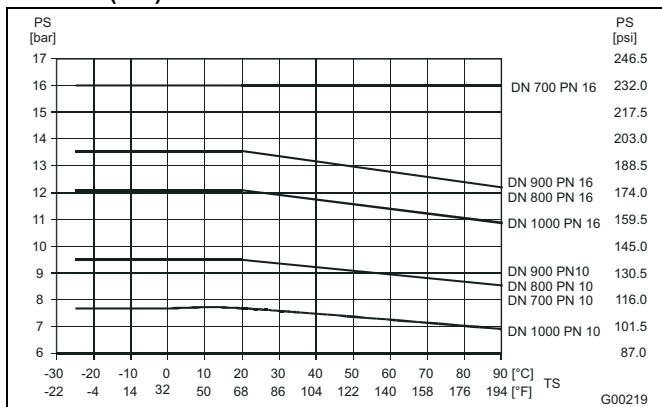


Fig. 6

DIN flange, steel, DN 700 (28") up to DN 1000 (40")

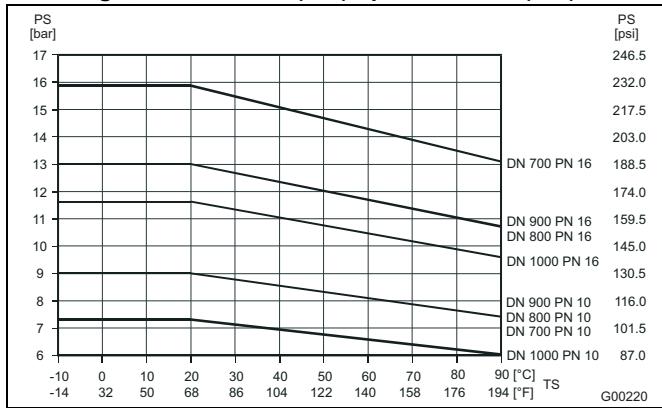


Fig. 7

ASME flange, Steel, DN 25 ... 400 (1 ... 24")

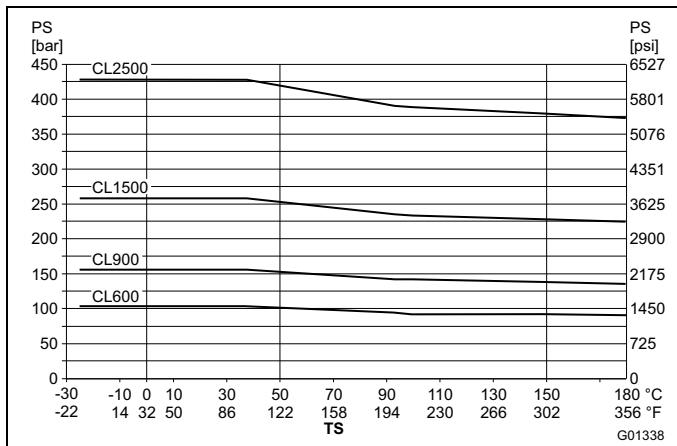


Fig. 8

ASME flange, stainless steel, DN 25 ... 400 (1 ... 24")

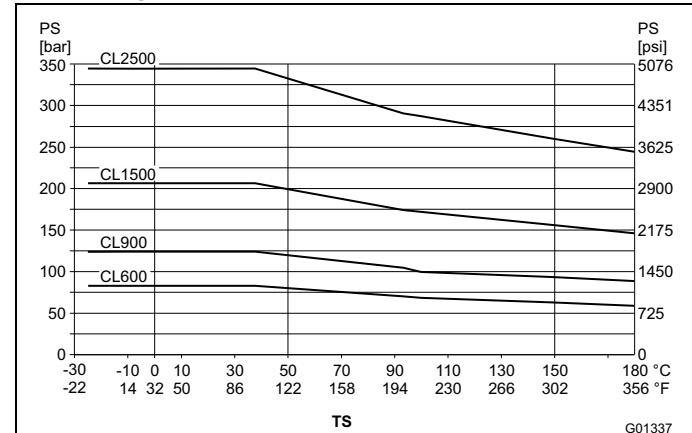


Fig. 9

Flowmeter sensor design level "C"

Steel casted housing, DN 25 ... 600 (1 ... 24")

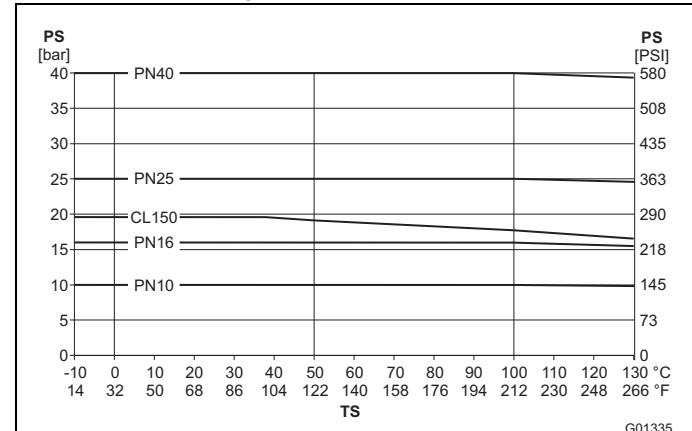


Fig. 10

Welded steel housing, DN 25 ... 600 (1 ... 24")

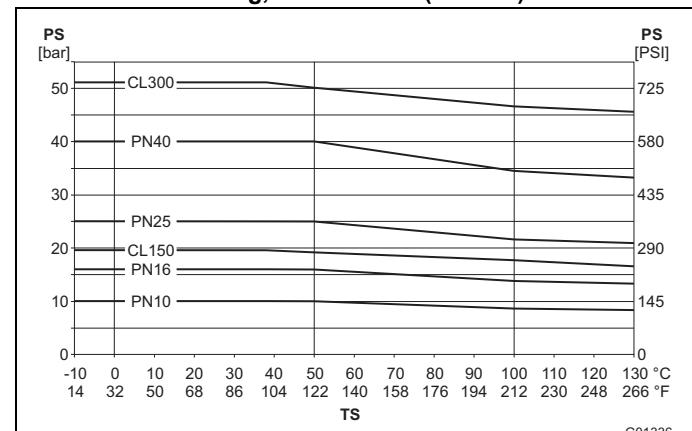


Fig. 11

Specifications - transmitter**IP rating****According to EN 60529**

IP 65, IP 67, NEMA 4X

Vibration**According to EN 60068-2**

- In the range 10 ... 58 Hz with max. 0.15 mm (0.006 inch) deflection ¹⁾
- In the range 58 ... 150 Hz max. 2 g acceleration ¹⁾

1) Peak load

Temperature data**Ambient temperature**

-20 ... 60 °C (-4 ... 140 °F) Standard range

-40 ... 60 °C (-40 ... 140 °F) Extended range

Storage temperature

-40 ... 70 °C (-40 ... 158 °F)

Electrical data and options**Power supply**

Supply voltage	100 ... 230 V AC (-15 % / +10 %), 47 ... 64 Hz 24 V AC (-30 % / +10 %), 47 ... 64 Hz 24 V DC (-30 % / +30 %), ripple: < 5 %
Power consumption	
AC	≤ 20 VA
DC	12 W (switch-on current 5.6 A)
Screw terminals	Max. 2,5 mm ² (AWG 14)

Isolation of input / outputs

The current output, digital outputs DO1 and DO2, and digital input are electrically isolated from the flowmeter sensor input circuit and from each other. The same is valid for the signal outputs of the versions with PROFIBUS PA and FOUNDATION fieldbus.

Empty pipe detection

The function requires:

A conductivity of the measured fluid $\geq 20 \mu\text{S}/\text{cm}$, a signal cable length $\leq 50 \text{ m}$ (164 ft), a nominal diameter $\text{DN} \geq \text{DN } 10$, and the flowmeter sensor must not be provided with a preamplifier.

Mechanical properties

Integral mount design	Housing made of Aluminium	Housing made of stainless steel
Housing	Cast aluminum, painted	Stainless steel CF3M
Paint	Paint coat $\geq 80 \mu\text{m}$ thick, RAL 9002 (light gray)	-
Cable gland²⁾	Polyamide	Polyamide
	Stainless steel ¹⁾	Stainless steel ¹⁾

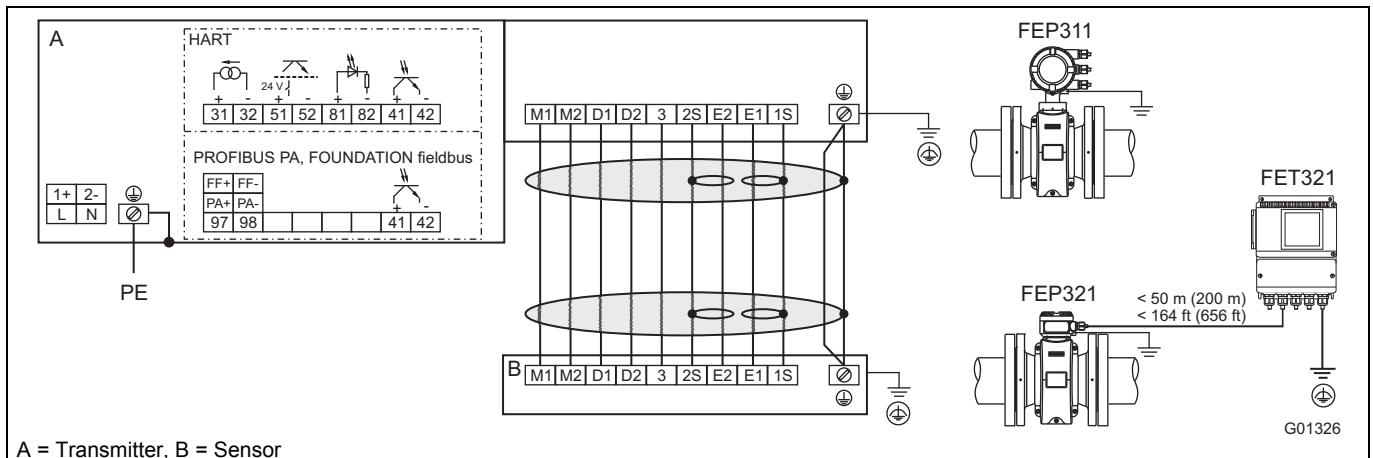
Remote mount design	
Housing	Cast aluminum, painted
Paint	Paint coat $\geq 80 \mu\text{m}$ thick, RAL 7012 (dark gray), front cover / rear cover RAL 9002 (light gray)
Cable gland²⁾	Polyamide
	Stainless steel ¹⁾
Weight	4.5 kg (9.92 lb)

1) In the case of hazardous area design for ambient temperature of -40 °C (40 °F)

2) Cable Gland with M20x1,5 thread or NPT thread with plug to be specified through modelcode

Electrical connections

HART, PROFIBUS PA and FOUNDATION fieldbus protocol for non-explosion-proof design flowmeters



A = Transmitter, B = Sensor

Fig. 12: HART-, PROFIBUS PA- and FOUNDATION fieldbus protocol

Power supply connections

AC power supply	
Terminal	Function / Notes
L	Live / Phase
N	Neutral
PE / ⊕	Protective earth (PE)

DC power supply	
Terminal	Function / Notes
1+	+
2-	-
PE / ⊕	Protective earth (PE)

Sensor cable terminal connections

Only on remote mount design.

Terminal	Function / Notes	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
⊕ / SE	Shield	-
E1	Signal line	Violet
1S	Shield for E1	-
E2	Signal line	Blue
2S	Shield for E2	-
3	Measurement potential	Green

Output connections

Terminal	Function / Notes
31 / 32	Current / HART output The current output is available in "active" or "passive" mode.
97 / 98	Digital communication PROFIBUS PA (PA+ / PA-) or FOUNDATION fieldbus (FF+ / FF-) in acc. with IEC 61158-2.
51 / 52	Digital output DO1 active / passive Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Pulse Output“.
81 / 82	Digital input / contact input Function can be configured locally as „External output switch-off“, „external totalizer reset“, „external totalizer stop“ or „other“.
41 / 42	Digital output DO2 passive Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Digital Output“, flow direction signaling.
⊖	Functional ground

Electrical data

Current / HART output

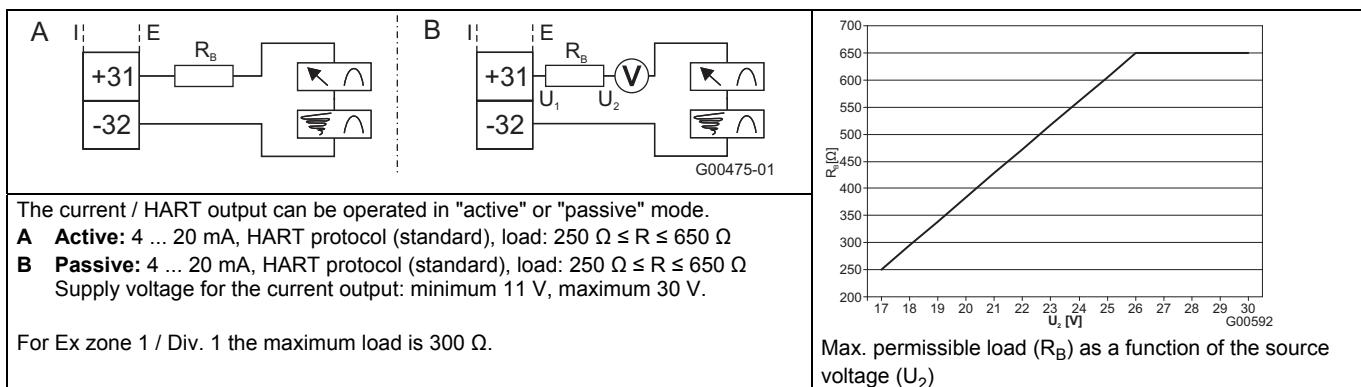


Fig. 13: (I = internal, E = external)

Digital output DO1

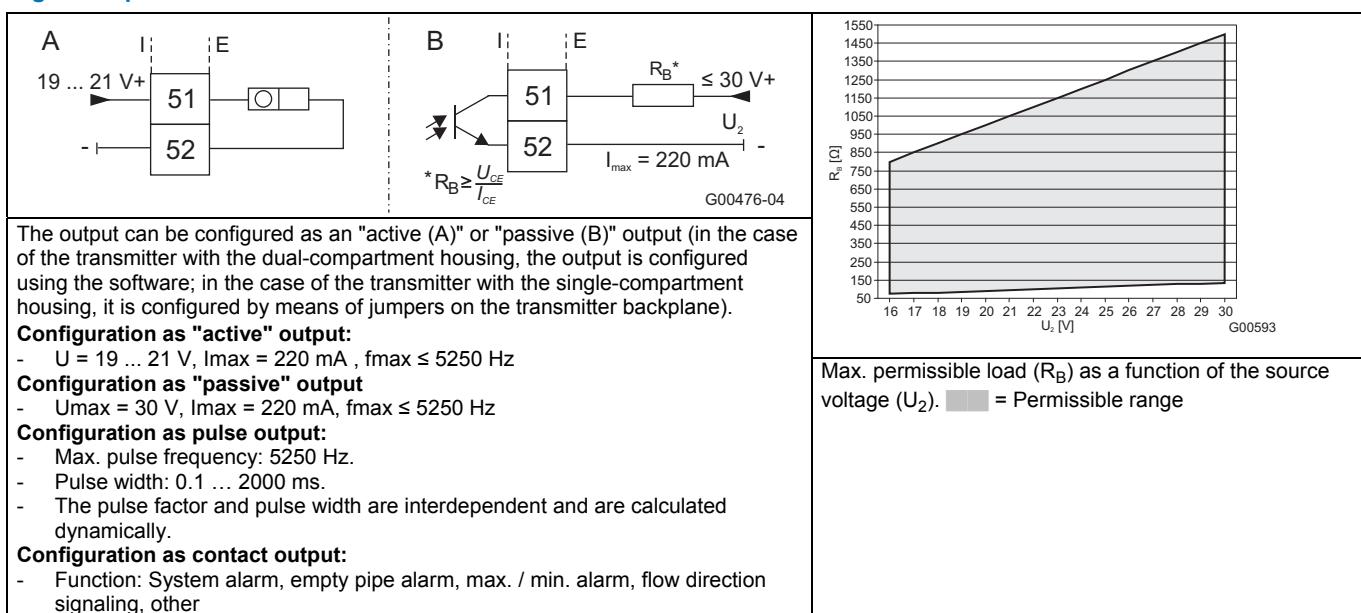


Fig. 14: (I = internal, E = external)

Digital output DO2

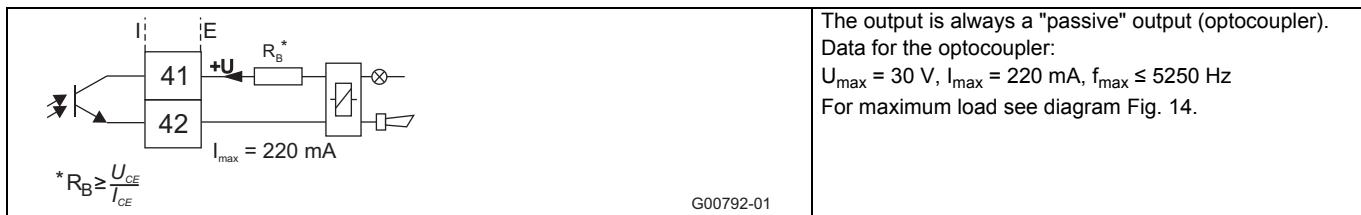


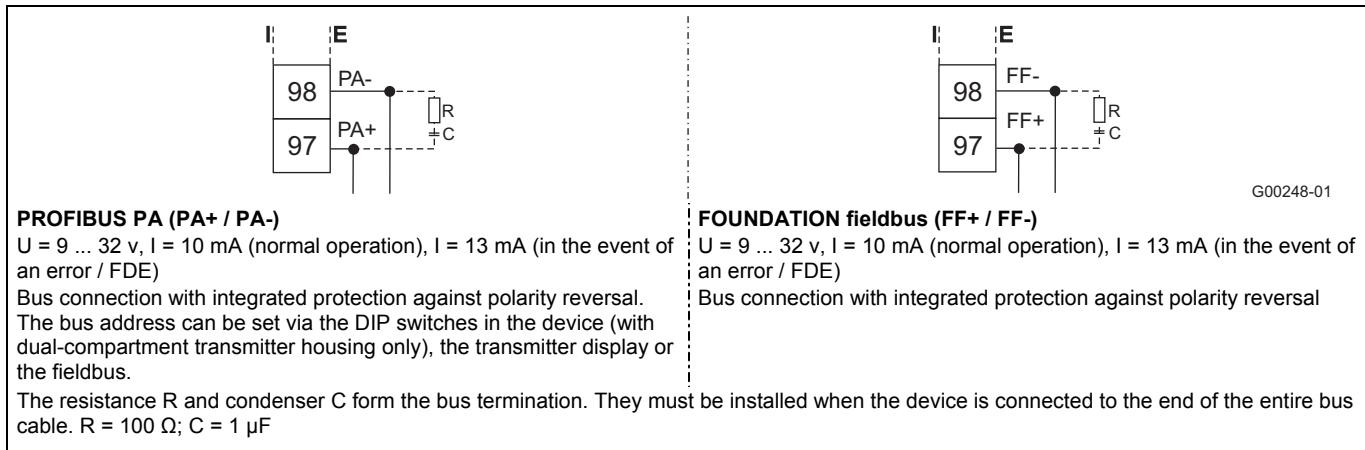
Fig. 15: (I = internal, E = external)

Digital input DI



Fig. 16: (I = internal, E = external)

Digital communication



Connection examples

Digital output DO2

E.g., for system monitoring, max. / min. alarm, empty meter tube or forward / reverse signal, or counting pulses
(function can be configured using software)

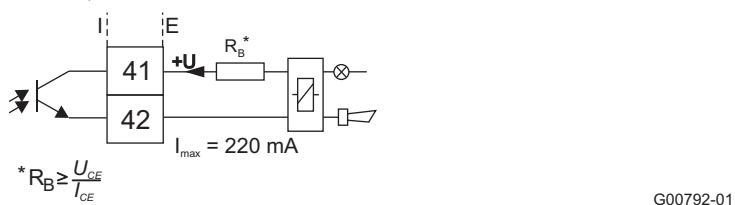


Fig. 18: (I = internal, E = external)

Digital outputs DO1 and DO2

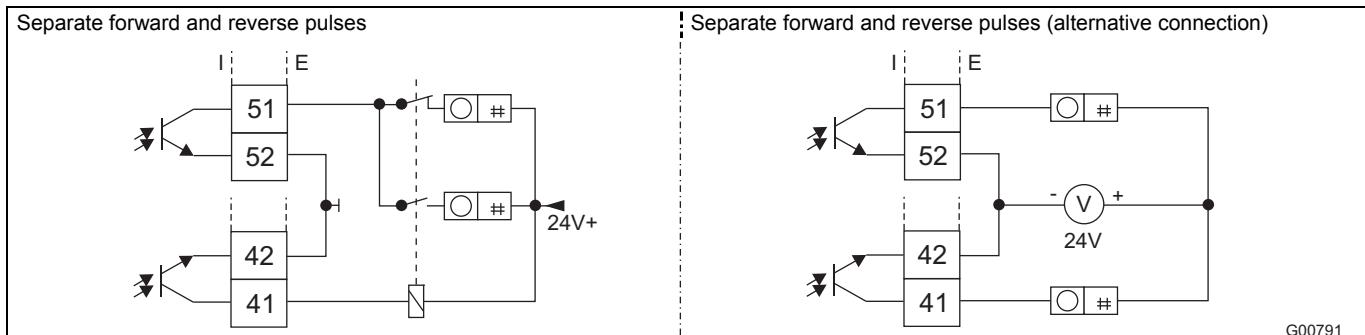


Fig. 19: (I = internal, E = external)

PROFIBUS PA - Connection via M12 plug

Only in non-hazardous areas

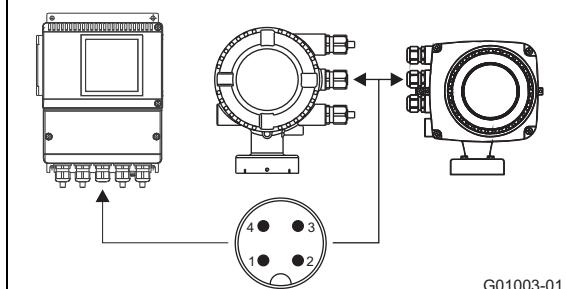


Fig. 20

Pin assignment
(Front view showing pin insert and pins)
PIN 1 = PA+
PIN 2 = nc
PIN 3 = PA-
PIN 4 = shield

Digital communication

HART protocol

The unit is registered with the HART Communication Foundation.

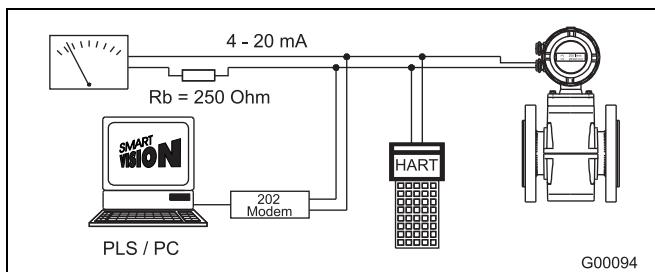


Fig. 21

Configuration	Directly on the device Software DAT200 Asset Vision Basic (+ HART-DTM)
Transmission	FSK modulation on current output 4 ... 20 mA acc. to Bell 202 standard
Max. signal amplitude	1.2 mA _{ss}
Current output load	Min. 250 Ω, max. = 560 Ω
Cable	AWG 24 twisted
Max. cable length	1500 m
Baud rate	1,200 baud
Display	Log. 1: 1,200 Hz Log. 0: 2,200 Hz

For additional information, see separate interface documentation.

System integration

In conjunction with the DTM (Device Type Manager) available for the device, communication (configuration, parameterization) can occur with the corresponding framework applications according to FDT 1.21 (DAT200 Asset Vision Basic).

Other tool/system integrations (e.g., Emerson AMS/Siemens PCS7) are available upon request.

A free of charge version of the DAT200 Asset Vision Basic framework application for HART® or PROFIBUS is available upon request.

The required DTMs are contained on the DAT200 Asset Vision Basic DVD or in the DTM Library. They can also be downloaded from www.abb.com/flow.

PROFIBUS PA

The interface conforms to profile 3.01 (PROFIBUS standard, EN 50170, DIN 19245 [PRO91]).

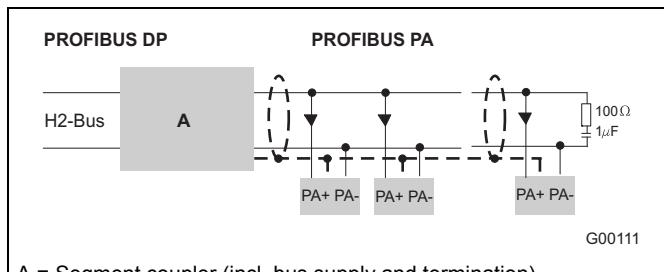


Fig. 22: Example for PROFIBUS PA interface connection

PROFIBUS PA ID no	0x3430
Alternative standard ID no	0x9700 or 0x9740
Configuration	Directly on the device Software DAT200 Asset Vision Basic (+ PROFIBUS PA-DTM)
Transmission signal	Acc. to IEC 61158-2
Cable	Shielded, twisted cable (acc. to IEC 61158-2, types A or B are preferred)

Bus topology

- Tree and/or line structure
- Bus termination: passive at both ends of the main bus line (RC element R = 100 Ω, C = 1 μF)

Voltage / current consumption

- Average current consumption: 10 mA
- In the event of an error, the integrated FDE function (=Fault Disconnection Electronic) integrated in the device ensures that the current consumption can rise to a maximum of 13 mA.
- The upper current limit is restricted electronically.
- The voltage on the bus line must lie in the range of 9 ... 32 V DC.

For additional information, see separate interface documentation.

System integration

ABB provides three different GSD files (equipment master data) which can be integrated in the system.

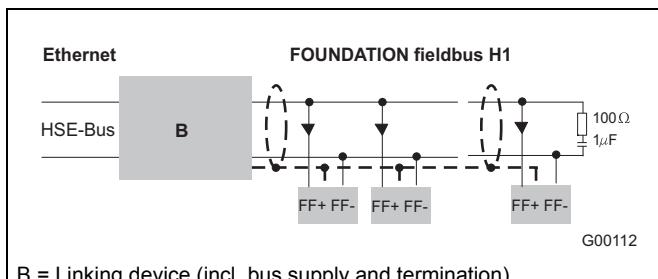
Users decide at system integration whether to install the full range of functions or only part.

The change-over is done using the "ID-number selector" parameter.

ID number 0x9700,	GSD file name: PA139700.gsd
ID number 0x9740,	GSD file name: PA139740.gsd
ID number 0x3430,	GSD file name: ABB_3430.gsd

The GSD files can be downloaded from www.abb.com/flow. The files required for operation can be downloaded from www.profibus.com.

FOUNDATION fieldbus (FF)



B = Linking device (incl. bus supply and termination)

Fig. 23: Example for FOUNDATION fieldbus interface connection

Interoperability test campaign no.	ITK 5.20
Manufacturer ID	0x000320
Device ID	0x0124
Configuration	<ul style="list-style-type: none"> • Directly on the device • Via services integrated in the system • National configurator
Transmission signal	Acc. to IEC 61158-2

Bus topology

- Tree and/or line structure
- Bus termination: passive at both ends of the main bus line ($\text{RC element } R = 100 \Omega, C = 1 \mu\text{F}$)

Voltage / current consumption

- Average current consumption: 10 mA
- In the event of an error, the integrated FDE function (=Fault Disconnection Electronic) integrated in the device ensures that the current consumption can rise to a maximum of 13 mA.
- Upper current limit: electronically restricted.
- The voltage on the bus line must lie in the range of 9 ... 32 V DC.

Bus address

The bus address is automatically assigned or can be set in the system manually.

The identifier (ID) is formed using a unique combination of manufacturer ID, device ID, and device serial number.

System integration

The following are required:

- DD (Device Description) file, which includes the device description.
- The CFF (Common File Format) file is required for engineering the segment. Engineering can be performed online or offline.

The files can be downloaded from www.abb.com/flow.

The files required for operation can also be downloaded from <http://www.fieldbus.org>.

Ex relevant specifications

Electrical connection for operation in zones 1, 21, 22 / Div 1

Flowmeter sensor and transmitter in zone 1 / Div 1

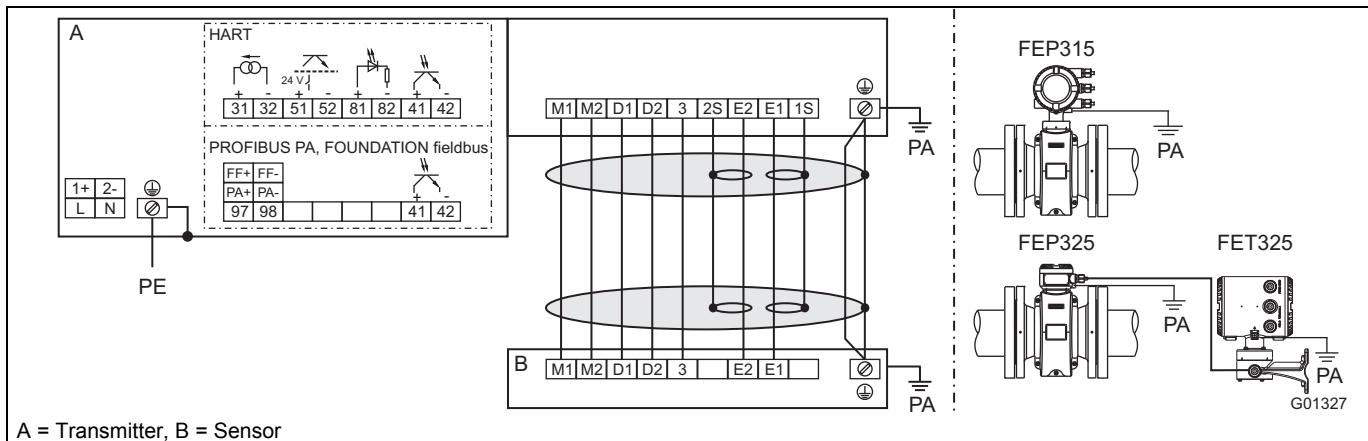


Fig. 24: HART, PROFIBUS PA and FOUNDATION Fieldbus protocol

Power supply connections

AC power supply	
Terminal	Function / Notes
L	Live / Phase
N	Neutral
PE / \ominus	Protective earth (PE)

DC power supply	
Terminal	Function / Notes
1+	+
2-	-
PE / \ominus	Protective earth (PE)

Sensor cable terminal connections

Only on remote mount design.

Terminal	Function / Notes	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
\oplus / SE	Shield	-
E1	Signal line	Violet
1S	Schield for E1	-
E2	Signal line	Blue
2S	Schield for E2	-
3	Measurement potential	Green

Output connections

Terminal	Function / Notes
31 / 32	Current / HART output The current output is available in "active" or "passive" mode. The configuration must be specified ordering the meter, because it is not possible to change the configuration on site.
97 / 98	Digital communication PROFIBUS PA (PA+ / PA-) or FOUNDATION fieldbus (FF+ / FF-) in acc. with IEC 61158-2.
51 / 52	Digital output DO1 passive Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Pulse Output“.
81 / 82	Digital input / contact input Function can be configured locally as „External output switch-off“, „external totalizer reset“, „external totalizer stop“ or „other“. Only available in conjunction with current output „passive“.
41 / 42	Digital output DO2 passive Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Digital Output“, flow direction signaling.
PA	Potential Equalization (PA)

Note

The housing for the transmitter and flowmeter sensor must be connected to the potential equalization PA. The operator must ensure that when connecting the protective conductor (PE) no potential differences can occur between protective conductor and potential equalization (PA).

A temperature of 70 °C (158 °F) at the cable entry is assumed for the Ex calculations. Therefore, the cables used for the supply power and the signal inputs and outputs must have a minimum specification of 70 °C (158 °F).

For devices with remote mount design for use in FM / cFM Div. 1 or FM / cFM Div. 2 the signal cable between the flowmeter sensor and the transmitter must have a minimum length of 5 m (16.4 ft).

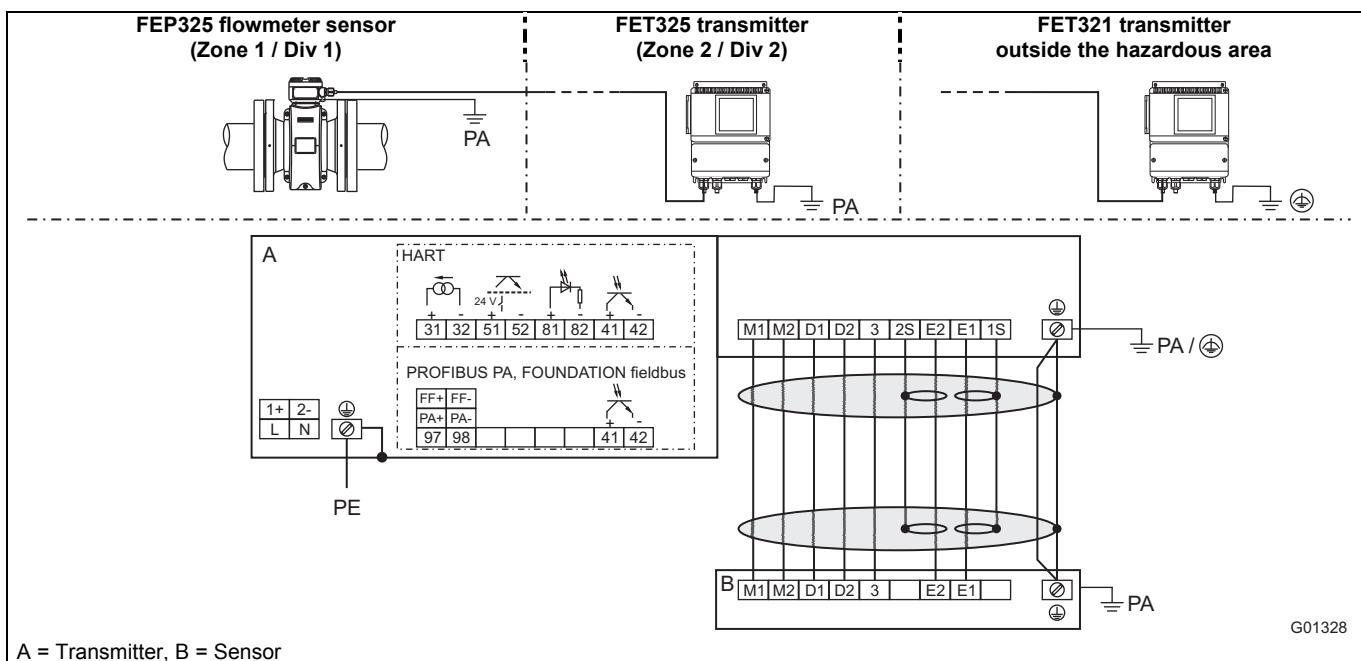
Flowmeter sensor in zone 1 / Div 1 and transmitter in zone 2 / Div 2 or outside the hazardous area

Fig. 25: HART, PROFIBUS PA and FOUNDATION fieldbus protocol

Power supply connections

AC power supply	
Terminal	Function / Notes
L	Live / Phase
N	Neutral
PE / \ominus	Protective earth (PE)

DC power supply	
Terminal	Function / Notes
1+	+
2-	-
PE / \ominus	Protective earth (PE)

Sensor cable terminal connections

Only on remote mount design.

Terminal	Function / Notes	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
\ominus / SE	Shield	-
E1	Signal line	Violet
1S	Schield for E1	-
E2	Signal line	Blue
2S	Schield for E2	-
3	Measurement potential	Green

Output connections

Terminal	Function / Notes
31 / 32	Current / HART output The current output is available in "active" or "passive" mode.
97 / 98	Digital communication PROFIBUS PA (PA+ / PA-) or FOUNDATION fieldbus (FF+ / FF-) in acc. with IEC 61158-2.
51 / 52	Digital output DO1 active / passive Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Pulse Output“.
81 / 82	Digital input / contact input Function can be configured locally as „External output switch-off“, „external totalizer reset“, „external totalizer stop“ or „other“.
41 / 42	Digital output DO2 passive Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Digital Output“, flow direction signaling.
PA	Potential Equalization (PA)
\ominus	Functional ground (only with transmitter outside the hazardous area)

Note

The housing for the transmitter and flowmeter sensor must be connected to the potential equalization PA. The operator must ensure that when connecting the protective conductor (PE) no potential differences can occur between protective conductor and potential equalization (PA).

A temperature of 70 °C (158 °F) at the cable entry is assumed for the Ex calculations. Therefore, the cables used for the supply power and the signal inputs and outputs must have a minimum specification of 70 °C (158 °F).

For devices with remote mount design for use in FM / cFM Div. 1 or FM / cFM Div. 2 the signal cable between the flowmeter sensor and the transmitter must have a minimum length of 5 m (16.4 ft).

Electrical data for operation in zones 1, 21, 22 / Div. 1

Devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct current output design (active/passive), see the marking contained in the device's terminal box.

Dependent upon the device design, an "active" or a "passive" output will be available. For devices designed for use in Ex Zone 1, the current output cannot be reconfigured locally. The configuration required for the current output (active/passive) must be specified when the order is placed.

Model FEP315 or FET325

Inputs and outputs	Operating values		Type of protection Ex i, IS					
	U_N [V]	I_N [mA]	U_O [V]	I_O [mA]	P_O [mW]	C_O [nF]	C_{OPA} [nF]	L_O [mH]
Active current / HART output (Terminals 31 / 32) Load: $250 \Omega \leq R \leq 300 \Omega$	30	30	20	100	500	210	195	6
			U_I [V]	I_I [mA]	P_I [mW]	C_I [nF]	C_{IPA} [nF]	L_I [mH]
			60	425 ⁴⁾	2000 ⁴⁾	8,4	24	0,065
Passive current / HART output (Terminals 31 / 32) Load: $250 \Omega \leq R \leq 650 \Omega$	30	30	U_I [V]	I_I [mA]	P_I [mW]	C_I [nF]	C_{IPA} [nF]	L_I [nH]
			60	500 ⁴⁾	2000 ⁴⁾	8,4	24	170
Passive digital output DO2 (Terminals 41 / 42)	30	220	U_I [V]	I_I [mA]	P_I [mW]	C_I [nF]	C_{IPA} [nF]	L_I [nH]
			60	425 ¹⁾ ⁴⁾ 500 ²⁾ ⁴⁾	2000 ⁴⁾	3,6	3,6	170
Passive digital output DO1 (Terminals 51 / 52)	30	220	60	425 ¹⁾ ⁴⁾ 500 ²⁾ ⁴⁾	2000 ⁴⁾	3,6	3,6	170
Passive digital input DI (Terminals 81/82) ³⁾	30	10	60	500 ⁴⁾	2000 ⁴⁾	3,6	3,6	170

1) For "active" current output

2) For "passive" current output

3) Only available in conjunction with passive current output

4) Intrinsically safe single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

All inputs and outputs are electrically isolated from each other and from the power supply.

Note

The output circuits are designed in such a way that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits. It is not permitted to combine intrinsically safe and non-intrinsically safe circuits. In the case of intrinsically safe circuits, potential equalization is required.

The rated voltage of the non-intrinsically safe circuits is $U_M = 60$ V.

Provided that rated voltage $U_M = 60$ V is not exceeded if connections are established to non-intrinsically safe external circuits, intrinsic safety is still guaranteed.

Devices with PROFIBUS PA or FOUNDATION fieldbus

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct design (PROFIBUS PA or FOUNDATION fieldbus), see the marking contained in the device's terminal box.

For devices in Zone 1 / Div. 1 the bus termination must conform to the FISCO model or the explosion protection regulations, respectively.

For devices in Zone 2 / Div. 2 the bus termination must conform to the FNICO model or the explosion protection regulations, respectively.

Model FEP315 or FET325

The fieldbus and the digital output can be connected in zone 1 / Div. 1 in three different variants.

Variant 1: Intrinsically safe fieldbus connection in acc. with FISCO, intrinsically safe connection of the digital output

Inputs and outputs	Operating values		Type of protection Ex i, IS and FISCO					
	U_N [V]	I_N [mA]	U_i [V]	I_i [mA]	P_i [mW]	C_i [nF]	C_{iPA} [nF]	L_i [μH]
Passive digital output DO2 (terminals 41 / 42)	30	220	60	200 1)	5000 1)	3,6	3,6	0,17
Fieldbus (terminals 97 / 98)	32	30	17	380	5320	1	1	5

1) Intrinsically safe single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

Variant 2: Intrinsically safe fieldbus connection (not in acc. with FISCO!), intrinsically safe connection of the digital output

Inputs and outputs	Operating values		Type of protection Ex i, IS					
	U_N [V]	I_N [mA]	U_i [V]	I_i [mA]	P_i [mW]	C_i [nF]	C_{iPA} [nF]	L_i [μH]
Passive digital output DO2 (terminals 41 / 42)	30	220	60	200 1)	5000 1)	3,6	3,6	0,17
Fieldbus (terminals 97 / 98)	32	30	60	500	5000	1	1	5

1) Intrinsically safe single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

Variant 3: Fieldbus connection in acc. with FNICO (Zone 2, Div. 2), connection of digital output (Zone 2, Div. 2)

Inputs and outputs	Operating values		Type of protection Ex n, NI and FNICO					
	U_N [V]	I_N [mA]	U_i [V]	I_i [mA]	P_i [mW]	C_i [nF]	C_{iPA} [nF]	L_i [μH]
Passive digital output DO2 (terminals 41 / 42)	30	220	-	-	-	-	-	-
Fieldbus (terminals 97 / 98)	32	30	60	500 1)	5000 1)	1	1	5

1) Single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

All inputs and outputs are electrically isolated from each other and from the supply power.

Note

The output circuits are designed in such a way that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits. It is not permitted to combine intrinsically safe and non-intrinsically safe circuits. In the case of intrinsically safe circuits, potential equalization is required.

The rated voltage of the non-intrinsically safe circuits is $U_M = 60$ V. Provided that rated voltage $U_M = 60$ V is not exceeded if connections are established to non-intrinsically safe external circuits, intrinsic safety is still given.

Temperature data

Note

The maximum permissible fluid temperature depends on the lining and flange material, and is limited by the operating values in Table 1 and the explosion protection specifications in Tables 2 ... n.

Table 1: Measuring medium temperature as a function of lining and flange material for models FEP315 and FEP325

Materials		Measuring medium temperature (operating values)	
Lining	Flange	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Hard rubber	Stainless steel	-15 °C (5 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Soft rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)
Soft rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)
PFA	Steel	-10 °C (14 °F)	180 °C (356 °F)
PFA	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
ETFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)

1) Only China production site

Table 2: Measuring medium temperature for model FEP315

Nominal diameter	Design	Temperature class	Ambient temperature											
			(- 40 °C) ¹⁾ - 20 °C ... + 40 °C				(- 40 °C) ¹⁾ - 20 °C ... + 50 °C				(- 40 °C) ¹⁾ - 20 °C ... + 60 °C			
			Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
			Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
DN 3 ... DN 100	NT	T1	130 °C						90 °C	30 °C	80 °C	40 °C		
	HT		180 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T2	130 °C						90 °C	30 °C	80 °C	40 °C		
	HT		180 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T3	130 °C						90 °C	30 °C	80 °C	40 °C		
	HT		180 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T4	120 °C						90 °C	30 °C	80 °C	40 °C		
	HT		120 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T5	85 °C						70 °C	30 °C	80 °C	40 °C		
	HT		85 °C						85 °C	20 °C	85 °C	20 °C		
DN 125 ... DN 2000	NT	T6	70 °C						70 °C	30 °C	70 °C	40 °C		
	HT		70 °C						70 °C	20 °C	70 °C	20 °C		
	NT	T1	130 °C						90 °C	30 °C	80 °C	40 °C		
	HT		180 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T2	130 °C						90 °C	30 °C	80 °C	40 °C		
	HT		180 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T3	130 °C						90 °C	30 °C	80 °C	40 °C		
	HT		180 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T4	125 °C						90 °C	30 °C	80 °C	40 °C		
	HT		125 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T5	90 °C						90 °C	30 °C	80 °C	40 °C		
	HT		90 °C						90 °C	20 °C	90 °C	20 °C		
	NT	T6	75 °C						75 °C	30 °C	75 °C	40 °C		
	HT		75 °C						75 °C	20 °C	75 °C	20 °C		

1) Low-temperature version (option)

NT: standard sensor design, T_{medium} maximum 130 °C (266 °F),HT: high-temperature sensor design, T_{medium} maximum 180 °C (356 °F)

Not thermally insulated: The flowmeter sensor is not surrounded by pipe insulation material.

Thermally insulated: The flowmeter sensor is surrounded by pipe insulation material.

Note

The standard version includes explosion protection for gases and dust. Explosion protection for dust is only available for devices featuring a transmitter in a dual-compartment housing.

- If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.
- If the installation location for the device is classified as a potentially explosive area for gases only, the temperature data in the "Gas" column in the table must be taken into consideration.

Table 3: Measuring medium temperature for model FEP325

Nominal diameter	Design	Temperature class	Ambient temperature											
			(- 40 °C) ¹⁾ - 20 °C ... + 40 °C				(- 40 °C) ¹⁾ - 20 °C ... + 50 °C				(- 40 °C) ¹⁾ - 20 °C ... + 60 °C			
			Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
			Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
DN 3 ... DN 100	NT	T1			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T2			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T3			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T4			120 °C					110 °C	110 °C	110 °C	110 °C	
	HT				120 °C					120 °C	120 °C	120 °C	120 °C	
	NT	T5			85 °C					85 °C	85 °C	85 °C	85 °C	
	HT				85 °C					85 °C	85 °C	85 °C	85 °C	
	NT	T6			70 °C					70 °C	70 °C	70 °C	70 °C	
	HT				70 °C					70 °C	70 °C	70 °C	70 °C	
DN 125 ... DN 2000	NT	T1			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T2			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T3			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T4			125 °C					110 °C	110 °C	110 °C	110 °C	
	HT				125 °C					125 °C	125 °C	125 °C	125 °C	
	NT	T5			90 °C					90 °C	90 °C	90 °C	90 °C	
	HT				90 °C					90 °C	90 °C	90 °C	90 °C	
	NT	T6			75 °C					75 °C	75 °C	75 °C	75 °C	
	HT				75 °C					75 °C	75 °C	75 °C	75 °C	

1) Low-temperature version (option)

NT: standard sensor design, T_{medium} maximum 130 °C (266 °F).HT: high-temperature sensor design, T_{medium} maximum 180 °C (356 °F).

Not thermally insulated: The flowmeter sensor is not surrounded by pipe insulation material.

Thermally insulated: The flowmeter sensor is surrounded by pipe insulation material.

Note

The standard version includes explosion protection for gases and dust.

- If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.
- If the installation location for the device is classified as a potentially explosive area for gases only, the temperature data in the "Gas" columns in the table must be taken into consideration.

Electrical connection for operation in zone 2, 21, 22 / Div. 2

Flowmeter sensor and transmitter in zone 2 / Div 2, or transmitter outside the hazardous area

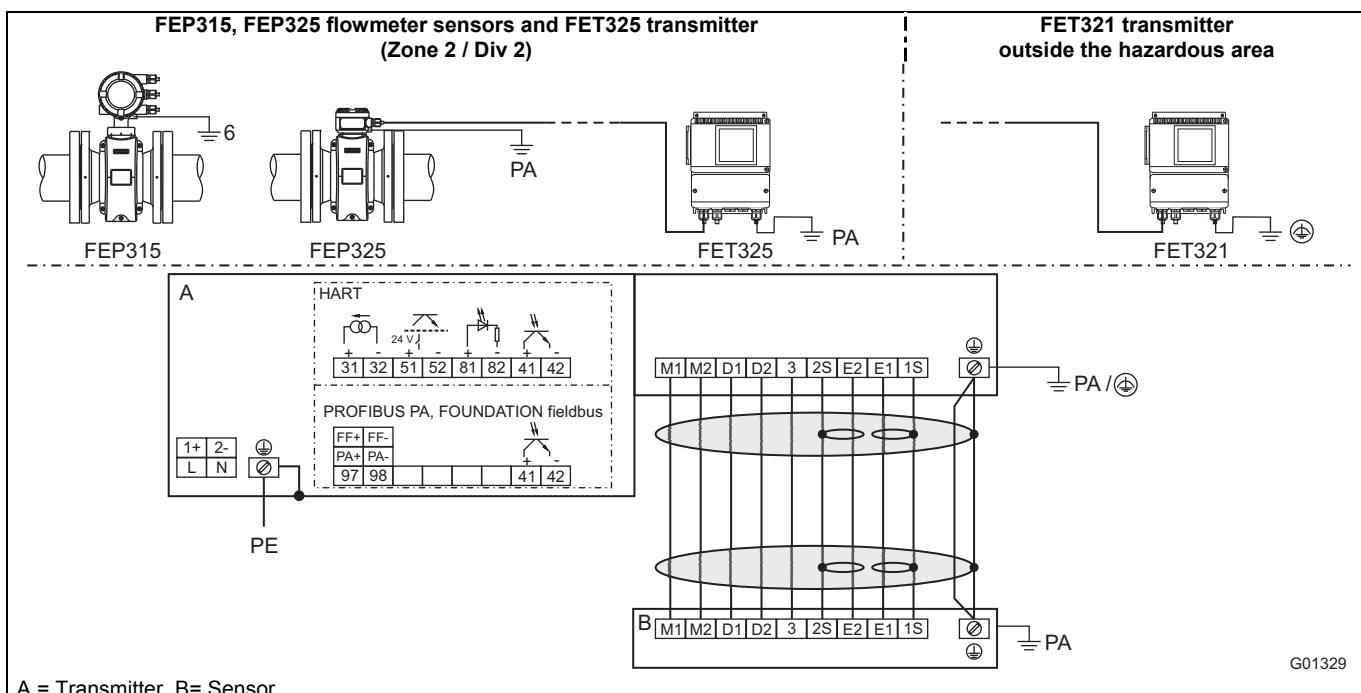


Fig. 26: HART, PROFIBUS PA and FOUNDATION fieldbus protocol

Power supply connections

AC power supply	
Terminal	Function / Notes
L	Live / Phase
N	Neutral
PE / ⊕	Protective earth (PE)

DC power supply	
Terminal	Function / Notes
1+	+
2-	-
PE / ⊕	Protective earth (PE)

Sensor cable terminal connections

Only on remote mount design.

Terminal	Function / Notes	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
⊕ / SE	Shield	-
E1	Signal line	Violet
1S	Schield for E1	-
E2	Signal line	Blue
2S	Schield for E2	-
3	Measurement potential	Green

Output connections

Terminal	Function / Notes
31 / 32	Current / HART output The current output is available in "active" or "passive" mode.
97 / 98	Digital communication PROFIBUS PA (PA+ / PA-) or FOUNDATION fieldbus (FF+ / FF-) in acc. with IEC 61158-2.
51 / 52	Digital output DO1 active / passive Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Pulse Output“.
81 / 82	Digital input / contact input Function can be configured locally as „External output switch-off“, „external totalizer reset“, „external totalizer stop“ or „other“.
41 / 42	Digital output DO2 passive Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Digital Output“, flow direction signaling.
PA	Potential Equalization (PA)
⊕	Functional ground (only for transmitter outside the hazardous area)

Note

The housing for the transmitter and flowmeter sensor must be connected to the potential equalization PA. The operator must ensure that when connecting the protective conductor (PE) no potential differences can occur between protective conductor and potential equalization (PA).

A temperature of 70 °C (158 °F) at the cable entry is assumed for the Ex calculations. Therefore, the cables used for the supply power and the signal inputs and outputs must have a minimum specification of 70 °C (158 °F).

Electrical data for operation in zones 2, 21, 22 / Div. 2

Devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct current output design (active/passive), see the marking contained in the device's terminal box.

Model FEP315 or FET325

Signal inputs and outputs	Operating values		Type of protection Ex n/NI	
	U_i [V]	I_i [mA]	U_i [V]	I_i [mA]
Current / HARToutput, active/passive (terminals 31/32) Load: $250 \Omega \leq R \leq 650 \Omega$	30	30	30	30
Digital output DO1, active/passive (terminals 51/52)	30	220	30	220
Digital output DO2, passive (terminals 41/42)	30	220	30	220
Digital input DI (terminals 81/82)	30	10	30	10

All inputs and outputs are electrically isolated from each other and from the supply power.

Devices with PROFIBUS PA or FOUNDATION fieldbus

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct design (PROFIBUS PA or FOUNDATION fieldbus), see the marking contained in the device's terminal box.

For devices in Zone 2 / Div. 2 the bus termination must conform to the FNICO model or the explosion protection regulations, respectively.

Model FEP315 or FET325

Inputs and outputs	Operating values		Type of protection Ex n, NI and FNICO					
	U_N [V]	I_N [mA]	U_i [V]	I_i [mA]	P_i [mW]	C_i [nF]	C_{IPA} [nF]	L_i [μ H]
Digital output DO2, passive (terminals 41/42)	30	220	-	-	-	-	-	-
Fieldbus (terminals 97/98)	32	30	32	500 ¹⁾	7000 ¹⁾	1	1	5

1) Single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

Temperature data

Table 1: Measuring medium temperature as a function of lining and flange material for models FEP315 and FEP325

Materials		Measuring medium temperature (operating values)	
Lining	Flange	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Hard rubber	Stainless steel	-15 °C (5 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Soft rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)
Soft rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)
PFA	Steel	-10 °C (14 °F)	180 °C (356 °F)
PFA	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
Elastomer ²⁾	Steel	-10 °C (14 °F)	130 °C (266 °F)
Elastomer ²⁾	Stainless steel	-20 °C (-4 °F)	130 °C (266 °F)
ETFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)

1) Only China production site

2) USA production site, only (only for FM / cFM Div 2)

Table 2: Measuring medium temperature for model FEP315

Nominal diameter ProcessMaster DN 3 ... DN 2000 HygienicMaster DN 3 ... DN 100	Design NT HT	Temperature class T1 T2 T3 T4	Ambient temperature											
			- 20 °C ... + 40 °C				- 20 °C ... + 50 °C				- 20 °C ... + 60 °C			
			- 40 °C ... + 40 °C ¹⁾				- 40 °C ... + 50 °C ¹⁾				- 40 °C ... + 60 °C ¹⁾			
			Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
			Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
ProcessMaster DN 3 ... DN 2000 HygienicMaster DN 3 ... DN 100	NT	T1	130 °C	130 °C	---	---	130 °C	100 °C ²⁾ 110 °C ³⁾	---	---	80 °C	40 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	40 °C	180 °C	40 °C	40 °C
	HT	T2	130 °C	130 °C	---	---	130 °C	100 °C ²⁾ 110 °C ³⁾	---	---	80 °C	40 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	40 °C	180 °C	40 °C	40 °C
	NT	T3	130 °C	130 °C	---	---	130 °C	100 °C ²⁾ 110 °C ³⁾	---	---	80 °C	40 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	40 °C	180 °C	40 °C	40 °C
	NT	T4	130 °C	130 °C	---	---	130 °C	100 °C ²⁾ 110 °C ³⁾	---	---	80 °C	40 °C	---	---
			130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	40 °C	130 °C	40 °C	40 °C

1) Low-temperature version (option)

2) Temperature values for ProcessMaster

3) Temperature values for HygienicMaster

NT: standard sensor design, T_{medium} maximum 130 °C (266 °F)HT: high-temperature sensor design, T_{medium} maximum 180 °C (356 °F)

Not thermally insulated: The flowmeter sensor is not surrounded by pipe insulation material.

Thermally insulated: The flowmeter sensor is surrounded by pipe insulation material.

Note

The standard version includes explosion protection for gases and dust. Explosion protection for dust is only available for devices featuring a transmitter in a dual-compartment housing.

- If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.
- If the installation location for the device is classified as a potentially explosive area for gases only, the temperature data in the "Gas" column in the table must be taken into consideration.

Table 3: Measuring medium temperature for model FEP325

Nominal diameter	Design	Temperature class	Ambient temperature											
			- 20 °C ... + 40 °C				- 20 °C ... + 50 °C				- 20 °C ... + 60 °C			
			- 40 °C ... + 40 °C ¹⁾				- 40 °C ... + 50 °C ¹⁾				- 40 °C ... + 60 °C ¹⁾			
			Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
			Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
ProcessMaster DN 3 ... DN 2000 HygienicMaster DN 3 ... DN 100	NT	T1	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C ²⁾ 120 °C ³⁾	110 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C
	NT	T2	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C ²⁾ 120 °C ³⁾	110 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C
	NT	T3	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C ²⁾ 120 °C ³⁾	110 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C
	NT	T4	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C ²⁾ 120 °C ³⁾	110 °C	---	---
			130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C
	NT	T5	95 °C	95 °C	---	---	95 °C	95 °C	---	---	95 °C	95 °C	---	---
			95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C
	NT	T6	80 °C	80 °C	---	---	80 °C	80 °C	---	---	80 °C	80 °C	---	---
			80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C

1) Low-temperature version (option)

2) Temperature values for ProcessMaster

3) Temperature values for HygienicMaster

NT: standard sensor design, T_{medium} maximum 130 °C (266 °F)HT: high-temperature sensor design, T_{medium} maximum 180 °C (356 °F)

Not thermally insulated: The flowmeter sensor is not surrounded by pipe insulation material.

Thermally insulated: The flowmeter sensor is surrounded by pipe insulation material.

Note

The standard version includes explosion protection for gases and dust.

- If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.
- If the installation location for the device is classified as a potentially explosive area for gases only, the temperature data in the "Gas" columns in the table must be taken into consideration.

Specifications for operation in areas with combustible dust

The device with dual-compartment transmitter housing is approved for use in potentially explosive areas (gas and dust).

The Ex certification is provided on the name plate.



DANGER - Risk of explosion!

The dust explosion protection is also provided by the housing.

Modifications to the housing are not allowed (e.g., removing or omitting parts).

Maximum allowable surface temperature

Model	Maximum surface temperature
FEP325	T 85 °C (185 °F) ... T _{medium}
FEP315	T 70 °C (158 °F) ... T _{medium}
FET325	T 70 °C (158 °F)

The maximum surface temperature is applicable to dust layers of up to 5 mm (0.20 inch) in thickness. The minimum permissible ignition and smoldering temperatures of the dust atmosphere should be calculated in accordance with IEC61241ff.

With thicker dust layers, the maximum permissible surface temperature must be reduced. The dust can be conductive or non-conductive. IEC61241ff must be observed.

Minimum signal cable length

In explosion protection areas, the signal cable cannot be shorter than 5 m (16.4 ft).

Installation requirements

Grounding

The flowmeter sensor must be connected to ground potential. For technical reasons, this potential should be identical to the potential of the metering fluid.

For plastic or insulated lined pipelines, the fluid is grounded by installing ground plates. When there are stray potentials present in the pipeline, a ground plate is recommended on both ends of the meter sensor.

Mounting

The following points must be observed for the installation:

- The meter tube must always be completely full.
- The flow direction must correspond to the identification if present.
- The maximum torque for all flange connections must be complied with. The max torque depends on the temperature, pressure, material of the flange bolts and gaskets and has to be chosen accordingly.
- The devices must be installed without mechanical tension (torsion, bending).
- Flowmeters with coplanar counter flanges may only be installed with suitable seals.
- Use flange seals made from a compatible material for the fluid and fluid temperatures.
- Seals must not extend into the flow area since possible turbulence could influence the device accuracy.
- The pipeline may not exert any unallowable forces and torques on the device.
- Do not remove the plugs in the cable connectors until you are ready to install the electrical cable.
- Install the separate converter at a largely vibration-free location.
- Do not expose the converter to direct sunlight or provide for appropriate sun protection where necessary.

Flow direction

The device measures the flowrate in both directions. Forward flow is the factory setting, as shown in Fig. 27.

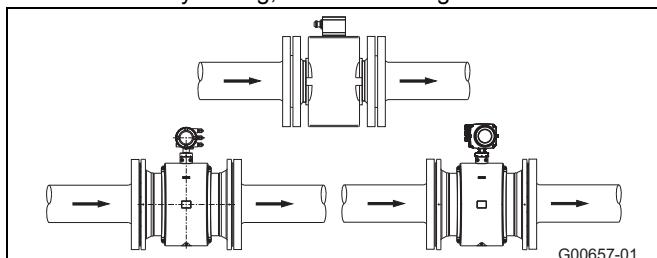


Fig. 27

Electrode axis

Electrode axis (1) should be horizontal if at all possible or no more than 45° from horizontal.

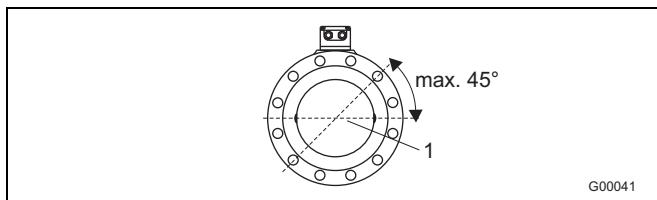


Fig. 28

Inlet and outlet pipe sections

The metering principle is independent of the flow profile as long as standing eddies do not extend into the metering section, such as may occur after double elbows (1), in the event of tangential inflow, or where half-open gate valves are located upstream of the flowmeter sensor.

In such cases, measures must be put in place to normalize the flow profile.

- Do not install fittings, manifolds, valves, etc., directly in front of the flowmeter sensor (1).
- Butterfly valves must be installed so that the valve plate does not extend into the flowmeter sensor.
- Valves or other turn-off components should be installed in the outlet pipe section (2).

Experience has shown that, in most installations, straight inlet sections 3 x DN long and straight outlet sections 2 x DN long are sufficient (DN = nominal diameter of the sensor Fig. 29). For test stands, the reference conditions of 10 x DN straight inlet and 5 x DN straight outlet must be provided, in accordance with EN 29104 / ISO 9104.

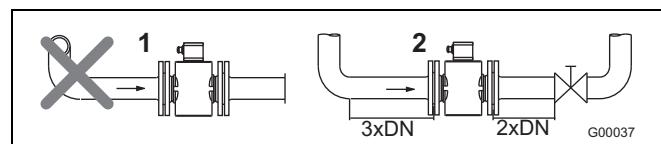


Fig. 29

Vertical connections

Vertical installation for measuring abrasive fluids, preferably with flow in upward direction.

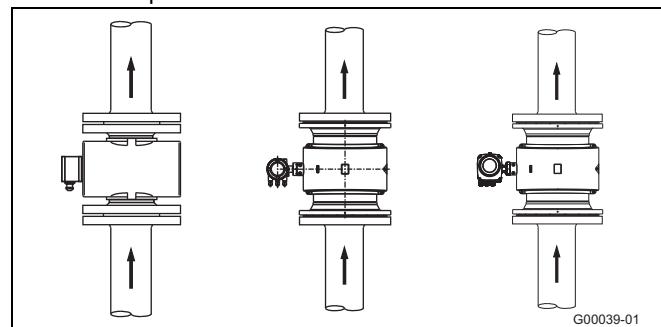


Fig. 30

Horizontal connections

- Meter tube must always be completely full.
- Provide for a slight incline of the connection for degassing.

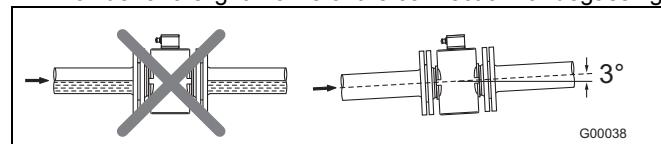


Fig. 31

Free inlet or outlet

- Do not install the flowmeter at the highest point or in the draining-off side of the pipeline, flowmeter runs empty, air bubbles can form (1).
- Provide for a siphon fluid intake for free inlets or outlets so that the pipeline is always full (2).

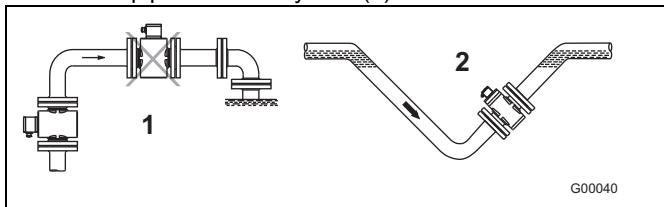


Fig. 32

Strongly contaminated fluids

For strongly contaminated fluids, a bypass connection according to the figure is recommended so that operation of the system can continue to run without interruption during the mechanical cleaning.

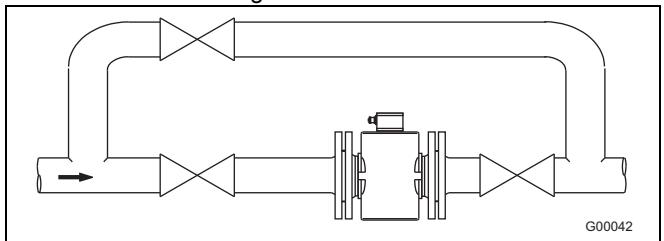


Fig. 33

Installation in the vicinity of pumps

For flowmeter primaries which are to be installed in the vicinity of pumps or other vibration generating equipment, the utilization of mechanical snubbers is advantageous.

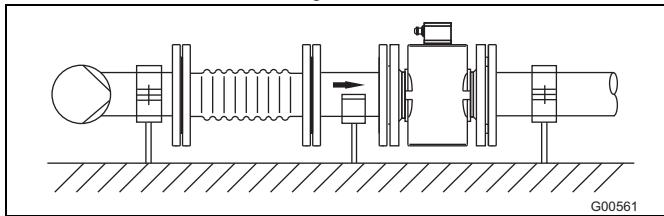


Fig. 34

Installation of the high temperature design

The high temperature design allows for complete thermal insulation of the sensor. The pipeline and sensor must be insulated after installing the unit according to the following illustration.

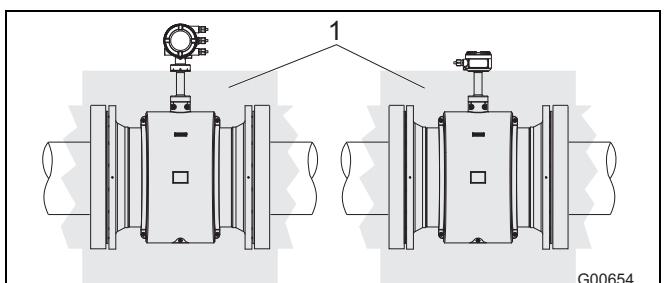


Fig. 35

1 Insulation

Installation in pipelines with larger nominal diameters

Determine the resulting pressure loss when using reduction pieces (1):

- Calculate the diameter ratio d/D .
- Determine the flow velocity based on the flow range nomograph (Fig. 37).
- Read the pressure drop on the Y-axis in Fig. 37.

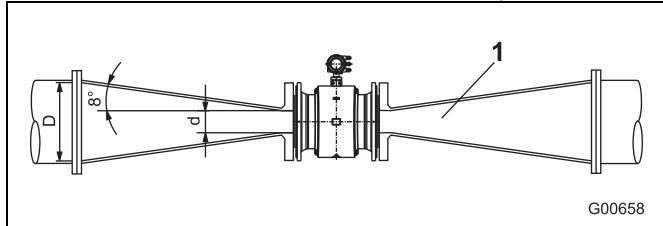


Fig. 36

1 Flange transition piece
d Inside diameter of the flowmeter
V flow velocity [m/s]

Δp pressure loss [mbar]
D Inside diameter of the pipeline

Nomograph for pressure drop calculations

For flange transition piece with $\alpha/2 = 8^\circ$

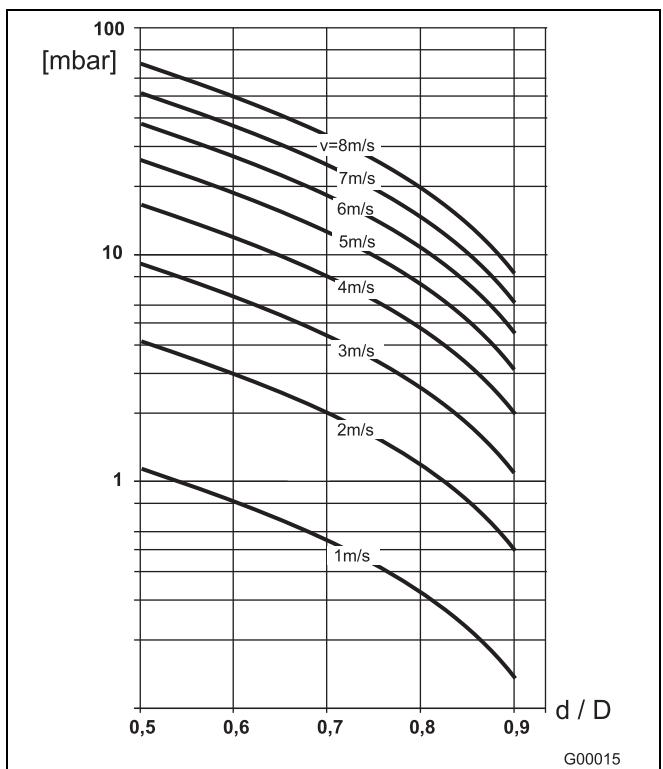
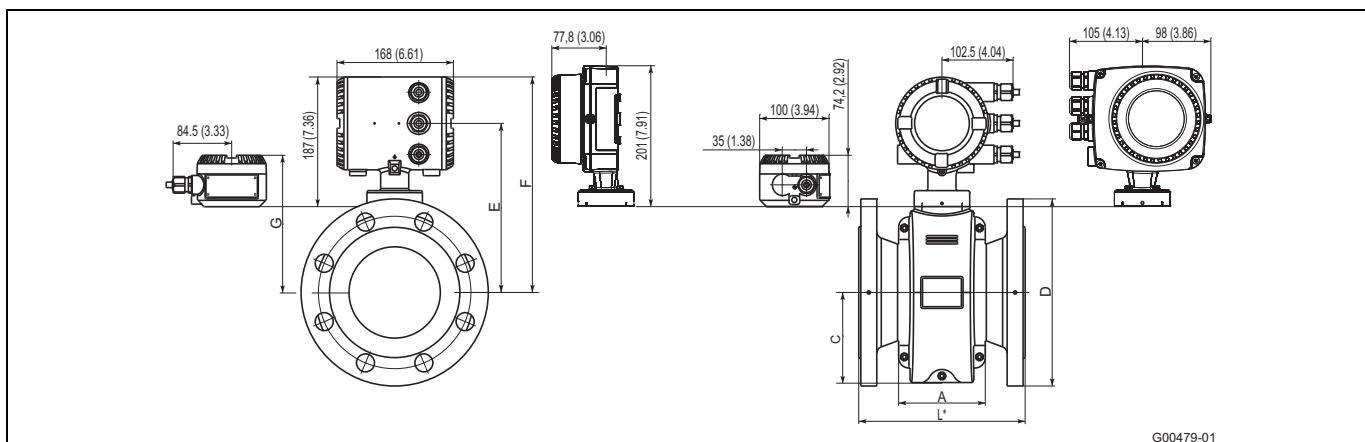


Fig. 37

Dimensions for sensor design level „B“**Flange DN 3 ... 125 (1/10 ... 5"), Sensor housing made of Aluminium (Clamp Shell)**

G00479-01

Fig. 38: Dimensions in mm (inch)

DN	Process connection	Dimensions mm (inch)							Approx. weight kg (lb)	
		D	L ^{2) 3) 8)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	A	Integral	Remote
3 ... 8 ⁵⁾ (1/8 ... 5/16 ⁶⁾	EN 1092-1 ⁷⁾ PN 10 ... 40 ¹⁾	90 (3.54)	200 (7.84)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	7 (15)	5 (11)
	ASME B16.5 CL 150	89 (3.50)								
	ASME B16.5 CL 300	96 (3.78)								
	JIS 10K	90 (3.54)								
15 (1/2)	EN 1092-1 ⁷⁾ PN 10 ... 40 ¹⁾	95 (3.74)	200 (7.84)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	7 (15)	5 (11)
	ASME B16.5 CL 150	89 (3.50)								
	ASME B16.5 CL 300	96 (2.72)								
	JIS 10K	95 (3.74)								
20 (3/4)	EN 1092-1 ⁷⁾ PN 10 ... 40 ¹⁾	105 (4.13)	200 (7.84)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	8 (18)	6 (13)
	ASME B16.5 CL 150	98 (3.86)								
	ASME B16.5 CL 300	118 (4.65)								
	JIS 10K	100 (3.94)								
25 (1)	EN 1092-1 ⁷⁾ PN 10 ... 40 ¹⁾	115 (4.53)	200 (7.84)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	9 (20)	7 (15)
	ASME B16.5 CL 150	108 (4.25)								
	ASME B16.5 CL 300	124 (4.88)								
	JIS 10K	125 (4.92)								
32 (1 1/4)	EN 1092-1 ⁷⁾ PN 10 ... 40 ¹⁾	140 (5.51)	200 (7.87)	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)	113 (4.45)	10 (22)	8 (18)
	ASME B16.5 CL 150	118 (4.65)								
	ASME B16.5 CL 300	134 (5.28)								
	JIS 10K	135 (5.31)								
40 (1 1/2)	EN 1092-1 ⁷⁾ PN 10 ... 40 ¹⁾	150 (5.91)	200 (7.87)	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)	113 (4.45)	11 (24)	9 (20)
	ASME B16.5 CL 150	127 (5.00)								
	ASME B16.5 CL 300	156 (6.14)								
	JIS 10K	140 (5.51)								

Toleranz L: +0 / -3 mm (+0 / -0,018 inch)

DN	Process connection	Dimensions mm (inch)							Approx. weight kg (lb)	
		D	L ^{2) 3) 8)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	A	Integral	Remote
50 (2)	EN 1092-1 7) PN 10 ... 40 ¹⁾	165 (6.50)	200 (7.87)	268 (10.55)	97 (3.82)	201 (7.91)	156 (6.14)	115 (4.53)	12 (26)	10 (22)
	ASME B16.5 CL 150	153 (6.02)								
	ASME B16.5 CL 300	165 (6.50)								
	JIS 10K	155 (6.10)								
	AS2129 table D AS2129 table E	150 (5.91)								
65 (2 1/2)	EN 1092-1 7) PN 10 ... 40 ¹⁾	185 (7.28)	200 (7.87)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)	104 (4.09)	15 (33)	13 (29)
	ASME B16.5 CL 150	178 (7.01)							13 (29)	11 (24)
	ASME B16.5 CL 300	191 (7.52)							15 (33)	13 (29)
	JIS 10K	175 (6.89)							15 (33)	13 (29)
	AS2129 table D AS2129 table E	165 (6.50)							13 (29)	11 (24)
80 (3)	EN 1092-1 7) PN 10 ... 40 ¹⁾	200 (7.87)	200 (7.87)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)	104 (4.09)	17 (38)	15 (33)
	ASME B16.5 CL 150	191 (7.52)							17 (38)	15 (33)
	ASME B16.5 CL 300	210 (8.27)							19 (42)	17 (38)
	JIS 10K	185 (7.28)							19 (42)	17 (38)
	AS2129 table D AS2129 table E	185 (7.28)							17 (38)	15 (33)
100 (4)	EN 1092-1 7) PN 10 ... 16 ¹⁾	220 (8.66)	250 (9.84)	301 (11.85)	122 (4.80)	234 (9.21)	189 (7.44)	125 (4.92)	19 (42)	17 (38)
	EN 1092-1 7) PN 25 ... 40 ¹⁾	235 (9.25)							23 (51)	21 (46)
	ASME B16.5 CL 150	229 (9.02)							21 (46)	19 (42)
	ASME B16.5 CL 300	254 (10.0)							30 (66)	28 (62)
	JIS 10K	210 (8.72)							19 (42)	17 (38)
	AS2129 table D AS2129 table E	215 (8.46)							21 (46)	19 (42)
125 (5)	EN 1092-1 7) PN 10 ... 16 ¹⁾	250 (9.84)	250 (9.84)	311 (12.24)	130 (5.12)	244 (9.61)	199 (7.83)	125 (4.92)	22 (49)	20 (44)
	EN 1092-1 7) PN 25 ... 40 ¹⁾	270 (10.63)							29 (64)	27 (60)
	ASME B16.5 CL 150	254 (10.0)							22 (49)	20 (44)
	ASME B16.5 CL 300	280 (11.02)							35 (77)	33 (73)
	JIS 10K	250 (9.84)							22 (49)	20 (44)
	AS2129 table D AS2129 table E	255 (10.04)							22 (49)	20 (44)

Tolerance L: +0 / -0.118 inch

- 1) Other pressure ratings upon request.
- 2) If a grounding plate is installed (attached to one side of the flange), this increases dimension L as follows: DN 3 ... 100 by 3 mm (0.118 inch); DN 125 by 5 mm (0.197 inch).
- 3) If protection plates are installed (attached to both sides of the flange), this increases dimension L as follows: DN 3 ... 100 by 6 mm (0.236 inch); DN 125 by 10 mm (0.394 inch).
- 4) Depending on the device design, the dimensions change according to the following table.

Device design	Dimension E, F	Dimension G
Without explosion protection	Standard sensor design High-temperature sensor design	0 +127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design High-temperature sensor design	+74 mm (+2.91 inch) +127 mm (+5 inch)
Explosion protection Zone 2, Div. 2	Standard sensor design High-temperature sensor design	0 +127 mm (+5 inch)
		+127 mm (+5 inch) +47 mm (+1.85 inch) +174 mm (+6.85 inch)

- 5) Connection flange DN 10
- 6) Connection flange 1/2"
- 7) Connecting dimensions in acc. with EN 1092-1. For DN 65, PN 16 in acc. with EN 1092-1, please order PN 40.
- 8) For devices with ordering code "Installation length JN" (China production site) the installation length corresponds to the ISO installation length.

Flange DN 150 ... 400 (6 ... 16"), Sensor housing made of Aluminium (Clamp Shell)

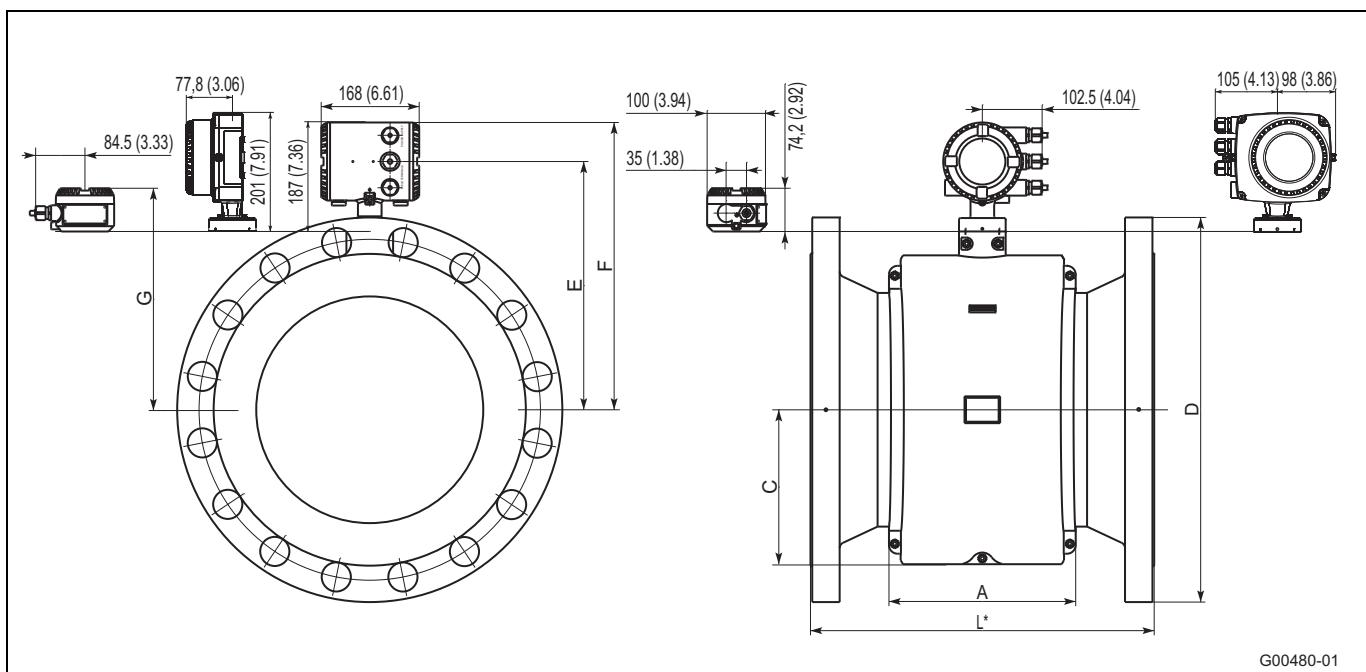


Fig. 39: Dimensions in mm (inch)

Dimensions mm (inch)								Approx. weight kg (lb)		
DN	Process connection	D	L 2) 3)	F 4)	C	E 4)	G 4)	A	Integral	Remote
150 (6)	EN 1092-1 PN 10 ... 16 ¹⁾	285 (11.22)	300 (11.81)	358 (14.09)	146 (5.75)	291 (11.46)	246 (9.69)	166 (6.54)	33 (73)	31 (68)
	EN 1092-1 PN 25 ... 40 ¹⁾	300 (11.81)							39 (86)	37 (82)
	ASME B16.5 CL 150	280 (11.02)							33 (73)	31 (68)
	ASME B16.5 CL 300	381 (15)							47 (104)	45 (99)
	JIS 10K	280 (11.02)							33 (73)	31 (68)
	AS2129 table D AS2129 table E	280 (11.02)							33 (73)	31 (68)
200 (8)	EN 1092-1 PN 10 ... 16 ¹⁾	340 (13.39)	350 (13.78)	399 (15.71)	170 (6.69)	331 (13.03)	286 (11.26)	200 (7.87)	41 (90)	39 (86)
	EN 1092-1 PN 25 ... 40 ¹⁾	340 (13.39)							43 (95)	41 (90)
	ASME B16.5 CL 150	343 (13.5)							50 (110)	48 (106)
	ASME B16.5 CL 300	381 (15)							72 (158)	70 (154)
	JIS 10K	330 (12.99)							43 (95)	41 (90)
	AS2129 table D AS2129 table E	335 (13.19)							50 (110)	48 (106)
250 (10)	EN 1092-1 PN 10 ... 16 ¹⁾	395 (15.55)	450 (17.72)	413 (16.26)	198 (7.80)	346 (13.62)	301 (11.85)	235 (9.25)	61 (135)	59 (130)
	EN 1092-1 PN 25 ... 40 ¹⁾	405 (15.94)							65 (143)	63 (139)
	ASME B16.5 CL 150	407 (16.02)							70 (154)	68 (150)
	ASME B16.5 CL 300	445 (17.52)							105 (232)	103 (227)
	JIS 10K	400 (15.75)							65 (143)	63 (139)
	AS2129 table D AS2129 table E	405 (15.94)							70 (154)	68 (150)

Tolerance L: DN 150 ... 200 +0 / -3 mm (+0 / -0,118 inch), DN 250 ... 400 +0 / -5 mm (+0 / -0,197 inch)

Dimensions mm (inch)								Approx. weight kg (lb)		
DN	Process connection	D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	A	Integral	Remote
300 (12)	EN 1092-1 PN 10 ... 16 ¹⁾	445 (17.52)	500 (19.68)	436 (17.17)	228 (8.98)	369 (14.53)	324 (12.76)	272 (10.71)	74 (163)	72 (159)
	EN 1092-1 PN 25 ... 40 ¹⁾	460 (18.11)							80 (176)	78 (172)
	ASME B16.5 CL 150	483 (19.02)							105 (232)	103 (227)
	ASME B16.5 CL 300	521 (20.51)							150 (331)	148 (326)
	JIS 10K	445 (17.52)							80 (176)	78 (172)
	AS2129 table D AS2129 table E	455 (17.19)							105 (232)	103 (227)
350 (14)	EN 1092-1 PN 10 ... 16 ¹⁾	505 (19.88)	550 (21.65)	451 (17.76)	265 (10.43)	384 (15.12)	339 (13.35)	322 (12.68)	95 (209)	93 (203)
	EN 1092-1 PN 25 ... 40 ¹⁾	520 (20.47)							110 (243)	108 (238)
	ASME B16.5 CL 150	533 (20.98)							105 (232)	103 (227)
	ASME B16.5 CL 300	584 (22.99)							140 (309)	138 (304)
	JIS 10K	490 (19.29)							110 (243)	108 (238)
	AS2129 table D AS2129 table E	525 (20.67)							105 (232)	103 (227)
400 (16)	EN 1092-1 PN 10 ... 16 ¹⁾	565 (22.24)	600 (23.62)	493 (19.41)	265 (10.43)	426 (16.77)	381 (15.00)	322 (12.68)	103 (227)	101 (223)
	EN 1092-1 PN 25 ... 40 ¹⁾	580 (22.83)							126 (278)	124 (273)
	ASME B16.5 CL 150	597 (23.50)							175 (386)	173 (381)
	ASME B16.5 CL 300	647 (25.47)							265 (584)	263 (580)
	JIS 10K	560 (22.05)							126 (278)	124 (273)
	AS2129 table D AS2129 table E	580 (22.83)							175 (386)	173 (381)

Tolerance L: DN 150 ... 200 +0 / -3 mm (+0 / -0,118 inch), DN 250 ... 400 +0 / -5 mm (+0 / -0,197 inch)

- 1) Other pressure ratings upon request.
- 2) If a grounding plate is installed (attached to one side of the flange), this increases dimension L by 5 mm (0.197 inch).
- 3) If protection plates are installed (attached to both sides of the flange), this increases dimension L by 10 mm (0.394 inch).
- 4) Depending on the device design, the dimensions change according to the following table.

Device design		Dimension E, F	Dimension G
Without explosion protection	Standard sensor design	0	0
	High-temperature sensor design	+127 mm (+5 inch)	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2.91 inch)	+47 mm (+1.85 inch)
	High-temperature sensor design	+127 mm (+5 inch)	+174 mm (+6.85 inch)
Explosion protection Zone 2, Div. 2	Standard sensor design	0	0
	High-temperature sensor design	+127 mm (+5 inch)	+127 mm (+5 inch)

Flange DN 450 ... 2000 (18 ... 80"), Sensor housing made of carbon steel

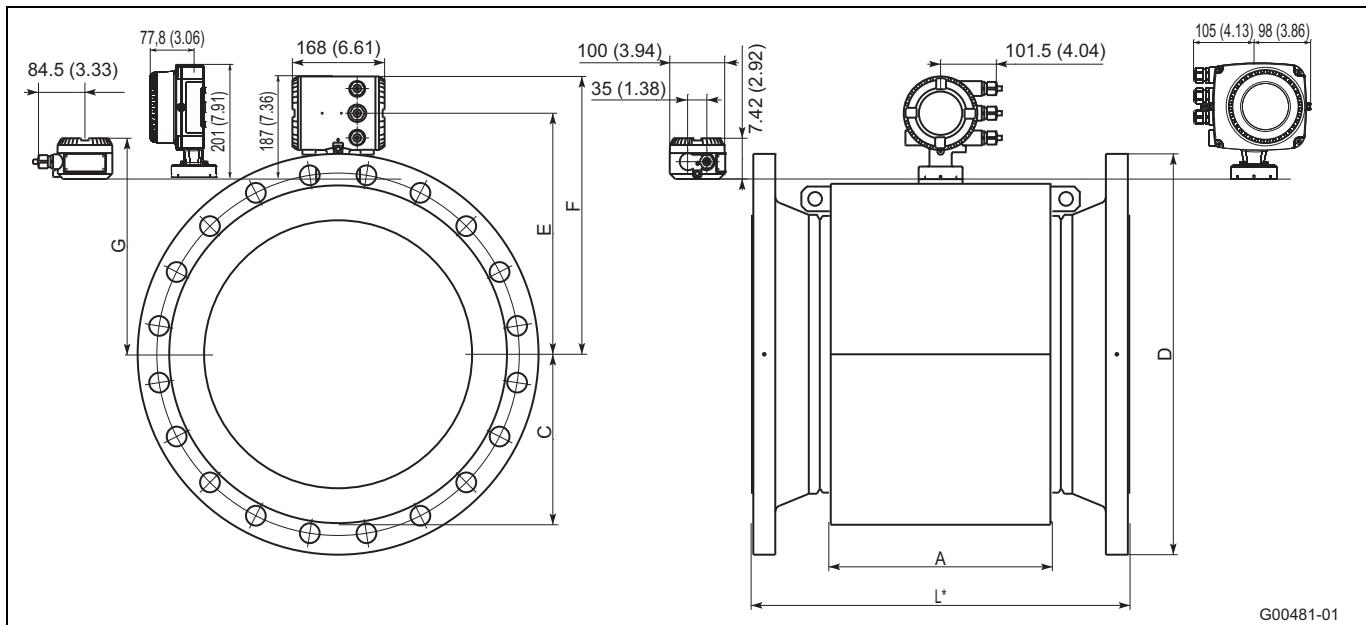


Fig. 40: Dimensions in mm (inch)

DN	Process connection	Dimensions mm (inch)							Approx. weight kg (lb)	
		D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	A	Integral	Remote
450 (18)	ASME B16.5 CL 150	635 (25.0)	686 (27.01)	501 (19.72)	310 (12.20)	434 (17.09)	389 (15.31)	-	260 (573)	258 (569)
	AS2129 table D AS2129 table E	640 (25.20)								
500 (20)	EN 1092-1 PN 10 ¹⁾	670 (26.38)	650 (25.59)	501 (19.72)	310 (12.20)	434 (17.09)	389 (15.31)	407 (16.02)	190 (419)	188 (415)
	EN 1092-1 PN 16 ¹⁾	715 (28.15)							240 (529)	238 (525)
	ASME B16.5 CL 150	699 (27.52)							300 (661)	298 (657)
	AS2129 table D AS2129 table E	705 (27.76)								
600 (24)	EN 1092-1 PN 10 ¹⁾	780 (30.71)	780 (30.71)	552 (21.73)	361 (14.21)	485 (19.09)	440 (17.32)	469 (18.46)	246 (542)	244 (537)
	EN 1092-1 PN 16 ¹⁾	840 (33.07)							318 (701)	316 (697)
	ASME B16.5 CL 150	813 (32.01)							425 (937)	423 (933)
	AS2129 table D AS2129 table E	825 (32.48)								
700 (28)	EN 1092-1 PN 10 ¹⁾	895 (35.24)	910 (35.83)	596 (23.46)	405 (15.94)	529 (20.83)	484 (19.06)	537 (21.14)	320 (706)	318 (701)
	EN 1092-1 PN 16 ¹⁾	910 (35.83)							440 (970)	438 (966)
	ASME B16.5 CL 150	837 (32.95)							350 (772)	348 (767)
760 (30)	ASME B16.5 CL 150	888 (34.96)	990 (38.96)	606 (23.86)	435 (17.13)	539 (21.22)	494 (19.45)	-	230 (507)	228 (503)
800 (32)	EN 1092-1 PN 10 ¹⁾	1015 (39.96)	1040 (40.94)	646 (25.43)	455 (17.91)	579 (22.8)	534 (21.02)	605 (23.82)	420 (926)	418 (922)
	EN 1092-1 PN 16 ¹⁾	1025 (40.35)							490 (1080)	488 (1076)
900 (36)	EN 1092-1 PN 10 ¹⁾	1115 (43.90)	1170 (46.06)	696 (27.40)	505 (19.88)	629 (24.76)	584 (22.99)	671 (26.42)	505 (1113)	503 (1109)
	EN 1092-1 PN 16 ¹⁾	1125 (44.29)							590 (1301)	588 (1296)
	ASME B16.5 CL 150	1057 (41.61)							680 (1499)	678 (1495)

Tolerance L: DN 450 ... 500 +0 / -5 mm (+0 / -0.197 inch), DN 600 ... 2000 +0 / -10 mm (+0 / -0.394 inch)

DN	Process connection	Dimensions mm (inch)							Approx. weight kg (lb)	
		D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	A	Integral	Remote
1000 (40)	EN 1092-1 PN 10 ¹⁾	1230 (48.43)	1300 (51.18)	746 (29.37)	555 (21.85)	679 (26.73)	634 (24.96)	739 (29.09)	690 (1521)	688 (1516)
	EN 1092-1 PN 16 ¹⁾	1255 (49.41)							850 (1873)	848 (1869)
	ASME B16.5 CL 150	1380 (54.33)							880 (1940)	878 (1936)
1050 (42)	ASME B16.5 CL 150	1067 (42.01)	1365 (53.74)	771 (30.35)	580 (22.83)	704 (72.72)	659 (25.94)	-	-	-
1100 (44)	ASME B16.5 CL 150	1118 (44.02)	1430 (56.30)	-	-	-	-	-	-	-
1200 (40)	EN 1092-1 PN 10 ¹⁾	1405 (55.31)	1560 (61.42)	856 (33.7)	660 (25.98)	789 (31.06)	742 (29.21)	800 (31.5)	700 (1543)	698 (1538)
	EN 1092-1 PN 16 ¹⁾	1455 (57.28)							930 (2050)	928 (2046)
1400 (40)	EN 1092-1 PN 10 ¹⁾	1630 (64.17)	1820 (71.65)	950 (37.4)	755 (29.72)	884 (34.8)	838 (32.99)	900 (35.43)	810 (1786)	808 (1781)
	EN 1092-1 PN 16 ¹⁾	1675 (65.94)							1210 (2668)	1208 (2663)
1500 (60)	ASME B16.5 CL 150	1676 (65.98)	1950 (76.77)	996 (39.21)	805 (31.69)	929 (36.57)	884 (34.80)	-	-	-
1600 (40)	EN 1092-1 PN 10 ¹⁾	1830 (72.05)	2080 (81.89)	1060 (41.73)	865 (34.06)	994 (39.13)	948 (37.32)	990 (38.98)	1180 (2602)	1178 (2597)
	EN 1092-1 PN 16 ¹⁾	1915 (75.39)							1630 (3593)	1628 (3589)
1800 (40)	EN 1092-1 PN 10 ¹⁾	2045 (80.51)	2340 (92.13)	1176 (46.3)	980 (38.58)	1109 (43.66)	1062 (41.81)	1080 (42.52)	1490 (3285)	1488 (3280)
	EN 1092-1 PN 16 ¹⁾	2115 (83.27)							2230 (4916)	2228 (4912)
2000 (40)	EN 1092-1 PN 10 ¹⁾	2265 (89.17)	2600 (102.36)	1286 (50.63)	1090 (42.91)	1219 (47.99)	1172 (46.14)	1170 (46.06)	1880 (4145)	1878 (4140)
	EN 1092-1 PN 16 ¹⁾	2325 (91.54)							2650 (5842)	2648 (5838)

Tolerance L: DN 450 ... 500 +0 / -5 mm (+0 / -0.197 inch), DN 600 ... 2000 +0 / -10 mm (+0 / -0.394 inch)

- 1) Other pressure ratings available on request.
- 2) If a grounding plate is installed (attached to one side of the flange), this increases dimension L as follows: DN 400 ... 600 by 5 mm (0.197 inch).
- 3) If protection plates are installed (attached to both sides of the flange), this increases dimension L as follows: DN 400 ... 600 by 10 mm (0.394 inch).
- 4) Depending on the device design, the dimensions change according to the following table.

Device design		Dimension E, F	Dimension G
Without explosion protection	Standard sensor design	0	0
	High-temperature sensor design	+127 mm (+5 inch)	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2.91 inch)	+47 mm (+1.85 inch)
	High-temperature sensor design	+127 mm (+5 inch)	+174 mm (+6.85 inch)
Explosion protection Zone 2, Div. 2	Standard sensor design	0	0
	High-temperature sensor design	+127 mm (+5 inch)	+127 mm (+5 inch)

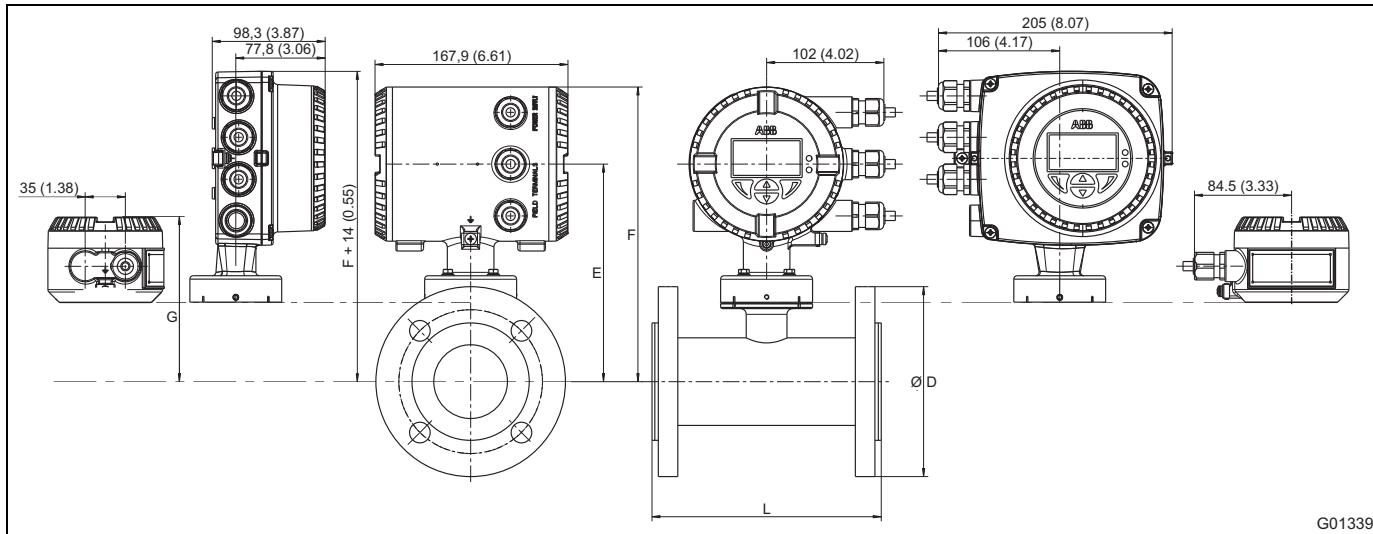
Dimensions for sensor design level „C“**Flange DN 25 ... 600 (18 ... 24"), Sensor housing made of carbon steel**

Fig. 41: Dimensions in mm (inch)

DN	Process connection	Dimensions mm (inch)					Approx. weight kg (lb)	
		D	L ^{2) 3)}	F ⁴⁾	E ⁴⁾	G ⁴⁾	Integral	Remote
25 (1")	EN 1092-1 PN 10 ... 40 ¹⁾	115 (4.53)	200 (7.84)	244 (9.61)	177 (6.97)	131 (5.16)	9 (20)	7 (15)
	ASME B16.5 CL 150	108 (4.25)						
	ASME B16.5 CL 300	124 (4.88)						
	JIS 10K	125 (4.92)						
	AS2129 table D AS2129 table E	115 (4.53)						
32 (1 1/4")	EN 1092-1 PN 10 ... 40 ¹⁾	140 (5.51)	200 (7.84)	249 (9.80)	182 (7.17)	136 (5.35)	10 (22)	8 (18)
	ASME B16.5 CL 150	118 (4.65)						
	ASME B16.5 CL 300	134 (5.28)						
	JIS 10K	135 (5.31)						
	AS2129 table D AS2129 table E	120 (4.72)						
40 (1 1/2")	EN 1092-1 PN 10 ... 40 ¹⁾	150 (5.91)	200 (7.84)	254 (10.0)	187 (7.36)	141 (5.55)	11 (24)	9 (20)
	ASME B16.5 CL 150	127 (5.00)						
	ASME B16.5 CL 300	156 (6.14)						
	JIS 10K	140 (5.51)						
	AS2129 table D AS2129 table E	135 (5.31)						
50 (2")	EN 1092-1 PN 10 ... 40 ¹⁾	165 (6.50)	200 (7.84)	257 (10.12)	190 (7.48)	144 (5.67)	12 (26)	10 (22)
	ASME B16.5 CL 150	153 (6.02)						
	ASME B16.5 CL 300	165 (6.50)						
	JIS 10K	155 (6.10)						
	AS2129 table D AS2129 table E	150 (5.91)						
65 (2 1/2")	EN 1092-1 PN 10 ... 40 ¹⁾	185 (7.28)	200 (7.87)	271 (10.67)	204 (8.03)	158 (6.22)	15 (33)	13 (29)
	ASME B16.5 CL 150	178 (7.01)					13 (29)	11 (24)
	ASME B16.5 CL 300	191 (7.52)					15 (33)	13 (29)
	JIS 10K	175 (6.89)					15 (33)	13 (29)
	AS2129 table D AS2129 table E	165 (6.50)					13 (29)	11 (24)

Tolerance L: +0 / -3 mm (+0 / -0.018 inch)

Dimensions mm (inch)							Approx. weight kg (lb)	
DN	Process connection	D	L ^{2) 3)}	F ⁴⁾	E ⁴⁾	G ⁴⁾	Integral	Remote
80 (3")	EN 1092-1 PN 10 ... 40 ¹⁾	200 (7.87)	200 (7.87)	275 (10.83)	208 (8.19)	162 (6.38)	17 (38)	15 (33)
	ASME B16.5 CL 150	191 (7.52)					17 (38)	15 (33)
	ASME B16.5 CL 300	210 (8.27)					19 (42)	17 (38)
	JIS 10K	185 (7.28)					19 (42)	17 (38)
	AS2129 table D	185 (7.28)					17 (38)	15 (33)
	AS2129 table E							
100 (4")	EN 1092-1 PN 10 ... 40 ¹⁾	220 (8.66)	250 (9.84)	306 (12.05)	239 (9.41)	193 (7.60)	19 (42)	17 (38)
	EN 1092-1 PN 25 ... 40 ¹⁾	235 (9.25)					23 (51)	21 (46)
	ASME B16.5 CL 150	229 (9.02)					21 (46)	19 (42)
	ASME B16.5 CL 300	254 (10.00)					30 (66)	28 (62)
	JIS 10K	210 (8.72)					19 (42)	17 (38)
	AS2129 table D	215 (8.46)					21 (46)	19 (42)
125 (5")	EN 1092-1 PN 10 ... 40 ¹⁾	250 (9.84)	250 (9.84)	318 (12.52)	251 (9.88)	205 (8.07)	22 (49)	20 (44)
	EN 1092-1 PN 25 ... 40 ¹⁾	270 (10.63)					29 (64)	27 (60)
	ASME B16.5 CL 150	254 (10.00)					22 (49)	20 (44)
	ASME B16.5 CL 300	280 (11.02)					35 (77)	33 (73)
	JIS 10K	250 (9.84)					22 (49)	20 (44)
	AS2129 table D	255 (10.04)					22 (49)	20 (44)
150 (6")	EN 1092-1 PN 10 ... 40 ¹⁾	285 (11.22)	300 (11.81)	339 (13.35)	272 (10.71)	226 (8.90)	33 (73)	31 (68)
	EN 1092-1 PN 25 ... 40 ¹⁾	300 (11.81)					39 (86)	37 (82)
	ASME B16.5 CL 150	280 (11.02)					33 (73)	31 (68)
	ASME B16.5 CL 300	381 (15.00)					47 (104)	45 (99)
	JIS 10K	280 (11.02)					33 (73)	31 (68)
	AS2129 table D	280 (11.02)					33 (73)	31 (68)
200 (8")	EN 1092-1 PN 10 ... 40 ¹⁾	340 (13.39)	350 (13.78)	364 (14.33)	297 (11.69)	252 (9.92)	41 (90)	39 (86)
	EN 1092-1 PN 25 ... 40 ¹⁾	340 (13.39)					43 (95)	41 (90)
	ASME B16.5 CL 150	343 (13.50)					50 (110)	48 (106)
	ASME B16.5 CL 300	381 (15.00)					72 (158)	70 (154)
	JIS 10K	330 (12.99)					43 (95)	41 (90)
	AS2129 table D	335 (13.19)					50 (110)	48 (106)
250 (10")	EN 1092-1 PN 10 ... 16 ¹⁾	395 (15.55)	450 (17.72)	390 (15.35)	323 (12.72)	278 (10.94)	61 (135)	59 (130)
	EN 1092-1 PN 25 ... 40 ¹⁾	405 (15.94)					65 (143)	63 (139)
	ASME B16.5 CL 150	407 (16.02)					70 (154)	68 (150)
	ASME B16.5 CL 300	445 (17.52)					105 (232)	103 (227)
	JIS 10K	400 (15.75)					65 (143)	63 (139)
	AS2129 table D	405 (15.94)					70 (154)	68 (150)
300 (12")	EN 1092-1 PN 10 ... 16 ¹⁾	445 (17.52)	500 (19.68)	415 (16.34)	348 (15.12)	303 (11.93)	74 (163)	72 (159)
	EN 1092-1 PN 25 ... 40 ¹⁾	460 (18.11)					80 (176)	78 (172)
	ASME B16.5 CL 150	483 (19.02)					105 (232)	103 (227)
	ASME B16.5 CL 300	521 (20.51)					150 (331)	148 (326)
	JIS 10K	445 (17.52)					80 (176)	78 (172)
	AS2129 table D	455 (17.19)					105 (232)	103 (227)
350 (14")	EN 1092-1 PN 10 ... 16 ¹⁾	505 (19.88)	550 (21.65)	438 (17.24)	371 (14.61)	326 (12.83)	95 (209)	93 (203)
	EN 1092-1 PN 25 ... 40 ¹⁾	520 (20.47)					110 (243)	108 (238)
	ASME B16.5 CL 150	533 (20.98)					105 (232)	103 (227)
	ASME B16.5 CL 300	584 (22.99)					140 (309)	138 (304)
	JIS 10K	490 (19.29)					110 (243)	108 (238)
	AS2129 table D	525 (20.67)					105 (232)	103 (227)
400 (16")	EN 1092-1 PN 10 ... 16 ¹⁾	565 (22.24)	600 (23.62)	462 (18.19)	395 (15.55)	350 (13.78)	103 (227)	101 (223)
	EN 1092-1 PN 25 ... 40 ¹⁾	580 (22.83)					126 (278)	124 (273)
	ASME B16.5 CL 150	597 (23.50)					175 (386)	173 (381)
	ASME B16.5 CL 300	647 (25.47)					265 (584)	263 (580)
	JIS 10K	560 (22.05)					126 (278)	124 (273)
	AS2129 table D	580 (22.83)					175 (386)	173 (381)

Tolerance L: DN 150 ... 200 +0 / -3 mm (+0 / -0.018 inch), DN 250 ... 600 +0 / -5 mm (+0 / -0.197 inch)

Abmessungen mm (inch)							Gewicht ca. kg (lb)	
DN	Prozessanschluss	D	L ^{2) 3)}	F ⁴⁾	E ⁴⁾	G ⁴⁾	kompakt	getrennt
450 (18")	ASME B16.5 CL 150	635 (25.00)	600 (23.62)	487 (19.17)	420 (16.54)	375 (14.76)	260 (573)	258 (569)
	AS2129 table D AS2129 table E	640 (25.20)						
500 (20")	EN 1092-1 PN 10 1)	670 (26.38)	600 (23.62)	514 (20.24)	447 (17.60)	402 (15.83)	190 (419)	188 (415)
	EN 1092-1 PN 16 1)	715 (28.15)					240 (529)	238 (525)
	ASME B16.5 CL 150	699 (27.52)					300 (661)	298 (657)
	AS2129 table D AS2129 table E	705 (27.76)						
600 (24")	EN 1092-1 PN 10 1)	780 (30.71)	800 (31.50)	569 (22.40)	502 (19.76)	457 (17.99)	246 (542)	244 (537)
	EN 1092-1 PN 16 1)	840 (33.07)					318 (701)	316 (697)
	ASME B16.5 CL 150	813 (32.01)					425 (937)	423 (933)
	AS2129 table D AS2129 table E	825 (32.48)						

Tolerance L: DN 150 ... 200 +0 / -3 mm (+0 / -0.018 inch), DN 250 ... 600 +0 / -5 mm (+0 / -0.197 inch)

- 1) Other pressure ratings available on request.
- 2) If a grounding plate is installed (attached to one side of the flange), this increases dimension L by 5 mm (0.197 inch).
- 3) If protection plates are installed (attached to both sides of the flange), this increases dimension L by 10 mm (0.394 inch).
- 4) Depending on the device design, the dimensions change according to the following table.

Device design	Dimension E, F	Dimension G
Without explosion protection	Standard sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2.91 inch)
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 2, Div. 2	Standard sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)

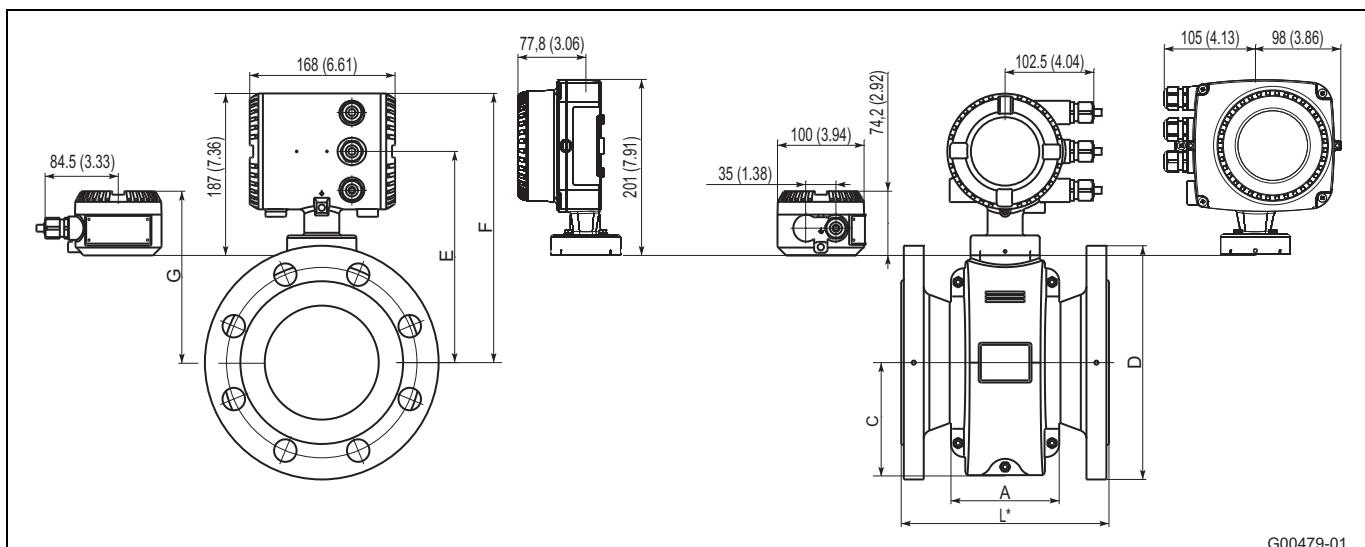
Dimensions for high-pressure sensor version**Flange DN 15 ... 400 (1/2" ... 16"), high-pressure version, Sensor housing made of Aluminium (Clamp Shell)**

Fig. 42: Dimensions in mm (inch)

DN	Process connection	Dimensions mm (inch)						Approx. weight kg (lb)	
		D	L 1) 2)	F 4)	C	E 3)	G 3)	A	Integral
15 (1/2")	DIN 2636 PN 63	105	270	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	10 (22)
	DIN 2637 PN 100	(4.13)	(10.63)						8 (18)
25 (1")	ASME B16.5, CL 600	95	270	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	12 (26)
	ASME B16.5, CL 600	(3.74)	(10.63)						10 (22)
	DIN 2636 PN 63	140	270						12 (27)
	DIN 2637 PN 100	(5.51)	(10.63)						10 (22)
	ASME B16.5, CL 900	124	270						12 (26)
	ASME B16.5, CL 900	(4.88)	(10.63)						10 (22)
40 (1 1/2")	ASME B16.5, CL 1500	149	300	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)	113 (4.45)	13 / 14 (29 / 31)
	ASME B16.5, CL 1500	(5.87)	(11.81)						11 (27)
	ASME B16.5, CL 2500	149	300						13 (29)
	ASME B16.5, CL 2500	(5.87)	(11.81)						11 (24)
	ASME B16.5, CL 2500	158	350						11 (24)
50 (2")	DIN 2636 PN 63	170	280	268 (10.55)	97 (3.82)	195 (7.68)	150 (5.91)	113 (4.53)	13 (29)
	DIN 2637 PN 100	(6.69)	(11.02)						15 (33)
	ASME B16.5, CL 600	156	280						16 (35)
	ASME B16.5, CL 900	(6.14)	(11.02)						15 (33)
	ASME B16.5, CL 900	177	300						13 (29)
	ASME B16.5, CL 1500	(6.97)	(11.81)						11 (24)
50 (2")	ASME B16.5, CL 1500	177	350						11 (24)
	ASME B16.5, CL 2500	203	400						11 (24)
	ASME B16.5, CL 2500	(7.99)	(15.75)						11 (24)
	DIN 2636 PN 63	180	280						11 (24)
	DIN 2637 PN 100	(7.09)	(11.02)						11 (24)
	ASME B16.5, CL 600	195	280						11 (24)

Tolerance L: DN 25 ... 100 +0 / -3 mm (+0 / -0,018 inch), DN 150 ... 200 +0 / -3 mm (+0 / -0,118 inch),
DN 250 ... 400 +0 / -5 mm (+0 / -0,197 inch)

DN	Process connection	Dimensions mm (inch)						Approx. weight kg (lb)		
		D	L ^{1) 2)}	F ⁴⁾	C	E ³⁾	G ³⁾	A	Integral	
65 (2 1/2")	DIN 2636 PN 63	205 (8.07)	330 (12.99)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)	104 (4.09)	18 (40)	16 (35)
	DIN 2637 PN 100	220 (8.66)	330 (12.99)						23 (51)	21 (46)
	ASME B16.5, CL 600	190 (7.48)	330 (12.99)						20 (44)	18 (40)
	ASME B16.5, CL 900	244 (9.61)	400 (15.75)							
	ASME B16.5, CL 1500	244 (9.61)	400 (15.75)							
	ASME B16.5, CL 2500	266 (10.47)	450 (17.72)							
80 (3")	DIN 2636 PN 63	215 (8.46)	340 (13.39)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)	104 (4.09)	22 (49)	20 (44)
	DIN 2637 PN 100	230 (9.06)	340 (13.39)						26 (57)	24 (53)
	ASME B16.5, CL 600	209 (8.23)	340 (13.39)						25 (55)	23 (51)
	ASME B16.5, CL 900	241 (9.49)	400 (15.75)							
	ASME B16.5, CL 1500	266 (10.47)	400 (15.75)							
	ASME B16.5, CL 2500	305 (12.01)	500 (19.68)							
100 (4")	DIN 2636 PN 63	250 (9.84)	400 (15.75)	301 (11.85)	122 (4.8)	234 (9.21)	189 (7.44)	125 (4.92)	29 (64)	27 (60)
	DIN 2637 PN 100	265 (10.43)	400 (15.75)						38 (84)	26 (57)
	ASME B16.5, CL 600	273 (10.75)	400 (15.75)						46 (101)	44 (97)
	ASME B16.5, CL 900	292 (11.50)	400 (15.75)							
	ASME B16.5, CL 1500	311 (12.24)	420 (16.54)							
	ASME B16.5, CL 2500	355 (13.98)	600 (23.62)							
125 (5")	DIN 2636 PN 63	295 (11.61)	450 (17.72)	311 (12.24)	130 (5.12)	244 (9.61)	199 (7.83)	125 (4.92)	on request	on request
	DIN 2637 PN 100	315 (12.4)	450 (17.72)							
	ASME B16.5, CL 600	330 (12.99)	400 (15.75)							
	ASME B16.5, CL 900	349 (13.74)	450 (17.72)							
	ASME B16.5, CL 1500	374 (14.72)	500 (19.68)							
	ASME B16.5, CL 2500	419 (16.50)	700 (27.56)							
150 (6")	DIN 2636 PN 63	345 (13.58)	450 (17.72)	358 (14.09)	146 (5.75)	291 (11.46)	246 (9.69)	166 (6.54)	on request	on request
	DIN 2637 PN 100	355 (13.98)	450 (17.72)							
	ASME B16.5, CL 600	355 (13.98)	450 (17.72)							
	ASME B16.5, CL 900	381 (15.0)	500 (19.68)							
	ASME B16.5, CL 1500	393 (15.47)	600 (23.62)							
	ASME B16.5, CL 2500	482 (18.98)	800 (31.50)							

Tolerance L: DN 25 ... 100 +0 / -3 mm (+0 / -0,018 inch), DN 150 ... 200 +0 / -3 mm (+0 / -0,118 inch),
DN 250 ... 400 +0 / -5 mm (+0 / -0,197 inch)

DN	Process connection	Dimensions mm (inch)						Approx. weight kg (lb)		
		D	L ^{1) 2)}	F ⁴⁾	C	E ³⁾	G ³⁾	A	Integral	
200 (8")	DIN 2636 PN 63	415 (16.34)	500 (19.68)	399 (15.71)	170 (6.69)	331 (13.03)	286 (11.26)	200 (7.87)	on request	on request
	DIN 2637 PN 100	430 (16.93)	500 (19.68)							
	ASME B16.5, CL 600	419 (16.50)	500 (19.68)							
	ASME B16.5, CL 900	470 (18.50)	600 (23.62)							
	ASME B16.5, CL 1500	482 (18.98)	700 (27.56)							
	ASME B16.5, CL 2500	552 (21.73)	950 (37.40)							
250 (10")	ASME B16.5, CL 600	508 (20.0)	500 (19.68)	413 (16.26)	198 (7.80)	346 (13.62)	301 (11.85)	235 (9.25)	on request	on request
	ASME B16.5, CL 900	546 (21.5)	700 (27.56)							
	ASME B16.5, CL 1500	584 (22.99)	850 (33.46)							
	ASME B16.5, CL 2500	673 (26.50)	1200 (47.24)							
300 (12")	ASME B16.5, CL 600	559 (22.01)	750 (29.53)	436 (17.17)	228 (8.98)	369 (14.53)	324 (12.76)	272 (10.71)	on request	on request
	ASME B16.5, CL 900	609 (23.98)	800 (31.50)							
	ASME B16.5, CL 1500	673 (26.50)	950 (37.40)							
	ASME B16.5, CL 2500	762 (30.00)	1400 (55.12)							
350 (14")	ASME B16.5, CL 600	603 (23.74)	750 (29.53)	451 (17.76)	265 (10.43)	384 (15.12)	339 (13.35)	322 (12.68)	on request	on request
	ASME B16.5, CL 900	641 (25.24)	850 (33.46)							
	ASME B16.5, CL 1500	749 (29.49)	1050 (41.34)							
400 (16")	ASME B16.5, CL 600	686 (27.01)	800 (31.50)	493 (19.41)	265 (10.43)	426 (16.77)	381 (15.00)	322 (12.68)	on request	on request
	ASME B16.5, CL 900	705 (27.76)	900 (35.43)							
	ASME B16.5, CL 1500	825 (32.48)	1100 (43.31)							

Tolerance L: DN 25 ... 100 +0 / -3 mm (+0 / -0,018 inch), DN 150 ... 200 +0 / -3 mm (+0 / -0,118 inch),

DN 250 ... 400 +0 / -5 mm (+0 / -0,197 inch)

- 1) If a grounding plate is installed (attached to one side of the flange), this increases dimension L as follows: DN 3 ... 100 by 3 mm (0.118 inch); DN 125 by 5 mm (0.197 inch).
- 2) If protection plates are installed (attached to both sides of the flange), this increases dimension L as follows: DN 3 ... 100 by 6 mm (0.236 inch); DN 125 by 10 mm (0.394 inch).
- 3) Depending on the device design, the dimensions change according to the following table.

Device design		Dimension E, F	Dimension G
Without explosion protection	Standard sensor design	0	0
	High-temperature sensor design	+127 mm (+5 inch)	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2.91 inch)	+47 mm (+1.85 inch)
	High-temperature sensor design	+127 mm (+5 inch)	+174 mm (+6.85 inch)
Explosion protection Zone 2, Div. 2	Standard sensor design	0	0
	High-temperature sensor design	+127 mm (+5 inch)	+127 mm (+5 inch)

Flange DN 25... 400 (1 ... 16"), high-pressure version, Sensor housing made of stainless steel

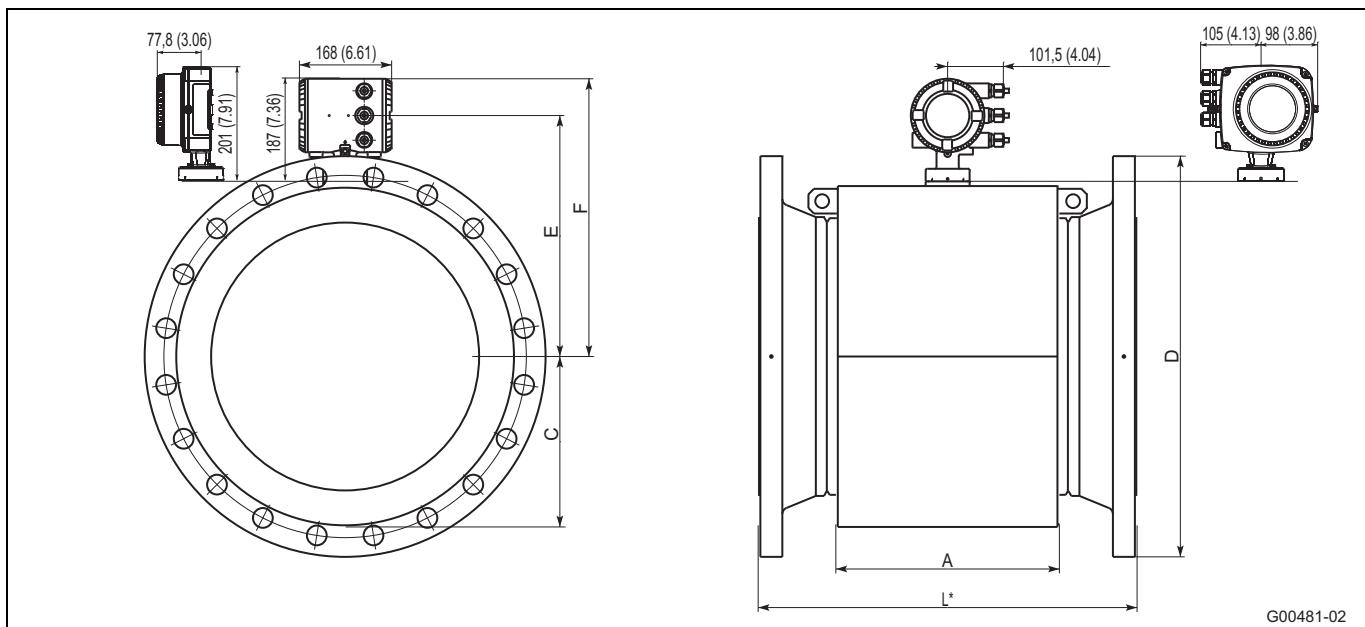


Fig. 43: Dimensions in mm (inch)

Dimensions [mm (inch)]							Approx. weight	
DN	Process connection	D	L ^{1) 2)}	F ⁴⁾	C	E ³⁾	A	[kg (lb)]
25 (1")	ASME B16.5 CL 600	124 (4.88)	270 (10.63)	283 (11.14)	73 (2.87)	216 (8.50)	105 (4.13)	12 (26)
	ASME B16.5 CL 900	149 (5.87)	300 (11.81)					
	ASME B16.5 CL 1500	149 (5.87)	300 (11.81)					
	ASME B16.5 CL 2500	158 (6.22)	350 (13.78)					
40 (1 1/2")	ASME B16.5 CL 600	156 (6.14)	280 (11.02)	288 (11.34)	78 (3.07)	221 (8.70)	105 (4.13)	13 (29)
	ASME B16.5 CL 900	177 (6.97)	300 (11.81)					
	ASME B16.5 CL 1500	177 (6.97)	350 (13.78)					
	ASME B16.5 CL 2500	203 (7.99)	400 (15.75)					
50 (2")	ASME B16.5 CL 600	165 (6.5)	280 (11.02)	305 (12.01)	85 (3.35)	238 (9.37)	105 (4.13)	15 (33)
	ASME B16.5 CL 900	216 (8.50)	400 (15.75)					
	ASME B16.5 CL 1500	216 (8.50)	400 (15.75)					
	ASME B16.5 CL 2500	235 (9.25)	450 (17.72)					
65 (2 1/2")	ASME B16.5 CL 600	190 (7.48)	330 (12.99)	316 (12.44)	91 (3.58)	249 (9.80)	105 (4.13)	20 (44)
	ASME B16.5 CL 900	244 (9.61)	400 (15.75)					
	ASME B16.5 CL 1500	244 (9.61)	400 (15.75)					
	ASME B16.5 CL 2500	266 (10.47)	450 (17.72)					

Tolerance L: DN 25 ... 100 +0 / -3 mm (+0 / -0.018 inch)

Dimensions [mm (inch)]							Approx. weight [kg (lb)]	
DN	Process connection	D	L 1) 2)	F 4)	C	E 3)	A	
80 (3")	ASME B16.5 CL 600	209 (8.23)	340 (13.39)	316 (12.44)	91 (3.58)	249 (9.80)	105 (4.13)	25 (55)
	ASME B16.5 CL 900	241 (9.49)	400 (15.75)					
	ASME B16.5 CL 1500	266 (10.47)	400 (15.75)					
	ASME B16.5 CL 2500	305 (12.01)	500 (19.68)					
100 (4")	ASME B16.5 CL 600	273 (10.75)	400 (15.75)	331 (13.03)	91 (3.58)	249 (9.80)	109 (4.29)	46 (101)
	ASME B16.5 CL 900	292 (11.50)	400 (15.75)					
	ASME B16.5 CL 1500	311 (12.24)	420 (16.54)					
	ASME B16.5 CL 2500	355 (13.98)	600 (23.62)					
125 (5")	ASME B16.5 CL 600	330 (12.99)	400 (15.75)	344 (13.54)	116 (4.57)	277 (10.91)	109 (4.29)	
	ASME B16.5 CL 900	349 (13.74)	450 (17.72)					
	ASME B16.5 CL 1500	374 (14.72)	500 (19.68)					
	ASME B16.5 CL 2500	419 (16.50)	700 (27.56)					
150 (6")	ASME B16.5 CL 600	355 (13.98)	450 (17.72)	385 (15.16)	136 (5.35)	318 (12.52)	143 (5.63)	
	ASME B16.5 CL 900	381 (15.00)	500 (19.68)					
	ASME B16.5 CL 1500	393 (15.47)	600 (23.62)					
	ASME B16.5 CL 2500	482 (18.98)	800 (31.50)					
200 (8")	ASME B16.5 CL 600	419 (16.50)	500 (19.69)	411 (16.18)	162 (6.38)	344 (13.54)	175 (6.89)	
	ASME B16.5 CL 900	470 (18.50)	600 (23.62)					
	ASME B16.5 CL 1500	482 (18.98)	700 (27.56)					
	ASME B16.5 CL 2500	552 (21.73)	950 (37.40)					
250 (10")	ASME B16.5 CL 600	508 (20.00)	500 (19.68)	440 (17.32)	191 (7.52)	373 (14.68)	208 (8.19)	
	ASME B16.5 CL 900	546 (21.50)	700 (27.56)					
	ASME B16.5 CL 1500	584 (22.99)	850 (33.46)					
	ASME B16.5 CL 2500	673 (26.50)	1200 (47.25)					
300 (12")	ASME B16.5 CL 600	559 (22.01)	750 (29.53)	457 (17.99)	209 (8.23)	390 (15.35)	243 (9.57)	
	ASME B16.5 CL 900	609 (23.98)	800 (31.50)					
	ASME B16.5 CL 1500	673 (26.50)	950 (37.40)					
	ASME B16.5 CL 2500	762 (30.00)	1400 (55.12)					

Tolerance L: DN 25 ... 100 +0 / -3 mm (+0 / -0.018 inch), DN 150 ... 200 +0 / -3 mm (+0 / -0.118 inch),
 DN 250 ... 400 +0 / -5 mm (+0 / -0.197 inch)

Dimensions [mm (inch)]							Approx. weight [kg (lb)]
DN	Process connection	D	L 1) ²⁾	F ⁴⁾	C	E ³⁾	A
350 (14")	ASME B16.5 CL 600	603 (23.74)	750 (29.61)	501 (19.72)	221 (8.70)	434 (17.09)	271 (10.67)
	ASME B16.5 CL 900	641 (25.24)	850 (33.46)				
	ASME B16.5 CL 1500	749 (29.49)	1050 (41.34)				
400 (16")	ASME B16.5 CL 600	686 (27.01)	800 (31.50)	501 (19.72)	258 (10.16)	434 (17.09)	291 (11.46)
	ASME B16.5 CL 900	705 (27.76)	900 (35.43)				
	ASME B16.5 CL 1500	825 (32.48)	1100 (43.31)				

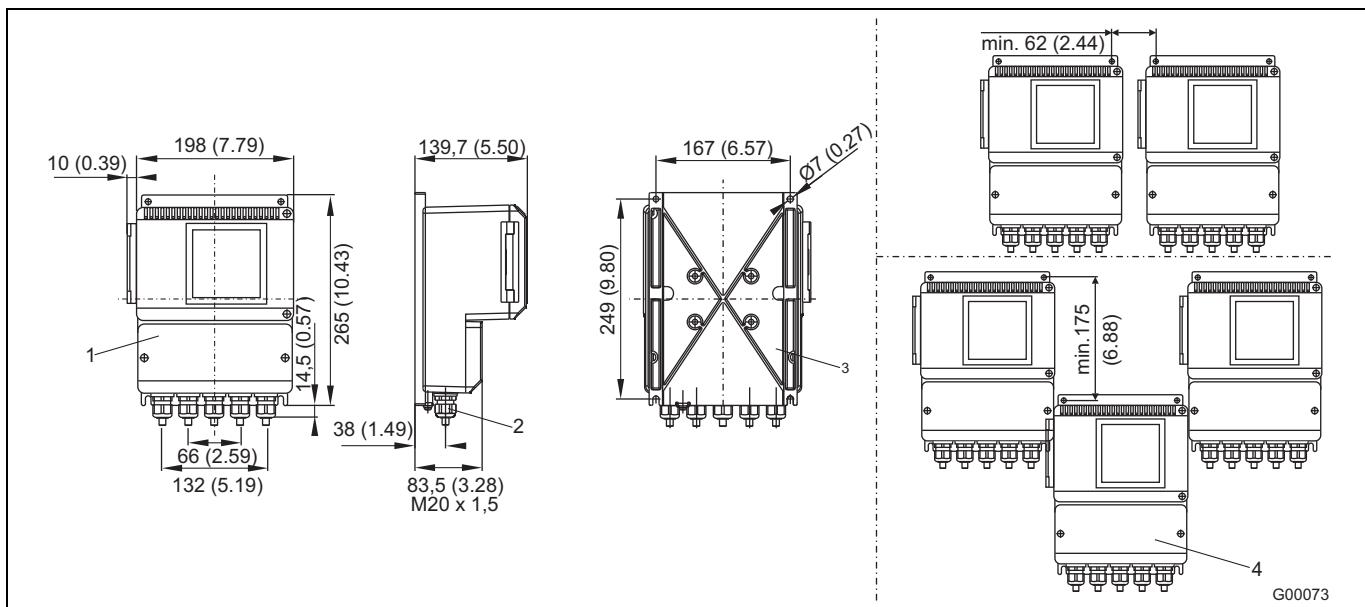
Tolerance L: DN 25 ... 100 +0 / -3 mm (+0 / -0.018 inch), DN 150 ... 200 +0 / -3 mm (+0 / -0.118 inch),
 DN 250 ... 400 +0 / -5 mm (+0 / -0.197 inch)

- 1) If a grounding plate is installed (attached to one side of the flange), this increases dimension L as follows: DN 3 ... 100 by 3 mm (0.118 inch); DN 125 by 5 mm (0.197 inch).
- 2) If protection plates are installed (attached to both sides of the flange), this increases dimension L as follows: DN 3 ... 100 by 6 mm (0.236 inch); DN 125 by 10 mm (0.394 inch).
- 3) Depending on the device design, the dimensions change according to the following table.

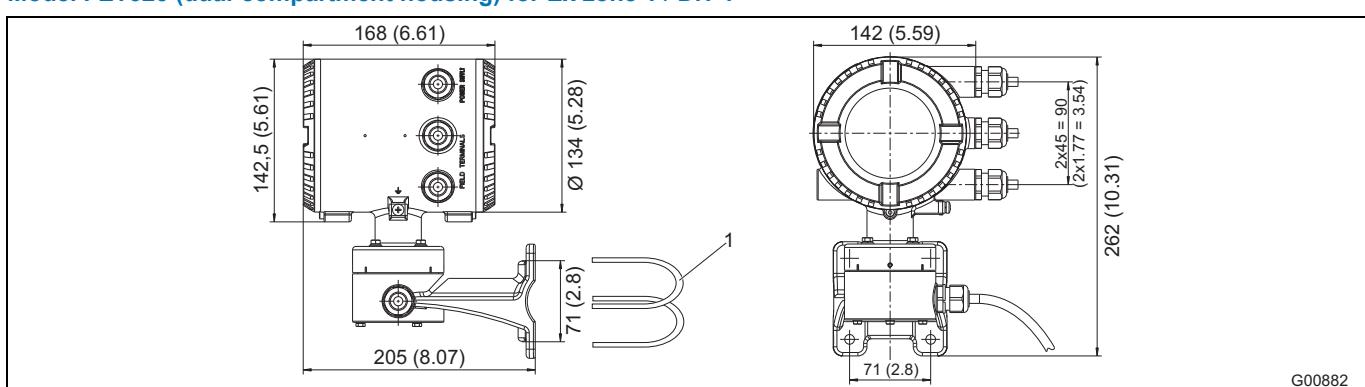
Device design	Dimension E, F	Dimension G
Without explosion protection	Standard sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2.91 inch)
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 2, Div. 2	Standard sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)

Dimensions for transmitter

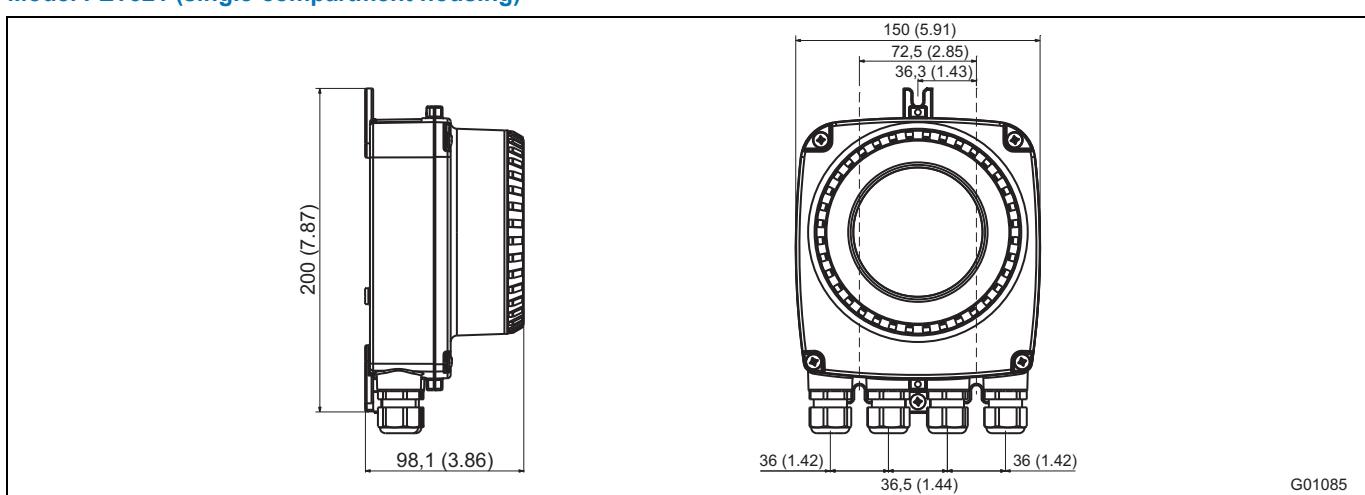
Model FET321 and FET325 (dual-compartment housing) for Ex zone 2 / Div 2



Model FET325 (dual-compartment housing) for Ex zone 1 / Div 1



Model FET321 (single-compartment housing)



Ordering information**Electromagnetic flowmeter ProcessMaster - FEP311 and FEP315 , integral mount design**

	Version number	Main order number																					Add. order no.	
		1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Nominal diameter																								
DN 3 (1/10 in.)		0	0	3																				
DN 4 (5/32 in.)		0	0	4																				
DN 6 (1/4 in.)		0	0	6																				
DN 8 (5/16 in.)		0	0	8																				
DN 10 (3/8 in.)		0	1	0																				
DN 15 (1/2 in.)		0	1	5																				
DN 20 (3/4 in.)		0	2	0																				
DN 25 (1 in.)		0	2	5																				
DN 32 (1-1/4 in.)		0	3	2																				
DN 40 (1-1/2 in.)		0	4	0																				
DN 50 (2 in.)		0	5	0																				
DN 65 (2-1/2 in.)		0	6	5																				
DN 80 (3 in.)		0	8	0																				
DN 100 (4 in.)		1	0	0																				
DN 125 (5 in.)		1	2	5																				
DN 150 (6 in.)		1	5	0																				
DN 200 (8 in.)		2	0	0																				
DN 250 (10 in.)		2	5	0																				
DN 300 (12 in.)		3	0	0																				
DN 350 (14 in.)		3	5	0																				
DN 400 (16 in.)		4	0	0																				
DN 450 (18 in.)		4	5	0																				
DN 500 (20 in.)		5	0	0																				
DN 550 (22 in.)	1)	5	5	0																				
DN 600 (24 in.)		6	0	0																				
DN 650 (26 in.)	1)	6	5	0																				
DN 700 (28 in.)		7	0	0																				
DN 760 (30 in.)		7	6	0																				
DN 800 (32 in.)		8	0	0																				
DN 900 (36 in.)		9	0	0																				
DN 1000 (40 in.)		0	0	1																				
DN 1050 (42 in.)		0	5	1																				
DN 1100 (44 in.)		1	0	1																				
DN 1200 (48 in.)		2	0	1																				
DN 1400 (54 in.)		4	0	1																				
DN 1500 (60 in.)		5	0	1																				
DN 1600 (66 in.)		6	0	1																				
DN 1800 (72 in.)		8	0	1																				
DN 2000 (80 in.)		0	0	2																				
Lining material																								
PTFE																								A
ETFE																								E
Thick PTFE																								F
Hard rubber																								H
Linatex																								J
PFA																								P
Soft rubber																								S
Electrode design																								
Standard																								1
Standard + full filling electrode (TFE)																								3) 2
Pointed head																								5
Pointed head + full filling electrode (TFE)																								3) 6

Continued on next page

- 1) Available with JIS flanges.
- 2) Upon request: Available with model FEP311 DN 50 ... 600 (2 ... 24 in.)
- 3) TFE electrode for detecting partially filled tubes, available from DN 50 (2 in.) with sensor design level "B". Not available for Zone 1 / Div 1.

Continued

	Main order number																				Add. order no.		
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
Signal electrode material																							
Stainless steel 1.4539 (904)																						A	
Hastelloy C-4 (2.4610)																						D	
Titanium																						F	
Tantalum																						G	
Hastelloy B-3 (2.4600)																						H	
Platinum-iridium																						J	
Stainless steel 1.4571 (316Ti)																						S	
Tungsten carbide coated																						T	
Grounding accessories																							
Standard																						1	
Grounding electrodes																						2	
(for material, refer to "Signal electrode material")																							
Grounding plate made of stainless steel, attached to one side of the flange																						4) 3	
Protection plate made of stainless steel, attached to both sides of the flange																						4) 4	
Process connection																							
Flange DIN PN 6																						5) D 0	
Flange DIN PN 10																						D 1	
Flange DIN PN 16																						D 2	
Flange DIN PN 25																						D 3	
Flange DIN PN 40																						D 4	
Flange DIN PN 64																						6) D 5	
Flange DIN PN 100																						6) D 6	
Flange, ASME CL 150																						A 1	
Flange, ASME CL 300																						A 3	
Flange, JIS 10K																						J 1	
Flange, JIS 5K																						J 2	
Flange, JIS 20K																						J 3	
Flange, AS2129 table E																						7) E 4	
Flange, AS2129 table D																						7) E 5	
Process connection material																						B	
Steel																							
Stainless steel flange																						8) D	
Certificates																							
Meter tube with PED approval																						0	
Meter tube without PED approval (only China and US production sites).																						1	
Specify installation length J1, J3 or JN)																							
Acceptance test certificate (3.1) to EN 10204																						2	
Pressure test to AD-2000																						3	
Material certificate 3.1 to EN 10204 and pressure test to AD-2000																						4	
Calibration																							
Standard accuracy																						9) A	
Increased accuracy																						10) B	
Standard accuracy + ScanMaster function																						9) K	
Increased accuracy + ScanMaster function																						10) L	
Witnessed factory calibration																						11) M	
5-point DKD calibration																						12) T	

Continued on next page

- 4) Can only be used for sensors ≤ DN 600 (24 in) and PTFE / thick PTFE / ETFE / PFA linings. Material: See data sheet. For Hard rubber, soft rubber and Linatex please use loose grounding rings.
- 5) Available from DN 1000 (40 in.)
- 6) DN 15 ... DN 200 (1/2 ... 8 in.) Hard rubber
- 7) Upon request
- 8) Material: See data sheet
- 9) Standard accuracy (0.4% of rate) assumes 2 calibration points. If more than 2 calibration points are required, you must specify 3 or 5 points under "Number of test points"
- 10) Increased accuracy (0.2% of rate) assumes 3 calibration points. If more than 3 calibration points are required, you must specify 5 points under "Number of test points". Available for DN10 (3/8 in.) ... 800 (32 in.)
- 11) 3rd party witnessed calibration
- 12) Available for nominal diameters DN 50 (2 in.) ... 600 (24 in.), DN 800 (32 in.)

Continued

	Main order number																				Add. order no.			
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX		
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX		
Sensor temperature range / Ambient temperature range																								
Standard sensor design / -20 ... 60 °C (-4 ... 140 °F)																13)	1							
Standard sensor design / -40 ... 60 °C (-40 ... 140 °F)																13)	2							
High-temperature sensor design / -20 ... 60 °C (-4 ... 140 °F)																14)	3							
High-temperature sensor design / -40 ... 60 °C (-40 ... 140 °F)																14)	4							
Name plate																								
Sticker																		A						
Stainless steel																		B						
Stainless steel, and TAG label stainless steel																		C						
Sticker, chinese language																	18)	S						
Stainless steel, chinese language																	18)	T						
Stainless steel, and TAG label stainless steel, chinese language																	18)	U						
Signal cable length																							0	
No cable																								
Explosion protection																								
None																	15)	A						
ATEX / IEC Zone 1																		L						
ATEX / IEC Zone 2 / 21																		M						
usFMc Div 2 Zone 2																		P						
usFMc Div 1																	16)	R						
NEPSI Zone1																	17)	U						
NEPSI Zone2																	17)	V						
Protection type for transmitter / sensor																								
Standard / IP67 (NEMA 4X)																	18)	1						
Other																		9						
Cable gland																								
M20 x 1.5																		A						
1/2 in. NPT																		B						
PF 1/2 in.																	15)	C						
Power supply																								
100 ... 230 V AC, 50 Hz																		1						
24 V AC / DC, 50 Hz																		2						
100 ... 230 V AC, 60 Hz																		3						
24 V AC / DC, 60 Hz																		4						
Signal inputs and outputs																								
HART + 20 mA passive + pulses + contact input / output																		19)	B					
HART + 20 mA active + pulses + contact input / output																	20)	C						
HART + 20 mA active + pulses + contact output																	21)	D						
PROFIBUS PA + contact output																		E						
FOUNDATION Fieldbus + contact output																		F						
Default settings / Diagnostics																							1	
Parameters are at factory settings / Standard																								
Parameters are set according to customer specifications / Standard																								3

Continued on next page

- 13) Maximum fluid temperature for standard sensor design:
 130 °C with PTFE, PFA, ETFE, thick PTFE,
 90 °C (80 °C for China production site) with hard rubber,
 60 °C with soft rubber,
 70 °C with Linatek,
 -40 °C only in conjunction with stainless steel flange.
- 14) Maximum fluid temperature for high-temperature sensor design: 180 °C with PFA, thick PTFE. 130 °C with ETFE, PTFE. Thick PTFE available for DN 25 ... DN 300, PFA available for DN 10 ... DN 200. -40 °C only in conjunction with stainless steel flange.
- 15) Only with model FEP311.
- 16) Div 1 available up to DN 300 (12 in.).
- 17) Production site: China.
- 18) Transmitter degree of protection = IP67 (NEMA 4X) with single-compartment and dual-compartment housing
- 19) Available with Ex design Zone 2 / Div 2 or Zone 1 / Div1.
- 20) Available with Ex design Zone 2 / Div 2.
- 21) Available with Ex design Zone 1 / Div 1.

Continued

	Main order number																				Add. order no.		
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
Accessories																							
None																					AY		
Plug connector																					22)	U2	
Transmitter housing design																					15)	H1	
Single-compartment housing / Aluminium																					H2		
Dual-compartment housing / Aluminium																							
Lay Length																					JA		
Flanges, ASME CL 150, ISO-compliant installation length																					JC		
Flanges, ASME CL 300, ISO-compliant installation length																					JN		
Flanges (Chinese installation length) (production site: China. Certificate: Without PED approval)																							
Sensor housing material																					SMA		
Aluminium / Carbon steel																							
Additional certificates																					24)		
Russia, metrological and GOST R certificate																					25)	CG1	
Kazakhstan, metrological and GOST K certificate																					25)	CG2	
Ukraine, metrological certificate																					25)	CG3	
Belarus, metrological certificate																					25)	CG6	
Additional Ex certificates and approvals																					24)		
Russia, GOST-Ex and RTN certificate																					25)	EG7	
Kazakhstan, Ex applications certificate																					25)	EG3	
Ukraine, GOST Ex and Ex application certificate																					25)	EG5	
Belarus, GGTN certificate																					25)	EG9	
Number of test points																					T3		
3 points																					T5		
Design Level																					26)	B	
Sensor design Level B																					26)	C	
Language of documentation																					M1		
German																					M5		
English																					M6		
Chinese																					MB		
Russian																					MW		
Western Europe / Scandinavia language package (languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)																					ME		
Eastern Europe language package (languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)																							

15) Only with model FEP311 and FEP315 Zone 2 / Div 2

22) Only for PROFIBUS PA Not for model FEP315

23) To be coded in case of FM approval only

24) Not available for PROFIBUS PA or FOUNDATION Fieldbus

25) Not with single-compartment housing

26) Specified by ABB. Sesordesign Level C with model FEP311 only

Electromagnetic flowmeter ProcessMaster - FEP321 and FEP325, remote mount design

	Main order number																											Add. order no.			
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27									
Without explosion protection	FEP321	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX			
With explosion protection	FEP325	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX			
Nominal diameter																															
DN 3 (1/10 in.)		0	0	3																											
DN 4 (5/32 in.)		0	0	4																											
DN 6 (1/4 in.)		0	0	6																											
DN 8 (5/16 in.)		0	0	8																											
DN 10 (3/8 in.)		0	1	0																											
DN 15 (1/2 in.)		0	1	5																											
DN 20 (3/4 in.)		0	2	0																											
DN 25 (1 in.)		0	2	5																											
DN 32 (1-1/4 in.)		0	3	2																											
DN 40 (1-1/2 in.)		0	4	0																											
DN 50 (2 in.)		0	5	0																											
DN 65 (2-1/2 in.)		0	6	5																											
DN 80 (3 in.)		0	8	0																											
DN 100 (4 in.)		1	0	0																											
DN 125 (5 in.)		1	2	5																											
DN 150 (6 in.)		1	5	0																											
DN 200 (8 in.)		2	0	0																											
DN 250 (10 in.)		2	5	0																											
DN 300 (12 in.)		3	0	0																											
DN 350 (14 in.)		3	5	0																											
DN 400 (16 in.)		4	0	0																											
DN 450 (18 in.)		4	5	0																											
DN 500 (20 in.)		5	0	0																											
DN 550 (22 in.)	1)	5	5	0																											
DN 600 (24 in.)		6	0	0																											
DN 650 (26 in.)	1)	6	5	0																											
DN 700 (28 in.)		7	0	0																											
DN 760 (30 in.)		7	6	0																											
DN 800 (32 in.)		8	0	0																											
DN 900 (36 in.)		9	0	0																											
DN 1000 (40 in.)		0	0	1																											
DN 1050 (42 in.)		0	5	1																											
DN 1100 (44 in.)		1	0	1																											
DN 1200 (48 in.)		2	0	1																											
DN 1400 (54 in.)		4	0	1																											
DN 1500 (60 in.)		5	0	1																											
DN 1600 (66 in.)		6	0	1																											
DN 1800 (72 in.)		8	0	1																											
DN 2000 (80 in.)		0	0	2																											
Lining material																															
PTFE																															A
ETFE																															E
Thick PTFE																															F
Hard rubber																															H
Linatex																															2)
PFA																															P
Soft rubber																															S
Electrode design																															
Standard																															1
Standard + full filling electrode (TFE)																															3)
Pointed head																															5
Pointed head + full filling electrode (TFE)																															3)
																															6

Continued on next page

- 1) Available with JIS flanges.
- 2) Upon request: Available with model FEP321 DN 50 ... 600 (2 ... 24 in.).
- 3) TFE electrode for detecting partially filled tubes, available from DN 50 (2 in.) with sensor design level "B". Not available for Zone 1 / Div 1.

Continued

	Main order number																											Add. order no.	
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27							
Without explosion protection	FEP321	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
With explosion protection	FEP325	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
Signal electrode material																													
Stainless steel 1.4539 (904)																													
Hastelloy C-4 (2.4610)																													
Titanium																													
Tantalum																													
Hastelloy B-3 (2.4600)																													
Platinum-iridium																													
Stainless steel 1.4571 (316Ti)																													
Tungsten carbide coated																													
Grounding accessories																													
Standard																													
Grounding electrodes																													
(for material, refer to "Signal electrode material")																													
Grounding plate made of stainless steel, attached to one side of the flange																													
Protection plate made of stainless steel, attached to both sides of the flange																													
Process connection																													
Flange DIN PN 6																													
Flange DIN PN 10																													
Flange DIN PN 16																													
Flange DIN PN 25																													
Flange DIN PN 40																													
Flange DIN PN 64																													
Flange DIN PN 100																													
Flange, ASME CL 150																													
Flange, ASME CL 300																													
Flange, JIS 10K																													
Flange, JIS 5K																													
Flange, JIS 20K																													
Flange, AS2129 table E																													
Flange, AS2129 table D																													
Process connection material																													
Steel																													
Stainless steel flange																													
Certificates																													
Meter tube with PED approval																													
Meter tube without PED approval (only China and US production sites.)																													
Specify installation length J1, J3 or JN)																													
Acceptance test certificate (3.1) to EN 10204																													
Pressure test																													
Material certificate 3.1 to EN 10204 and pressure test																													
Calibration																													
Standard accuracy																													
Increased accuracy																													
Standard accuracy + ScanMaster function																													
Increased accuracy + ScanMaster function																													
Witnessed factory calibration																													
5-point DKD calibration																													

Continued on next page

- 4) Can only be used for sensors ≤ DN 600 (24 in) and PTFE / thick PTFE / ETFE / PFA linings. Material: See data sheet. For Hard rubber, Soft rubber and Linatex please use loose grounding rings.
- 5) Available from DN 1000 (40 in.)
- 6) DN 15 ... DN 200 (1/2 ... 8 in.) Hard rubber
- 7) Upon request
- 8) Material: See data sheet
- 9) Standard accuracy (0.4% of rate) assumes 2 calibration points. If more than 2 calibration points are required, you must specify 3 or 5 points under "Number of test points"
- 10) Increased accuracy (0.2% of rate) assumes 3 calibration points. If more than 3 calibration points are required, you must specify 5 points under "Number of test points". Available for DN10 (3/8 in.) ... 800 (32 in.)
- 11) 3rd party witnessed calibration
- 12) Available for nominal diameters DN 50 (2 in.) ... 600 (24 in.), DN 800 (32 in.)

Continued

	Main order number																											Add. order no.	
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27							
Without explosion protection	FEP321	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX		
With explosion protection	FEP325	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX		
Sensor temperature range / Ambient temperature range																													
Standard sensor design / -20 ... 60 °C (-4 ... 140 °F)																													13) 1
Standard sensor design / -40 ... 60 °C (-40 ... 140 °F)																													13) 2
High-temperature sensor design / -20 ... 60 °C (-4 ... 140 °F)																													14) 3
High-temperature sensor design / -40 ... 60 °C (-40 ... 140 °F)																													14) 4
Name plate																													
Sticker																													A
Stainless steel																													B
Stainless steel, and TAG label stainless steel																													C
Sticker, chinese language																													18) S
Stainless steel, chinese language																													18) T
Stainless steel, and TAG label stainless steel, chinese language																													18) U
Signal cable length																													15)
No cable																													0
5 m (approx. 15 ft.) standard cable																													1
10 m (approx. 30 ft.) standard cable																													2
20 m (approx. 60 ft.) standard cable																													3
30 m (approx. 100 ft.) standard cable																													4
50 m (approx. 165 ft.) standard cable																													5
80 m (approx. 260 ft.) standard cable																													6
100 m (approx. 325 ft.) standard cable																													7
150 m (approx. 490 ft.) standard cable																													8
Explosion protection																													
None																													16) A
ATEX / IEC Zone 1																													L
ATEX / IEC Zone 2 / 21																													M
usFMC Div 2 Zone 2																													P
usFMC Div 1																													17) R
NEPSI Zone1																													18) U
NEPSI Zone2																													18) V
Protection type for transmitter / sensor																													
Standard / IP 67 (NEMA 4X)																													19) 1
Standard / IP 68 (NEMA 6P)																													19) 2
Standard / IP 68 (NEMA 6P), signal cable fitted and potted																													19) 3
Cable gland																													
M20 x 1.5																													A
1/2 in. NPT																													B
PF 1/2 in.																													C
Power supply																													0
None																													
Signal inputs and outputs																													16) Y
None																													
Default settings / Diagnostics																													
Parameters are at factory settings / Standard diagnostic functions activated																													1
Parameters are set according to customer specifications / Standard diagnostic functions activated																													3

Continued on next page

13) Maximum fluid temperature for standard sensor design:

- 130 °C with PTFE, PFA, ETFE, thick PTFE,
- 90 °C (80 °C for China production site) with hard rubber,
- 60 °C with soft rubber,
- 70 °C with Linatex,
- 40 °C only in conjunction with stainless steel flange.

14) Maximum fluid temperature for high-temperature sensor design: 180 °C with PFA, thick PTFE. 130 °C with ETFE, PTFE. Thick PTFE available for DN 25 ... DN 300, PFA available for DN 10 ... DN 200. -40 °C only in conjunction with stainless steel flange.

15) For flowmeter sensor model FEP325 designed for zone 1 / Div 1, signal cable length can be max. 50 m (164 ft) in combination with transmitter model FET321 or transmitter model FET 325 designed for zone 2 / Div 2. For sensor model FEP325 designed for zone 1 / Div 1, signal cable length can be max. 10 m (32.8 ft) in combination with transmitter model FET325 designed for zone 1 / Div 1.

16) Model FEP321 only.

17) Div 1 available up to DN 300 (12 in.).

18) Production site: China.

19) Transmitter degree of protection = IP67 (NEMA 4X) with single-compartment and dual-compartment housing.

20) Only with external transmitter, sealing compound (optional) D141B038U01.

21) Not available with FET325 transmitter in zone1 / Div1 design.

Continued

	Main order number																					Add. order no.		
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		
Without explosion protection	FEP321	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
With explosion protection	FEP325	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
Accessories																								
None																							AY	
With preamplifier, integrated into sensor housing																							AP	
Lay length																							JA	
Flanges, ASME CL 150, ISO-compliant installation length																							JC	
Flanges, ASME CL 300, ISO-compliant installation length																							JN	
Flanges (Chinese installation length) (production site: China. Certificate: Without PED approval)																							23)	
Connection box material																							UTA	
Aluminum																								
Sensor housing material																							SMA	
Aluminium / Carbon steel																								
Power frequency																							JA	
50 Hz (When ordering the sensor without a transmitter, specify the mains frequency.)																							F5	
60 Hz (When ordering the sensor without a transmitter, specify the mains frequency.)																							F6	
Additional certificates																							24)	
Russia, metrological and GOST R certificate																								CG1
Kazakhstan, metrological and GOST K certificate																								CG2
Ukraine, metrological certificate																								CG3
Belarus, metrological certificate																								CG6
Additional Ex certificates and approvals																							24)	
Russia, GOST-Ex and RTN certificate																								EG7
Kazakhstan, Ex applications certificate																								EG3
Ukraine, GOST Ex and Ex application certificate																								EG5
Belarus, GGTN certificate																								EG9
Number of test points																							T3	
3 points																								T5
Design Level																							25)	
Sensordesign Level B																								B
Sensordesign Level C																								25)
Language of documentation																							M1	
German																								M5
English																								M6
Chinese																								MB
Russian																								MW
Western Europe / Scandinavia language package (languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)																								ME
Eastern Europe language package (languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)																								

22) Preamplifier required if signal cable length is > 50 m (>160 ft). Preamplifier not available for zone1 / Div1

23) To be coded in case of FM approval only

24) Not available for PROFIBUS PA or FOUNDATION Fieldbus. Not with single-compartment housing. Not with plastic terminal box.

25) Specified by ABB. Sensordesign Level C with model FEP321 only

Remote transmitter for ProcessMaster - FET321, FET325

	Version number	Main order number										Add. order no.
		1 – 6	7	8	9	10	11	12	13	14	15	
Without explosion protection	FET321	X	X	X	X	X	X	X	X	X	X	XX
With explosion protection	FET325	X	X	X	X	X	X	X	X	X	X	XX
Sensor temperature range / Ambient temperature range												
Standard sensor design / -20 ... 60 °C (-4 ... 140 °F)		1										
Standard sensor design / -40 ... 60 °C (-4 ... 140 °F)		2										
High-temperature sensor design / -20 ... 60 °C (-4 ... 140 °F)		3										
High-temperature sensor design / -40 ... 60 °C (-4 ... 140 °F)		4										
Name plate												
Sticker												A
Stainless steel												B
Stainless steel, and TAG label stainless steel												C
Sticker, chinese language												4) S
Stainless steel, chinese language												4) T
Stainless steel, and TAG label stainless steel, chinese language												4) U
Signal cable length												
No cable												1) 0
Explosion protection												2)
None												
ATEX / IEC Zone 1												3) L
ATEX / IEC Zone 2 / 21												3) M
usFMc Div 2 Zone 2												3) P
usFMc Div 1												3) R
NEPSI Zone1												3) 4) U
NEPSI Zone2												3) 4) V
Protection type for transmitter / sensor												5) 1
Standard / IP 67 (NEMA 4X)												
Cable gland												
M20 x 1.5												A
1/2 in. NPT												B
PF 1/2 in.												10) C
None												Y
Power supply												
100 ... 230 V AC, 50 Hz												1
24 V AC / DC, 50 Hz												2
100 ... 230 V AC, 60 Hz												3
24 V AC / DC, 60 Hz												4
Signal inputs / outputs												
HART + 20 mA passive + pulses + contact input / output												6) B
HART + 20 mA active + pulses + contact input / output												7) C
HART + 20 mA active + pulses + contact output												8) D
PROFIBUS PA + contact output												E
FOUNDATION Fieldbus + contact output												F
Default settings / Diagnostics												
Without / standard diagnostic functions												9) 0
Parameters are at factory settings / Standard diagnostic functions activated												1
Parameters are set according to customer specifications / Standard diagnostic functions activated												3

Continued on next page

- 1) For model FET325 designed for Ex Zone 1 / Div 1 10 m (32.81 ft) of cable is connected to the transmitter.
- 2) Explosion protection only possible in conjunction with dual-compartment transmitter housing.
- 3) Model FET325 only.
- 4) Production site: China.
- 5) Transmitter degree of protection = IP67 (NEMA 4X) with single-compartment and dual-compartment housing, IP20 with panel-mount housing.
- 6) Available with Ex design Zone 2 / Div 2 or Zone 1 / Div1 or Zone 1 / Div1 or without explosion protection.
- 7) Available with Ex design Zone 2 / Div 2 or without explosion protection.
- 8) Available with Ex design Zone 1 / Div 1.
- 9) Must be selected if transmitter is being ordered as a spare part or without a sensor.
- 10) Model FET321 only.

Continued

	Version number	Main order number										Add. order no.
		1 – 6	7	8	9	10	11	12	13	14	15	
Without explosion protection	FET321	X	X	X	X	X	X	X	X	X	X	XX
With explosion protection	FET325	X	X	X	X	X	X	X	X	X	X	XX
Plug connector M12 x 1 fieldbus												11) U2
Transmitter housing design Single-compartment housing / Aluminium Dual-compartment housing / Aluminium												12) H1 H2
Additional options With Gore-Tex membrane												12) KG
Other certificates PMO approval (only for USA)												CR
Additional certificates Russia, metrological and GOST R certificate Kazakhstan, metrological and GOST K certificate Ukraine, metrological certificate Belarus, metrological certificate												13) CG1 CG2 CG3 CG6
Additional Ex certificates and approvals Russia, GOST-Ex and RTN certificate Kazakhstan, Ex applications certificate Ukraine, GOST Ex and Ex application certificate Belarus, GGTN certificate												13) EG7 EG3 EG5 EG9
Language of documentation German English Chinese Russian Western Europe / Scandinavia language package (languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV) Eastern Europe language package (languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)												M1 M5 M6 MB MW ME

11) Only for Profibus PA, not for model FET325.

12) Available with Model FET321 and FET325 Zone 2 / Div 2.

13) Not available for PROFIBUS PA or FOUNDATION Fieldbus. Not with single-compartment housing.

Electromagnetic flowmeter ProcessMaster - FEP311 and FEP315, integral mount design, high pressure version

	Main order number																				Add. order no.		
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Nominal diameter																							
DN 25 (1 in.)	0	2	5																				
DN 32 (1-1/4 in.)	0	3	2																				
DN 40 (1-1/2 in.)	0	4	0																				
DN 50 (2 in.)	0	5	0																				
DN 65 (2-1/2 in.)	0	6	5																				
DN 80 (3 in.)	0	8	0																				
DN 100 (4 in.)	1	0	0																				
DN 125 (5 in.)	1	2	5																				
DN 150 (6 in.)	1	5	0																				
DN 200 (8 in.)	2	0	0																				
DN 250 (10 in.)	2	5	0																				
DN 300 (12 in.)	3	0	0																				
DN 350 (14 in.)	3	5	0																				
DN 400 (16 in.)	4	0	0																				
Lining material																							
ETFE																						E	
Hard rubber																						H	
Electrode design																							
Standard																						1	
Pointed head																						5	
Signal electrode material																							
Hastelloy C-4 (2.4610)																						D	
Stainless steel 1.4571 (316Ti)																						S	
Grounding accessories																							
Standard																						1	
Process connection																							
Flange ASME CL 600																						A 6	
Flange ASME CL 900																						A 7	
Flange ASME CL 1500																						A 8	
Flange ASME CL 2500																						1) A 9	
Flange ASME CL 600 RTJ																						H 6	
Flange ASME CL 900 RTJ																						H 7	
Flange ASME CL 1500 RTJ																						H 8	
Flange ASME CL 2500 RTJ																						1) H 9	
Process connection material																							
Steel																						B	
Stainless steel flange																						2) D	
Certificates																						0	
Meter tube with PED approval																							
Calibration																							
Standard accuracy																						3) A	
Increased accuracy																						4) B	
Standard accuracy + ScanMaster function																						3) K	
Increased accuracy + ScanMaster function																						4) L	
Witnessed factory calibration																						5) M	

Continued on next page

- 1) Available up to DN 300 (12 in.)
- 2) Material: See data sheet
- 3) Standard accuracy (0.4% of rate) assumes 2 calibration points. If more than 2 calibration points are required, you must specify 3 or 5 points under "Number of test points"
- 4) Increased accuracy (0.2% of rate) assumes 3 calibration points. If more than 3 calibration points are required, you must specify 5 points under "Number of test points". Available for DN10 (3/8 in.) ... 800 (32 in.)
- 5) 3rd party witnessed calibration

Continued

	Main order number																											Add. order no.
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27						
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX
Sensor temperature range / Ambient temperature range																												
Standard sensor design / -20 ... 60 °C (-4 ... 140 °F)																												6) 1
Standard sensor design / -40 ... 60 °C (-40 ... 140 °F)																												6) 2
Name plate																												A
Sticker																												B
Stainless steel																												C
Signal cable length																												0
No cable																												
Explosion protection																												7)
None																												8) A
ATEX / IEC Zone 1																												L
ATEX / IEC Zone 2 / 21																												M
usFMc Div 2 Zone 2																												P
usFMc Div 1																												9) R
Protection type for transmitter / sensor																												10) 1
Standard / IP67 (NEMA 4X)																												9
Other																												
Cable gland																												A
M20 x 1.5																												B
1/2 in. NPT																												C
PF 1/2 in.																												11) C
Power supply																												1
100 ... 230 V AC, 50 Hz																												2
24 V AC / DC, 50 Hz																												3
100 ... 230 V AC, 60 Hz																												4
Signal inputs and outputs																												12) B
HART + 20 mA passive + pulses + contact input / output																												13) C
HART + 20 mA active + pulses + contact input / output																												14) D
HART + 20 mA active + pulses + contact output																												E
PROFIBUS PA + contact output																												F
FOUNDATION Fieldbus + contact output																												1
Parameters are at factory settings / Standard																												3

Continued on next page

- 6) Maximum fluid temperature for standard sensor design:
130 °C with ETFE, 90 °C (194 °F) with hard rubber
-40 °C only in conjunction with stainless steel flange.
- 7) Explosion protection only possible in conjunction with dual-compartment transmitter housing.
- 8) Only with model FEP311.
- 9) Div 1 available up to DN 300 (12 in.).
- 10) Transmitter degree of protection = IP67 (NEMA 4X) with single-compartment and dual-compartment housing
- 11) Not Available with design Zone 2 / Div 2 or Zone 1 / Div1.
- 12) Choice with design Zone 2 / Div 2.
- 13) Choice with design Zone 1 / Div 1.

Continued

		Main order number																					Add. order no.	
Version number		1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
Accessories	None																						AY	
Steckverbinder	Feldbus M12 x 1																						15)	U2
Transmitter housing design	Single-compartment housing / Aluminium																						H1	
Dual-compartment housing / Aluminium																							H2	
Dual-compartment housing / Stainless steel																							16)	H4
Sensor housing material	Aluminium / Carbon steel																						17)	SMA
Stainless steel																							18)	SMS
Number of test points	3 points																						T3	
5 points																							T5	
Design-Level	Sensordesign Level B																						19)	B
Material Sourcing	Material sourcing limitations apply																						MS1	
Language of documentation	German																						M1	
English																							M5	
Chinese																							M6	
Russian																							MB	
Western Europe / Scandinavia language package (languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)																							MW	
Eastern Europe language package (languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)																							ME	
Material Certifications	Test report 2.2 acc. EN 10204 confirmation of material																						C1	
Material monitoring with inspection certificate 3.1 acc. EN 10204																							C2	
Material monitoring with inspection certificate 3.2 acc. EN 10204																							C3	
Declaration of compliance with the order 2.1 acc. EN 10204																							C4	
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test																							C6	
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (inclusive heat analysis)																							CA	
Certificate of accuracy 2.1 acc. EN 10204																							CM	
Material monitoring NACE MR 0175 / MR 0103 if applicable, with inspection certificate 3.1 acc. EN 10204																							CN	
Others																							CZ	
Tests and Reports	Inspection certificate 3.1 acc. EN 10204 for non-destructive testing of welds (X-Ray) acc. to DIN																						N1	
Inspection certificate 3.1 acc. EN 10204 for non-destructive testing of welds (X-Ray) acc. to ASME																							NA	
Inspection certificate 3.1 acc. EN 10204 for non-destructive testing of welds (Dye Pen Test) acc. to ASME																							NB	
Pressure test acc. AD2000 acc. to ASME																							N6	
Welder qualification & welding procedure certificate acc. to ASME																							NF	

15) Only for PROFIBUS PA Not for model FEP315.

16) In conjunction with sensor housing material Stainless steel.

17) In conjunction with Transmitter housing design (Aluminium) only.

18) In conjunction with Transmitter housing design (Stainless steel) only.

19) Specified by ABB.

Electromagnetic flowmeter ProcessMaster - FEP321 and FEP325, remote mount design, high pressure version

	Main order number																				Add. order no.		
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
Without explosion protection	FEP321	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
With explosion protection	FEP325	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Nominal diameter																							
DN 25 (1 in.)		0	2	5																			
DN 32 (1-1/4 in.)		0	3	2																			
DN 40 (1-1/2 in.)		0	4	0																			
DN 50 (2 in.)		0	5	0																			
DN 65 (2-1/2 in.)		0	6	5																			
DN 80 (3 in.)		0	8	0																			
DN 100 (4 in.)		1	0	0																			
DN 125 (5 in.)		1	2	5																			
DN 150 (6 in.)		1	5	0																			
DN 200 (8 in.)		2	0	0																			
DN 250 (10 in.)		2	5	0																			
DN 300 (12 in.)		3	0	0																			
DN 350 (14 in.)		3	5	0																			
DN 400 (16 in.)		4	0	0																			
Lining material																							
ETFE																						E	
Hard rubber																						H	
Electrode design																							
Standard																						1	
Pointed head																						5	
Signal electrode material																							
Hastelloy C-4 (2.4610)																						D	
Stainless steel 316Ti (1.4571)																						S	
Grounding accessories																							
Standard																						1	
Process connection																							
Flanges ANSI Class 600 RF																						A 6	
Flanges ANSI Class 900 RF																						A 7	
Flanges ANSI Class 1500 RF																						A 8	
Flanges ANSI Class 2500 RF																						1) A 9	
Flange ANSI Class 600 RTJ																						H 6	
Flange ANSI Class 900 RTJ																						H 7	
Flange ANSI Class 1500 RTJ																						H 8	
Flange ANSI Class 2500 RTJ																						1) H 9	
Process connection material																							
Steel																						B	
Stainless steel flange																						2) D	
Usage Certifications																						0	
Meter tube with PED approval																							
Calibration Type																							
Standard accuracy																						3) A	
Increased accuracy																						4) B	
Standard accuracy + ScanMaster function																						3) K	
Increased accuracy + ScanMaster function																						4) L	
Witnessed factory calibration																						5) M	

Continued on next page

- 1) Available up to DN 300 (12 in.)
- 2) Material: See data sheet
- 3) Standard accuracy (0.4% of rate) assumes 2 calibration points. If more than 2 calibration points are required, you must specify 3 or 5 points under "Number of test points"
- 4) Increased accuracy (0.2% of rate) assumes 3 calibration points. If more than 3 calibration points are required, you must specify 5 points under "Number of test points". Available for DN10 (3/8 in.) ... 800 (32 in.)
- 5) 3rd party witnessed calibration

Continued

	Main order number																											Add. order no.			
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27									
Without explosion protection	FEP321	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX			
With explosion protection	FEP325	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX			
Sensor temperature range / Ambient temperature range																															
Standard sensor design / -20 ... 60 °C (-4 ... 140 °F)																													6) 1		
Standard sensor design / -40 ... 60 °C (-40 ... 140 °F)																													6) 2		
Name plate																													A		
Adhesive label																													B		
Stainless steel																													C		
Stainless steel and TAG plate (stainless steel)																															
Signal Cable Length and Type																													7)		
No cable																													0		
5 m (15 ft) standard cable																													1		
10 m (30 ft) standard cable																													2		
20 m (60 ft) standard cable																													3		
30 m (100 ft) standard cable																													4		
50 m (165 ft) standard cable																													5		
80 m (260 ft) standard cable																													6		
100 m (325 ft) standard cable																													7		
150 m (490 ft) standard cable																													8		
Other																													9		
Explosion Protection Certification																													8) A		
None																													L		
ATEX / IEC Zone 1																													M		
ATEX / IEC Zone 2 / 21																													P		
usFMc Div 2 Zone 2																													9) R		
Protection Class Transmitter / Protection Class Sensor																													10) 1		
IP 67 (NEMA 4X) / IP 67 (NEMA 4X)																													11) 2		
IP 67 (NEMA 4X) / IP 68 (NEMA 6P), cable not fitted and potted																													12) 3		
Cable Conduits																													A		
M20 x 1.5																													B		
1/2 in. NPT																													C		
PF 1/2 in.																													13) 0		
Power supply																													Y		
Without																													1		
Input and Output Signal Type																													3		
Without																															

Continued on next page

- 6) Maximum fluid temperature for standard sensor design:
130 °C with ETFE, 90 °C (194 °F) with hard rubber
-40 °C only in conjunction with stainless steel flange.
- 7) For flowmeter sensor model FEP325 designed for zone 1 / Div 1, signal cable length can be max. 50 m (164 ft) in combination with transmitter model FET321 or transmitter model FET 325 designed for zone 2 / Div 2.
For sensor model FEP325 designed for zone 1 / Div 1, signal cable length can be max. 10 m (32.8 ft) in combination with transmitter model FET325 designed for zone 1 / Div 1.
- 8) Model FEP321 only.
- 9) Div 1 available up to DN 300 (12 in.).
- 10) Transmitter degree of protection = IP67.
- 11) Only available with remote transmitter, sealing compound (optional) D141B038U01.
- 12) Not available with FET325 transmitter in zone1 / Div1 design.
- 13) Not available with Zone 2 / Div 2 or Zone 1 / Div1.

Continued

	Main order number																				Add. order no.		
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
Without explosion protection	FEP321	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
With explosion protection	FEP325	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	
Accessories																							
None																						AY	
With pre-amplifier installed in sensor terminal box																						AP	
Connectionbox Material																						UTA	
Aluminum																							
Sensor housing material																						SMA	
Aluminum < DN 450 / Carbon Steel > DN 400																							
Power Frequency																						F5	
50 Hz (If the Sensor is ordered without a Transmitter, the line frequency has to be specified here)																						F6	
60 Hz (If the Sensor is ordered without a Transmitter, the line frequency has to be specified here)																							
Number of test points																						T3	
3 points																						T5	
5 points																							
Design Level																						B	
Design Level B																							
Material Sourcing																						MS1	
Material sourcing limitations apply																							
Language of documentation																						M1	
German																						M5	
English																						M6	
Chinese																						MB	
Russian																						MW	
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)																						ME	
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)																							
Material Certifications																						C1	
Test report 2.2 acc. EN 10204 confirmation of material																						C2	
Material monitoring with inspection certificate 3.1 acc. EN 10204																						C3	
Material monitoring with inspection certificate 3.2 acc. EN 10204																						C4	
Declaration of compliance with the order 2.1 acc. EN 10204																						C6	
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test																						CA	
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (inclusive heat analysis)																						CM	
Certificate of accuracy 2.1 acc. EN 10204																						CN	
Material monitoring NACE MR 0175 / MR 0103 if applicable, with inspection certificate 3.1 acc. EN 10204																						CZ	
Others																							
Tests and Reports																						N1	
Inspection certificate 3.1 acc. EN 10204 for non-destructive testing of welds (X-Ray) acc. to DIN																						NA	
Inspection certificate 3.1 acc. EN 10204 for non-destructive testing of welds (X-Ray) acc. to ASME																						NB	
Pressure test acc. AD2000 acc. to ASME																						N6	
Welder qualification & welding procedure certificate acc. to ASME																						NF	

(15) Preamplifier required if signal cable length is > 50 m (>160 ft). Preamplifier not available for zone1 / Div1.

Transmitter plug-in module - FET301

	Main order number										Additional order no.
Version number	1 – 6	7	8	9	10	11	12	13	14	15	
	FET301	X	X	X	X	X	X	X	X	X	X
Temperature Range of Installation / Ambient Temperature Range Standard design / -20 ... 60 °C (-4 ... 140 °F)	1										
Name Plate Adhesive label		A									
Signal Cable Length and Type Without signal cable	0										
Explosion Protection Certification Without		A									
Protection Class Transmitter / Protection Class Sensor Others	9										
Cable Conduits Others	Z										
Power Supply 100 ... 230 V AC, 50 Hz 24 V AC / DC, 50 Hz 100 ... 230 V AC, 60 Hz 24 V AC / DC, 60 Hz	1	2	3	4							
Input and Output Signal Type HART + 20 mA passive + Pulse + Contact I/O HART + 20 mA active + Pulse + Contact I/O PROFIBUS PA + contact output FOUNDA FOUNDATION Fieldbus + contact output	B	C	E	F							
Configuration Type / Diagnostics Type Without / Standard diagnostic functions	0										
Language of Documentation German English Chinese Russian Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV) Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)	M1 M5 M6 MB MW ME										

Flowmeter sensor simulator - FXC4000

	Main order number					
Version number	1 – 5	6	7	8	9	10
	55XC4	X	X	X	X	X
Flow Signal Setting Without (adapter only) 3-position digitswitch with 1000 steps	0					
Power Supply Without (adapter only) 110 ... 240 V AC 50 / 60 Hz // With Schuko plug 24 ... 48 V AC / DC // With 4 mm plug 110 ... 240 V AC 50 / 60 Hz // With US plug	0	1	2	3		
Accessories Without Adapter for converter type FXE4000-E4, FXM2000-XM2, FXF2000-DF23 Adapter board for converter type FSM4000-S4 Adapter plate for converter FET321, FET325, FET521, FET525	0	1	5	6	*	
Design level (specified by ABB)						
Name Plate German English French	1	2	3			

Accessories

Description	Order number
<p>Diagnostic and verification software - ScanMaster FZC500 ScanMaster allows you to easily check the installed device for proper functioning. The determined test and verification results are stored in a database and can be printed if required. ScanMaster is based on DTM technology and can be run on Asset Vision Basic or other frame applications (as of FDT 1.2). There are two ways to communicate with the device.</p> <ul style="list-style-type: none"> - Via a HART modem (e.g. NHA121Nx (explosion-proof design) or NHA121No (standard design)) - Via FZA100 infrared service port adapter FZA100 	FZC500
Infrared service port adapter FZA100  G00788	FZA100
Installation set for 2" pipe installation in dual-compartment field-mount housing  G00789	612B091U07
Installation set for NPT 1/2" cable gland For sealing the cable conduit during outdoor installation.  G01312	3KXF081300L0001
Signal cable for nominal diameter ≥ DN 15 (1/2 inch) out of potentially explosive areas and in zone 2 / Div. 2	D173D031U01
Signal cable for all applications (including zone 1, 2 / Div. 1, 2)	D173D027U01

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3KXF231300R1001



Sales



Service



Software

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

4-wire compact device
For flow measurement of liquids and gases

Measurement made easy



CoriolisMaster simply fits!

The ideal NAMUR standard Device with NAMUR standard lay length

Measurement of massflow and volumeflow, density, temperature and concentration with only one meter with minimal investment costs

Minimum installation space requirements due to compact design

Minimum lifetime costs

FCH300 for all hygienic applications — EHEDG-certified

Minimum pressure drop, no moving parts, no wear out

Self draining: no measuring media residues remain in the meter

Worldwide approvals for hazardous areas and hygienic applications

State of the art transmitter

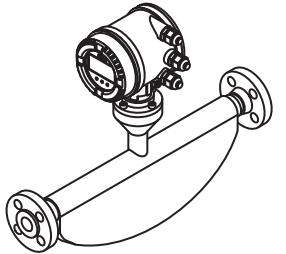
- Easy handling
- Data safety due to unique sensor memory concept
- Concentration measurement

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

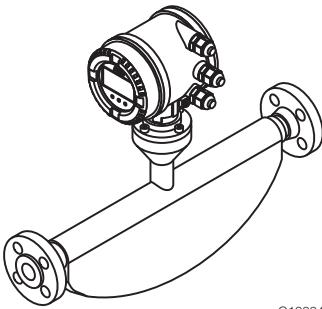
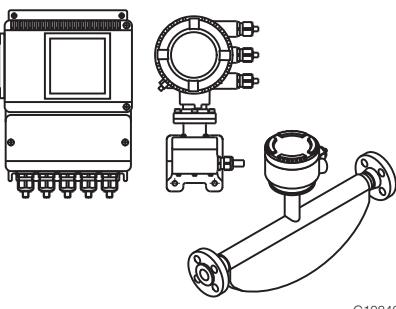
Overview of flowmeter sensor and transmitter designs

General remarks

FCB3xx and FCH3xx flowmeter sensor (integral mount design)				
		G10335		
Model number	FCB300 for standard applications	FCH300 for hygienic applications		
Process connections				
– Flange DIN 2501 / EN 1092-1	DN 10 ... 200, PN 40 ... 100	-		
– Flange ASME B16.5	DN 1/4" ... 8" PN CL150 ... CL600	-		
– Threaded pipe connection DIN 11851	DN 10 ... 100 (1/4" ... 4")	DN 25 ... 80 (1" ... 3")		
– Tri-Clamp	DIN 32676 (ISO 2852) BPE Tri-Clamp DN 10 ... 100 (1/4" ... 4")	DIN 32676 (ISO 2852) BPE Tri-Clamp DN 20 ... 100 (3/4" ... 4")		
– Other connections	On request	On request		
Wetted materials	Stainless steel Nickel-Alloy C4 / C22	Stainless steel, polished 1.4404 (AISI 316L) or 1.4435 (AISI 316L)		
Degree of protection acc. to EN 60529	IP 65 / 67, NEMA 4X	IP 65 / 67, NEMA 4X		
Approvals and certificates				
– Explosion protection ATEX / IECEx	Zone 0, 1, 2, 21, 22	Zone 0, 1, 2, 21, 22		
– Explosion protection cFMus	Class I Div. 1, Class I Div. 2, Zone 0, 1, 2, 20, 21	Class I Div. 1, Class I Div. 2, Zone 0, 1, 2, 20, 21		
– Explosion protection NEPSI	Zone 0, 1, 2, 21, 22	Zone 0, 1, 2, 21, 22		
– Hygienic and sterile requirements	-	EHEDG, FDA		
– Other approvals	On request			
Enclosure	Integral mount design, remote mount design			
Measuring accuracy for liquids	FCB330	FCB350	FCH330	FCH350
– Mass flow ¹⁾	0,4 % and 0,25 %	0,1 % and 0,15 %	0,4 % and 0,25 %	0,1 % and 0,15 %
– Volume flow ¹⁾	0,4 % and 0,25 %	0,15 %	0,4 % and 0,25 %	0,15 %
– Density	0,01 kg/l	– 0,002 kg/l – 0,001 kg/l (option) – 0,0005 kg/l ²⁾	0,01 kg/l	– 0,002 kg/l – 0,001 kg/l (option) – 0,0005 kg/l ²⁾
– Temperature	1 K	0,5 K	1 K	0,5 K
Measuring accuracy for gases ¹⁾	1 %	0,5 %	1 %	0,5 %
Permissible temperature of the medium being measured	-50 ... 160 °C (-58 ... 320 °F)	-50 ... 200 °C (-58 ... 392 °F)	-50 ... 160 °C (-58 ... 320 °F)	-50 ... 200 °C (-58 ... 392 °F)

1) Stated measuring accuracy in % of rate (% o. r.)

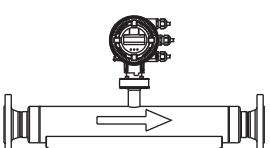
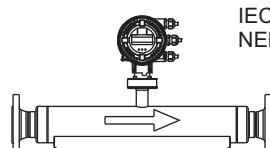
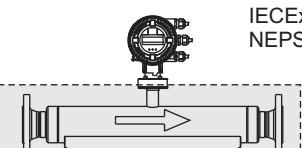
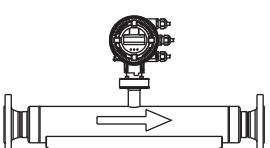
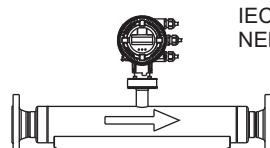
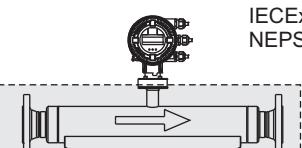
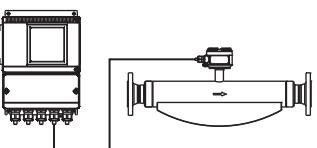
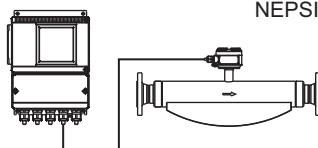
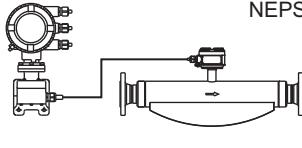
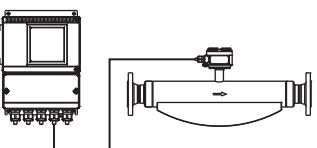
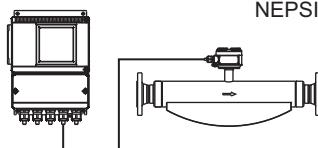
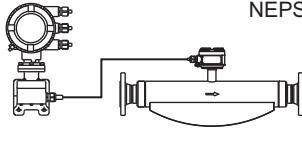
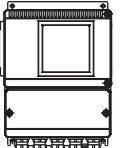
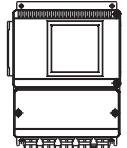
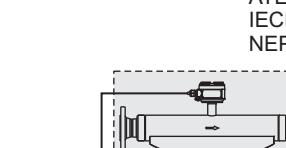
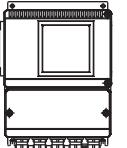
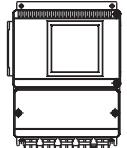
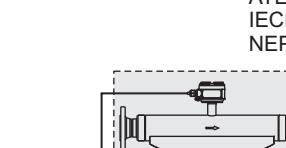
2) Measuring accuracy following on-site calibration under operating conditions

	FCTxxx transmitter	
	 G10334	 G10846
Enclosure	Integral mount design	Remote mount design
Cable length	Maximum 10 m (33 ft), remote mount design only	
Power supply	100 ... 230 V AC, 24 V AC/DC	
Current output	Current output 1: 0/4 ... 20 mA active or 4 ... 20 mA passive Current output 2: 4 ... 20 mA passive	
Pulse output	Active (not Zone 1 / Div. 1) or passive	
External output zero return	Yes	
External totalizer reset	Yes	
Forward / reverse flow metering	Yes	
Communication	HART protocol	
Empty pipe detection	Yes, based on preconfigured density alarm < 0.5 kg/l	
Self-monitoring and diagnostics	Yes	
Local display / totalization	Yes	
Field optimization for flow and density	Yes	
Degree of protection acc. to EN 60529	Integral mount design: IP 65/IP 67, NEMA 4X Remote mount design: IP 67, NEMA 4X	

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

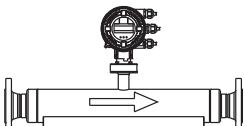
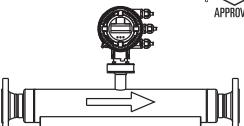
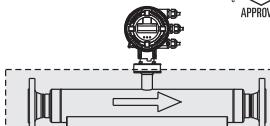
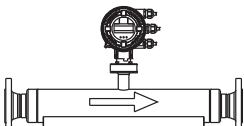
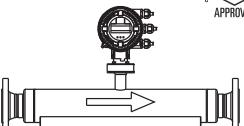
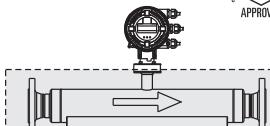
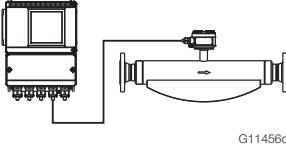
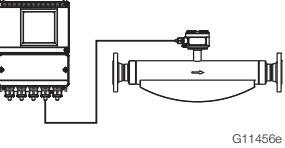
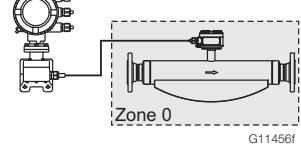
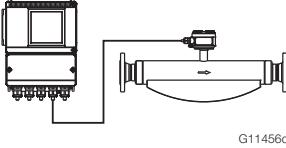
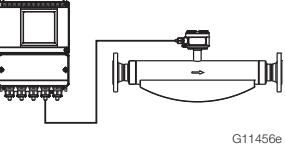
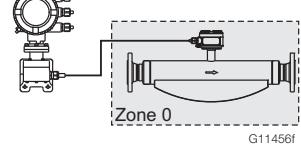
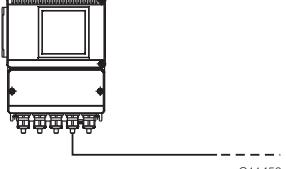
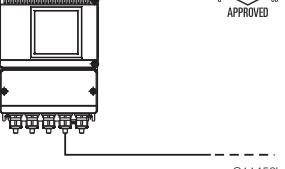
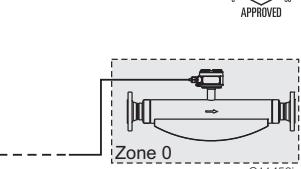
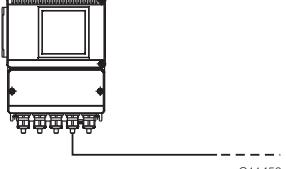
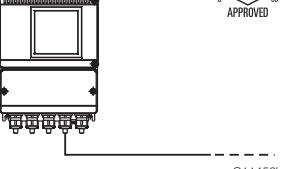
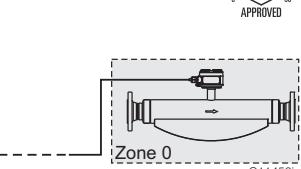
ATEX / IECEx / NEPSI device overview

	Standard / No explosion protection	Zone 2, 21, 22	Zone 1, 21 (Zone 0)			
Model number	FCx3xx Y0	FCx3xx A2, S2	FCx3xx A1, S1			
Integral mount design						
– Standard						
– Zone 2, 21, 22						
– Zone 1, 21						
– Zone 0	 G11455-01a	 G11455-01b	 G11455-01c			
Model number	FCT3xx Y0	FCx3xx Y0	FCT3xx A2	FCT3xx Y0	FCx3xx A1, S1	FCT3xx A2
Remote mount design						
Transmitter and flowmeter sensor						
– Standard						
– Zone 2, 21, 22						
– Zone 1, 21						
– Zone 0		 G11455-01d		 G11455-01e		 G11455-01f
Model number	FCT3xx Y0		FCT3xx A2		FCx3xx A1, S1	
Remote mount design						
Transmitter						
– Standard						
– Zone 2, 21, 22						
Flowmeter sensor						
– Zone 1, 21						
– Zone 0	 G11455-01g		 G11455-01h		 G11455-01i	

IMPORTANT (NOTE)

Details can be found in chapter „Ex relevant specifications acc. to ATEX / IECEx / NEPSI“ or in the respective certificate.

cFMus device overview

	Standard / No explosion protection	Class I Div. 2 Zone 2, 21	Class I Div. 1 Zone 0, 1, 20 ,21
Model number	FCx3xx Y0	FCx3xx F2	FCx3xx F1
Integral mount design			
– Standard			
– Class I Div. 2			
– Class I Div. 1			
– Zone 2, 21			
– Zone 1, 21			
– Zone 0, 20			
Model number	FCT3xx Y0	FCx3xx Y0	FCT3xx F2
Remote mount design			
Transmitter and flowmeter sensor			
– Standard			
– Class I Div. 2			
– Class I Div. 1			
– Zone 2, 21			
– Zone 1, 21			
– Zone 0, 20			
Model number	FCT3xx Y0	FCT3xx F2	FCx3xx F1
Remote mount design			
Transmitter			
– Standard			
– Class I Div. 2			
– Zone 2, 21			
Flowmeter sensor			
– Class I Div. 1			
– Zone 1, 21			
– Zone 0, 20			

IMPORTANT (NOTE)

Details can be found in chapter „Ex relevant specifications acc. to cFMus“ or in the respective certificate.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

General data

Device description

The CoriolisMaster FCB330, FCB350, FCH330, FCH350 is the most cost-effective and least complex ABB mass flowmeter featuring the new DSP transmitter.

The device is available in the integral mount design with internal transmitter and in the remote mount design with external transmitter.

The integral mount design reduces the time and effort spent on installation and wiring. Flowrate information can be viewed directly at the meter site and the meter can be installed in systems saving even more space than is currently possible.

The CoriolisMaster FCB330, FCB350, FCH330, FCH350 operates according to the Coriolis principle. The design offers the following benefits:

- Space-saving, rugged design
- Variety of process connection options
- Two separate current outputs for measuring mass or volume flow, density, or temperature, as well as one pulse output
- Digital input and output
- Communication via HART protocol
- Ex approval. The user can select the "i" or "e" type of protection for the output circuits; the type chosen will depend on the circuits which are connected. The type of protection can be changed even after installation has been completed. The digital outputs can be configured as NAMUR outputs by the user

Transmitter with digital signal processor (DSP)

The transmitter for the CoriolisMaster FCB330, FCB350, FCH330, FCH350 incorporates a digital signal processor (DSP) that enables high-precision mass flow and density measurements to be taken. The Coriolis sensor signals are immediately converted into digital data without any intermediate analog steps.

Excellent long-term stability and reliability together with fast signal processing are achieved with the new DSP transmitter.

Self-diagnostic functions for the flowmeter sensor and the transmitter, in combination with absolute zero stability, are benefits you can count on to ensure accurate measurements are taken.

The CoriolisMaster FCB330, FCB350, FCH330, FCH350 transmitter is particularly well suited for use in the following cases:

- Whenever mass flowrate is to be metered with maximum accuracy
- Whenever the density of the medium being measured is being determined
- Whenever the components of a recipe being mixed
- When metering non-conductive media or highly viscous, solid-loaded liquids, for example
- In batch filling processes

Installation instructions

Installation requirements/System sizing information

The CoriolisMaster FCB330, FCB350, FCH330, FCH350 is suitable for both indoor and outdoor installations. The standard device has an IP 67 enclosure. The flowmeter sensor is bidirectional and can be installed in any mounting position. It is important to ensure that the meter pipes are always completely filled with fluid. The material resistance of all wetted parts must be clarified.

The following points are to be considered during installation:

- The preferred flow direction is indicated by the arrow on the flowmeter sensor. Flow in this direction will be indicated as positive (a forward/reverse flow calibration is available as an option).
- The presence of gas bubbles in the meter tube increases the likelihood of erroneous measurements, particularly when measuring density. Therefore, the sensor should not be installed at the highest point in the system.
Advantageous are installations in low pipeline sections, e.g., at the bottom of a U-section in the pipeline (invert).
- Make sure that any gases dissolved in the medium do not outgas and that the meter tubes are always completely full. To safeguard this, a minimum back pressure of 0.2 bar (2.9 psi) is recommended.
- In case of gas measurements ensure that the gases are dry and do not contain liquids.
- Make sure that operation below the vapor pressure cannot occur when a vacuum exists in the meter tube or when liquids with a low boiling point are being processed.
- Ensure that during operation no Phase transitions take place in the medium. For gaseous Media any liquid phase must be avoided, for liquid media, any gas phase must be avoided.
- Long drop lines downstream of the flowmeter sensor should be avoided to prevent the meter tube from draining.
- The devices can be installed directly to or from elbows, valves or other equipment unless no cavitation is caused.

- This Flowmeter is designed for industrial installations. As long as electromagnetic fields in the environment of the meter are according to "best practice" as defined in the standards covered in our "EC-declaration of conformity", no additional efforts have to be taken. If electromagnetic fields exceed usual levels, sufficient distance is to be kept.
- Check that the flowmeter sensor does not come into contact with other objects. Do not attach the flowmeter sensor to the enclosure.
- In principle, no special supports or dampers are required on the device. In industrial and maritime facilities designed as "Best Practice" typical forces are absorbed sufficiently by the device. This is valid for serial or parallel installation of Coriolis meters as well, as long as the use and installation follows the manual.
- To avoid damages to the process connections and pipes by axial forces, supports are recommended for devices of higher weights.

Inlet sections

The flowmeter sensor does not require any inlet sections. Make sure that any valves, gates, sight glasses, etc., in the vicinity of the flowmeter sensor do not cavitate and are not set in vibration by the flowmeter sensor.

Model in remote mount design

Make sure that the flowmeter sensor and transmitter are assigned correctly. Compatible devices have the same end numbers, e. g., X001 and Y001 or X002 and Y002, on the name plate.

Pressure loss

Pressure loss is determined by the properties of the medium and the flow.

Documents to help you to calculate pressure loss can be downloaded from www.abb.com/flow.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Mounting positions

The flowmeter operates in any mounting position. The ideal installation position is vertical with flow from bottom to top.

IMPORTANT (NOTE)

EHEDG certification requires a self draining installation, only possible with a vertical installation.

Vertical installation in riser

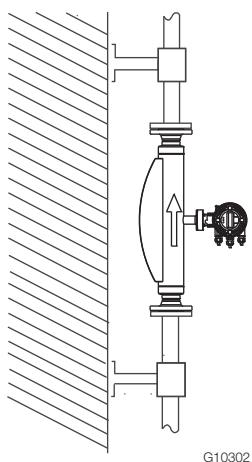


Fig. 1: Vertical installation, self-draining

Vertical installation in a drop line

Make sure that the flowmeter sensor is always completely full while measurements are being taken.

A pipeline reduction or an orifice must also be installed underneath the flowmeter sensor. The cross-section of the pipeline reduction or orifice must be smaller than the cross-section of the pipeline in order to prevent the flowmeter sensor from running dry while measurements are being taken.

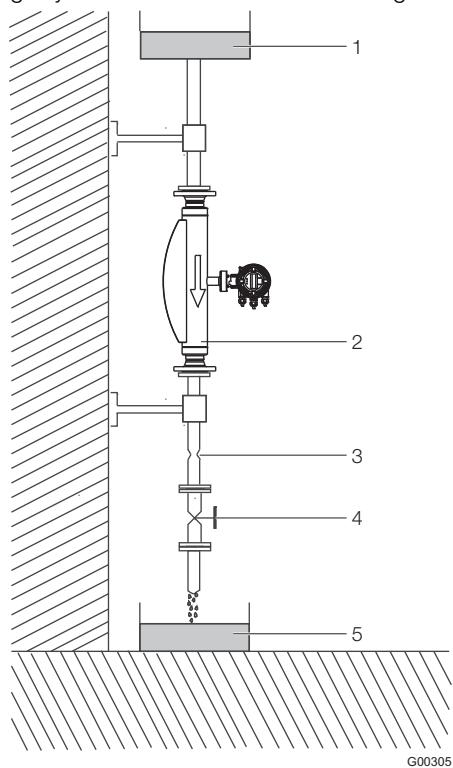


Fig. 2: Vertical installation in a drop line

1 Supply reservoir | 2 Flowmeter sensor |
3 Orifice or pipe constriction | 4 Valve | 5 Product reservoir

Horizontal installation in case of measurement of liquids

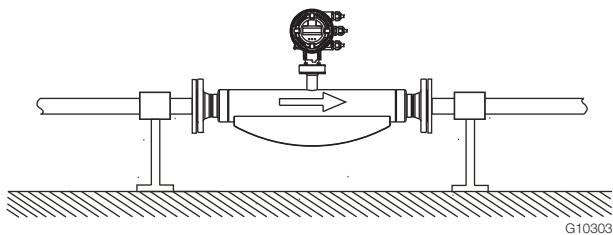


Fig. 3: Horizontal installation (liquids)

Horizontal installation in case of measurement of gases

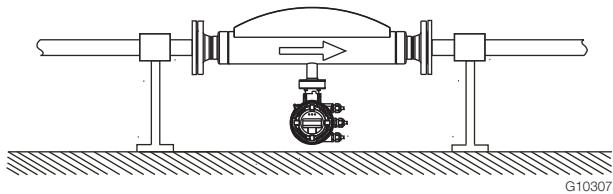


Fig. 4: Horizontal installation (gases)

In case of measurement of gases ensure that the transmitter housing or the terminal box pointing downwards.

Difficult installation locations for liquid measurement

The accumulation of air or gas bubbles in the meter tube will lead to increased inaccuracies.

Avoid the following installation locations in case of liquid measurement:

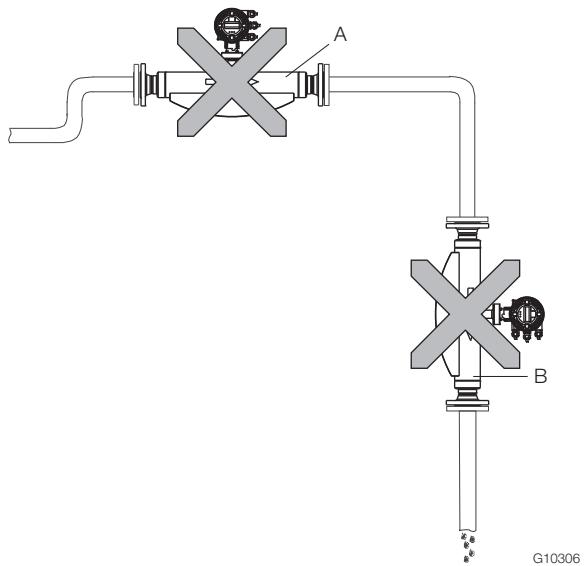


Fig. 5: Difficult installation locations

- "**A**": Installing the flowmeter sensor at the highest point of a pipeline leads to increased inaccuracies due to the accumulation of air or gas bubbles in the meter tube.
- "**B**": Installing the flowmeter sensor in a drop line means that there is no guarantee that the meter tube will be completely full while measurements are being taken and leads to increased inaccuracies.

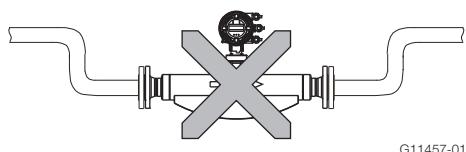
CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Difficult installation locations and gas metering

When metering gas, the accumulation of fluid or the formation of condensate in the meter tube will lead to increased inaccuracies.

Avoid the following installation locations when metering gas:



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Fig. 6: Difficult installation locations

Installing the flowmeter sensor at the lowest point of a pipeline leads to increased inaccuracies due to the accumulation of fluid or the formation of condensate in the meter tube.

Zero balance

CoriolisMaster flowmeters do not require in any case a zero point calibration. Only under these circumstances a calibration is recommended:

- when measuring below 10% of QmaxDN,
- when very high accuracies are required (0.1% or better),
- the operating conditions (pressure and temperature) differ widely from the reference conditions.

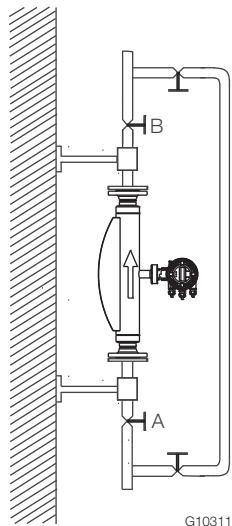


Fig. 7: Bypass line

Closing valves are to be installed in front (A) and after (B) the flowmeter.

We recommend installing a bypass line. Installing a bypass line means that adjustment can take place while the process is ongoing.

Before adjusting the zero under operating conditions, make sure that:

- The meter tube is completely full
- There are no gas bubbles or air in the meter tube (in case of liquid measurements)
- There are no condensates in the meter tube (in case of gas measurements)
- The pressure and temperature in the meter tube are appropriate for normal operating conditions

In case of a high zero point (> 0.1%) please check the installation for best praxis and ensure that there are no gas contents in a liquid or solids or liquids in gases. Please ensure that the meter is completely filled.

Installation dependent on the temperature of the medium being measured

The mounting position of the sensor is dependent on the temperature of the medium being measured T_{medium} . Be aware of the following mounting options!

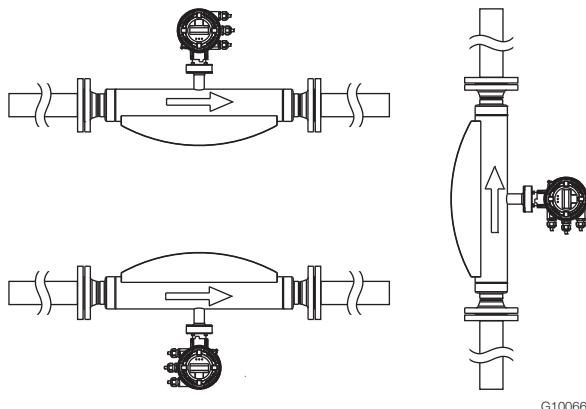


Fig. 8: Installation at T_{medium} -50° ... 120 °C (-58 ... 248 °F)

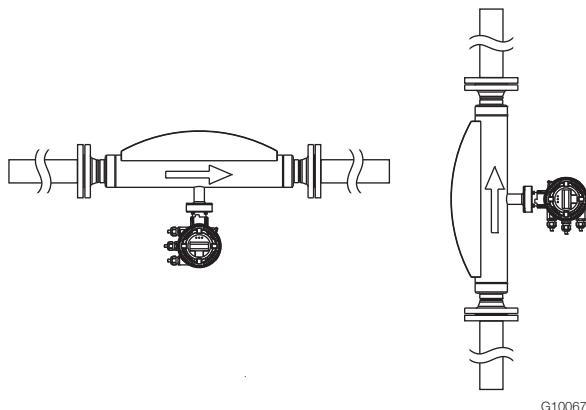


Fig. 9: Installation at T_{medium} -50° ... 200 °C (-58 ... 392 °F)

Installation with option TE1 "extended tower length"

IMPORTANT (NOTE)

The sensor must only be insulated in conjunction with the TE1 "Extended tower length" option, as shown in Fig. 10.

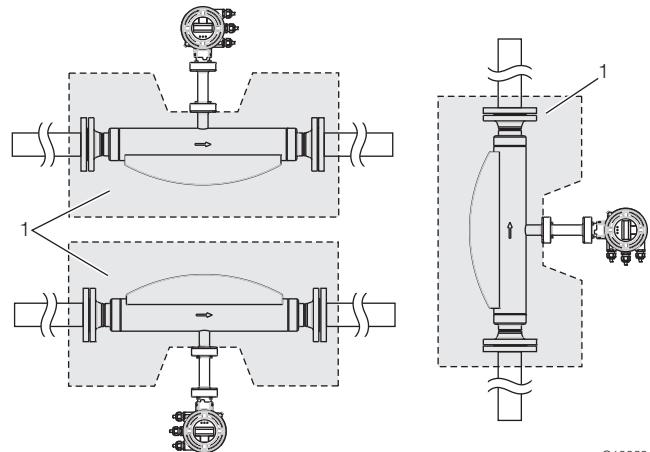


Fig. 10: Installation at T_{medium} -50° ... 200 (-58 ... 392 °F)

1 Insulation

Notes about EHEDG conformity

Bacteria and chemical substances can contaminate or pollute pipeline systems and the materials they are made of. The appropriate installation conditions must be observed in order to achieve an installation that complies with EHEDG requirements.

IMPORTANT (NOTE)

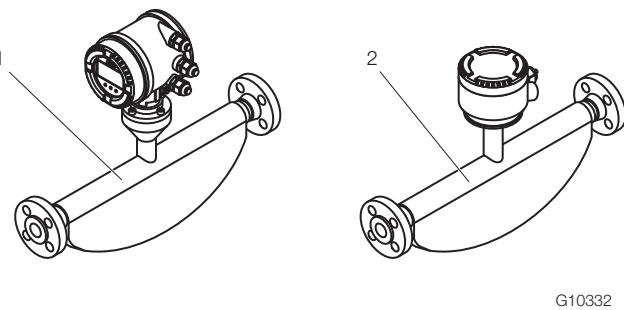
- EHEDG certification requires a self draining installation, only possible with a vertical installation.
- In order to achieve compliance with EHEDG requirements, the combination of process connection and gaskets selected by the operator must consist solely of EHEDG-compliant parts. Note the information in the latest version of the following document: EHEDG Position Paper: "Hygienic process connections to use with hygienic components and equipment".

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Flowmeter sensor

Designs



G10332

Fig. 11: FCB3xx / FCH3xx flowmeter sensor

- 1 Integral mount design |
- 2 Remote mount design (without transmitter)

Nominal diameter and measuring range

Nominal diameter	Q_{\max} in kg/h (lb/h)
DN 15 (1/2")	0 ... 8,000 (0 ... 17,637)
DN 25 (1")	0 ... 35,000 (0 ... 77,162)
DN 50 (2")	0 ... 90,000 (0 ... 198,416)
DN 80 (3")	0 ... 250,000 (0 ... 551,156)
DN 100 (4")	0 ... 520,000 (0 ... 1,146,404)
DN 150 (6")	0 ... 860,000 (0 ... 1,895,975)

Recommended flow range

Fluids:

- The recommended flow range is 5 ... 100 % of Q_{\max} .
- Flows < 1 % of Q_{\max} should be avoided.

Gases:

- The flow velocity of gases in the meter tube should not exceed 0.3 Mach (approx. 100 m/s (328 ft/s)).
- Flow velocities above 80m/s may lead to increased repeatability values.
- The maximum flow range of gases is determined by the operating density. Dimensioning guidelines are available at www.abb.com/flow.

Measuring accuracy

Reference conditions

Calibration fluid	Water
	— Temperature: 25 °C (77 °F) ±5 K
	— Pressure: 2 ... 4 bar (29 ... 58 psi)
Ambient temperature	25 °C (77 °F) +10 K / -5 K
Power supply	Line voltage according to name plate $U_N \pm 1 \%$
Warm-up phase	30 minutes
Installation	<ul style="list-style-type: none">— Installation according to chapter titled "Installation instructions" and "Mounting positions"— No visible gas phase— No external mechanical or hydraulic disturbances, particularly cavitation
Output calibration	Pulse output
Effect of the analog output on measuring accuracy	As pulse output ±0.1 % of measurement

Measured error

The measured error is calculated as follows for the flow:

Scenario 1:

If

$$\text{Flow} \geq \frac{\text{Zero stability}}{(\text{base accuracy} / 100)}$$

Then:

- Maximum measured error:
± base accuracy as % of measured value
- Reproducibility:
± 1/2 x base accuracy as % of measured value

Scenario 2:

If

$$\text{Flow} < \frac{\text{Zero stability}}{(\text{base accuracy} / 100)}$$

Then:

- Maximum measured error:
± (zero stability / measured value) × 100 % of measured value
- Reproducibility:
± 1/2 x (zero stability / measured value) × 100% of measured value

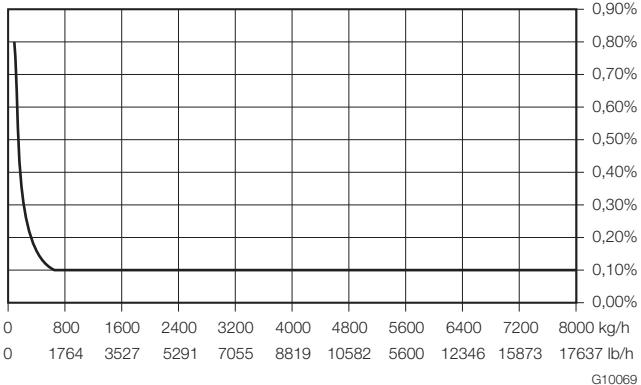


Fig. 12: Calculation of measured error FCB350 DN15 (example)

Measurement dynamic	Flow	Maximum measured error
100:1	80 kg/h (176.4 lb/h)	0.8 % o.r.
50:1	160 kg/h (352.7 lb/h)	0.4 % o.r.
10:1	800 kg/h (1763.7 lb/h)	0.1 % o.r.
2:1	4000 kg/h (8818.5 lb/h)	0.1 % o.r.
1:1	8000 kg/h (17637 lb/h)	0.1 % o.r.

Measured error and base accuracy for liquids

	FCx330	FCx350
Mass flow	± 0.4 % of rate ± 0.25 % of rate	± 0.15 % of rate ± 0.1 % of rate (option)
Volume flow	± 0.4 % of rate ± 0.25 % of rate	± 0.15 % of rate
Density	0.010 kg/l ¹⁾ 0.0005 kg/l (option) ³⁾	0.0002 kg/l ¹⁾ 0.001 kg/l ²⁾
Reproducibility for density	0.002 kg/l	0.00025 kg/l (option) ³⁾
Temperature	1 K	0.5 K

1) For the density range from 0.5 ... 1.8 kg/dm³

2) As 1 and for the medium temperature range from -10 ... 50 °C (14 ... 122 °F)

3) As 2 and following field adjustment under operating conditions

Measured error and base accuracy for gases

	FCx330	FCx350
Mass flow	± 1 % of rate	± 0.5 % of rate
Temperature	1 K	0.5 K

Zero stability

Nominal diameter	kg/h (lb/h)
DN 15 (1/2")	0.64 (1.41)
DN 25 (1")	2.16 (4.76)
DN 50 (2")	7.20 (15.87)
DN 80 (3")	20 (44)
DN 100 (4")	41.6 (91.7)
DN 150 (6")	68.8 (151.68)

Effect of the temperature of the medium being measured

For the flow, less than ± 0.0015 % of Q_{max} / 1 K.

For the density, less than 0.0001 kg/dm³ / 1 K.

Effect of the operating pressure

Nominal diameter	Flow [% of measurement / bar]	Density [kg/dm ³ / bar]
DN 15 (1/2")	-0.002	No effect
DN 25 (1")	-0.013	0.00035
DN 50 (2")	-0.010	0.00027
DN 80 (3")	-0.006	0.00019
DN 100 (4")	-0.009	0.00024
DN 150 (6")	-0.035	0.00045

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Technical data

Pressure loss

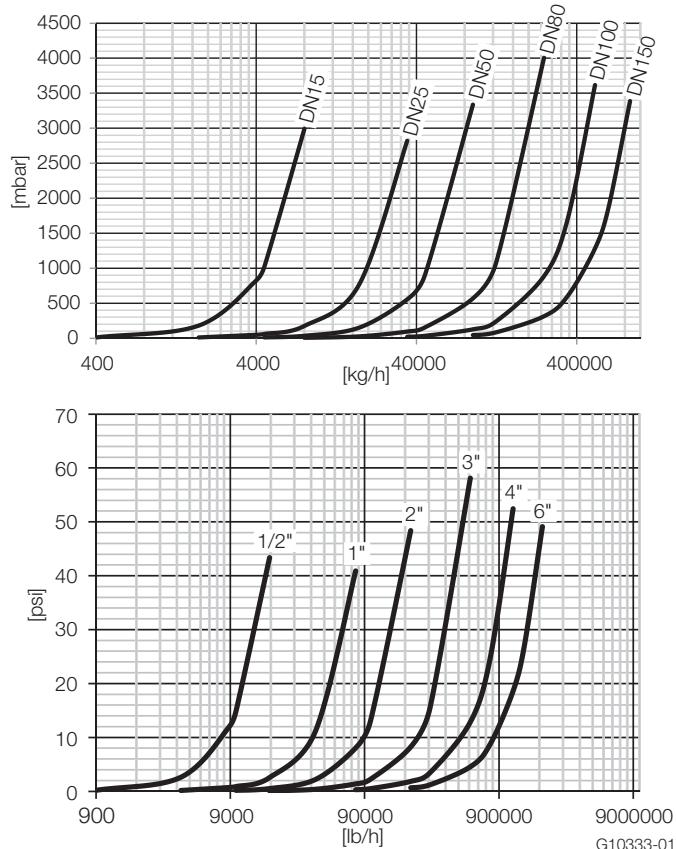


Fig. 13: Pressure loss curve (measured with water, viscosity: 1 mPas)

Viscosity range

If you are working with dynamic viscosities $\geq 1 \text{ Pas}$ ($1000 \text{ mPas} = 1000 \text{ cP}$), please contact ABB.

Temperature limits °C (°F)

IMPORTANT (NOTE)

When using the device in hazardous areas, note the additional temperature data in the chapter titled "Technical data relevant to hazardous areas"!

Temperature range of the medium being measured

FCx350: -50 ... 160 °C (-58 ... 320 °F)

FCx350: -50 ... 200 °C (-58 ... 392 °F)

Ambient temperature range

Standard: -20 ... 60 °C (-4 ... 140 °F)

Optional: -40 ... 60 °C (-40 ... 140 °F)

Process connections

- Flange design according to EN / ASME / JIS
- Tri-Clamp according to DIN 32676 (ISO 2852)
- DN 15 ... 100 (1/2 ... 4"): Series 3
- BPE Tri-Clamp
- DN 15 ... 100 (1/2 ... 4")

Pressure rating

PN 16, PN 40, PN 100, PN 160
CL 150, CL 300, CL 600, CL 900, CL 1500

The maximum permissible operating pressure is determined by the respective process connection, the temperature of the medium to be measured, the screws, and the gasket material.

Enclosure as protective device (optional)

Standard:

- Maximum burst pressure 60 bar (870 psi)

Optional:

- Higher bursting pressure resistant housings possible up to 100 bar (1450 psi) for meter sizes DN15 .. DN100 (1/2" ... 4").
- Higher bursting pressure resistant housings possible up to 150 bar (2175 psi) for meter sizes DN15 ... DN80 (1/2" ... 3")
- Purge fittings can be provided on request.

Pressure Equipment Directive

Conformity assessment according to Category III, fluid group 1, gas

Check the corrosion resistance of the meter tube materials against the measuring medium.

NAMUR standard lengths

The FCB300 is the ideal NAMUR standard device. Beside other standards, specifically the NAMUR standard lengths can be ordered with the order code "S5". The exact lengths can be found in the tables in chapter "Dimensions".

Materials for transmitters

Enclosure

Varnished alloy casting
Enclosure color
– Mid-section: RAL 7012
– Cover: RAL 9002
Varnish layer thickness: 80 ... 120 µm

Materials for flowmeter sensors

Wetted parts

Stainless steel
– 1.4404 (AISI 316L)
Stainless steel, polished
– 1.4404 (AISI 316L) or 1.4435 (AISI 316L) certified to EHEDG with flowmeter sensor material (AISI 316L)
– Nickel-Alloy C4 ¹⁾ (2.4610) oder Nickel-Alloy C22 ¹⁾ (2.4602)
Optional: Manufacture in accordance with NACE MR0175 and MR0103 (ISO 15156)

Housing²⁾

Stainless steel 1.4404 (AISI 316L), 1.4301 (AISI 304), 1.4308 (ASTM CF8)
--

- 1) Hastelloy C is a registered trademark of Haynes International. Nickel-Alloy C4 and C22 is equal to Hastelloy C4 and Hastelloy C22.
2) If the sensor wetted parts are Nickel-Alloy based, parts of the sensor housing are Nickel-Alloy based too.

Material load for process connections

Design	Nominal diameter	PS _{max}	TS _{max}	TS _{min}
Threaded pipe connection (DIN 11851)	DN 15 ... 40 (1/2 ... 1 1/2")	40 bar (580 psi)	140 °C (284 °F)	-40 °C (-40 °F)
	DN 50 ... 100 (2 ... 4")	25 bar (363 psi)	140 °C (284 °F)	-40 °C (-40 °F)
Tri-Clamp (DIN 32676)	DN 15 ... 50 (1/2 ... 2")	16 bar (232 psi)	120 °C (248 °F)	-40 °C (-40 °F)
	DN 65 ... 100 (2 1/2 ... 4")	10 bar (145 psi)	120 °C (248 °F)	-40 °C (-40 °F)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Material load curves for flange devices

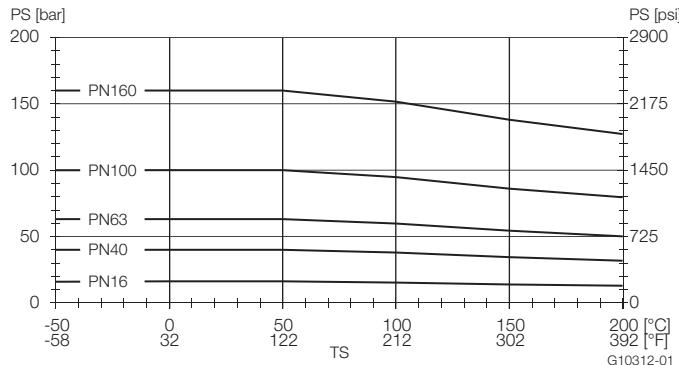


Fig. 14: Stainless steel DIN flange 1.4571 / 1.4404 (316Ti / 316L) up to DN 200 (8")

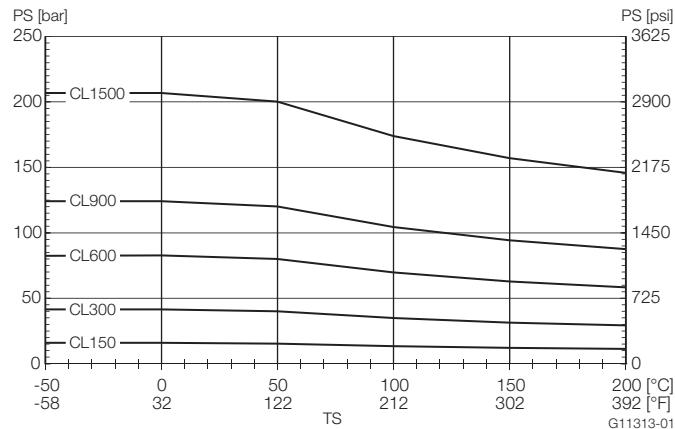


Fig. 15: Stainless steel ASME flange 1.4571 / 1.4404 (316Ti / 316L) up to DN 200 (8")

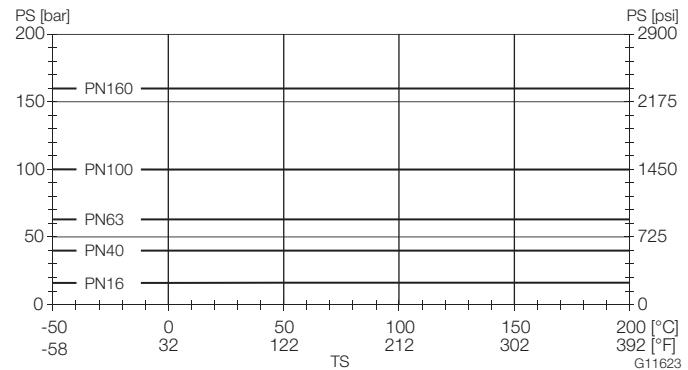


Fig. 16: DIN flange Nickel-Alloy C4 (2.4610) or Nickel-Alloy C22 up to DN 200 (8")

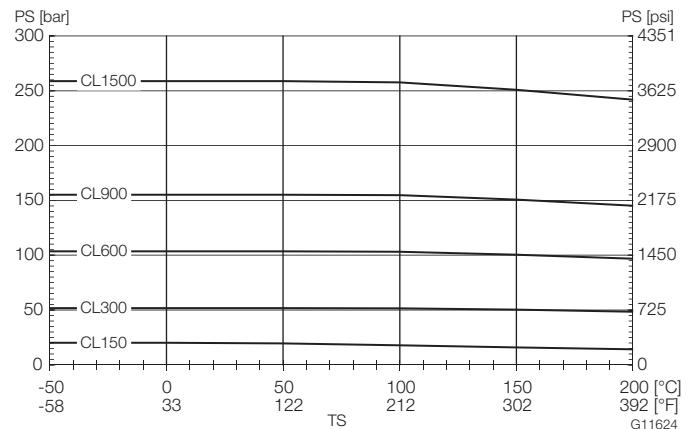
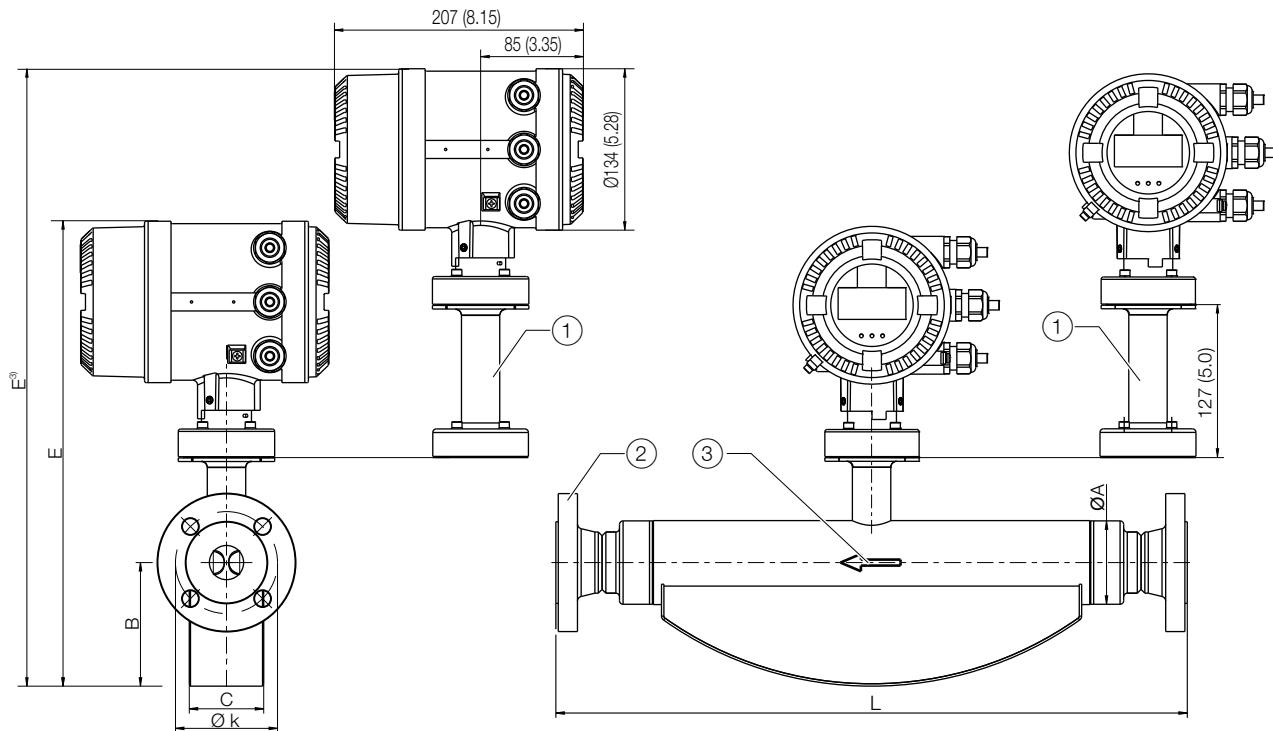


Fig. 17: ASME flange Nickel-Alloy C4 (2.4610) or Nickel-Alloy C22 up to DN 200 (8")

Dimensions for devices with integral mount design

Devices with meter tube nominal diameter DN 15 ... 50 and flange DN 10 ... 65

All specified dimensions and weights are in mm (inch) or kg (lb).



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Fig. 18: Devices with integral mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 (1/2")							Approx. weight	
DN / process connection	L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	SST ²⁾
10 (3/8)	PN 40 (EN 1092-1)	385 (15.2)	60 (2.4)	44.5 (1.8)	77 (3.0)	46 (1.8)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾	9 / 10 ³⁾ (19.8 / 22 ³⁾
	JIS 10K	385 (15.2)	65 (2.6)					
15 (1/2)	PN 40 (EN 1092-1)	385 (15.2)	65 (2.6)					12 / 13 ³⁾ (26.5 / 28.7 ³⁾
	PN 63 (EN 1092-1)	403 (15.9)	75 (3.0)					
	PN 100 (EN 1092-1)							
	CL150 (ASME B16.5)	435 (17.1)	60.5 (2.4)					
	CL300 (ASME B16.5)	421 (16.6)	66.7 (2.6)					
	CL600 (ASME B16.5)							
	CL900 (ASME B16.5)	421 (16.6)	82.6 (3.3)					
20 (3/4)	JIS 10K	385 (15.2)	70 (2.8)					
	PN 40 (EN 1092-1)	421 (16.6)	75 (3.0)					
	CL150 (ASME B16.5)	421 (16.6)	69.9 (2.8)					
	JIS 10K	421 (16.6)	75 (3.0)					

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Sensor with measuring agents made from stainless steel								Approx. weight	
Dimensions for sensors featuring meter tubes with nominal diameter DN 25 (1")								Aluminum ¹⁾	SST ²⁾
DN / process connection	L	Ø k	Ø A	B	C	E			
20 (3/4)	PN 40 (EN 1092-1)	576 (22.7)	75 (3.0)	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾)	11 / 12 ³⁾ (24,3 / 26.5 ³⁾)	14 / 15 ³⁾ (30.9 / 33.1 ³⁾)
	CL150 (ASME B16.5)	575 (22.6)	69.9 (2.8)						
	JIS 10K	576 (22.7)	75 (3.0)						
25 (1)	PN 40 (EN 1092-1)	525 (20.7)	85 (3.3)						
	PN 63 (EN 1092-1)	564 (22.2)	100 (3.9)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	575 (22.6)	79.2 (3.1)						
	CL300 (ASME B16.5)	575 (22.6)	88.9 (3.5)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	575 (22.6)	82.6 (3.25)						
40 (1 1/2)	CL1500 (ASME B16.5)								
	JIS 10K	525 (20.7)	90 (3.54)						
	PN 40 (EN 1092-1)	576 (22.7)	110 (4.33)						
	PN 63 (EN 1092-1)	572 (22.5)	125 (4.92)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	576 (22.7)	98.6 (3.88)						
	CL300 (ASME B16.5)	576 (22.7)	114.3 (45.0)						
JIS 10K	CL600 (ASME B16.5)								
	JIS 10K	576 (22.7)	105 (4.13)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 50 (2")							Approx. weight		
DN / process connection		L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	SST ²⁾
40 (1 1/2)	PN 40 (EN 1092-1)	763 (30)	110 (4.33)	99 (3.9)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾)	27 / 28 ³⁾ (59,5 / 61,7 ³⁾)	30 / 31 ³⁾ (66,1 / 68,3 ³⁾)
	PN 63 (EN 1092-1)	745 (29.33)	125 (4.92)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	763 (30)	98.6 (3.88)						
	CL300 (ASME B16.5)	756 (29.76)	114.3 (4.5)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	780 (30.71)	124 (4.88)						
	CL1500 (ASME B16.5)								
50 (2)	JIS 10K	763 (30)	105 (4.13)						
	PN 40 (EN 1092-1)	715 (28.15)	125 (4.92)						
	PN 63 (EN 1092-1)	745 (29.33)	135 (5.31)						
	PN 100 (EN 1092-1)	757 (29.8)	145 (5.71)						
	CL150 (ASME B16.5)	715 (28.15)	120.7 (4.75)						
	CL300 (ASME B16.5)	763 (30)	127 (5.0)						
	CL600 (ASME B16.5)	773 (30.43)	127 (5.0)						
	CL900 (ASME B16.5)	790 (31.1)	165.1 (6.5)						
	CL1500 (ASME B16.5)								
65 (2 1/2)	JIS 10K	715 (28.15)	120 (4.72)						
	PN 40 (EN 1092-1)	763 (30)	145 (5.71)						
	CL150 (ASME B16.5)	763 (30)	139.7 (5.5)						
	CL900 (ASME B16.5)	800 (31.5)	190.5 (7.5)						
	CL1500 (ASME B16.5)								
	JIS 10K	763 (30)	140 (5.51)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 80 and flange DN 65 ... 100

All specified dimensions and weights are in mm (inch) or kg (lb).

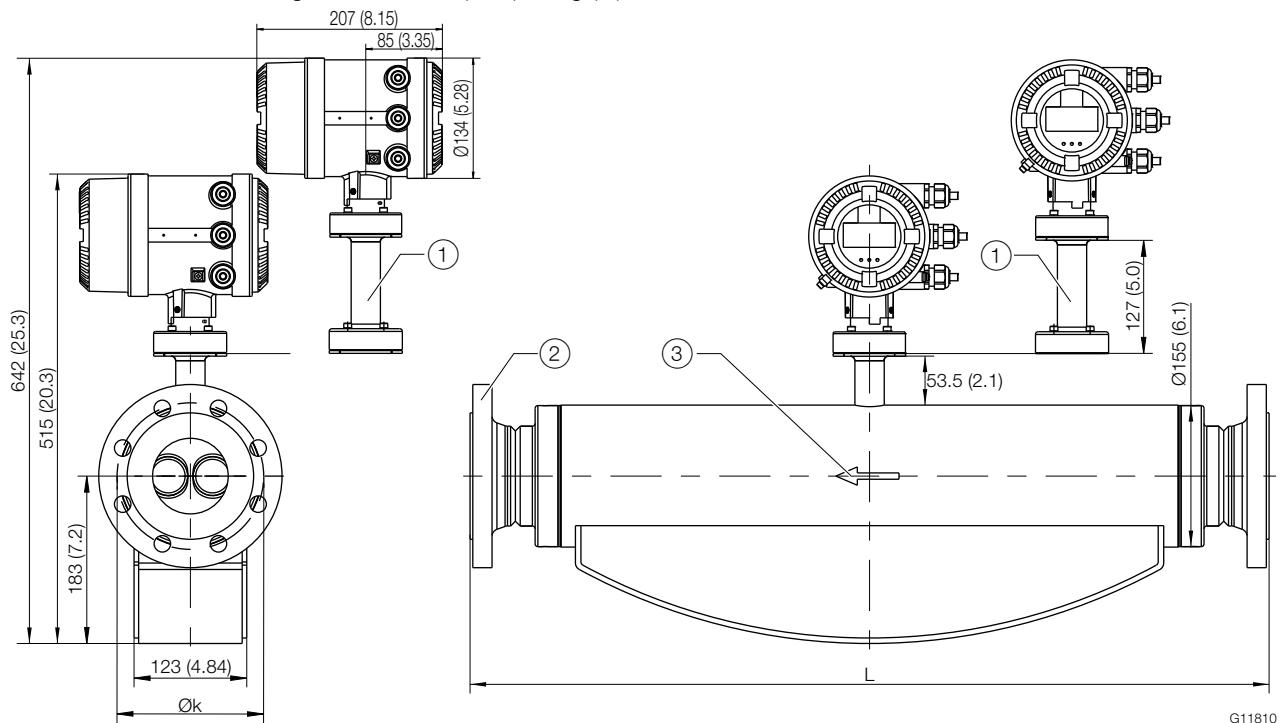


Fig. 19: Devices with remote mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 80 (3")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
65 (2 1/2")	PN 16 (EN 1092-1)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	PN 40 (EN 1092-1)	910 (35.83)	145 (5.71)	70 / 71 ³⁾ (154.3 / 156.5 ³⁾
	PN 63 (EN 1092-1)		160 (6.30)	74 / 75 ³⁾ (163.1 / 165.4 ³⁾
	PN 100 (EN 1092-1)		170 (6.69)	78 / 79 ³⁾ (172 / 174.2 ³⁾
	CL150 (ASME B16.5)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	CL300 (ASME B16.5)	920 (36.22)	149.4 (5.88)	72 / 73 ³⁾ (158.7 / 160.9 ³⁾
	CL600 (ASME B16.5)		—	73 / 74 ³⁾ (160.9 / 163.1 ³⁾
	CL900 (ASME B16.5)	965 (37.99)	190.5 (7.50)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
	CL1500 (ASME B16.5)		—	93 / 94 ³⁾ (205.3 / 207.23 ³⁾

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) On request

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 80 (3")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
80 (3")	PN 16 (EN 1092-1)	870 (34.25)	160 (6.30)	70 / 71 ³⁾ (154.3 / 156.5 ³⁾
	PN 40 (EN 1092-1)			71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	PN 63 (EN 1092-1)	910 (35.83)	170 (6.69)	75 / 76 ³⁾ (163.1 / 167.6 ³⁾
	PN 100 (EN 1092-1)		180 (7.09)	81 / 82 ³⁾ (178.6 / 180.8 ³⁾
	CL150 (ASME B16.5)	880 (34.65)	152.4 (6.00)	71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	CL300 (ASME B16.5)	895 (35.24)	168.1 (6.62)	75 / 76 ³⁾ (163.1 / 167.6 ³⁾
	CL600 (ASME B16.5)	920 (36.22)		78 / 79 ³⁾ (172.0 / 174.2 ³⁾
	CL900 (ASME B16.5)	1100 (43.31)	190.5 (7.50)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
100 (4")	CL1500 (ASME B16.5)	1130 (44.49)	203.2 (8.00)	102 / 103 ³⁾ (224.9 / 227.0 ³⁾
	PN 16 (EN 1092-1)	875 (34.45)	190 (7.48)	71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	PN 40 (EN 1092-1)			73 / 74 ³⁾ (161 / 163 ³⁾
	PN 63 (EN 1092-1)	1060 (41.73)	200 (7.87)	82 / 83 ³⁾ (180.8 / 183.0 ³⁾
	PN 100 (EN 1092-1)	1080 (42.52)	210 (8.27)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
	CL150 (ASME B16.5)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	CL300 (ASME B16.5)	1075 (42.32)	200.2 (7.88)	87 / 88 ³⁾ (191.8 / 194.0 ³⁾
	CL600 (ASME B16.5)	1100 (43.31)	215.9 (8.50)	97 / 98 ³⁾ (213.9 / 216.1 ³⁾
	CL900 (ASME B16.5)	1130 (44.49)	234.9 (9.25)	107 / 108 ³⁾ (235.9 / 238.1 ³⁾
	CL1500 (ASME B16.5)	1150 (45.28)	241.3 (9.50)	122 / 123 ³⁾ (269.0 / 271.2 ³⁾

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) On request

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 100 and flange DN 80 ... 100

All specified dimensions and weights are in mm (inch) or kg (lb).

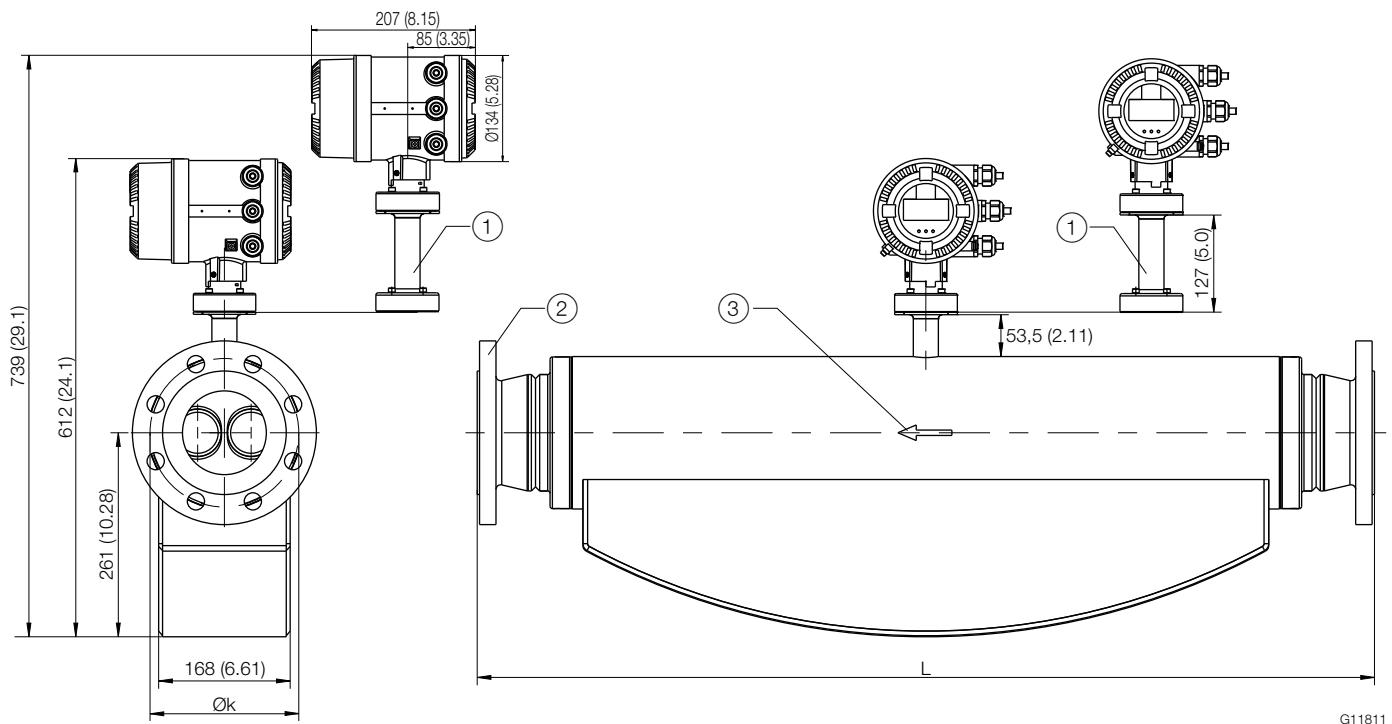


Fig. 20: Devices with integral mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 100 (4")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
80 (3")	PN 16 (EN 1092-1)	1222 (48.11)	160 (6.30)	122 / 1233 (269 / 2713))
	PN 40 (EN 1092-1)			123 / 1243 (271 / 2733))
	PN 63 (EN 1092-1)	1234 (48.58)	170 (6.69)	127 / 1283 (280 / 2823))
	PN 100 (EN 1092-1)		180 (7.09)	129 / 1303 (284 / 2873))
CL150 (ASME B16.5)	1244 (48.98)	152.4 (6.00)	124 / 1253 (273 / 2763))	126 / 1273 (278 / 2803))
		168.1 (6.62)	132 / 1333 (291 / 2933))	134 / 1353 (295 / 2983))
		168.1 (6.62)	135 / 1363 (298 / 3003))	137 / 1383 (302 / 3043))
CL900 (ASME B16.5)	1130 (44.49)	190.5 (7.50)	138 / 1393 (304 / 3063))	140 / 1413 (307 / 3113))
CL1500 (ASME B16.5)	1360 (45.67)	203.2 (8.00)	150 / 1513 (331 / 3353))	152 / 1533 (355 / 3373))

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 100 (4")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
100 (4")	PN 16 (EN 1092-1)	1122 (44.17)	180 (7.09)	119 / 1203 (262 / 2653))
	PN 40 (EN 1092-1)	1144 (45.04)	190 (7.48)	122 / 1233 (269 / 2713))
	PN 63 (EN 1092-1)	1304 (51.34)	138 (5.43)	129 / 1303 (248 / 2873))
	PN 100 (EN 1092-1)	1334 (52.52)	150 (5.91)	137 / 1383 (302 / 3043))
	CL150 (ASME B16.5)	1144 (45.04)	190.5 (7.50)	123 / 1243 (271 / 2733))
	CL300 (ASME B16.5)	1324 (52.13)	200.2 (7.88)	135 / 1363 (298 / 3003))
	CL600 (ASME B16.5)	1354 (53.31)	215.9 (8.50)	137 / 1383 (302 / 3043))
	CL900 (ASME B16.5)	1380 (54.33)	234.9 (9.25)	157 / 1583 (346 / 3483))
	CL1500 (ASME B16.5)	1400 (55.12)	241.3 (9.50)	171 / 1723 (377 / 3793))
150 (6")	PN 16 (EN 1092-1)	1300 (51.18)	240 (9.44)	128 / 1293 (282 / 2843))
	PN 40 (EN 1092-1)		250 (9.84)	136 / 1373 (300 / 3023))

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 150 and flange DN 150

All specified dimensions and weights are in mm (inch) or kg (lb).

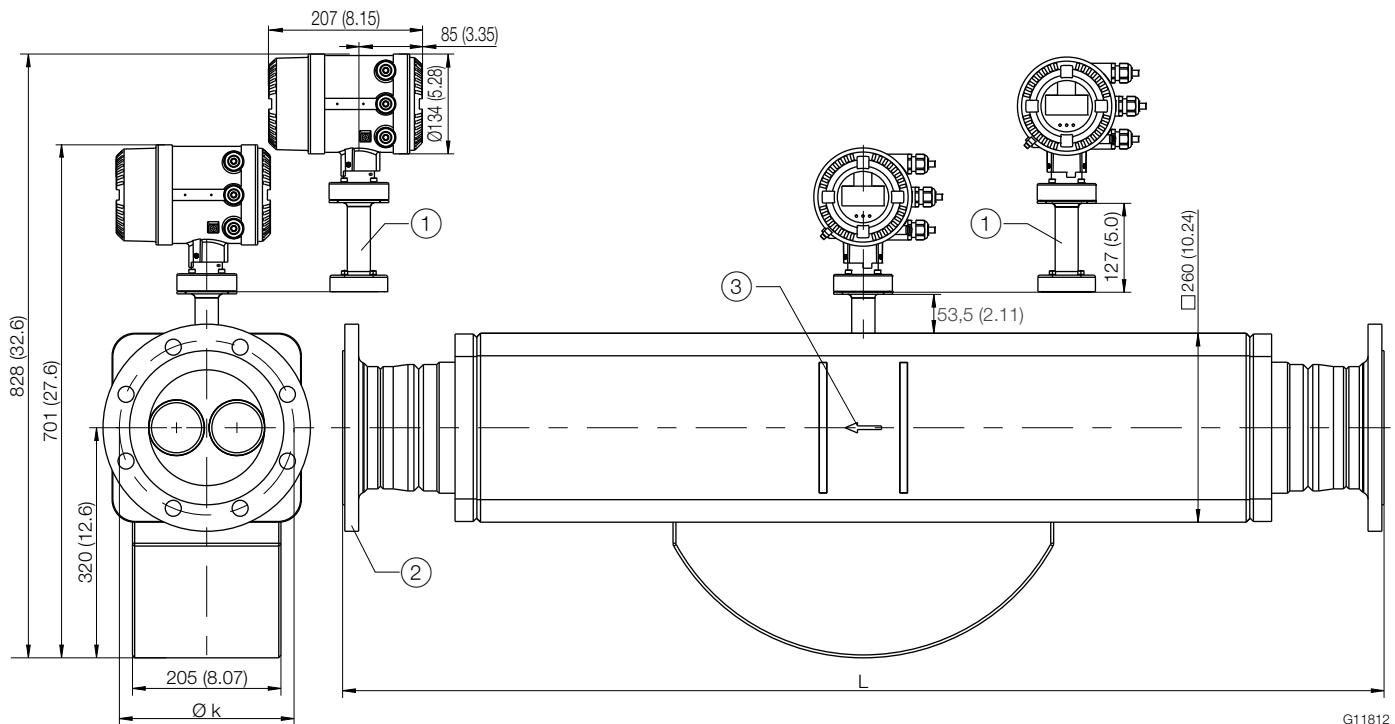


Fig. 21: Devices with integral mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 150 (6")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
150 (6")	PN 16 (EN 1092-1)	1421 (55.94)	240 (9.45)	174 / 175 ³⁾ (384 / 386 ³⁾)
	PN 40 (EN 1092-1)	1461 (57.52)	250 (9.84)	182 / 183 ³⁾ (401 / 403 ³⁾)
	CL150 (ASME B16.5)	1485 (58.46)	241.3 (9.50)	181 / 182 ³⁾ (399 / 401 ³⁾)
	CL300 (ASME B16.5)	1505 (59.25)	269.7 (10.62)	199 / 200 ³⁾ (439 / 441 ³⁾)
	CL600 (ASME B16.5)	1555 (61.22)	292.1 (11.50)	221 / 222 ³⁾ (487 / 489 ³⁾)
	CL900 (ASME B16.5)	1605 (63.19)	317.5 (12.5)	245 / 246 ³⁾ (540 / 542 ³⁾)
	CL1500 (ASME B16.5)	1665 (65.55)		287 / 288 ³⁾ (633 / 635 ³⁾)

1) Devices with transmitter housing made from aluminum.

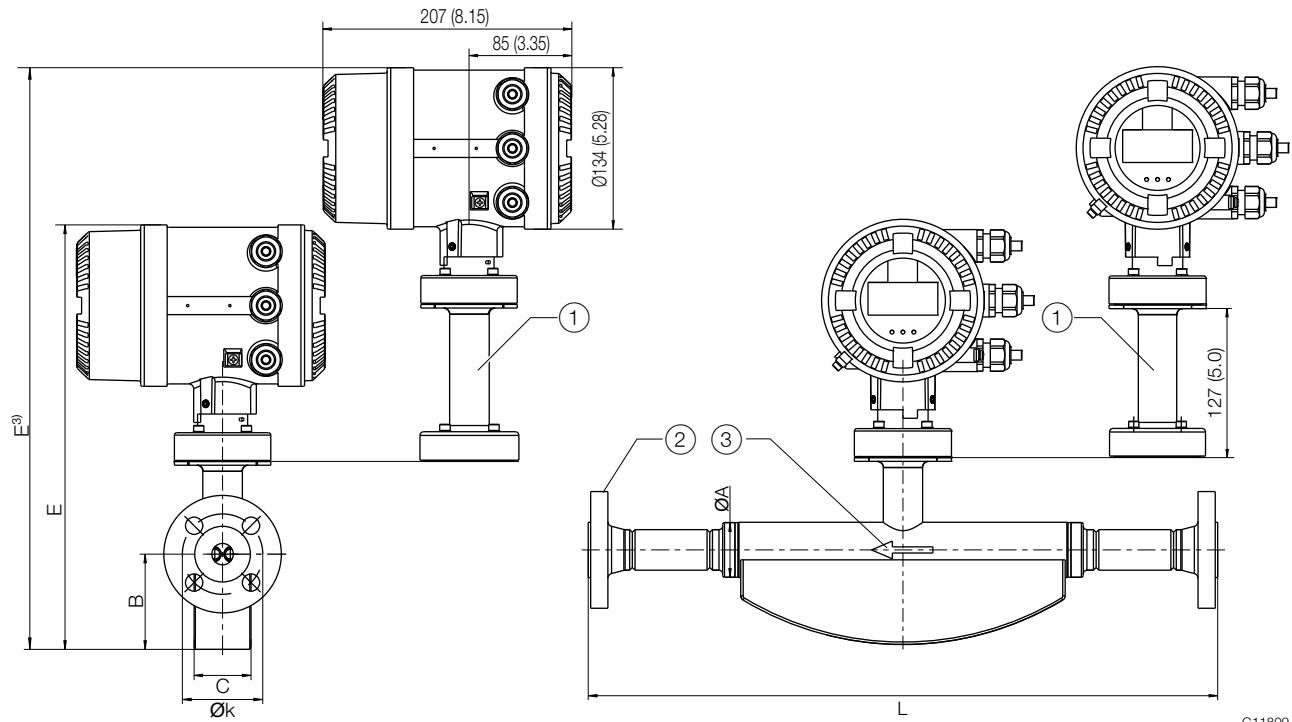
2) Devices with transmitter housing made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -5 mm (+0 / -0.2 inch)

Devices DN 15 ... 150 in NAMUR standard installation lengths (order option S5)

All specified dimensions and weights are in mm (inch) or kg (lb).



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Fig. 22: Devices with integral mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1 (3) flow direction

Sensor with measuring agents made from stainless steel

Meter tube	Process connection	L	Ø k	Ø A	B	C	E	Approx. weight	
								Aluminum ¹⁾	Stainless steel ²⁾
DN 15 (1/2")	DN 15 (1/2") / PN 40 (EN 1092-1)	510 (20.08)	60 (2.4) (20.08)	44.5 (1.8)	77 (3.0)	46 (1.8)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾	9.5 / 10.5 ³⁾ (20.9 / 23.2 ³⁾	12.5 / 13.5 ³⁾ (27.6 / 29.8 ³⁾
DN 25 (1")	DN 25 (1") / PN 40 (EN 1092-1)	600 (23.62)	75 (3.0) (23.62)	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾	11 / 12 ³⁾ (24.3 / 26.53)	14 / 15 ³⁾ (30.9 / 33.1 ³⁾
DN 50 (1")	DN 50 (1") / PN 40 (EN 1092-1)	715 (28.15)	125 (4.92)	99 (3.9)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾	27 / 28 ³⁾ (59.5 / 61.7 ³⁾	30 / 31 ³⁾ (66.1 / 68.3 ³⁾
DN 80 (3")	DN 80 (3") / PN 40 (EN 1092-1)	915 (36.02)	160 (6.30)	155 (6.1)	183 (7.2)	123 (4.84)	502 / 629 ³⁾ (19.76 / 24.76 ³⁾	70 / 71 ³⁾ (154 / 157 ³⁾	73 / 74 ³⁾ (161 / 163 ³⁾
DN 100 (4")	DN 100 (4") / PN 16 (EN 1092-1)	1400 (55.12)	180 (7.09)	195 (7.68)	261 (10.28)	168 (6.61)	612 / 739 ³⁾ (24.1 / 29.1 ³⁾	119 / 120 ³⁾ (262 / 265 ³⁾	122 / 123 ³⁾ (269 / 271 ³⁾
DN 150 (6")	DN 150 (6") / PN 16 (EN 1092-1)	1700 (66.93)	240 (9.45)	260 (10.24)	320 (12.6)	205 (8.07)	701 / 828 ³⁾ (27.6 / 32.6 ³⁾	174 / 175 ³⁾ (384 / 386 ³⁾	177 / 178 ³⁾ (390 / 392 ³⁾

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 15 ... 80 and connections in accordance with DIN 11851, DIN 32676, DIN ISO 228, ASME BPE and ASME B 1.20.1

All specified dimensions and weights are in mm (inch) or kg (lb).

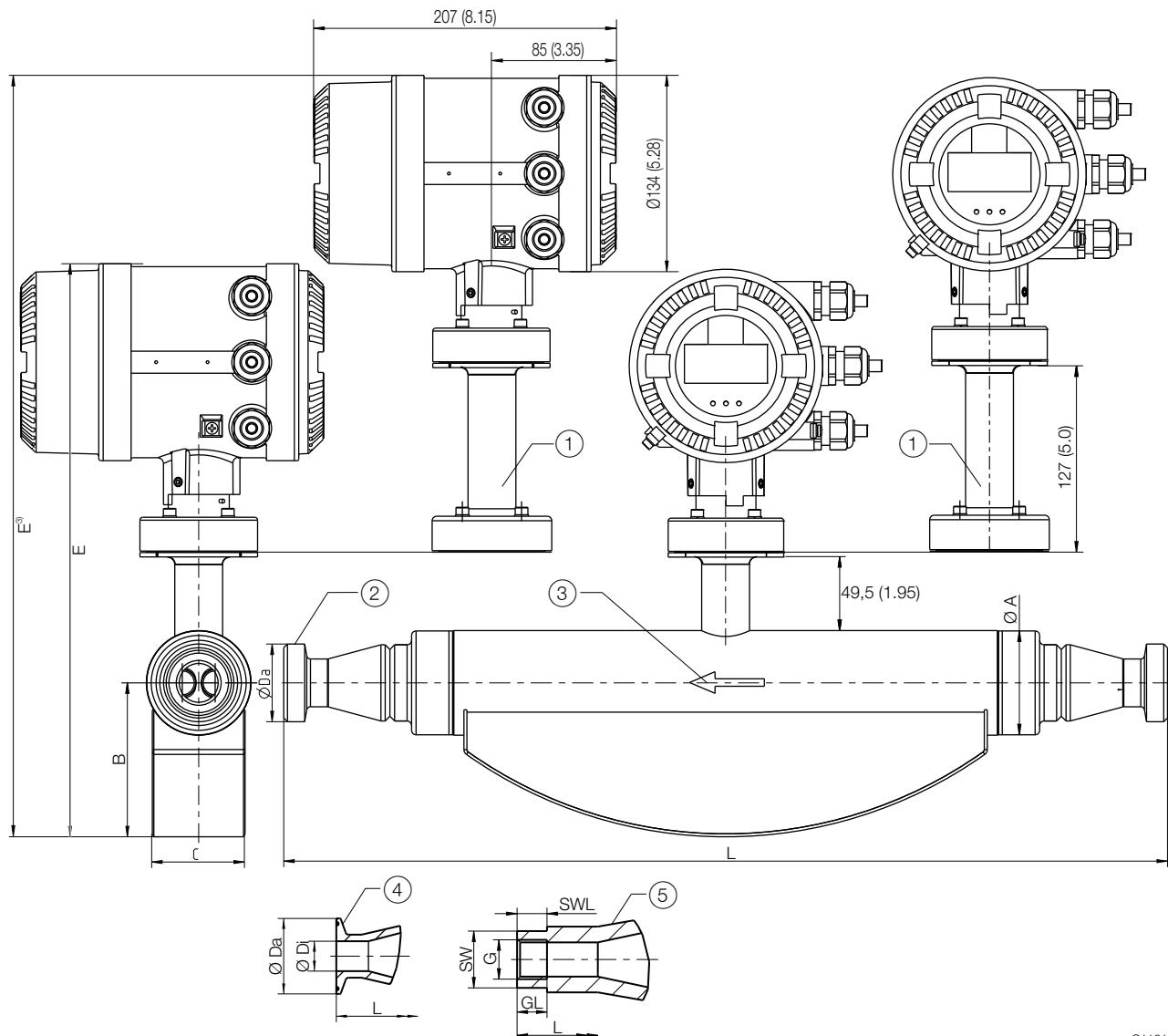


Fig. 23: Devices with integral mount design

- ① Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- ② Threaded spud in accordance with DIN 11851
- ③ Flow direction
- ④ Terminal in accordance with DIN 32676 and ASME BPE
- ⑤ Internal-thread connection in accordance with DIN ISO 228 and ASME B 1.20.1

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN 11851

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	10 (3/8")	40	413 (16.3)	RD 28x1/8"	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	15 (1/2")			RD 34x1/8"	16 (0.63)						
	20 (3/4")			RD 44x1/6"	20 (0.79)						
25 (1")	20 (3/4")	590 (23.2)	590 (23.2)	RD 44x1/6"	20 (0.79)	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾)	11 / 12 ³⁾ (24 / 27 ³⁾)	14 / 15 ³⁾ (31 / 33 ³⁾)
	25 (1")			RD 52x1/6"	26 (1.02)						
	40 (1 1/2")			RD 65x1/6"	38 (1.5)						
50 (2")	40 (1 1/2")	25	763 (30.0)	RD 65x1/6"	38 (1.5)	99 (3.46)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾)	27 / 28 ³⁾ (60 / 62 ³⁾)	30 / 31 ³⁾ (66 / 68 ³⁾)
	50 (2")			RD 78x1/6"	50 (1.97)						
	65 (2 1/2")			RD 95x1/6"	66 (2.6)						
80 (3")	65 (2 1/2")	990 (39.0)	990 (39.0)	RD 95x1/6"	66 (2.6)	155 (6.10)	183 (7.20)	123 (4.84)	502 / 629 ³⁾ (19.76 / 24.76 ³⁾)	68 / 69 ³⁾ (150 / 152 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)
	80 (3")			RD 110x1/4"	81 (3.19)						
	100 (4")			RD 130x1/4"	100 (3.94)						

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN 32676

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	10 (3/8")	40	410 (16.1)	34 (1.34)	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	15 (1/2")				16 (0.63)						
	20 (3/4")				20 (0.79)						
25 (1")	20 (3/4")	590 (23.2)	590 (23.2)	50.5 (1.99)	20 (0.79)	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾)	11 / 12 ³⁾ (24 / 27 ³⁾)	14 / 15 ³⁾ (31 / 33 ³⁾)
	25 (1")				26 (1.02)						
	40 (1 1/2")				38 (1.5)						
50 (2")	40 (1 1/2")	763 (30.0)	763 (30.0)	38 (1.5)	38 (1.5)	99 (3.46)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾)	27 / 28 ³⁾ (60 / 62 ³⁾)	30 / 31 ³⁾ (66 / 68 ³⁾)
	50 (2")				64 (2.52)						
	65 (2 1/2")				91 (3.58)						
80 (3")	65 (2 1/2")	10	950 (37.4)	66 (2.6)	66 (2.6)	155 (6.10)	183 (7.20)	123 (4.84)	502 / 629 ³⁾ (19.76 / 24.76 ³⁾)	68 / 69 ³⁾ (150 / 152 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)
	80 (3")				81 (3.19)						
	100 (4")				119 (4.69)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with ASME BPE

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	3/8"-Type A	10	—	—	—	44.5 (1.75)	77 (3.03)	46 (1.81)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	1/2"-Type A		433 (17.05)	25 (0.98)	9.4 (0.37)						
	3/4"-Type A		—	—	—						
25 (1")	3/4"-Type A		—	—	—	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾)	11 / 12 ³⁾ (24 / 27 ³⁾)	14 / 15 ³⁾ (31 / 33 ³⁾)
	1"-Type B		590 (23.23)	50.4 (1.98)	22.1 (0.87)						
	1 1/2"-Type B		—	—	—						
50 (2")	1 1/2"-Type B		—	—	—	99 (3.46)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾)	27 / 28 ³⁾ (60 / 62 ³⁾)	30 / 31 ³⁾ (66 / 68 ³⁾)
	2"-Type B		740 (29.13)	63.9 (2.52)	47.5 (1.87)						
	2 1/2"-Type B		—	—	—						
80 (3")	2 1/2"-Type B		950 (37.40)	77.4 (3.05)	60.2 (2.37)	155 (6.10)	183 (7.20)	183 (7.20)	502 / 629 ³⁾ (19.76 / 24.76 ³⁾)	68 / 69 ³⁾ (150 / 152 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)
	3"-Type B		910 (35.83)	90.9 (3.19)	72.9 (2.87)						
	4"-Type B		910 (35.83)	118.9 (4.68)	97.4 (3.83)						

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN ISO 228 and ASME B 1.20.1

Meter tube	Process connection		L	GL	WS ⁴⁾	WS L	Ø A	B	C	E	Approx. weight	
	DN / G	PN									Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	8 (1/4") / G 1/4"	100	450 (17.72)	10 (0.39)	19	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	15 (1/2") / G 1/2"											
	25 (1") / G 1"											
	15 (1/2") / 1/2" NPT											

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) Dimension SW: Width across flats specified in mm.

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Dimensions for devices with remote mount design

Devices with meter tube nominal diameter DN 15 ... 50 and flange DN 10 ... 65

All specified dimensions and weights are in mm (inch) or kg (lb).

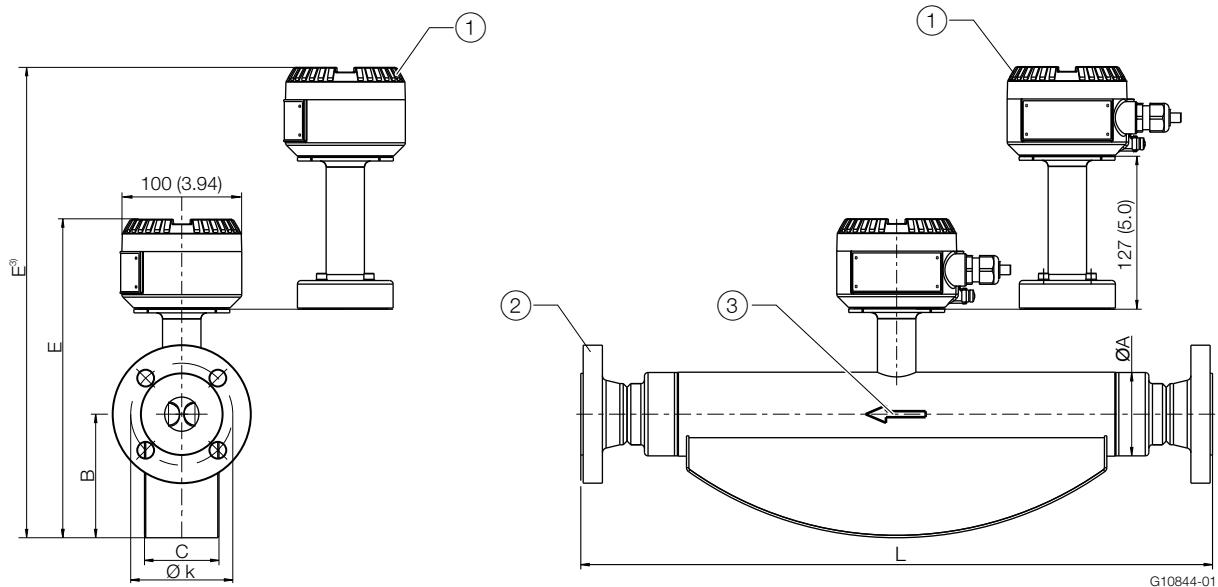


Fig. 24: Devices with remote mount design

(1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"

(2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))

(3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 (1/2")							Approx. weight		
DN / process connection		L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	Stainless steel ^[2]
10 (3/8)	PN 40 (EN 1092-1)	385 (15.2)	60 (2.4)	44.5 (1.8)	77 (3.0)	46 (1.8)	227 / 354 ³⁾ (8.94 / 13.94 ³⁾	9 / 10 ³⁾ (19.8 / 22 ³⁾)	12 / 13 ³⁾ (26.5 / 28.7 ³⁾)
	JIS 10K	385 (15.2)	65 (2.6)						
15 (1/2)	PN 40 (EN 1092-1)	385 (15.2)	65 (2.6)						
	PN 63 (EN 1092-1)	403 (15.9)	75 (3.0)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	435 (17.1)	60.5 (2.4)						
	CL300 (ASME B16.5)	421 (16.6)	66.7 (2.6)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	421 (16.6)	82.6 (3.3)						
20 (3/4)	PN 40 (EN 1092-1)	421 (16.6)	75 (3.0)						
	CL150 (ASME B16.5)	421 (16.6)	69.9 (2.8)						
	JIS 10K	421 (16.6)	75 (3.0)						

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Sensor with measuring agents made from stainless steel								Approx. weight	
Dimensions for sensors featuring meter tubes with nominal diameter DN 25 (1")									
DN / process connection		L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	Stainless steel ²⁾
20 (3/4)	PN 40 (EN 1092-1)	576 (22.7)	75 (3.0)	69.5 (2.74)	103 (4.06)	62 (2.44)	266 / 393 ³⁾ (10.5 / 15.47 ³⁾)	11 / 12 ³⁾ (24.3 / 26.5 ³⁾)	14 / 15 ³⁾ (30.9 / 33.1 ³⁾)
	CL150 (ASME B16.5)	575 (22.6)	69.9 (2.8)						
	JIS 10K	576 (22.7)	75 (3.0)						
25 (1)	PN 40 (EN 1092-1)	525 (20.7)	85 (3.3)						
	PN 63 (EN 1092-1)	564 (22.2)	100 (3.9)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	575 (22.6)	79.2 (3.1)						
	CL300 (ASME B16.5)	575 (22.6)	88.9 (3.5)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	575 (22.6)	82.6 (3.25)						
40 (1 1/2)	PN 40 (EN 1092-1)	576 (22.7)	110 (4.33)						
	PN 63 (EN 1092-1)	572 (22.5)	125 (4.92)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	576 (22.7)	98.6 (3.88)						
	CL300 (ASME B16.5)	576 (22.7)	114.3 (45.0)						
	CL600 (ASME B16.5)								
	JIS 10K	576 (22.7)	105 (4.13)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 50 (2")							Approx. weight		
DN / process connection		L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	Stainless steel ²⁾
40 (1 1/2)	PN 40 (EN 1092-1)	763 (30)	110 (4.33)	99 (3.9)	125 (4.92)	80 (3.15)	303 / 430 ³⁾ (11.9 / 16.93 ³⁾)	27 / 28 ³⁾ (59,5 / 61,7 ³⁾)	30 / 31 ³⁾ (66,1 / 68,3 ³⁾)
	PN 63 (EN 1092-1)	745 (29.33)	125 (4.92)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	763 (30)	98.6 (3.88)						
	CL300 (ASME B16.5)	756 (29.76)	114.3 (4.5)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	780 (30.71)	124 (4.88)						
50 (2)	CL1500 (ASME B16.5)								
	JIS 10K	763 (30)	105 (4.13)						
	PN 40 (EN 1092-1)	715 (28.15)	125 (4.92)						
	PN 63 (EN 1092-1)	745 (29.33)	135 (5.31)						
	PN 100 (EN 1092-1)	757 (29.8)	145 (5.71)						
	CL150 (ASME B16.5)	715 (28.15)	120.7 (4.75)						
	CL300 (ASME B16.5)	763 (30)	127 (5.0)						
	CL600 (ASME B16.5)	773 (30.43)	127 (5.0)						
65 (2 1/2)	CL900 (ASME B16.5)	790 (31.1)	165.1 (6.5)						
	CL1500 (ASME B16.5)								
	JIS 10K	715 (28.15)	120 (4.72)						
	PN 40 (EN 1092-1)	763 (30)	145 (5.71)						
	CL150 (ASME B16.5)	763 (30)	139.7 (5.5)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 80 and flange DN 65 ... 100

All specified dimensions and weights are in mm (inch) or kg (lb).

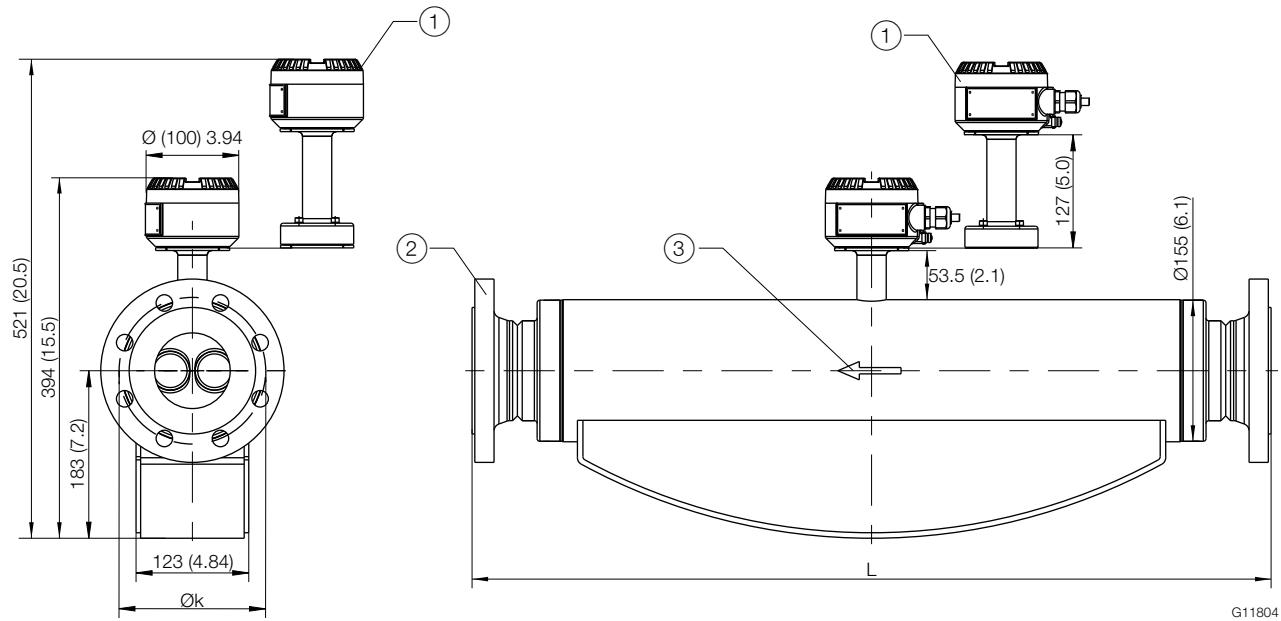


Fig. 25: Devices with remote mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 80 (3")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
65 (2 1/2")	PN 16 (EN 1092-1)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	PN 40 (EN 1092-1)	910 (35.83)	145 (5.71)	70 / 71 ³⁾ (154.3 / 156.5 ³⁾)
	PN 63 (EN 1092-1)		160 (6.30)	74 / 75 ³⁾ (163.1 / 165.4 ³⁾)
	PN 100 (EN 1092-1)		170 (6.69)	78 / 79 ³⁾ (172 / 174.2 ³⁾)
	CL150 (ASME B16.5)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	CL300 (ASME B16.5)	920 (36.22)	149.4 (5.88)	72 / 73 ³⁾ (158.7 / 160.9 ³⁾)
	CL600 (ASME B16.5)			73 / 74 ³⁾ (160.9 / 163.1 ³⁾)
	CL900 (ASME B16.5)	965 (37.99)	190.5 (7.50)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾)
	CL1500 (ASME B16.5)			93 / 94 ³⁾ (205.3 / 207.23 ³⁾)

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) On request

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 80 (3")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
80 (3")	PN 16 (EN 1092-1)	870 (34.25)	160 (6.30)	70 / 71 ³⁾ (154.3 / 156.5 ³⁾
	PN 40 (EN 1092-1)			71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	PN 63 (EN 1092-1)	910 (35.83)	170 (6.69)	75 / 76 ³⁾ (163.1 / 167.6 ³⁾
	PN 100 (EN 1092-1)		180 (7.09)	81 / 82 ³⁾ (178.6 / 180.8 ³⁾
	CL150 (ASME B16.5)	880 (34.65)	152.4 (6.00)	71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	CL300 (ASME B16.5)	895 (35.24)	168.1 (6.62)	75 / 76 ³⁾ (163.1 / 167.6 ³⁾
	CL600 (ASME B16.5)	920 (36.22)		78 / 79 ³⁾ (172.0 / 174.2 ³⁾
	CL900 (ASME B16.5)	1100 (43.31)	190.5 (7.50)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
100 (4")	CL1500 (ASME B16.5)	1130 (44.49)	203.2 (8.00)	102 / 103 ³⁾ (224.9 / 227.0 ³⁾
	PN 16 (EN 1092-1)	875 (34.45)	190 (7.48)	71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	PN 40 (EN 1092-1)			73 / 74 ³⁾ (161 / 163 ³⁾
	PN 63 (EN 1092-1)	1060 (41.73)	200 (7.87)	82 / 83 ³⁾ (180.8 / 183.0 ³⁾
	PN 100 (EN 1092-1)	1080 (42.52)	210 (8.27)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
	CL150 (ASME B16.5)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	CL300 (ASME B16.5)	1075 (42.32)	200.2 (7.88)	87 / 88 ³⁾ (191.8 / 194.0 ³⁾
	CL600 (ASME B16.5)	1100 (43.31)	215.9 (8.50)	97 / 98 ³⁾ (213.9 / 216.1 ³⁾
	CL900 (ASME B16.5)	1130 (44.49)	234.9 (9.25)	107 / 108 ³⁾ (235.9 / 238.1 ³⁾
	CL1500 (ASME B16.5)	1150 (45.28)	241.3 (9.50)	122 / 123 ³⁾ (269.0 / 271.2 ³⁾

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) On request

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 100 and flange DN 80 ... 100

All specified dimensions and weights are in mm (inch) or kg (lb).

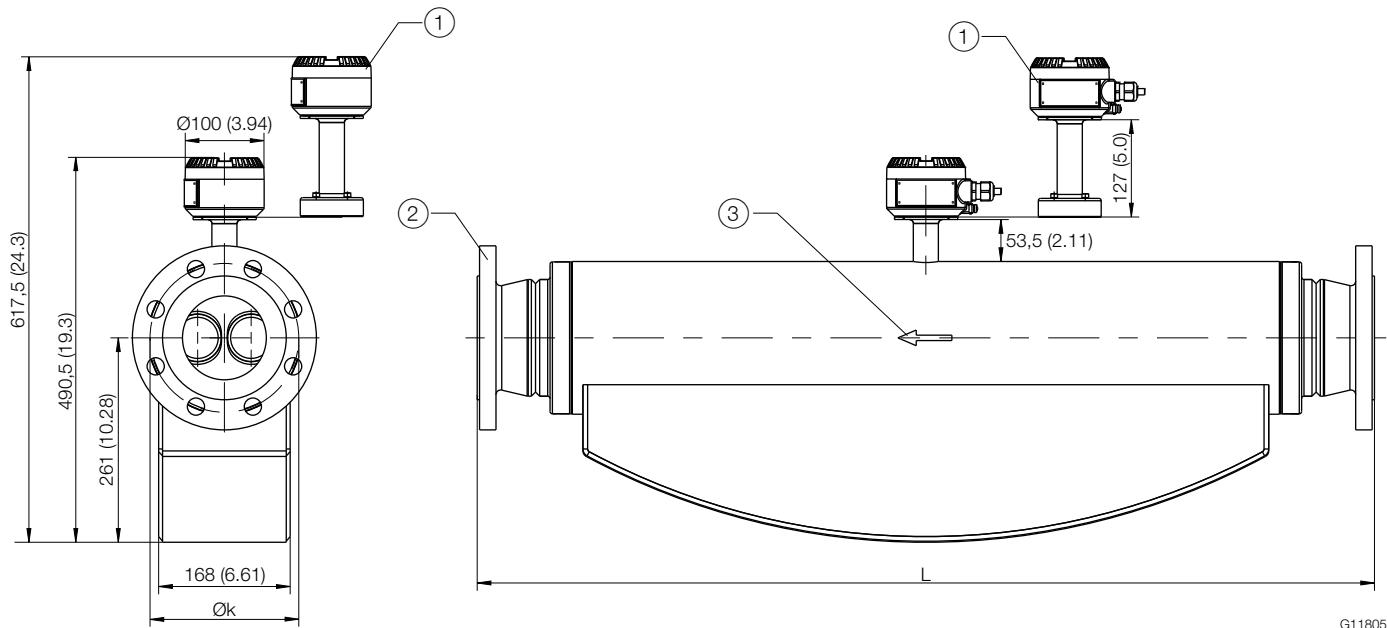


Fig. 26: Devices with remote mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 100 (4")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
80 (3")	PN 16 (EN 1092-1)	1222 (48.11)	160 (6.30)	122 / 1233 (269 / 2713))
	PN 40 (EN 1092-1)			125 / 1263 (276 / 2783))
	PN 63 (EN 1092-1)	1234 (48.58)	170 (6.69)	127 / 1283 (280 / 2823))
	PN 100 (EN 1092-1)		180 (7.09)	129 / 1303 (284 / 2873))
CL150 (ASME B16.5)	1244 (48.98)	152.4 (6.00)	124 / 1253 (273 / 2763))	126 / 1273 (278 / 2803))
		168.1 (6.62)	132 / 1333 (291 / 2933))	134 / 1353 (295 / 2983))
		168.1 (6.62)	135 / 1363 (298 / 3003))	137 / 1383 (302 / 3043))
CL900 (ASME B16.5)	1130 (44.49)	190.5 (7.50)	138 / 1393 (304 / 3063))	140 / 1413 (307 / 3113))
CL1500 (ASME B16.5)	1360 (45.67)	203.2 (8.00)	150 / 1513 (331 / 3353))	152 / 1533 (355 / 3373))

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 100 (4")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
100 (4")	PN 16 (EN 1092-1)	1122 (44.17)	180 (7.09)	119 / 1203 (262 / 2653))
	PN 40 (EN 1092-1)	1144 (45.04)	190 (7.48)	122 / 1233 (269 / 2713))
	PN 63 (EN 1092-1)	1304 (51.34)	138 (5.43)	129 / 1303 (248 / 2873))
	PN 100 (EN 1092-1)	1334 (52.52)	150 (5.91)	137 / 1383 (302 / 3043))
	CL150 (ASME B16.5)	1144 (45.04)	190.5 (7.50)	123 / 1243 (271 / 2733))
	CL300 (ASME B16.5)	1324 (52.13)	200.2 (7.88)	135 / 1363 (298 / 3003))
	CL600 (ASME B16.5)	1354 (53.31)	215.9 (8.50)	137 / 1383 (302 / 3043))
	CL900 (ASME B16.5)	1380 (54.33)	234.9 (9.25)	157 / 1583 (346 / 3483))
	CL1500 (ASME B16.5)	1400 (55.12)	241.3 (9.50)	171 / 1723 (377 / 3793))
150 (6")	PN 16 (EN 1092-1)	1300 (51.18)	240 (9.44)	128 / 1293 (282 / 2843))
	PN 40 (EN 1092-1)		250 (9.84)	136 / 1373 (300 / 3023))

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 150 and flange DN 150

All specified dimensions and weights are in mm (inch) or kg (lb).

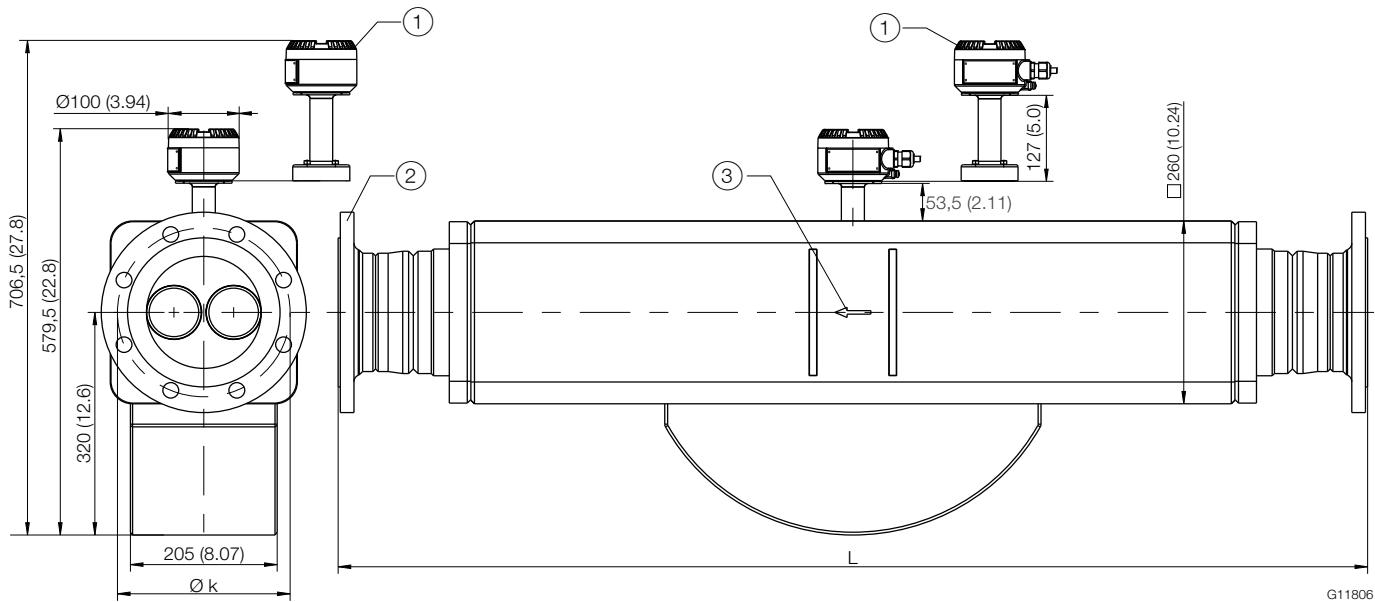


Fig. 27: Devices with remote mount design

(1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"

(2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))

(3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 150 (6")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
150 (6")	PN 16 (EN 1092-1)	1421 (55.94)	240 (9.45)	174 / 175 ³⁾ (384 / 386 ³⁾)
	PN 40 (EN 1092-1)	1461 (57.52)	250 (9.84)	182 / 183 ³⁾ (401 / 403 ³⁾)
	CL150 (ASME B16.5)	1485 (58.46)	241.3 (9.50)	181 / 182 ³⁾ (399 / 401 ³⁾)
	CL300 (ASME B16.5)	1505 (59.25)	269.7 (10.62)	199 / 200 ³⁾ (439 / 441 ³⁾)
	CL600 (ASME B16.5)	1555 (61.22)	292.1 (11.50)	221 / 222 ³⁾ (487 / 489 ³⁾)
	CL900 (ASME B16.5)	1605 (63.19)	317.5 (12.5)	245 / 246 ³⁾ (540 / 542 ³⁾)
	CL1500 (ASME B16.5)	1665 (65.55)		287 / 288 ³⁾ (633 / 635 ³⁾)

1) Devices with transmitter housing made from aluminum.

2) Devices with transmitter housing made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -5 mm (+0 / -0.2 inch)

Devices DN 15 ... 150 in NAMUR standard installation lengths (order option S5)

All specified dimensions and weights are in mm (inch) or kg (lb).

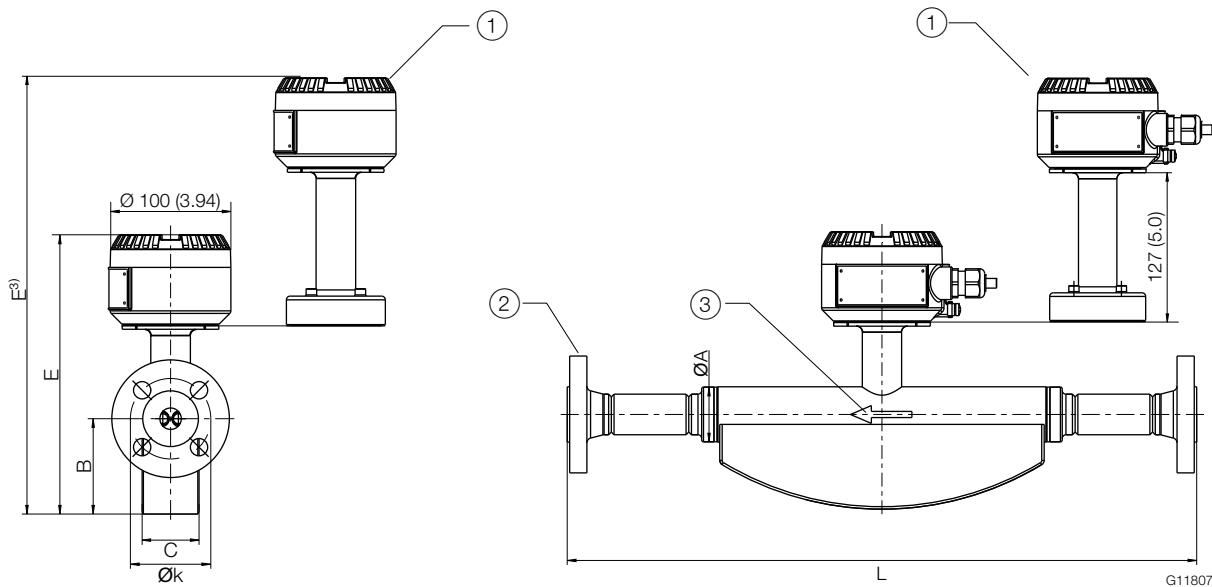


Fig. 28: Devices with remote mount design

(1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"

(2) Flange in accordance with EN 1092-1 (3) flow direction

Sensor with measuring agents made from stainless steel

Meter tube	Process connection	L	Ø k	Ø A	B	C	E	Approx. weight	
								Aluminum ¹⁾	Stainless steel ²⁾
DN 15 (1/2")	DN 15 (1/2") / PN 40 (EN 1092-1)	510 (20.08)	60 (2.4) (1.8)	44.5 (1.8)	77 (3.0)	46 (1.8)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾)	9.5 / 10.5 ³⁾ (20.9 / 23.2 ³⁾)	12.5 / 13.5 ³⁾ (27.6 / 29.8 ³⁾)
DN 25 (1")	DN 25 (1") / PN 40 (EN 1092-1)	600 (23.62)	75 (3.0) (2.74)	69.5 (2.74)	103 (4.06)	62 (2.44)	266.5 / 393.5 ³⁾ (10.5 / 15.5 ³⁾)	11 / 12 ³⁾ (24.3 / 26.53))	14 / 15 ³⁾ (30.9 / 33.1 ³⁾)
DN 50 (1")	DN 50 (1") / PN 40 (EN 1092-1)	715 (28.15)	125 (4.92)	99 (3.9)	125 (4.92)	80 (3.15)	303.5 / 430.5 ³⁾ (11.9 / 16.9 ³⁾)	27 / 28 ³⁾ (59.5 / 61.7 ³⁾)	30 / 313) (66.1 / 68.3 ³⁾)
DN 80 (3")	DN 80 (3") / PN 40 (EN 1092-1)	915 (36.02)	160 (6.30)	155 (6.1)	183 (7.2)	123 (4.84)	394.5 / 521.5 ³⁾ (15.5 / 20.5 ³⁾)	70 / 71 ³⁾ (154 / 157 ³⁾⁾	73 / 74 ³⁾ (161 / 163 ³⁾⁾
DN 100 (4")	DN 100 (4") / PN 16 (EN 1092-1)	1400 (55.12)	180 (7.09)	195 (7.68)	261 (10.28)	168 (6.61)	490.5 / 617.5 ³⁾ (19.3 / 24.3 ³⁾⁾	119 / 120 ³⁾ (262 / 265 ³⁾⁾	122 / 123 ³⁾ (269 / 271 ³⁾⁾
DN 150 (6")	DN 150 (6") / PN 16 (EN 1092-1)	1700 (66.93)	240 (9.45)	260 (10.24)	320 (12.6)	205 (8.07)	579.5 / 706.5 ³⁾ (22.8 / 27.8 ³⁾⁾	174 / 175 ³⁾ (384 / 386 ³⁾⁾	177 / 178 ³⁾ (390 / 392 ³⁾⁾

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

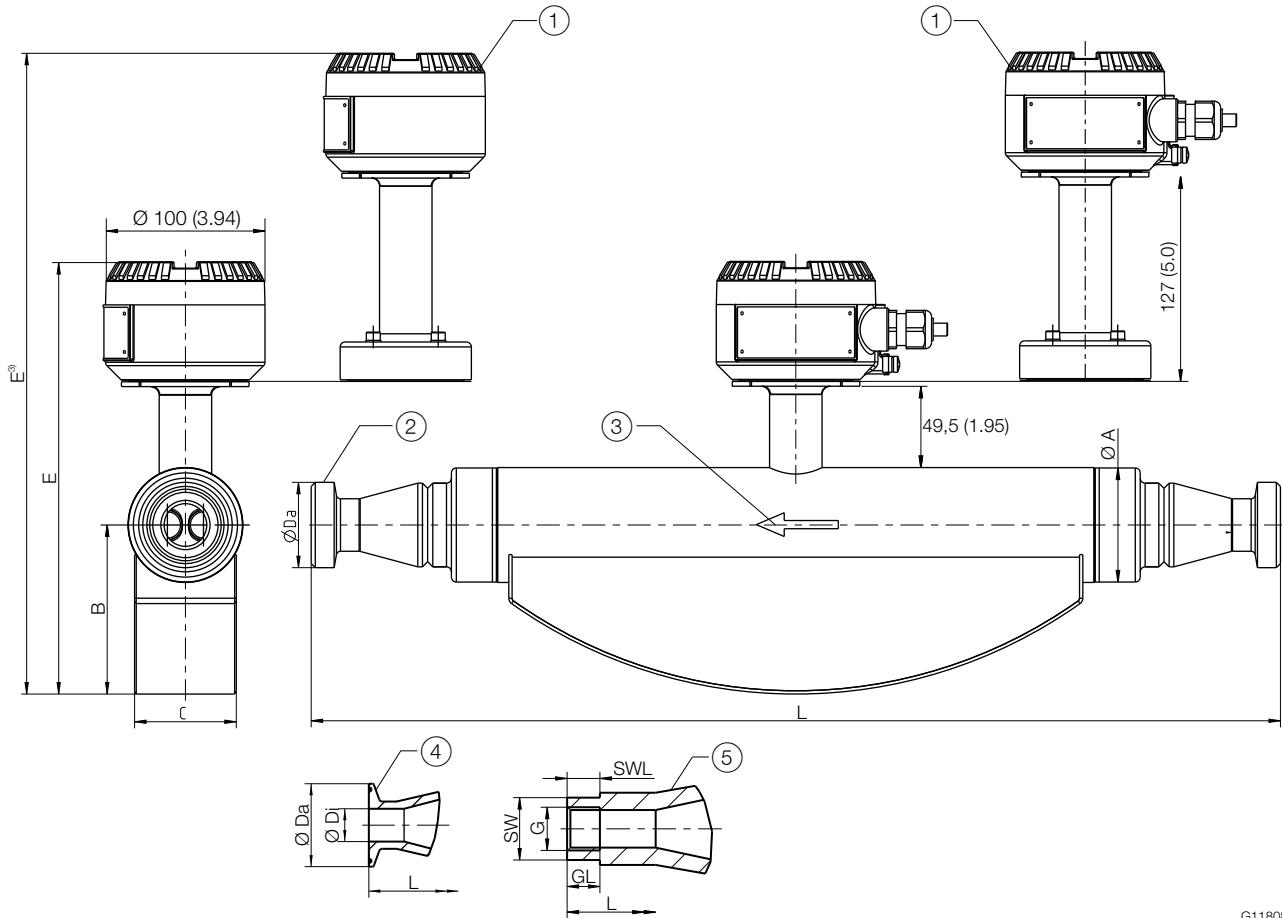
Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 15 ... 80 and connections in accordance with DIN 11851, DIN 32676, DIN ISO 228, ASME BPE and ASME B 1.20.1

All specified dimensions and weights are in mm (inch) or kg (lb).



G11808

Fig. 29: Devices with remote mount design

- ① Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- ② Threaded spud in accordance with DIN 11851 ③ Flow direction ④ Terminal in accordance with DIN 32676 and ASME BPE
- ⑤ Internal-thread connection in accordance with DIN ISO 228 and ASME B 1.20.1

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN 11851

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	10 (3/8")	40	413 (16.3)	RD 28x1/8"	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾	9 / 10 ³⁾ (20 / 22 ³⁾	12 / 13 ³⁾ (27 / 29 ³⁾
	15 (1/2")			RD 34x1/8"	16 (0.63)						
	20 (3/4")			RD 44x1/6"	20 (0.79)						
25 (1")	20 (3/4")	590 (23.2)	590 (23.2)	RD 44x1/6"	20 (0.79)	69.5 (2.74)	103 (4.06)	62 (2.44)	266.5 / 393.5 ³⁾ (10.5 / 15.5 ³⁾	11 / 12 ³⁾ (24 / 27 ³⁾	14 / 15 ³⁾ (31 / 33 ³⁾
	25 (1")			RD 52x1/6"	26 (1.02)						
	40 (1 1/2")			RD 65x1/6"	38 (1.5)						
50 (2")	40 (1 1/2")	25	763 (30.0)	RD 65x1/6"	38 (1.5)	99 (3.46)	125 (4.92)	80 (3.15)	303.5 / 430.5 ³⁾ (11.9 / 16.9 ³⁾	27 / 28 ³⁾ (60 / 62 ³⁾	30 / 31 ³⁾ (66 / 68 ³⁾
	50 (2")			RD 78x1/6"	50 (1.97)						
	65 (2 1/2")			RD 95x1/6"	66 (2.6)						
80 (3")	65 (2 1/2")	990 (39.0)	990 (39.0)	RD 95x1/6"	66 (2.6)	155 (6.10)	183 (7.20)	123 (4.84)	394.5 / 521.5 ³⁾ (15.5 / 20.5 ³⁾	68 / 69 ³⁾ (150 / 152 ³⁾	71 / 72 ³⁾ (157 / 159 ³⁾
	80 (3")			RD 110x1/4"	81 (3.19)						
	100 (4")			RD 130x1/4"	100 (3.94)						

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN 32676

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	10 (3/8")	40	410 (16.1)	34 (1.34)	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾	9 / 10 ³⁾ (20 / 22 ³⁾	12 / 13 ³⁾ (27 / 29 ³⁾
	15 (1/2")				16 (0.63)						
	20 (3/4")				20 (0.79)						
25 (1")	20 (3/4")	590 (23.2)	590 (23.2)	20 (0.79)	69.5	103 (4.06)	62 (2.44)	266.5 / 393.5 ³⁾ (10.5 / 15.5 ³⁾	11 / 12 ³⁾ (24 / 27 ³⁾	14 / 15 ³⁾ (31 / 33 ³⁾	
	25 (1")				26 (1.02)						
	40 (1 1/2")				38 (1.5)						
50 (2")	40 (1 1/2")	763 (30.0)	763 (30.0)	38 (1.5)	99	125 (4.92)	80 (3.15)	303.5 / 430.5 ³⁾ (11.9 / 16.9 ³⁾	27 / 28 ³⁾ (60 / 62 ³⁾	30 / 31 ³⁾ (66 / 68 ³⁾	
	50 (2")				50.5 (1.99)						
	65 (2 1/2")				66 (2.6)						
80 (3")	65 (2 1/2")	10	950 (37.4)	66 (2.6)	155	183 (7.20)	123 (4.84)	394.5 / 521.5 ³⁾ (15.5 / 20.5 ³⁾	68 / 69 ³⁾ (150 / 152 ³⁾	71 / 72 ³⁾ (157 / 159 ³⁾	
	80 (3")				81 (3.19)						
	100 (4")				100 (3.94)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with ASME BPE

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	3/8"-Type A	10	—	—	—	44.5 (1.75)	77 (3.03)	46 (1.81)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	1/2"-Type A		433 (17.05)	25 (0.98)	9.4 (0.37)						
	3/4"-Type A		—	—	—						
25 (1")	3/4"-Type A	590 (23.23)	—	—	—	69.5 (2.74)	103 (4.06)	62 (2.44)	266.5 / 393.5 ³⁾ (10.5 / 15.5 ³⁾)	11 / 12 ³⁾ (24 / 27 ³⁾)	14 / 15 ³⁾ (31 / 33 ³⁾)
	1"-Type B		590 (23.23)	50.4 (1.98)	22.1 (0.87)						
	1 1/2"-Type B		—	—	—						
50 (2")	1 1/2"-Type B	740 (29.13)	—	—	—	99 (3.46)	125 (4.92)	80 (3.15)	303.5 / 430.5 ³⁾ (11.9 / 16.9 ³⁾)	27 / 28 ³⁾ (60 / 62 ³⁾)	30 / 31 ³⁾ (66 / 68 ³⁾)
	2"-Type B		740 (29.13)	63.9 (2.52)	47.5 (1.87)						
	2 1/2"-Type B		—	—	—						
80 (3")	2 1/2"-Type B	950 (37.40)	77.4 (3.05)	60.2 (2.37)	155 (6.10)	183 (7.20)	183 (7.20)	394.5 / 521.5 ³⁾ (15.5 / 20.5 ³⁾)	68 / 69 ³⁾ (150 / 152 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)
	3"-Type B		910 (35.83)	90.9 (3.19)	72.9 (2.87)						
	4"-Type B		910 (35.83)	118.9 (4.68)	97.4 (3.83)						

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN ISO 228 and ASME B 1.20.1

Meter tube	Process connection		L	GL	WS ⁴⁾	WS L	Ø A	B	C	E	Approx. weight	
	DN	DN / G									Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	8 (1/4") / G 1/4"	100	450 (17.72)	10 (0.39)	19	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	15 (1/2") / G 1/2"			13.5 (0.53)	27	15 (0.59)						
	25 (1") / G 1"			490 (19.29)	17 (0.67)	50						
	15 (1/2") / 1/2" NPT			450 (17.72)	15.6 (0.61)	27						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) Dimension SW: Width across flats specified in mm.

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Dimensions for devices with measuring agents made from nickel alloy

Sensor with measuring agents made from C4 or C22 nickel alloy

For devices with measuring agents made from C4 or C22 nickel alloy, the installation length (L) is different from previous tables. All other dimensions and the weight are unchanged. All dimensions specified in mm (inch).

Dimensions for sensors with process connection in accordance with EN 1092-1 and ASME B16.5 (ANSI)

Meter tube nominal diameter	Process connection	L						JIS 10K		
		EN 1092-1		PN 16	PN 40	PN 63	PN 100	ASME CL		
								CL150	CL300	CL600
DN 15 (1/2")	DN 10 (1/4")	—	449 (17.7)	449 (17.7)	449 (17.7)	—	—	—	449 (17.7)	
	DN 15 (1/2")	—	442 (17.4)	442 (17.4)	442 (17.4)	442 (17.4)	442 (17.4)	442 (17.4)	442 (17.4)	
	DN 20 (3/4")	—	428 (16.9)	428 (16.9)	428 (16.9)	428 (16.9)	428 (16.9)	428 (16.9)	428 (16.9)	
DN 25 (1")	DN 20 (3/4")	—	646 (25.4)	646 (25.4)	646 (25.4)	646 (25.4)	646 (25.4)	646 (25.4)	646 (25.4)	
	DN 25 (1")	—	614 (24.2)	614 (24.2)	614 (24.2)	614 (24.2)	614 (24.2)	614 (24.2)	614 (24.2)	
	DN 40 (1 1/2")	—	576 (22.7)	576 (22.7)	576 (22.7)	576 (22.7)	576 (22.7)	576 (22.7)	576 (22.7)	
DN 50 (2")	DN 40 (1 1/2")	—	814 (32.0)	814 (32.0)	814 (32.0)	814 (32.0)	814 (32.0)	814 (32.0)	814 (32.0)	
	DN 50 (2")	—	764 (30.1)	764 (30.1)	764 (30.1)	764 (30.1)	764 (30.1)	764 (30.1)	764 (30.1)	
	DN 65 (2 1/2")	—	819 (32.2)	819 (32.2)	819 (32.2)	792 (31.2)	792 (31.2)	792 (31.2)	819 (32.2)	
DN 80 (3")	DN 65 (2 1/2")	—	1021 (40.2)	1021 (40.2)	1021 (40.2)	1021 (40.2)	1021 (40.2)	1021 (40.2)	1021 (40.2)	
	DN 80 (3")	—	971 (38.2)	—	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	
	DN 100 (4")	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	
DN 100 (4")	DN 80 (3")	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	
	DN 100 (4")	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	
	DN 150 (6")	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	
DN 150 (6")	DN 100 (4")	1592 (62.7)	1592 (62.7)	1632 (64.3)	1632 (64.3)	1592 (62.7)	1632 (64.3)	1632 (64.3)	1592 (62.7)	
	DN 150 (6")	1502 (59.1)	1502 (59.1)	1542 (60.7)	1542 (60.7)	1502 (59.1)	1542 (60.7)	1542 (60.7)	1502 (59.1)	

L dimension tolerance:

- Meter tube nominal diameter DN 15 ... 50 (1/2" ... 2"): +0 / -3 mm (+0 / -0.018 inch)
- Meter tube nominal diameter DN 80 (3"): +0 / -5 mm (+0 / -0.2 inch)
- Meter tube nominal diameter DN 100 ... 150 (4" ... 6"): +0 / -8 mm (+0 / -0.31 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Ordering information

Main ordering information CoriolisMaster FCB330, FCB350

Base model

CoriolisMaster FCB330 Coriolis Mass Flowmeter	FCB330	XX	XX	XXXXX	XX	XX	X	X	XX	XX	X
CoriolisMaster FCB350 Coriolis Mass Flowmeter	FCB350	XX	XX	XXXXX	XX	XX	X	X	XX	XX	X

Explosion Protection Certification

General Purpose	Y0		Continued see next page
ATEX / IECEx, (Zone 2 / 22)	A2		
ATEX / IECEx, (Zone 1 / 21)	A1		
cFMus version Class 1 Div. 2 (Zone 2 / 21)	F2		
cFMus version Class 1 Div. 1 (Zone 1 / 21)	F1		
NEPSI (Zone 2 / 22)	S2		
NEPSI (Zone 1 / 21)	S1		

Connection Design / Connection Box Material / Cable Glands

Integral, defined by Transmitter housing	Y0	
Remote / Stainless Steel / 1 x M20 x 1.5	A1	
Remote / Stainless Steel / 1 x NPT 1/2 in.	A2	

Meter Size / Connection Size

DN 15 (1/2 in.) / DN 10 (1/4 in.)	015E1	
DN 15 (1/2 in.) / DN 15 (1/2 in.)	015R0	
DN 15 (1/2 in.) / DN 20 (3/4 in.)	015R1	
DN 25 (1 in.) / DN 20 (3/4 in.)	025E1	
DN 25 (1 in.) / DN 25 (1 in.)	025R0	
DN 25 (1 in.) / DN 40 (1-1/2 in.)	025R2	
DN 50 (2 in.) / DN 40 (1-1/2 in.)	050E1	
DN 50 (2 in.) / DN 50 (2 in.)	050R0	
DN 50 (2 in.) / DN 65 (2-1/2 in.)	050R1	
DN 80 (3 in.) / DN 65 (2-1/2 in.)	080E1	
DN 80 (3 in.) / DN 80 (3 in.)	080R0	
DN 80 (3 in.) / DN 100 (4 in.)	080R1	
DN 100 (4 in.) / DN 80 (3 in.)	100E1	
DN 100 (4 in.) / DN 100 (4 in.)	100R0	
DN 100 (4 in.) / DN 150 (6 in.)	100R2	
DN 150 (6 in.) / DN 100 (4 in.)	150E2	
DN 150 (6 in.) / DN 150 (6 in.)	150R0	
DN 150 (6 in.) / DN 200 (8 in.)	150R2	

Main ordering information

CoriolisMaster FCB330 Coriolis Mass Flowmeter	XX	XX	X	X	XX	XX	X
CoriolisMaster FCB350 Coriolis Mass Flowmeter	XX	XX	X	X	XX	XX	X
Process Connection Type							
Flanges DIN PN 16	D2						Continued see next page
Flanges DIN PN 40	D4						
Flanges DIN PN 63	D5						
Flanges DIN PN 100	D6						
Flanges EN 1092-1 PN 40, NAMUR length (DN 15: 510 mm, DN 25: 600 mm, DN 50: 715 mm)	S5						
Flanges with groove PN40 EN1092-10-D	S6						
Flanges EN 1092-1 PN 16, NAMUR length (DN 15: 510 mm, DN 25: 600 mm, DN 50: 715 mm)	S7						
Flanges ANSI / ASME B16.5 Class 150	A1						
Flanges ANSI / ASME B16.5 Class 300	A3						
Flanges ANSI / ASME B16.5 Class 600	A6						
Flanges ANSI / ASME B16.5 Class 900 (p-t rating Cl 600)	A7						
Flanges ANSI / ASME B16.5 Class 1500 (p-t rating Cl 600)	A8						
Flanges JIS 10K	J1						
Tri-Clamp acc. DIN 32676	T1						
Tri-Clamp acc. BPE	T3						
Food industry fittings acc. DIN 11851	F1						
Female NPT thread	N5						
Female G thread	M5						
Others	Z9						
Material of Wetted Parts							
Stainless steel	A1						
Ni-Alloy	C1						
Flow Calibration							
Flow forward +/- 0,40 % of flow rate, Gas 1 % of flow rate	1)	A					
Flow forward +/- 0,25 % of flow rate, Gas 1 % of flow rate	1)	B					
Flow forward +/- 0,15 % of flow rate, Gas 0,5 % of flow rate	2)	C					
Flow forward +/- 0,10 % of flow rate, Gas 0,5 % of flow rate	2)	D					
Flow forward / reverse +/- 0,40 % of flow rate, Gas 1 % of flow rate	1)	J					
Flow forward / reverse +/- 0,25 % of flow rate, Gas 1 % of flow rate	1)	K					
Flow forward / reverse +/- 0,15 % of flow rate, Gas 0,5 % of flow rate	2)	L					
Flow forward / reverse +/- 0,10 % of flow rate, Gas 0,5 % of flow rate	2)	M					
Others	Z						
Density Calibration							
Density 10 g/l	1)	1					
Density 2 g/l	2)	3					
Density 1 g/l	2)	4					
Others	9						

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Main ordering information

CoriolisMaster FCB330 Coriolis Mass Flowmeter	XX	XX	X
CoriolisMaster FCB350 Coriolis Mass Flowmeter	XX	XX	X
Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands			
Integral / Dual compartment / Aluminium / 3 x M20 x 1.5	D1		
Integral / Dual compartment / Aluminium / 3 x NPT 1/2 in.	D2		
Remote / Not specified	Y0		
Others	Z9		
Outputs			
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive, no HART	A1		
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A2		
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A3		
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive + HART	H1		
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H2		
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H3		
Without	Y0		
Others	Z9		
Power Supply			
100 ... 230 V AC	A		
24 V AC / DC	B		
Without	Y		

Additional ordering information

CoriolisMaster FCB330 Coriolis Mass Flowmeter	XX	XX
CoriolisMaster FCB350 Coriolis Mass Flowmeter	XX	XX
Certificates		
Test report 2.2 acc. EN 10204 confirmation of material	C1	
Material monitoring with inspection certificate 3.1 acc. EN 10204	C2	
Material monitoring with inspection certificate 3.2 acc. EN 10204	C3	
Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204	CN	
Declaration of compliance with the order 2.1 acc. EN 10204	C4	
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test	C6	
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (confirmation only)	CA	
Pressure test acc. AD2000	CB	
Test package (pressure test, non-destructive test, welder & welding procedure certificate)	CT	
Inspection certificate 3.1 acc. EN 10204 for NDE of welds	C8	
Certificate of accuracy 2.1 acc. EN 10204	CM	
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (inclusive heat analysis)	CR	
Others	CZ	

Special Operation Mode

Standard + DensiMass concentration measurement	2)	N6
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Additional ordering information

CoriolisMaster FCB330 Coriolis Mass Flowmeter	XX	XXX	XXX	XX	XXX	XXX
CoriolisMaster FCB350 Coriolis Mass Flowmeter	XX	XXX	XXX	XX	XXX	XXX
Documentation Language						
German	M1					
English	M5					
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)	MW					
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)	ME					
Others	MZ					
Pressure Rating of Sensor Secondary Containment						
Maximum burst pressure 6 MPa / 60 bar / 870 psi inclusive tower length extension	PR5					
Maximum burst pressure 10 MPa / 100 bar / 1450 psi inclusive tower length extension	PR6					
Maximum burst pressure 15 MPa / 150 bar / 2175 psi inclusive tower length extension	PR7					
Signal Cable Length						
Without	SC0					
5 m (approx. 15 ft)	SC1					
10 m (approx. 30 ft)	SC2					
20 m (approx. 66 ft)	SC4					
25 m (approx. 82 ft)	SC5					
30 m (approx. 98 ft)	SC6					
40 m (approx. 131 ft)	SC8					
50 m (approx. 164 ft)	SCA					
Others	SC9					
Device Identification Plate						
Stainless steel plate with TAG no.	T1					
Others	TZ					
Ambient Temperature Range						
-40 ... 60 °C (-40 ... 140 °F)	TA4					
Extended Tower Length						
Tower length extension - meter insulation capability	TE1					

- 1) Only with CoriolisMaster FCB330
2) Only with CoriolisMaster FCB350

Accessories

Description	Order no.
FCB330, FCB350 Connection Cable (Price per Meter)	D173D148U02

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Main ordering information CoriolisMaster FCH330, FCH350

Base model											
CoriolisMaster FCH330 Coriolis Mass Flowmeter	FCH330	XX	XX	XXXXX	XX	XX	X	X	XX	XX	X
CoriolisMaster FCH350 Coriolis Mass Flowmeter	FCH350	XX	XX	XXXXX	XX	XX	X	X	XX	XX	X
Explosion Protection Certification											
General Purpose		Y0									
ATEX / IECEx, (Zone 2 / 22)		A2									
ATEX / IECEx, (Zone 1 / 21)		A1									
cFMus version Class 1 Div. 2 (Zone 2 / 21)		F2									
cFMus version Class 1 Div. 1 (Zone 1 / 21)		F1									
NEPSI (Zone 2 / 22)		S2									
NEPSI (Zone 1 / 21)		S1									
Connection Design / Connection Box Material / Cable Glands											
Integral, defined by Transmitter housing		Y0									
Remote / Stainless Steel / 1 x M20 x 1.5		A1									
Remote / Stainless Steel / 1 x NPT 1/2 in.		A2									
Meter Size / Connection Size											
DN 25 (1 in.) / DN 20 (3/4 in.)			025E1								
DN 25 (1 in.) / DN 25 (1 in.)			025R0								
DN 25 (1 in.) / DN 40 (1-1/2 in.)			025R2								
DN 50 (2 in.) / DN 40 (1-1/2 in.)			050E1								
DN 50 (2 in.) / DN 50 (2 in.)			050R0								
DN 50 (2 in.) / DN 65 (2-1/2 in.)			050R1								
DN 80 (3 in.) / DN 65 (2-1/2 in.)			080E1								
DN 80 (3 in.) / DN 80 (3 in.)			080R0								
DN 80 (3 in.) / DN 100 (4 in.)			080R1								
Process Connection Type											
Tri-Clamp acc. DIN 32676			T1								
Tri-Clamp acc. ASME BPE			T3								
Food industry fittings acc. DIN 11851			F1								
Others			Z9								
Material of Wetted Parts											
Stainless steel, polished 1.4404 / 1.4435 (316L)			H2								
Continued see next page											

Main ordering information

CoriolisMaster FCH330 Coriolis Mass Flowmeter	X	X	XX	XX	X
CoriolisMaster FCH350 Coriolis Mass Flowmeter	X	X	XX	XX	X

Flow Calibration

Flow forward +/- 0,40 % of flow rate, Gas 1 % of flow rate	1)	A			
Flow forward +/- 0,25 % of flow rate, Gas 1 % of flow rate	1)	B			
Flow forward +/- 0,15 % of flow rate, Gas 0,5 % of flow rate	2)	C			
Flow forward +/- 0,10 % of flow rate, Gas 0,5 % of flow rate	2)	D			
Flow forward / reverse +/- 0,40 % of flow rate, Gas 1 % of flow rate	1)	J			
Flow forward / reverse +/- 0,25 % of flow rate, Gas 1 % of flow rate	1)	K			
Flow forward / reverse +/- 0,15 % of flow rate, Gas 0,5 % of flow rate	2)	L			
Flow forward / reverse +/- 0,10 % of flow rate, Gas 0,5 % of flow rate	2)	M			
Others		Z			

Density Calibration

Density 10 g/l	1)	1		
Density 2 g/l	2)	3		
Density 1 g/l	2)	4		
Others		9		

Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands

Integral / Dual compartment / Aluminium / 3 x M20 x 1.5	D1
Integral / Dual compartment / Aluminium / 3 x NPT 1/2 in.	D2
Remote / Not specified	Y0
Others	Z9

Outputs

Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive, no HART	A1
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A2
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A3
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive + HART	H1
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H2
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H3
Without	Y0
Others	Z9

Power Supply

100 ... 230 V AC	A
24 V AC / DC	B
Without	Y

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Additional ordering information

CoriolisMaster FCH330 Coriolis Mass Flowmeter	XX	XX	XX	XXX
CoriolisMaster FCH350 Coriolis Mass Flowmeter	XX	XX	XX	XXX
Certificates				
Test report 2.2 acc. EN 10204	C1			
Material monitoring with inspection certificate 3.1 acc. EN 10204	C2			
Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204	CN			
Declaration of compliance with the order 2.1 acc. EN 10204	C4			
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test	C6			
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (confirmation only)	CA			
Pressure test acc. AD2000	CB			
Test package (pressure test, non-destructive test, welder & welding procedure certificate)	CT			
Certificate of compliance for calibration 2.1 acc. EN 10204	CM			
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (inclusive heat analysis)	CR			
Others	CZ			
Special Operation Mode				
Standard + DensiMass concentration measurement	2)	N6		
Documentation Language				
German	M1			
English	M5			
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)	MW			
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)	ME			
Others	MZ			
Pressure Rating of Sensor Secondary Containment				
Maximum burst pressure 4 MPa / 40 bar / 580 psi inclusive tower length extension				PR4

Additional ordering information

CoriolisMaster FCH330 Coriolis Mass Flowmeter	XXX	XX	XXX	XXX
CoriolisMaster FCH350 Coriolis Mass Flowmeter	XXX	XX	XXX	XXX
Signal Cable Length				
Without	SC0			
5 m (approx. 15 ft)	SC1			
10 m (approx. 30 ft)	SC2			
20 m (approx. 66 ft)	SC4			
25 m (approx. 82 ft)	SC5			
30 m (approx. 98 ft)	SC6			
40 m (approx. 131 ft)	SC8			
50 m (approx. 164 ft)	SCA			
Others	SC9			
Device Identification Plate				
Stainless steel plate with TAG no.	T1			
Others	TZ			
Ambient Temperature Range				
-40 ... 60 °C (-40 ... 140 °F)	TA4			
Extended Tower Length				
Tower length extension - meter insulation capability	TE1			

- 1) Only with CoriolisMaster FCB330
 2) Only with CoriolisMaster FCB350

Accessories

Description	Order no.
FCB330, FCB350 Connection Cable (Price per Meter)	D173D148U02

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Transmitter

Technical data



G10320

Fig. 30: FCT3xx transmitter in field enclosure

Measuring range

The measuring range can be set at will between 0.01 ... 1 Qmax.

Degree of protection

IP 65 / IP 67, NEMA 4X

Electrical connections

Cable gland M20 x 1.5 or 1/2" NPT

The maximum signal cable length for the remote mount design is 50 m (164 ft) (longer lengths on request).

Power supply

Supply voltage	100 ... 230 V AC, 47 ... 63 Hz (tolerance -15 % / +10 %)
	20.4 ... 26.4 V AC, 47 ... 63 Hz
	20.4 ... 31.2 V DC (ripple: ≤ 5 %)
Power consumption	S ≤ 25 VA

Response time

As step function 0 ... 99 % (corr. to 5 τ) \geq 1 s

Ambient temperature

Standard: -20 ... 60 °C (-4 ... 140 °F)

Optional: -40 ... 60 °C (-40 ... 140 °F)

At operation below -20 °C (-4 °F), the LCD can no longer be read and the electronic unit should be operated with as few vibrations as possible.

Full functionality is assured at temperatures above -20 °C (-4 °F).

Housing design

Enclosure

Varnished alloy casting

Enclosure color

— Mid-section: RAL 7012

— Cover: RAL 9002

Varnish layer thickness: 80 ... 120 μ m

Forward/reverse flow metering

The flow direction is indicated by the arrows on the transmitter LCD and via the digital switching output (if configured).

LCD display

LCD, 2 lines, backlit

Both lines of the LCD are freely configurable.

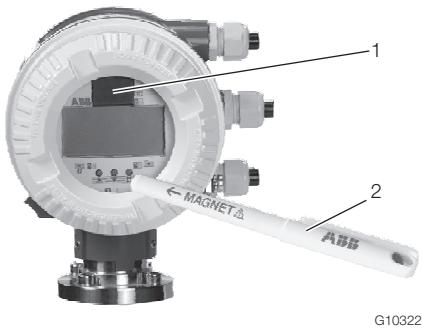
The following values can be displayed:

- Mass flow
- Volume flow
- Density or temperature
- Flow count, 7-digit with overflow counter and specification of physical unit for mass or volume.

On integral mount design devices, the transmitter enclosure can be rotated through approx. 180° in any direction. The LCD can be rotated to four positions to ensure optimum readability.

Operation

Three buttons on the transmitter are used to operate the device and enter parameters. Alternatively, if the enclosure cover on the transmitter is closed, operators can use a magnetic pen.



G10322

Fig. 31: Operation with magnetic pen
1 FRAM (plug-in) | 2 Magnetic pen

Data backup

Data is backed up to an FRAM integrated in the transmitter. Data is saved for a period of 10 years without power supply. Hardware and software are identified according to NAMUR recommendation NE53.

IMPORTANT (NOTE)

The device meets the requirements of the EMC directive 2004/108/EC (EN 61326) and the low-voltage directive 2006/95/EC (EN 61010-1).

DensiMass concentration measurement (FCB350 only)

The transmitter can calculate the current concentration from the measured density and temperature using concentration matrices.

The following concentration matrices are preconfigured in the transmitter as standard:

- Concentration of sodium hydroxide in water
- Concentration of alcohol in water
- Concentration of sugar in water
- Concentration of corn starch in water
- Concentration of wheat starch in water

The user can enter two more user-defined matrices containing up to 100 values.

Accuracy of concentration measurement

The accuracy of the concentration measurement is determined in the first instance by the quality of the matrix data entered. However, as the calculation is based on temperature and density (the input variables), the accuracy of the concentration measurement is ultimately determined by the measuring accuracy of temperature and density.

Example:

Density of 0 % alcohol in water at 20 °C (68 °F): 998.23 g/l

Density of 100 % alcohol in water at 20 °C (68 °F): 789.30 g/l

Concentration	Density
100 %	208.93 g/l
0.48 %	1 g/l
0.69 %	2 g/l

The accuracy class of the density measurement thus directly determines the accuracy of the concentration measurement.

See the device operating instructions for detailed information.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Electrical data

Current outputs

Current output 1, active

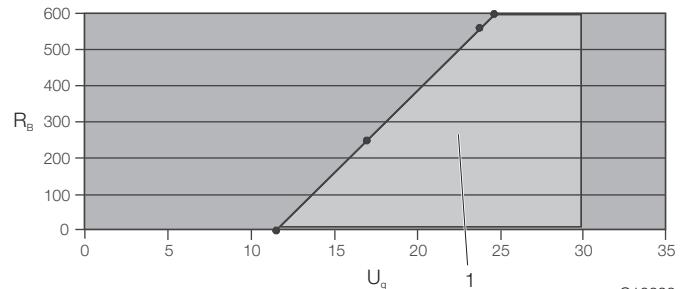
Output signal	Active, 0 ... 20 mA or 4 ... 20 mA switchable
Load	$0 \Omega \leq R_B \leq 560 \Omega$
Measurement uncertainty	< 0.1 % of measured value
Terminals	31 / 32
Measured values	Mass flow, volume flow, density, and temperature (freely configurable via software)

Current output 1, passive

Output signal	4 ... 20 mA passive
Load	$0 \Omega \leq R_B \leq 600 \Omega$
Source voltage	$12 V \leq U_q \leq 30 V$
Measurement uncertainty	< 0.1 % of measured value
Terminals	31 / 32
Measured values	Mass flow, volume flow, density, and temperature (freely configurable via software)

Current output 2, passive

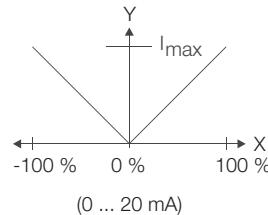
Output signal	4 ... 20 mA passive
Load	$0 \Omega \leq R_B \leq 600 \Omega$
Source voltage	$12 V \leq U_q \leq 30 V$
Measurement uncertainty	< 0.1 % of measured value
Terminals	33 / 34
Measured values	Mass flow, volume flow, density, and temperature (freely configurable via software)



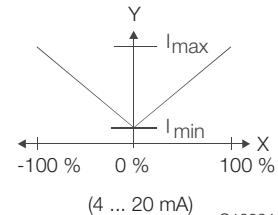
G10323

Fig. 32: Permissible source voltage as a function of load resistance, where $I_{max} = 22 \text{ mA}$

1 Permissible range



(0 ... 20 mA)



(4 ... 20 mA)

G10324

Fig. 33

IMPORTANT (NOTE)

Failure information according to NAMUR recommendation NE43.

Pulse output

Scaled pulse output (maximum 5 kHz) with configurable pulse factor between 0.001 and 1000 pulses per unit. The pulse width is configurable from 0.1 ... 2000 ms. The output is electrically isolated from the current outputs.

	Passive	Active
Operating voltage	$16 V \leq U_{CEH} \leq 30 V \text{ DC}$ $0 V \leq U_{CEL} \leq 2 V$	$16 V \leq U \leq 30 V \text{ DC}$ Load $\geq 150 \Omega$
Operating current	$0 \text{ mA} \leq I_{CEH} \leq 0.2 \text{ mA}$ $2 \text{ mA} \leq I_{CEL} \leq 220 \text{ mA}$	-
fmax	5 kHz	5 kHz
Pulse width	0.1 ... 2000 ms	0.1 ... 2000 ms
Terminals	51 / 52	51 / 52

IMPORTANT (NOTE)

If you are using a mechanical totalizer, we recommend setting a pulse width of $\geq 30 \text{ ms}$ and a maximum frequency of $f_{max} \leq 3 \text{ kHz}$.

Digital switching outputs

The switching function can be selected via the software.

Switching function	<ul style="list-style-type: none"> – System monitoring (normally closed contact or normally open contact) – Forward / reverse (closed for forward) – Min. /max. alarm (normally closed contact or normally open contact)
Output "closed"	$0 \text{ V} \leq U_{\text{CEL}} \leq 2 \text{ V}$ $2 \text{ mA} \leq I_{\text{CEL}} \leq 220 \text{ mA}$
Output "open"	$16 \text{ V} \leq U_{\text{CEH}} \leq 30 \text{ V DC}$ $0 \text{ mA} \leq I_{\text{CEH}} \leq 0.2 \text{ mA}$
Terminals	41 / 42

Digital switching inputs

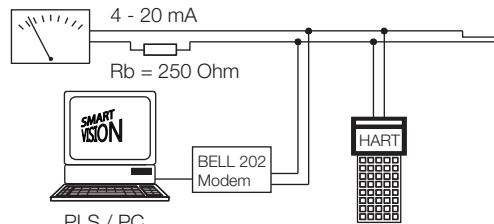
The switching function can be selected via the software.

Switching function	<ul style="list-style-type: none"> – External output zero return – External totalizer reset
Input "On"	$16 \text{ V} \leq U_{\text{KL}} \leq 30 \text{ V}$
Input "Off"	$0 \text{ V} \leq U_{\text{KL}} \leq 2 \text{ V}$
Internal resistance	$R_i = 2 \text{ k}\Omega$
Terminals	81 / 82

All inputs and outputs are electrically isolated from one other.

HART protocol

The device is registered with the HART Communication Foundation.



G10052

Fig. 34: Communication via HART protocol

HART protocol

Configuration	<ul style="list-style-type: none"> – Directly on the device – Via software DSV401 + HART-DTM
Transmission	FSK modulation on voltage output 4 ... 20 mA according to Bell 202 standard
Baud rate	1200 baud
Display	Logic 1: 1200 Hz Logic 0: 2200 Hz
Maximum signal amplitude	1.2 mAss
Load at current output	250 ... 560 Ω (in hazardous area: maximum 300 Ω)

Cable

Design	Two-wire cable AWG 24, twisted
Maximum length	1500 m (4921 ft)

See the interface description for detailed information.

System integration:

Communication (configuration, parameterization) can be performed with the DTM (Device Type Manager) available for the device and the corresponding framework applications as per FDT 0.98 or 1.2 (DSV401 R2).

Other tool/system integrations (e.g., Emerson AMS/Siemens PCS7) are available on request.

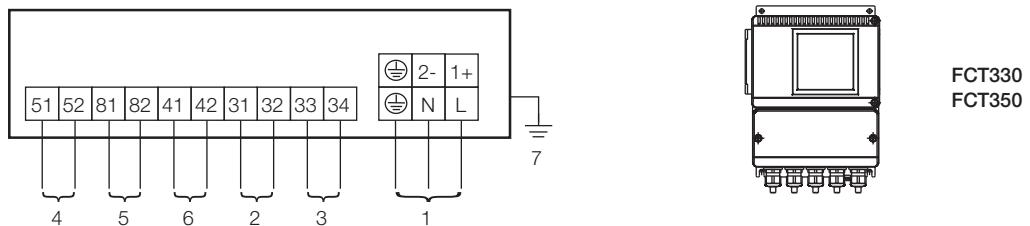
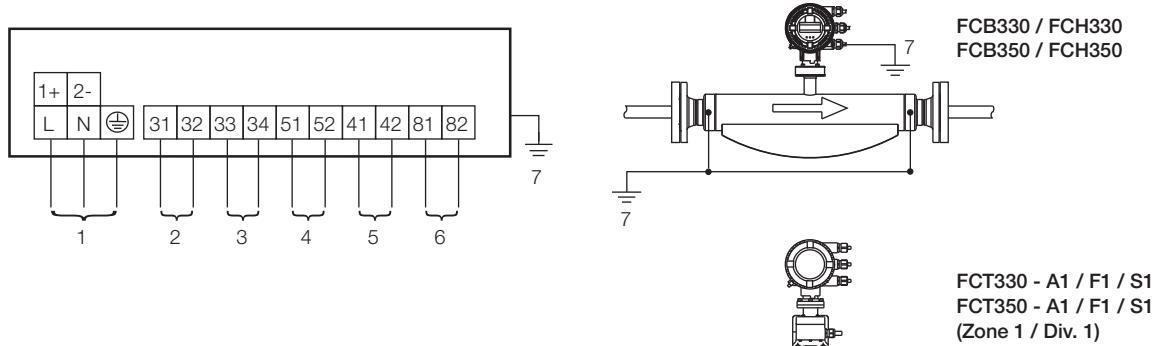
The necessary DTMs can also be downloaded from www.abb.com/flow.

CoriolisMaster FCB330, FCB350, FCH330, FCH350 Coriolis mass flowmeter

Electrical connections

Connection of transmitter models to peripherals

Models FCB330, FCB350, FCH330, FCH350, FCT330, FCT350



G10331-02

Fig. 35

1 Power supply | 2 Current output 1 | 3 Current output 2 | 4 Pulse output | 5 Digital switching output |
6 Digital switching input | 7 Equipotential bonding (PA)

IMPORTANT (NOTE)

When using the device in hazardous areas, note the additional connection data in the chapter titled "Ex relevant specifications"!

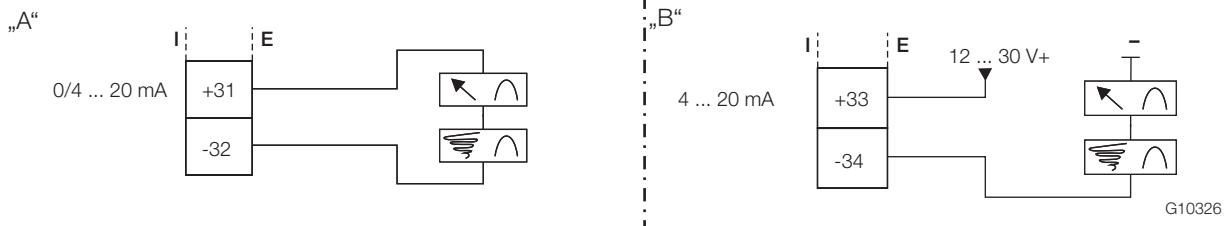
Terminal	Function
L / N / PE	Power supply, 100 ... 230 V AC, 50/60 Hz
1+ / 2- / PE	Power supply — 24 V AC, 50/60 Hz — 24 V DC
31 / 32	Current output 1, active 0/4 ... 20 mA , (0 Ω ≤ R _B ≤ 560 Ω, FCT300-A1/F1:1 0 Ω ≤ R _B ≤ 300 Ω)
	Current output 1, passive 4 ... 20 mA (0 Ω ≤ R _B ≤ 600 Ω), source voltage 12 ≤ U _q ≤ 30 V
33 / 34	Current output 2, passive 4 ... 20 mA (0 Ω ≤ R _B ≤ 600 Ω), source voltage 12 ≤ U _q ≤ 30 V
51 / 52	Pulse output, passive fmax = 5 kHz, pulse width = 0.1 ... 2000 ms, 0.001 ... 1000 pulses/unit — "Closed": 0 V ≤ U _{CEL} ≤ 2 V, 2 mA ≤ I _{CEL} ≤ 220 mA — "Open": 16 V ≤ U _{CEH} ≤ 30 V DC, 0 mA ≤ I _{CEH} ≤ 0.2 mA
	Pulse output active, U = 16 ... 30 V, load ≥ 150 Ω, fmax = 5 kHz
41 / 42	Digital switching output, passive — "Closed": 0 V ≤ U _{CEL} ≤ 2 V, 2 mA ≤ I _{CEL} ≤ 220 mA — "Open": 16 V ≤ U _{CEH} ≤ 30 V DC, 0 mA ≤ I _{CEH} ≤ 0.2 mA
81 / 82	Digital switching input, passive — Input "On": 16 V ≤ UKL ≤ 30 V — Input "Off": 0 V ≤ UKL ≤ 2 V
-	Equipotential bonding "PA" When the FCT300 transmitter is connected to the FCB3xx / FCH3xx flowmeter sensor, the transmitter must also be connected to "PA".

CoriolisMaster FCB330, FCB350, FCH330, FCH350

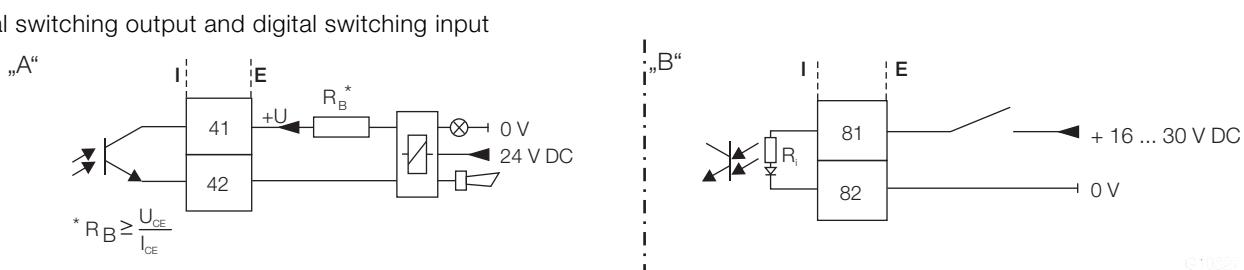
Coriolis mass flowmeter

Connection examples for the peripherals

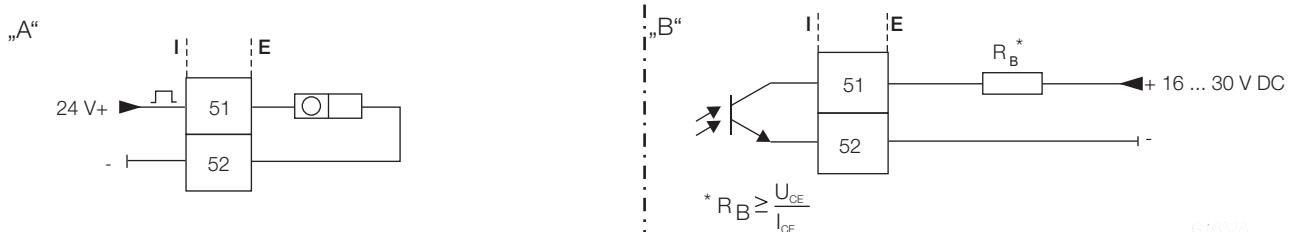
Current outputs (including HART communication)



Digital switching output and digital switching input

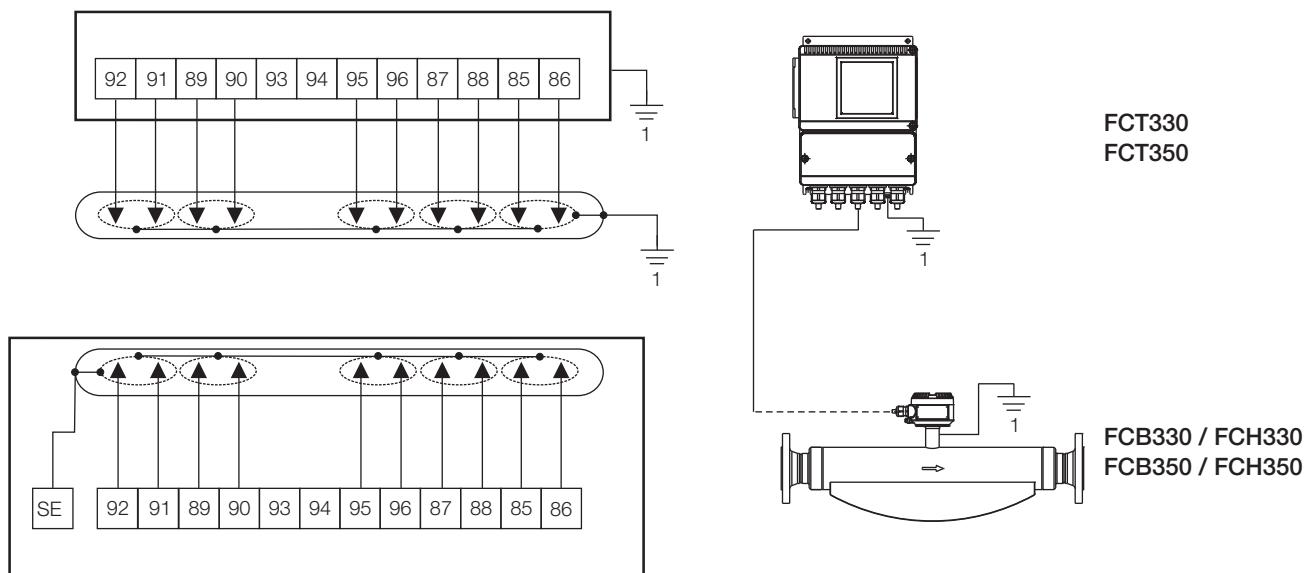


Pulse output



Connection of transmitter to flowmeter sensor

FCT330, FCT350 transmitter to FCB330, FCB350, FCH330, FCH350 flowmeter sensor



G10329-02

Fig. 39
1 Equipotential bonding (PA)

Terminal	Corresponding wire color	Function
85	White	Sensor 1
86	Brown	Sensor 1
87	Green	Sensor 2
88	Yellow	Sensor 2
89	Black	Temperature
90	Violet	Temperature

Terminal	Corresponding wire color	Function
91	Gray	Driver
92	Pink	Driver
93	-	Not used
94	-	Not used
95	Blue	Temperature
96	Red	Temperature

IMPORTANT (NOTE)

The precise position of the PA terminals may vary according to the device type. Each terminal is marked accordingly. When the FCT330, FCT350 transmitter is connected to the FCB330, FCB350, FCH330, FCH350 flowmeter sensor, the transmitter must also be connected to "PA".

The following flowmeter sensor / transmitter combinations are permitted:

- FCB330, FCH330 flowmeter sensor with FCT330 transmitter
- FCB350, FCH350 flowmeter sensor with FCT350 transmitter

CoriolisMaster FCB330, FCB350, FCH330, FCH350 Coriolis mass flowmeter

Connection of transmitter to flowmeter sensor in Zone 1 / Div. 1

FCT330, FCT350 transmitter to FCB330, FCB350, FCH330, FCH350 flowmeter sensor

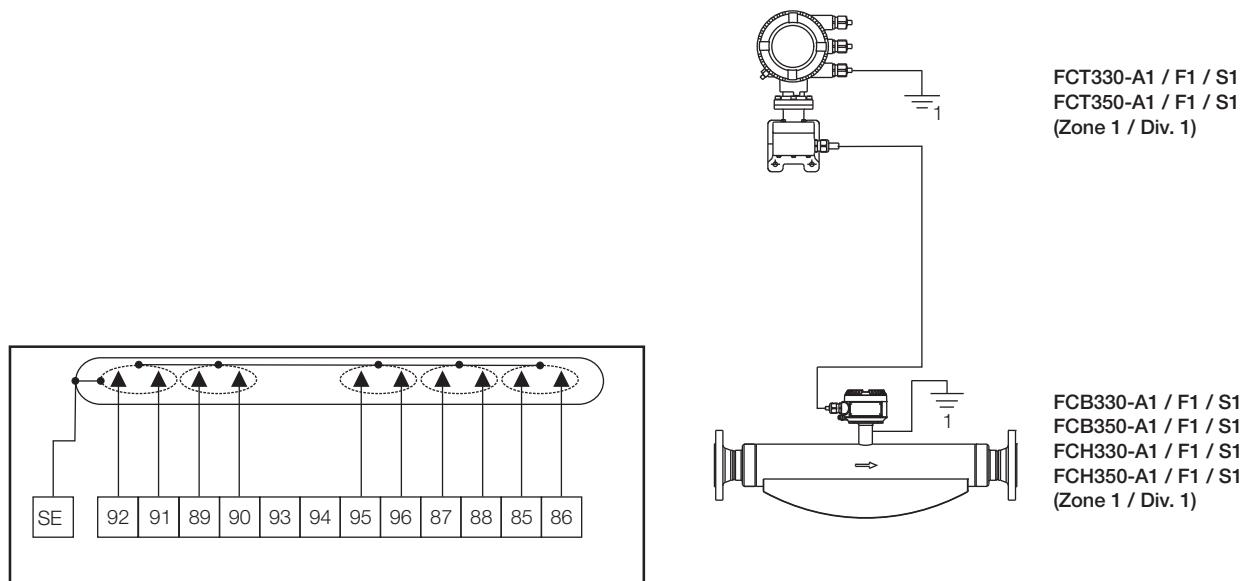


Fig. 40
1 Equipotential bonding (PA)

G10330-02

Terminal	Corresponding wire color	Function
85	White	Sensor 1
86	Brown	Sensor 1
87	Green	Sensor 2
88	Yellow	Sensor 2
89	Black	Temperature
90	Violet	Temperature

Terminal	Corresponding wire color	Function
91	Gray	Driver
92	Pink	Driver
93	-	Not used
94	-	Not used
95	Blue	Temperature
96	Red	Temperature

IMPORTANT (NOTE)

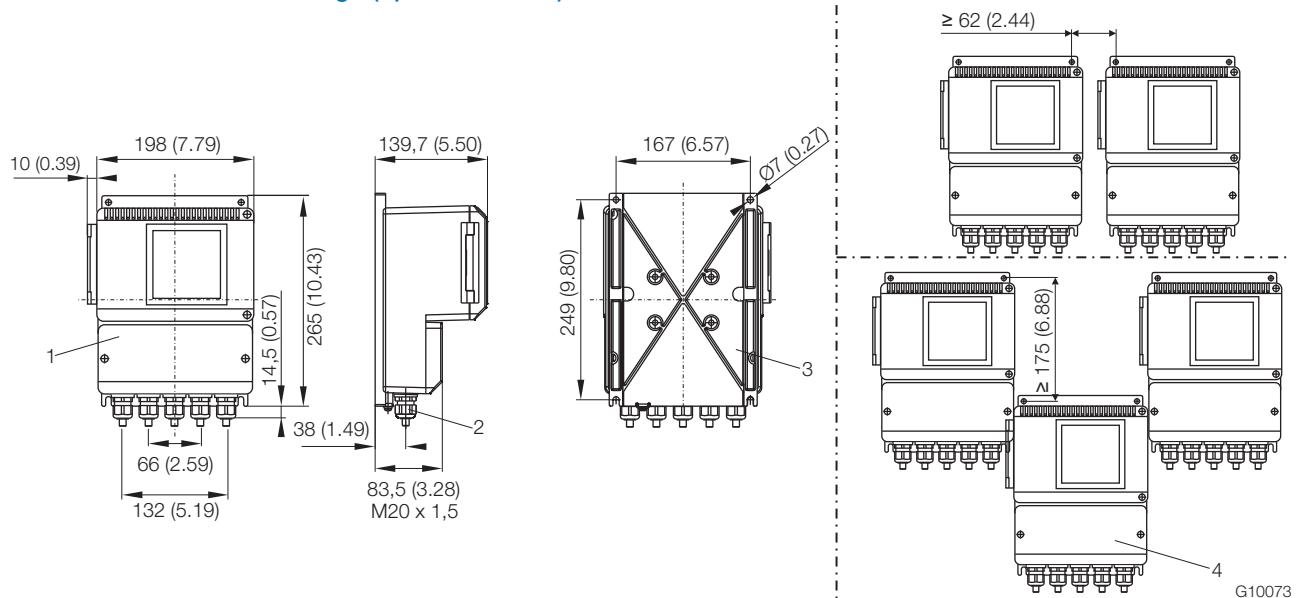
The wires must be connected in pairs in order to ensure EMC protection.

The following flowmeter sensor / transmitter combinations are permitted:

- FCB330, FCH330 flowmeter sensor with FCT330 transmitter
- FCB350, FCH350 flowmeter sensor with FCT350 transmitter

Dimensions

Transmitter in remote mount design (option F1 or F2)



Transmitter in remote mount design (option R1 or R2)

IP 65 / 67, NEMA 4X

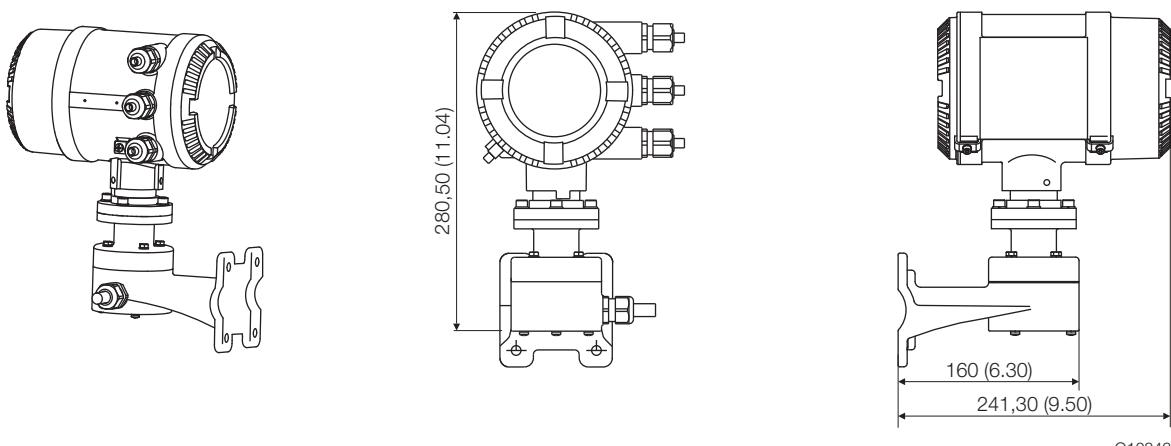


Fig. 42: Dimensions in mm (inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Ordering information

Main ordering information CoriolisMaster FCT330

	FCT330	XX	XX	XX	X
Base model					
CoriolisMaster FCT330 Coriolis Mass Flowmeter Transmitter					
Explosion Protection Certification					
General Purpose					
ATEX / IECEx, (Zone 2 / 22)	Y0				
ATEX / IECEx, (Zone 1 / 21)	A2				
cFMus version Class 1 Div. 2 (Zone 2 / 21)	A1				
cFMus version Class 1 Div. 1 (Zone 1 / 21)	F2				
NEPSI (Zone 2 / 22)	F1				
NEPSI (Zone 1 / 21)	S2				
	S1				
Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands					
Remote / Dual compartment, wall mounted / Aluminium / 4 x M20 x 1.5				R1	
Remote / Dual compartment, wall mounted / Aluminium / 4 x NPT 1/2 in.				R2	
Remote / Dual compartment, wall mounted (field) / Aluminium / 5 x M20 x 1.5				F1	
Remote / Dual compartment, wall mounted (field) / Aluminium / 5 x NPT 1/2 in.				F2	
Others				Z9	
Outputs					
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive, no HART					A1
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART					A2
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART					A3
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive + HART					H1
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive + HART					H2
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive + HART					H3
Others					Z9
Power Supply					
100 ... 230 V AC					A
24 V AC / DC					B

Additional ordering information CoriolisMaster FCT330

	XX	XX	XX
Mounting Bracket Shape / Material			
For 2 in. pipe mounting / Carbon steel		B1	
Documentation Language			
German			M1
English			M5
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)			MW
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)			ME
Others			MZ
Device Identification Plate			
Stainless steel plate with TAG no.			T1

Main ordering information CoriolisMaster FCT350

Base model	FCT350	XX	XX	XX	X
CoriolisMaster FCT350 Coriolis Mass Flowmeter Transmitter					
Explosion Protection Certification					
General Purpose	Y0				
ATEX / IECEx, (Zone 2 / 22)	A2				
ATEX / IECEx, (Zone 1 / 21)	A1				
cFMus version Class 1 Div. 2 (Zone 2 / 21)	F2				
cFMus version Class 1 Div. 1 (Zone 1 / 21)	F1				
NEPSI (Zone 2 / 22)	S2				
NEPSI (Zone 1 / 21)	S1				
Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands					
Remote / Dual compartment, wall mounted / Aluminium / 4 x M20 x 1.5	R1				
Remote / Dual compartment, wall mounted / Aluminium / 4 x NPT 1/2 in.	R2				
Remote / Dual compartment, wall mounted (field) / Aluminium / 5 x M20 x 1.5	F1				
Remote / Dual compartment, wall mounted (field) / Aluminium / 5 x NPT 1/2 in.	F2				
Others	Z9				
Outputs					
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive, no HART	A1				
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A2				
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A3				
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive + HART	H1				
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H2				
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H3				
Others	Z9				
Power Supply					
100 ... 230 V AC	A				
24 V AC / DC	B				

Additional ordering information CoriolisMaster FCT350

	XX	XX	XX
Mounting Bracket Shape / Material			
For 2 in. pipe mounting / Carbon steel	B1		
Documentation Language			
German	M1		
English	M5		
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)	MW		
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)	ME		
Others	MZ		
Device Identification Plate			
Stainless steel plate with TAG no.	T1		

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Ex relevant specifications acc. to ATEX / IECEX / NEPSI

Electrical data

Overview of the different output options

Versions	ATEX, IECEX, NEPSI Zone 2	ATEX, IECEX, NEPSI Zone 1
Version I Output option A1, A2, H1, H2 in the order number	<ul style="list-style-type: none"> – Current output 1: Active – Current output 2: Passive – Pulse output: Active / passive, switchable – Switching input and output: Passive 	<ul style="list-style-type: none"> – Current output 1: Active – Current output 2: Passive – Pulse output: Passive – Switching input and output: Passive
Version II Output option A3, H3 in the order number		<ul style="list-style-type: none"> – Current output 1: Passive – Current output 2: Passive – Pulse output: Passive – Switching input and output: Passive

Version I: Active / passive current outputs

Model FCx3xx-A1, FCT3xx-A1 or FCx3xx-A2, FCT3xx-A2 or FCx3xx-S2, FCT3xx-S2												
Current output 1, active Terminals 31 / 32 Terminal 32 is connected to "PA"	Type of protection "nA" (Zone 2)		General operating values		Type of protection "e" (Zone 1)		Type of protection "ib" (Zone 1)					
	U _i (V)	I _i (mA)	U _b (V)	I _b (mA)	U (V)	I (mA)	U _o (V)	I _o (mA)	P _o (mW)	C _o (nF)	C _{o pa} (nF)	
	30	30	30	30	60	35	20	100	500	217	0	3.8
Current output 2, passive Terminals 33 / 34 Terminal 34 is connected to "PA"	30	30	30	30	60	35	U _i (V)	I _i (mA)	P _i (mW)	C _i (nF)	C _{i pa} (nF)	L _i (mH)
							60	100	500	2.4	2.4	0.17
Pulse output, passive Terminals 51 / 52	30	65	30	65	60	35	15	30	115	2.4	2.4	0.17
Switching output, passive Terminals 41 / 42	30	65	30	65	60	35	15	30	115	2.4	2.4	0.17
Switching input, passive Terminals 81 / 82	30	10	30	10	60	35	30	60	500	2.4	2.4	0.17

All inputs and outputs are electrically isolated from one other and from the power supply. Only current outputs 1 and 2 in zone 1 design are not electrically isolated from one another.

Version II: Passive / passive current outputs

Model FCx3xx-A1, FCT3xx-A1 or FCx3xx-A2, FCT3xx-A2 or FCx3xx-S2, FCT3xx-S2

	Type of protection "nA" (Zone 2)		General operating values		Type of protection "e" (Zone 1)		Type of protection "ia" (Zone 1)					
	U _i (V)	I _i (mA)	U _b (V)	I _b (mA)	U (V)	I (mA)	U _i (V)	I _i (mA)	P _i (mW)	C _i (nF)	C _i pa (nF)	L _i (mH)
Current output 1, passive Terminals 31 / 32	30	30	30	30	60	35	60	300	2000	0.47	0.47	0.17
Current output 2, passive Terminals 33 / 34	30	30	30	30	60	35	60	300	2000	0.47	0.47	0.17
Pulse output, passive Terminals 51 / 52	30	65	30	65	60	35	60	300	2000	0.47	0.47	0.17
Switching output, passive Terminals 41 / 42	30	65	30	65	60	35	60	300	2000	0.47	0.47	0.17
Switching input, passive Terminals 81 / 82	30	10	30	10	60	35	60	300	2000	0.47	0.47	0.17

All inputs and outputs are electrically isolated from one other and from the auxiliary power.

Special connection conditions

The output circuits are designed so that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits.

It is not permitted to combine intrinsically safe and non-intrinsically safe circuits. When changing the type of protection, refer to the chapter titled "Changing the type of protection" in the commissioning instructions (CI/FCB300/FCH300) or the operating instructions (OI/FCB300/FCH300).

On intrinsically-safe circuits, equipotential bonding must be in place along the entire length of the cable used for the current outputs.

The rated voltage of the non-intrinsically safe circuits is U_M = 60 V.

The switching output and the pulse output (terminals 41 / 42 and 51 / 52) can be wired internally as a NAMUR contact for the purpose of connecting a NAMUR amplifier.

The cable glands are supplied in black by default. If the signal outputs are wired to intrinsically-safe circuits, we recommend that you use the light blue caps supplied for the appropriate cable entries.

IMPORTANT (NOTE)

If the protective conductor (PE) is connected in the flowmeter's terminal box, you must ensure that no dangerous potential difference can arise between the protective conductor (PE) and the equipotential bonding (PA) in the hazardous area.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Flowmeter sensor model FCB3xx / FCH3xx

Temperature class

Model FCx3xx-A1Y... or FCx3xx-S1Y... Zone 1			
Ambient temperature	≤40 °C (≤104 °F)	≤50 °C (≤122 °F)	≤60 °C (≤140 °F)
Temperature class			
T1	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)
T2	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)
T3	185 °C (365 °F)	180 °C (356 °F)	180 °C (356 °F)
T4	125 °C (257 °F)	120 °C (248 °F)	120 °C (248 °F)
T5	85 °C (185 °F)	85 °C (185 °F)	75 °C (167 °F)
T6	65 °C (149 °F)	65 °C (149 °F)	60 °C (140 °F)

Model FCx3xx-A2Y... or FCx3xx-S2Y... Zone 2			
Ambient temperature	≤40 °C (≤104 °F)	≤50 °C (≤122 °F)	≤60 °C (≤140 °F)
Temperature class			
T1	200 °C (392 °F)	200 °C (392 °F)	180 °C (356 °F)
T2	200 °C (392 °F)	200 °C (392 °F)	180 °C (356 °F)
T3	180 °C (356 °F)	180 °C (356 °F)	180 °C (356 °F)
T4	115 °C (239 °F)	115 °C (239 °F)	115 °C (239 °F)
T5	80 °C(176 °F)	80 °C(176 °F)	75 °C (167 °F)
T6	60 °C (140 °F)	60 °C (140 °F)	60 °C (140 °F)

Ambient and process conditions:

T_{amb}	-20 ... 60 °C (-4 ... 140 °F)
$T_{amb, optional}$	-40 ... 60 °C (-40 ... 140 °F) (only for integral mount design devices)
T_{medium}	-50 ... 200 °C (-58 ... 392 °F)
Protection class	IP 65, IP 67, and NEMA 4X

Hazardous area approval ATEX / IECEEx / NEPSI

Specific marking according to ATEX, IECEEx and NEPSI applies depending on the design of the flowmeter sensor (integral or remote mount design).

IMPORTANT (NOTE)

ABB reserves the right to make changes to the Ex-marking. The exact marking can be found at the name plate of the meter.

Modell FCx3xx-A2A... or FCx3xx-S2A... (remote mount design in Zone 2)

Approval	Marking	Comment
ATEX	II 3 G Ex nA IIC T6 ... T2 II 2 D Ex tD IIIC T85°C .. Tmedium	-
IECEEx or NEPSI	Ex nA IIC T6 ... T2 Gc Ex tb IIIC T85°C Tmedium	-

Model FCx3xx-A1A... or FCx3xx-S1A... (remote mount design in Zone 1)

Approval	Marking	Comment
ATEX	II 1 G Ex ia IIC T6 ... T2 II 1 D Ex ia IIIC T85°C... Tmedium	-
IECEEx or NEPSI	T2 Ga Ex ia IIIC T85°C .. Tmedium Da	-

Model FCx3xx-A2Y... or FCx3xx-S2Y... (integral mount design in Zone 2)

Approval	Marking	Comment
ATEX	II 3 G Ex nA nR IIC T6 ... T2 II 2 D Ex tD IIIC T85°C .. Tmedium	-
IECEEx or NEPSI	Ex nA nR IIC T6 .. T2 Gc Ex tb IIIC T85°C Tmedium Db	-

Modell FCx3xx-A1Y... or FCx3xx-S1Y... (integral mount design in Zone 1)

Approval	Marking	Comment
ATEX		
Version II	II 1/2 G Ex d e ia IIC T6 .. T2 II 2 D Ex ia tb IIIC T85°C .. Tmedium	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	II 1/2 G Ex d e ia ib IIC T6 .. T2 or II 1/2 G Ex d e ia IIC T6 .. T2 II 2 D Ex ia ia tb IIIC T85°C .. Tmedium or II 2 D Ex ia tb IIIC T85°C .. Tmedium	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.
IECEEx or NEPSI		
Version II	Ex d e ia IIC T6 .. T2 Ga/Gb Ex ia tb IIIC T85°C .. Tmedium	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	Ex d e ia ib IIC T6 .. T2 Ga/Gb or Ex d e ia IIC T6 .. T2 Ga/Gb Ex ia ib tb IIIC T85°C .. Tmedium or Ex ia tb IIIC T85°C .. Tmedium	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Transmitter model FCT300 in remote mount design

Ambient and process conditions:

T_{amb} -20 ... 60 °C (-4 ... 140 °F)

Protection class IP 65, IP 67, and NEMA 4X / Type 4X

Hazardous area approval ATEX / IECEx / NEPSI

Specific marking according to ATEX, IECEx and NEPSI applies depending on the design of the flowmeter sensor (integral or remote mount design).

IMPORTANT (NOTE)

ABB reserves the right to make changes to the Ex-marking. The exact marking can be found at the name plate of the meter.

Model FCT3xx-Y0... (Transmitter outside the hazardous area, Sensor in Zone 0, 1 or 2)		
Approval	Marking	Comment
ATEX	II (1) G [Ex ia] IIC	-
IECEx or NEPSI	[Ex ia Ga] IIC	-

Model FCT3xx-A2... or FCT3xx-S2... (Transmitter in Zone 2, Sensor in Zone 0, 1 or 2)		
Approval	Marking	Comment
ATEX	II 3(2) G Ex nA nR [ia] IIC T6 II 2 D Ex tb [ia] IIIC T85°C	-
IECEx or NEPSI	Ex nA nR [ia] IIC T6 Gc (Gb) Ex tb [ia] IIIC T85°C Db	-

Modell FCT3xx-A1... or FCT3xx-S1... (Transmitter in Zone 1, Sensor in Zone 0, 1 or 2)		
Approval	Marking	Comment
ATEX		
Version II	II 2 (1) G Ex d e ia IIC T6 II 2 (1) D Ex ia tb IIIC T85°C	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	II 2 (1) G Ex d e ib [ia] IIC T6 or II 2 (1) G Ex d e [ia] IIC T6 II 2 (1) D Ex ib tb [ia] IIIC T85°C or II 2 (1) D Ex tb [ia] IIIC T85°C	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.
IECEx or NEPSI		
Version II	Ex d e ia IIC T6 Gb (Ga) Ex ia tb IIIC T85°C Db (Da)	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	Ex d e ib [ia Ga] IIC T6 Gb or Ex d e [ia Ga] IIC T6 Gb Ex ib tb [ia Da] IIIC T85°C Db or Ex tb [ia Da] IIIC T85°C Db	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.

Ex relevant specifications acc. to cFMus

Overview of the different output options

Versions	Class I Div. 2	Class I Div. 1
Version I Output option A1, A2, H1, H2 in the order number	<ul style="list-style-type: none"> – Current output 1: Active – Current output 2: Passive – Pulse output: Active / passive, switchable – Switching input and output: Passive 	<ul style="list-style-type: none"> – Current output 1: Active – Current output 2: Passive – Pulse output: Passive – Switching input and output: Passive
Version II Output option A3, H3 in the order number		<ul style="list-style-type: none"> – Current output 1: Passive – Current output 2: Passive – Pulse output: Passive – Switching input and output: Passive

Electrical data for Div. 2 / Zone 2

Version I: Active / passive current outputs and Version II: passive / passive current outputs

Model FCx3xx-F2, FCT3xx-F2	Type of protection NI	
	Vmax _o (V)	I _{max} _o (mA)
Current output 1 Terminals 31 / 32	30	30
Current output 2 Terminals 33 / 34	30	30
Pulse output Terminals 51 / 52	30	65
Switching output Terminals 41 / 42	30	65
Switching input Terminals 81 / 82	30	10

All inputs and outputs are electrically isolated from one other and from the power supply.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Electrical data for Div. 1 / Zone 1

Version I: Active / passive current outputs

Model FCx3xx-F1, FCT3xx-F1								
	Type of protection non IS		Type of protection IS					
	Vmax _o (V)	I _{max} _o (mA)	Vmax _o (V)	I _{max} _o (mA)	P _o (mW)	C _o (nF)	C _{o PA} (nF)	L _o (mH)
Current output 1, active Terminals 31 / 32	30	30	20	100	500	217	0	3.8
			VMax (V)	I _{Max} (mA)	P _j (mW)	C _j (nF)	C _{j PA} (nF)	L _j (mH)
			60	100	500	2.4	2.4	0.17
Current output 2, passive Terminals 33 / 34	30	30	30	100	760	2.4	2.4	0.17
Pulse output, active or passive Terminals 51 / 52	30	65	15	30	115	2.4	2.4	0.17
Switching output, passive Terminals 41 / 42	30	65	15	30	115	2.4	2.4	0.17
Switching input, passive Terminals 81 / 82	30	10	30	60	500	2.4	2.4	0.17

All inputs and outputs are electrically isolated from one other and from the power supply. Only current outputs 1 and 2 are not electrically isolated from one another.

Version II: Passive / passive current outputs

Model FCx3xx-F1, FCT3xx-F1

	Type of protection non IS		Type of protection IS					
	Vmax (V)	I _{max} (mA)	Vmax (V)	I _{max} (mA)	P _i (mW)	C _i (nF)	C _{i PA} (nF)	L _i (mH)
Current output 1, passive Terminals 31 / 32	30	30	60	300	2000	0.47	0.47	0.17
Current output 2, passive Terminals 33 / 34	30	30	60	300	2000	0.47	0.47	0.17
Pulse output, active or passive Terminals 51 / 52	30	65	60	300	2000	0.47	0.47	0.17
Switching output, passive Terminals 41 / 42	30	65	60	300	2000	0.47	0.47	0.17
Switching input, passive Terminals 81 / 82	30	10	60	300	2000	0.47	0.47	0.17

All inputs and outputs are electrically isolated from one other and from the power supply.

Special connection conditions

The output circuits are designed so that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits.

It is not permitted to combine intrinsically-safe and non-intrinsically safe circuits. When changing the type of protection, refer to the chapter titled "Changing the type of protection" in the commissioning instructions (CI/FCB300/FCH300) or the operating instructions (OI/FCB300/FCH300).

On intrinsically-safe circuits, equipotential bonding must be in place along the entire length of the cable used for the current outputs.

The rated voltage of the non-intrinsically-safe circuits is U_M = 60 V.

Provided that rated voltage U_M = 60 V is not exceeded if connections are established to non-intrinsically-safe external circuits, intrinsic safety is retained.

IMPORTANT (NOTE)

The transmitter and flowmeter sensor enclosures must be connected to equipotential bonding PA. The operator must ensure that when connecting the protective conductor PE no potential differences can occur between the protective conductor PE and the equipotential bonding PA.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Flowmeter sensor model FCB300 / FCH300

Temperature class

Model FCx3xx-F1..., in Class I Div. 1			
Ambient temperature	≤40 °C (≤104 °F)	≤50 °C (≤122 °F)	≤60 °C (≤140 °F)
Temperature class			
T1	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)
T2	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)
T3	185 °C (365 °F)	180 °C (356 °F)	180 °C (356 °F)
T4	125 °C (257 °F)	120 °C (248 °F)	120 °C (248 °F)
T5	85 °C (185 °F)	85 °C (185 °F)	75 °C (167 °F)
T6	65 °C (149 °F)	65 °C (149 °F)	60 °C (140 °F)

Model FCx3xx-F2..., in Class I Div. 2			
Ambient temperature	≤40 °C (≤104 °F)	≤50 °C (≤122 °F)	≤60 °C (≤140 °F)
Temperature class			
T1	200 °C (392 °F)	200 °C (392 °F)	180 °C (356 °F)
T2	200 °C (392 °F)	200 °C (392 °F)	180 °C (356 °F)
T3	180 °C (356 °F)	180 °C (356 °F)	180 °C (356 °F)
T4	115 °C (239 °F)	115 °C (239 °F)	115 °C (239 °F)
T5	80 °C (176 °F)	80 °C (176 °F)	75 °C (167 °F)
T6	60 °C (140 °F)	60 °C (140 °F)	60 °C (140 °F)

Ambient and process conditions:

T_{amb} -20 ... 60 °C (-4 ... 140 °F)

T_{amb} , optional -40 ... 60 °C (-40 ... 140 °F) (only for integral mount design devices)

T_{medium} -50 ... 200 °C (-58 ... 392 °F)

Protection class IP 65, IP 67, and NEMA 4X / Type 4X

IMPORTANT (NOTE)

In the case of the remote mount design, the signal cable between the flowmeter sensor and the transmitter must measure at least 5 m (16.4 ft) in length. Install conduit seals within 18" (45 cm).

Hazardous area approval cFMus

Specific marking according to FM applies depending on the design of the flowmeter sensor (integral or remote mount design).

IMPORTANT (NOTE)

ABB reserves the right to make changes to the Ex-marking. The exact marking can be found at the name plate of the meter.

Model FCx3xx-F2A... (remote mount design in Zone 2, Div 2)

Approval	Marking	Comment
FM (marking US)	NI: CL I,II,III, DIV 2, GPS ABCDEFG CL I, ZN2, AEx nA IIC T6 ... T2 ZN 21 AEx tb IIIC T85°C ... T165°C	-
FM (marking Canada)	NI: CL I, II, III, Div 2 GPS ABCDEFG Ex nA IIC T6 ... T2	-

Model FCx3xx-F2Y... (integral mount design in Zone 2, Div 2)

Approval	Marking	Comment
FM (marking US)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP : CL III, Div 1,2 CL I, ZN 2, AEx nA nR IIC T6 ... T2 ZN 21 AEx tb IIIC T85°C ... T165°C	-
FM (marking Canada)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP : CL III, Div 1,2 Ex nA nR IIC T6 ... T2	-

Model FCx3xx-F1A... (remote mount design in Zone 1, Div 1)

Approval	Marking	Comment
FM (marking US)	CL I, II, III, Div 1, GPS ABCDEFG CL I, ZN0, AEx ia IIC T6 ... T2 ZN 20 AEx ia IIIC T85°C ... T165°C	-
FM (marking Canada)	CL I, II, III, Div 1, GPS ABCDEFG Ex ia IIC T6 ... T2	-

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Model FCx3xx-F1Y... (integral mount design in Zone 1, Div 1)		
Approval	Marking	Comment
FM (marking US)		
Version II	IS: CL I, Div 1, GPS ABCD NI: CL I,II,III, DIV2, GPS ABCDEFG XP: CL I, Div 1, GPS ABCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 CL I, ZN1, AEx d ia IIC T6 ZN 21 AEx ia tb IIIC T85°C to T165°C	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, DIV2, GPS ABCDEFG XP: CL I, Div 1, GPS ABCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 CL I, ZN 1, AEx d ia ib IIC T6 or CL I, ZN 1, AEx d ia IIC T6 ZN 21 AEx ib ia tb IIIC T85°C or ZN21 AEx tb ia IIC T6	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.
FM (marking Canada)		
Version II	IS: CL I, Div 1, GPS ABCD NI: CL I,II,III, Div 2, GPS ABCDEFG XP: CL I, Div 1, GPS BCD DIP CL II, Div 1, GPS EFG DIP CL III, Div 1, 2 Ex d ia IIC T6	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, Div 2, GPS ABCDEFG XP: CL I, Div 1, GPS BCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 Ex d ia ib IIC T6 or Ex d ia IIC T6	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.

Transmitter model FCT300 in remote mount design

Ambient and process conditions:

T_{amb} -20 ... 60 °C (-4 ... 140 °F)

Protection class IP 65, IP 67, and NEMA 4X / Type 4X

Hazardous area approval cFMus

Specific coding according to FM applies depending on the design of the flowmeter sensor (integral or remote mount design).

IMPORTANT (NOTE)

ABB reserves the right to make changes to the Ex-marking. The exact marking can be found at the name plate of the meter.

Model FCT3xx-Y0... (Transmitter in General Purpose and Sensor in Zone 2, Div 2 or Zone 0, Div 1)

Approval	Marking	Comment
FM (marking US)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP: CL III, Div 1,2	-
FM (marking Canada)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP: CL III, Div 1,2	-

Model FCT3xx-F2... (Transmitter and Sensor in Zone 2, Div 2)

Approval	Marking	Comment
FM (marking US)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP: CL III, Div 1,2 CL I, ZN 2, AEx nA nR [ia] IIC T6 ZN 21 AEx tb [ia] IIIC T85°C	-
FM (marking Canada)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP: CL III, Div 1,2 Ex nA nR [ia] IIC T6	-

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Model FCT3xx-F1... (Transmitter in Zone 1, Div 1, Sensor in Zone 0, 1 or 2, Div 2 oder Div 1)

Approval	Marking	Comment
FM (marking US)		
Version II	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, DIV2, GPS ABCDEFG XP: CL I, Div 1, GPS ABCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 CL I, ZN1, AEx d ia IIC T6 ZN 21 AEx ia tb IIIC T85°C	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, DIV2, GPS ABCDEFG XP: CL I, Div 1, GPS ABCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 CL I, ZN 1, AEx d ib [ia] IIC T6 or CL I, ZN1, AEx d [ia] IIC T6 ZN21 AEx ib tb [ia] IIIC T85°C or ZN21 AEx tb [ia] IIC T6	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.
FM (marking Canada)		
Version II	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, Div 2, GPS ABCDEFG XP: CL I, Div 1, GPS BCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 Ex d ia IIC T6	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, Div 2, GPS ABCDEFG XP: CL I, Div 1, GPS BCD DIP: CL II, Div 1, GPS EFG DIP CL III, Div 1, 2 Ex d ib [ia] IIC T6 or Ex d [ia] IIC T6	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.

Trademarks

® HART is a registered trademark of FieldComm Group, Austin, Texas, USA

™ Hastelloy C-4 is a Haynes International trademark

™ Hastelloy C-22 is a Haynes International trademark

™ Hastelloy C-276 is a Haynes International trademark

Questionnaire

Customer:	Date:
Ms. / Mr.:	Department:
Telephone:	Fax:

Measuring medium:	Liquid content:	Gas content:
Flow rate: (min., max., operating point)	kg/h	
Density: (min., max., operating point)	kg/m ³	
Dynamic viscosity: (min., max., operating point)	mPas/cP	
Fluid temperature: (min., max., operating point)	°C	
Ambient temperature	°C	
Pressure: (min., max., operating point)	bar	
Rate of flow:	<input type="checkbox"/> Steady	<input type="checkbox"/> Pulsating
Batch operation:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Concentration calculation:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Transmitter design:	<input type="checkbox"/> Integral mount design	<input type="checkbox"/> Remote mount design
Explosion protection:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Power supply:	<input type="checkbox"/> 100 ... 230 V AC, 50/60 Hz	<input type="checkbox"/> 24 V AC/DC, 50/60 Hz
Electrical outputs:	Communication: <input type="checkbox"/> Current output I: 0/4 ... 20 mA <input type="checkbox"/> HART protocol <input type="checkbox"/> Current output II: 0/4 ... 20 mA <input type="checkbox"/> Pulse output, active <input type="checkbox"/> Pulse output, passive	
Additional specifications:	Pipeline diameter: mm Process connection:	

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Note

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3KXF411008R1001



Sales



Service



Software

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

4-wire compact device
For flow measurement of liquids and gases

Measurement made easy



CoriolisMaster simply fits!

The ideal NAMUR standard Device with NAMUR standard lay length

Measurement of massflow and volumeflow, density, temperature and concentration with only one meter with minimal investment costs

Minimum installation space requirements due to compact design

Minimum lifetime costs

FCH300 for all hygienic applications — EHEDG-certified

Minimum pressure drop, no moving parts, no wear out

Self draining: no measuring media residues remain in the meter

Worldwide approvals for hazardous areas and hygienic applications

State of the art transmitter

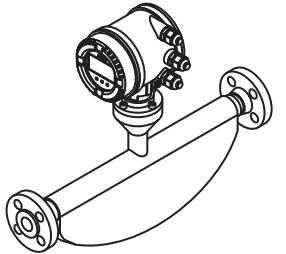
- Easy handling
- Data safety due to unique sensor memory concept
- Concentration measurement

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

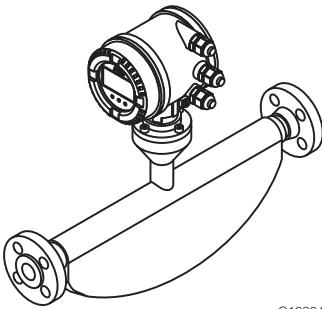
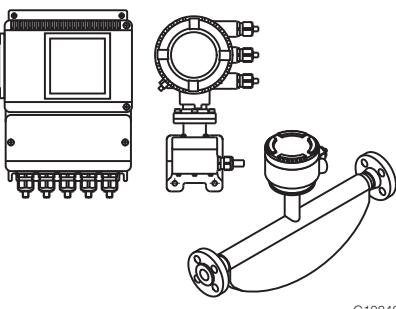
Overview of flowmeter sensor and transmitter designs

General remarks

FCB3xx and FCH3xx flowmeter sensor (integral mount design)				
		G10335		
Model number	FCB300 for standard applications	FCH300 for hygienic applications		
Process connections				
– Flange DIN 2501 / EN 1092-1	DN 10 ... 200, PN 40 ... 100	-		
– Flange ASME B16.5	DN 1/4" ... 8" PN CL150 ... CL600	-		
– Threaded pipe connection DIN 11851	DN 10 ... 100 (1/4" ... 4")	DN 25 ... 80 (1" ... 3")		
– Tri-Clamp	DIN 32676 (ISO 2852) BPE Tri-Clamp DN 10 ... 100 (1/4" ... 4")	DIN 32676 (ISO 2852) BPE Tri-Clamp DN 20 ... 100 (3/4" ... 4")		
– Other connections	On request	On request		
Wetted materials	Stainless steel Nickel-Alloy C4 / C22	Stainless steel, polished 1.4404 (AISI 316L) or 1.4435 (AISI 316L)		
Degree of protection acc. to EN 60529	IP 65 / 67, NEMA 4X	IP 65 / 67, NEMA 4X		
Approvals and certificates				
– Explosion protection ATEX / IECEx	Zone 0, 1, 2, 21, 22	Zone 0, 1, 2, 21, 22		
– Explosion protection cFMus	Class I Div. 1, Class I Div. 2, Zone 0, 1, 2, 20, 21	Class I Div. 1, Class I Div. 2, Zone 0, 1, 2, 20, 21		
– Explosion protection NEPSI	Zone 0, 1, 2, 21, 22	Zone 0, 1, 2, 21, 22		
– Hygienic and sterile requirements	-	EHEDG, FDA		
– Other approvals	On request			
Enclosure	Integral mount design, remote mount design			
Measuring accuracy for liquids	FCB330	FCB350	FCH330	FCH350
– Mass flow ¹⁾	0,4 % and 0,25 %	0,1 % and 0,15 %	0,4 % and 0,25 %	0,1 % and 0,15 %
– Volume flow ¹⁾	0,4 % and 0,25 %	0,15 %	0,4 % and 0,25 %	0,15 %
– Density	0,01 kg/l	– 0,002 kg/l – 0,001 kg/l (option) – 0,0005 kg/l ²⁾	0,01 kg/l	– 0,002 kg/l – 0,001 kg/l (option) – 0,0005 kg/l ²⁾
– Temperature	1 K	0,5 K	1 K	0,5 K
Measuring accuracy for gases ¹⁾	1 %	0,5 %	1 %	0,5 %
Permissible temperature of the medium being measured	-50 ... 160 °C (-58 ... 320 °F)	-50 ... 200 °C (-58 ... 392 °F)	-50 ... 160 °C (-58 ... 320 °F)	-50 ... 200 °C (-58 ... 392 °F)

1) Stated measuring accuracy in % of rate (% o. r.)

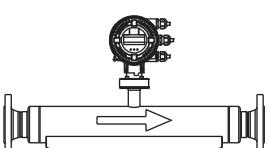
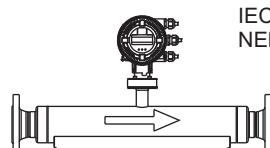
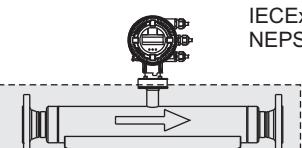
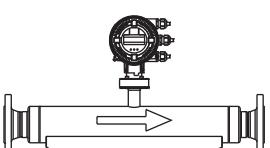
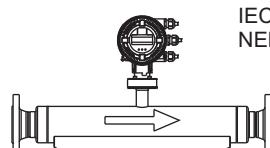
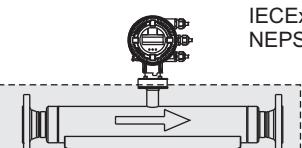
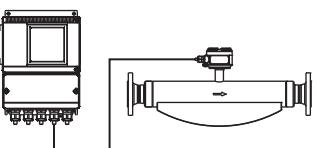
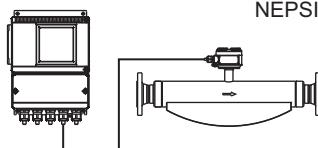
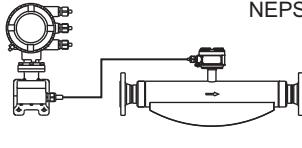
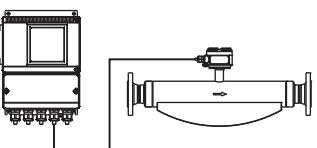
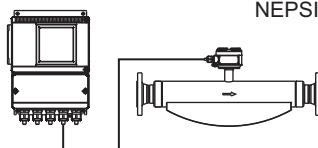
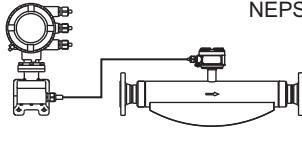
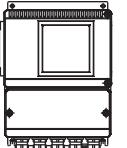
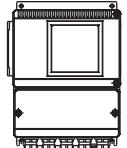
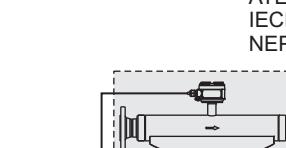
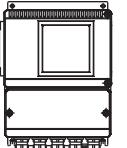
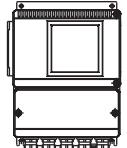
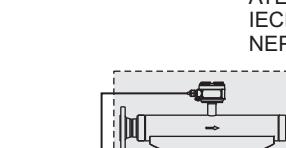
2) Measuring accuracy following on-site calibration under operating conditions

	FCTxxx transmitter	
	 G10334	 G10846
Enclosure	Integral mount design	Remote mount design
Cable length	Maximum 10 m (33 ft), remote mount design only	
Power supply	100 ... 230 V AC, 24 V AC/DC	
Current output	Current output 1: 0/4 ... 20 mA active or 4 ... 20 mA passive Current output 2: 4 ... 20 mA passive	
Pulse output	Active (not Zone 1 / Div. 1) or passive	
External output zero return	Yes	
External totalizer reset	Yes	
Forward / reverse flow metering	Yes	
Communication	HART protocol	
Empty pipe detection	Yes, based on preconfigured density alarm < 0.5 kg/l	
Self-monitoring and diagnostics	Yes	
Local display / totalization	Yes	
Field optimization for flow and density	Yes	
Degree of protection acc. to EN 60529	Integral mount design: IP 65/IP 67, NEMA 4X Remote mount design: IP 67, NEMA 4X	

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

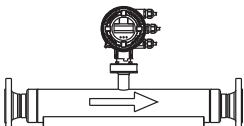
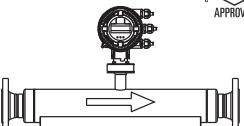
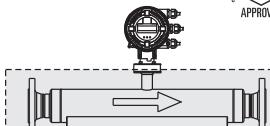
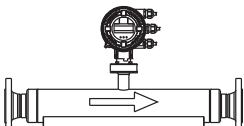
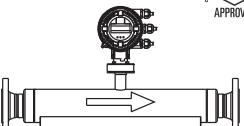
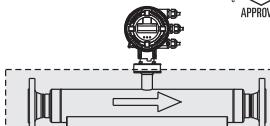
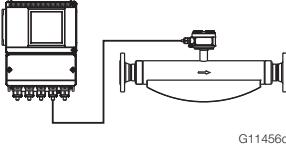
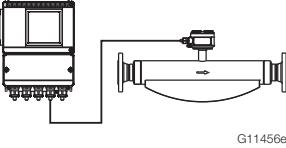
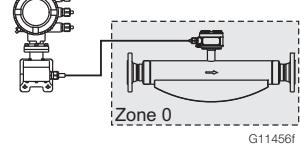
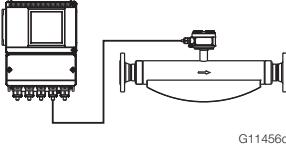
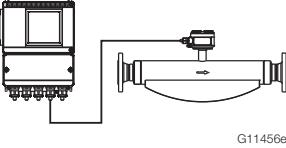
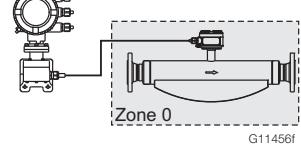
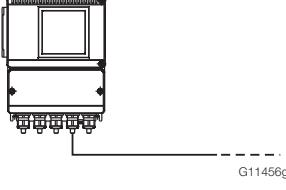
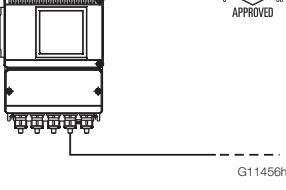
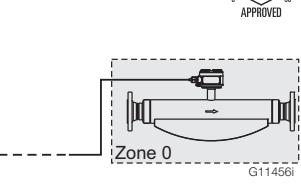
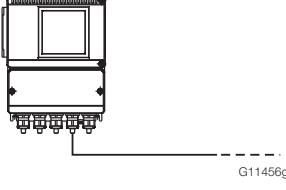
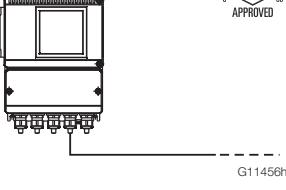
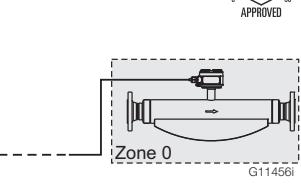
ATEX / IECEx / NEPSI device overview

	Standard / No explosion protection	Zone 2, 21, 22	Zone 1, 21 (Zone 0)			
Model number	FCx3xx Y0	FCx3xx A2, S2	FCx3xx A1, S1			
Integral mount design						
– Standard						
– Zone 2, 21, 22						
– Zone 1, 21						
– Zone 0	 G11455-01a	 G11455-01b	 G11455-01c			
Model number	FCT3xx Y0	FCx3xx Y0	FCT3xx A2	FCT3xx Y0	FCx3xx A1, S1	FCT3xx A2
Remote mount design						
Transmitter and flowmeter sensor						
– Standard						
– Zone 2, 21, 22						
– Zone 1, 21						
– Zone 0		 G11455-01d		 G11455-01e		 G11455-01f
Model number	FCT3xx Y0		FCT3xx A2		FCx3xx A1, S1	
Remote mount design						
Transmitter						
– Standard						
– Zone 2, 21, 22						
Flowmeter sensor						
– Zone 1, 21						
– Zone 0	 G11455-01g		 G11455-01h		 G11455-01i	

IMPORTANT (NOTE)

Details can be found in chapter „Ex relevant specifications acc. to ATEX / IECEx / NEPSI“ or in the respective certificate.

cFMus device overview

	Standard / No explosion protection	Class I Div. 2 Zone 2, 21	Class I Div. 1 Zone 0, 1, 20 ,21
Model number	FCx3xx Y0	FCx3xx F2	FCx3xx F1
Integral mount design			
– Standard			
– Class I Div. 2			
– Class I Div. 1			
– Zone 2, 21			
– Zone 1, 21			
– Zone 0, 20			
Model number	FCT3xx Y0	FCx3xx Y0	FCT3xx F2
Remote mount design			
Transmitter and flowmeter sensor			
– Standard			
– Class I Div. 2			
– Class I Div. 1			
– Zone 2, 21			
– Zone 1, 21			
– Zone 0, 20			
Model number	FCT3xx Y0	FCT3xx F2	FCx3xx F1
Remote mount design			
Transmitter			
– Standard			
– Class I Div. 2			
– Zone 2, 21			
Flowmeter sensor			
– Class I Div. 1			
– Zone 1, 21			
– Zone 0, 20			

IMPORTANT (NOTE)

Details can be found in chapter „Ex relevant specifications acc. to cFMus“ or in the respective certificate.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

General data

Device description

The CoriolisMaster FCB330, FCB350, FCH330, FCH350 is the most cost-effective and least complex ABB mass flowmeter featuring the new DSP transmitter.

The device is available in the integral mount design with internal transmitter and in the remote mount design with external transmitter.

The integral mount design reduces the time and effort spent on installation and wiring. Flowrate information can be viewed directly at the meter site and the meter can be installed in systems saving even more space than is currently possible.

The CoriolisMaster FCB330, FCB350, FCH330, FCH350 operates according to the Coriolis principle. The design offers the following benefits:

- Space-saving, rugged design
- Variety of process connection options
- Two separate current outputs for measuring mass or volume flow, density, or temperature, as well as one pulse output
- Digital input and output
- Communication via HART protocol
- Ex approval. The user can select the "i" or "e" type of protection for the output circuits; the type chosen will depend on the circuits which are connected. The type of protection can be changed even after installation has been completed. The digital outputs can be configured as NAMUR outputs by the user

Transmitter with digital signal processor (DSP)

The transmitter for the CoriolisMaster FCB330, FCB350, FCH330, FCH350 incorporates a digital signal processor (DSP) that enables high-precision mass flow and density measurements to be taken. The Coriolis sensor signals are immediately converted into digital data without any intermediate analog steps.

Excellent long-term stability and reliability together with fast signal processing are achieved with the new DSP transmitter.

Self-diagnostic functions for the flowmeter sensor and the transmitter, in combination with absolute zero stability, are benefits you can count on to ensure accurate measurements are taken.

The CoriolisMaster FCB330, FCB350, FCH330, FCH350 transmitter is particularly well suited for use in the following cases:

- Whenever mass flowrate is to be metered with maximum accuracy
- Whenever the density of the medium being measured is being determined
- Whenever the components of a recipe being mixed
- When metering non-conductive media or highly viscous, solid-loaded liquids, for example
- In batch filling processes

Installation instructions

Installation requirements/System sizing information

The CoriolisMaster FCB330, FCB350, FCH330, FCH350 is suitable for both indoor and outdoor installations. The standard device has an IP 67 enclosure. The flowmeter sensor is bidirectional and can be installed in any mounting position. It is important to ensure that the meter pipes are always completely filled with fluid. The material resistance of all wetted parts must be clarified.

The following points are to be considered during installation:

- The preferred flow direction is indicated by the arrow on the flowmeter sensor. Flow in this direction will be indicated as positive (a forward/reverse flow calibration is available as an option).
- The presence of gas bubbles in the meter tube increases the likelihood of erroneous measurements, particularly when measuring density. Therefore, the sensor should not be installed at the highest point in the system.
Advantageous are installations in low pipeline sections, e.g., at the bottom of a U-section in the pipeline (invert).
- Make sure that any gases dissolved in the medium do not outgas and that the meter tubes are always completely full. To safeguard this, a minimum back pressure of 0.2 bar (2.9 psi) is recommended.
- In case of gas measurements ensure that the gases are dry and do not contain liquids.
- Make sure that operation below the vapor pressure cannot occur when a vacuum exists in the meter tube or when liquids with a low boiling point are being processed.
- Ensure that during operation no Phase transitions take place in the medium. For gaseous Media any liquid phase must be avoided, for liquid media, any gas phase must be avoided.
- Long drop lines downstream of the flowmeter sensor should be avoided to prevent the meter tube from draining.
- The devices can be installed directly to or from elbows, valves or other equipment unless no cavitation is caused.

- This Flowmeter is designed for industrial installations. As long as electromagnetic fields in the environment of the meter are according to "best practice" as defined in the standards covered in our "EC-declaration of conformity", no additional efforts have to be taken. If electromagnetic fields exceed usual levels, sufficient distance is to be kept.
- Check that the flowmeter sensor does not come into contact with other objects. Do not attach the flowmeter sensor to the enclosure.
- In principle, no special supports or dampers are required on the device. In industrial and maritime facilities designed as "Best Practice" typical forces are absorbed sufficiently by the device. This is valid for serial or parallel installation of Coriolis meters as well, as long as the use and installation follows the manual.
- To avoid damages to the process connections and pipes by axial forces, supports are recommended for devices of higher weights.

Inlet sections

The flowmeter sensor does not require any inlet sections. Make sure that any valves, gates, sight glasses, etc., in the vicinity of the flowmeter sensor do not cavitate and are not set in vibration by the flowmeter sensor.

Model in remote mount design

Make sure that the flowmeter sensor and transmitter are assigned correctly. Compatible devices have the same end numbers, e. g., X001 and Y001 or X002 and Y002, on the name plate.

Pressure loss

Pressure loss is determined by the properties of the medium and the flow.

Documents to help you to calculate pressure loss can be downloaded from www.abb.com/flow.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Mounting positions

The flowmeter operates in any mounting position. The ideal installation position is vertical with flow from bottom to top.

IMPORTANT (NOTE)

EHEDG certification requires a self draining installation, only possible with a vertical installation.

Vertical installation in riser

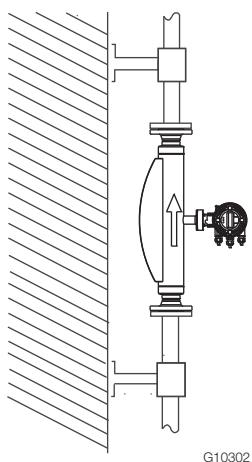


Fig. 1: Vertical installation, self-draining

Vertical installation in a drop line

Make sure that the flowmeter sensor is always completely full while measurements are being taken.

A pipeline reduction or an orifice must also be installed underneath the flowmeter sensor. The cross-section of the pipeline reduction or orifice must be smaller than the cross-section of the pipeline in order to prevent the flowmeter sensor from running dry while measurements are being taken.

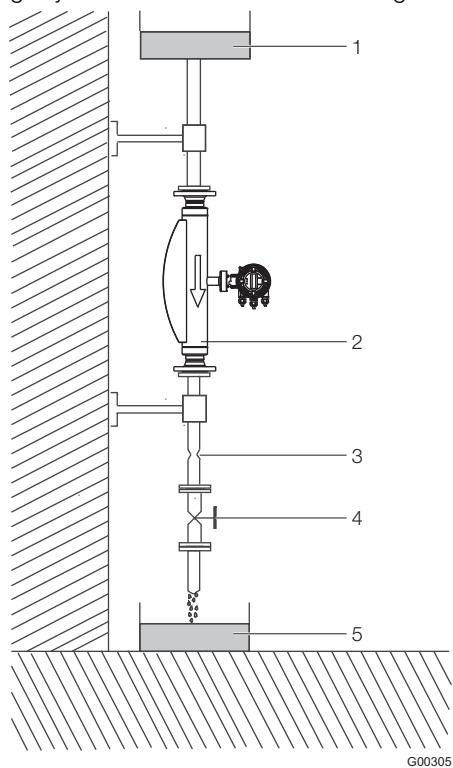


Fig. 2: Vertical installation in a drop line

1 Supply reservoir | 2 Flowmeter sensor |
3 Orifice or pipe constriction | 4 Valve | 5 Product reservoir

Horizontal installation in case of measurement of liquids

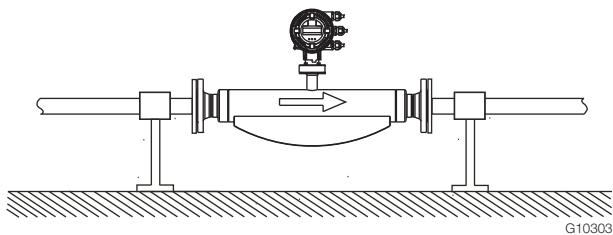


Fig. 3: Horizontal installation (liquids)

Horizontal installation in case of measurement of gases

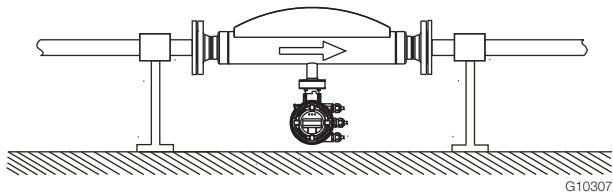


Fig. 4: Horizontal installation (gases)

In case of measurement of gases ensure that the transmitter housing or the terminal box pointing downwards.

Difficult installation locations for liquid measurement

The accumulation of air or gas bubbles in the meter tube will lead to increased inaccuracies.

Avoid the following installation locations in case of liquid measurement:

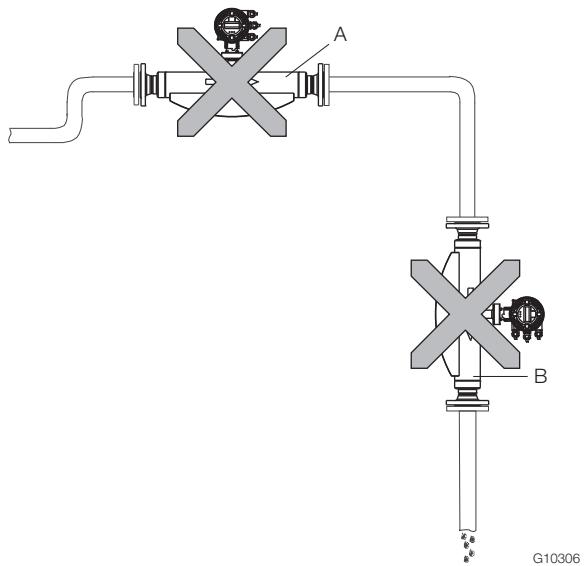


Fig. 5: Difficult installation locations

- "**A**": Installing the flowmeter sensor at the highest point of a pipeline leads to increased inaccuracies due to the accumulation of air or gas bubbles in the meter tube.
- "**B**": Installing the flowmeter sensor in a drop line means that there is no guarantee that the meter tube will be completely full while measurements are being taken and leads to increased inaccuracies.

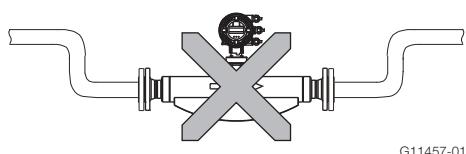
CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Difficult installation locations and gas metering

When metering gas, the accumulation of fluid or the formation of condensate in the meter tube will lead to increased inaccuracies.

Avoid the following installation locations when metering gas:



G11457-01

Fig. 6: Difficult installation locations

Installing the flowmeter sensor at the lowest point of a pipeline leads to increased inaccuracies due to the accumulation of fluid or the formation of condensate in the meter tube.

Zero balance

CoriolisMaster flowmeters do not require in any case a zero point calibration. Only under these circumstances a calibration is recommended:

- when measuring below 10% of QmaxDN,
- when very high accuracies are required (0.1% or better),
- the operating conditions (pressure and temperature) differ widely from the reference conditions.

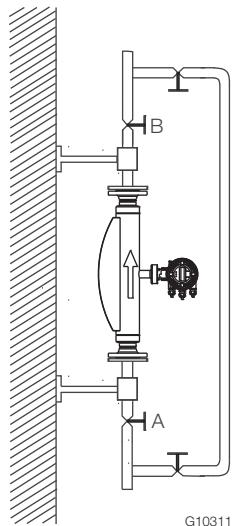


Fig. 7: Bypass line

Closing valves are to be installed in front (A) and after (B) the flowmeter.

We recommend installing a bypass line. Installing a bypass line means that adjustment can take place while the process is ongoing.

Before adjusting the zero under operating conditions, make sure that:

- The meter tube is completely full
- There are no gas bubbles or air in the meter tube (in case of liquid measurements)
- There are no condensates in the meter tube (in case of gas measurements)
- The pressure and temperature in the meter tube are appropriate for normal operating conditions

In case of a high zero point (> 0.1%) please check the installation for best praxis and ensure that there are no gas contents in a liquid or solids or liquids in gases. Please ensure that the meter is completely filled.

Installation dependent on the temperature of the medium being measured

The mounting position of the sensor is dependent on the temperature of the medium being measured T_{medium} . Be aware of the following mounting options!

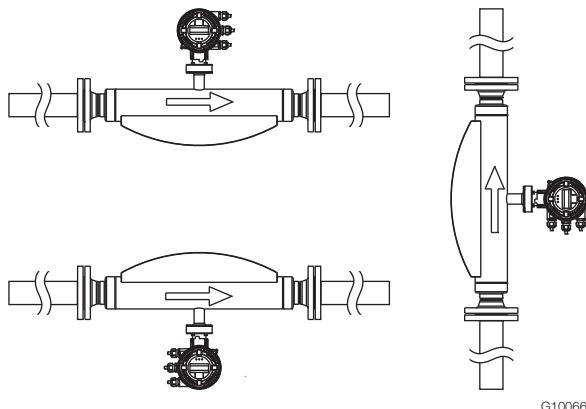


Fig. 8: Installation at T_{medium} -50° ... 120 °C (-58 ... 248 °F)

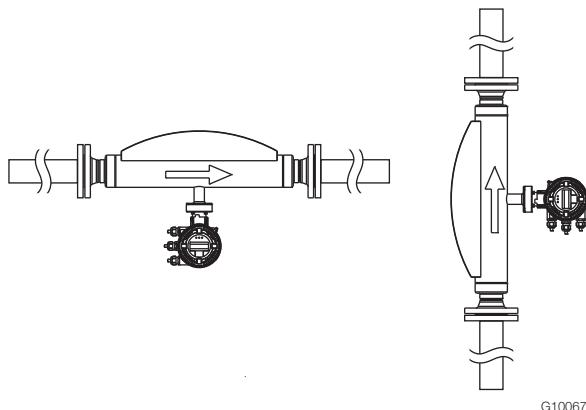


Fig. 9: Installation at T_{medium} -50° ... 200 °C (-58 ... 392 °F)

Installation with option TE1 "extended tower length"

IMPORTANT (NOTE)

The sensor must only be insulated in conjunction with the TE1 "Extended tower length" option, as shown in Fig. 10.

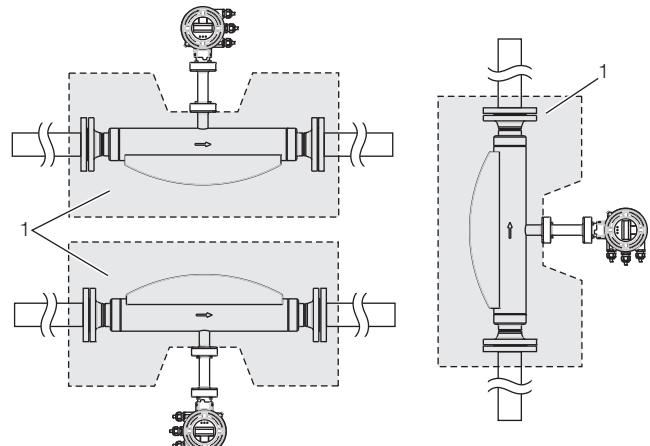


Fig. 10: Installation at T_{medium} -50° ... 200 (-58 ... 392 °F)
1 Insulation

Notes about EHEDG conformity

Bacteria and chemical substances can contaminate or pollute pipeline systems and the materials they are made of. The appropriate installation conditions must be observed in order to achieve an installation that complies with EHEDG requirements.

IMPORTANT (NOTE)

- EHEDG certification requires a self draining installation, only possible with a vertical installation.
- In order to achieve compliance with EHEDG requirements, the combination of process connection and gaskets selected by the operator must consist solely of EHEDG-compliant parts. Note the information in the latest version of the following document: EHEDG Position Paper: "Hygienic process connections to use with hygienic components and equipment".

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Flowmeter sensor

Designs

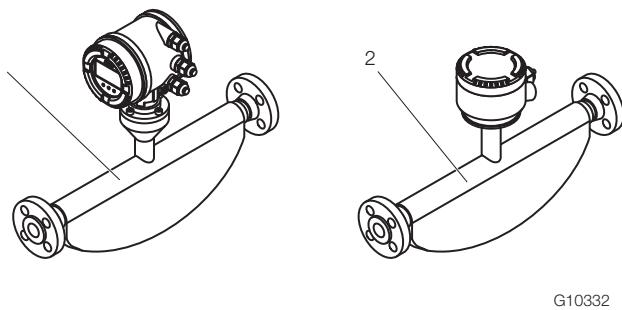


Fig. 11: FCB3xx / FCH3xx flowmeter sensor

- 1 Integral mount design |
- 2 Remote mount design (without transmitter)

Nominal diameter and measuring range

Nominal diameter	Q_{\max} in kg/h (lb/h)
DN 15 (1/2")	0 ... 8,000 (0 ... 17,637)
DN 25 (1")	0 ... 35,000 (0 ... 77,162)
DN 50 (2")	0 ... 90,000 (0 ... 198,416)
DN 80 (3")	0 ... 250,000 (0 ... 551,156)
DN 100 (4")	0 ... 520,000 (0 ... 1,146,404)
DN 150 (6")	0 ... 860,000 (0 ... 1,895,975)

Recommended flow range

Fluids:

- The recommended flow range is 5 ... 100 % of Q_{\max} .
- Flows < 1 % of Q_{\max} should be avoided.

Gases:

- The flow velocity of gases in the meter tube should not exceed 0.3 Mach (approx. 100 m/s (328 ft/s)).
- Flow velocities above 80m/s may lead to increased repeatability values.
- The maximum flow range of gases is determined by the operating density. Dimensioning guidelines are available at www.abb.com/flow.

Measuring accuracy

Reference conditions

Calibration fluid	Water
	— Temperature: 25 °C (77 °F) ±5 K
	— Pressure: 2 ... 4 bar (29 ... 58 psi)
Ambient temperature	25 °C (77 °F) +10 K / -5 K
Power supply	Line voltage according to name plate $U_N \pm 1 \%$
Warm-up phase	30 minutes
Installation	<ul style="list-style-type: none"> — Installation according to chapter titled "Installation instructions" and "Mounting positions" — No visible gas phase — No external mechanical or hydraulic disturbances, particularly cavitation
Output calibration	Pulse output
Effect of the analog output on measuring accuracy	As pulse output ±0.1 % of measurement

Measured error

The measured error is calculated as follows for the flow:

Scenario 1:

If

$$\text{Flow} \geq \frac{\text{Zero stability}}{(\text{base accuracy} / 100)}$$

Then:

- Maximum measured error:
± base accuracy as % of measured value
- Reproducibility:
± 1/2 x base accuracy as % of measured value

Scenario 2:

If

$$\text{Flow} < \frac{\text{Zero stability}}{(\text{base accuracy} / 100)}$$

Then:

- Maximum measured error:
± (zero stability / measured value) x 100 % of measured value
- Reproducibility:
± 1/2 x (zero stability / measured value) x 100% of measured value

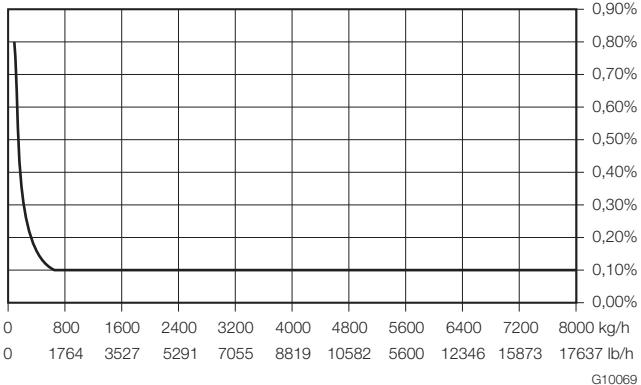


Fig. 12: Calculation of measured error FCB350 DN15 (example)

Measurement dynamic	Flow	Maximum measured error
100:1	80 kg/h (176.4 lb/h)	0.8 % o.r.
50:1	160 kg/h (352.7 lb/h)	0.4 % o.r.
10:1	800 kg/h (1763.7 lb/h)	0.1 % o.r.
2:1	4000 kg/h (8818.5 lb/h)	0.1 % o.r.
1:1	8000 kg/h (17637 lb/h)	0.1 % o.r.

Measured error and base accuracy for liquids

	FCx330	FCx350
Mass flow	± 0.4 % of rate ± 0.25 % of rate	± 0.15 % of rate ± 0.1 % of rate (option)
Volume flow	± 0.4 % of rate ± 0.25 % of rate	± 0.15 % of rate
Density	0.010 kg/l ¹⁾ 0.0005 kg/l (option) ³⁾	0.002 kg/l ¹⁾ 0.001 kg/l ²⁾
Reproducibility for density	0.002 kg/l	0.002 kg/l ¹⁾ 0.001 kg/l ²⁾ 0.00025 kg/l (option) ³⁾
Temperature	1 K	0.5 K

1) For the density range from 0.5 ... 1.8 kg/dm³

2) As 1 and for the medium temperature range from -10 ... 50 °C (14 ... 122 °F)

3) As 2 and following field adjustment under operating conditions

Measured error and base accuracy for gases

	FCx330	FCx350
Mass flow	± 1 % of rate	± 0.5 % of rate
Temperature	1 K	0.5 K

Zero stability

Nominal diameter	kg/h (lb/h)
DN 15 (1/2")	0.64 (1.41)
DN 25 (1")	2.16 (4.76)
DN 50 (2")	7.20 (15.87)
DN 80 (3")	20 (44)
DN 100 (4")	41.6 (91.7)
DN 150 (6")	68.8 (151.68)

Effect of the temperature of the medium being measured

For the flow, less than ± 0.0015 % of Q_{max} / 1 K.

For the density, less than 0.0001 kg/dm³ / 1 K.

Effect of the operating pressure

Nominal diameter	Flow [% of measurement / bar]	Density [kg/dm ³ / bar]
DN 15 (1/2")	-0.002	No effect
DN 25 (1")	-0.013	0.00035
DN 50 (2")	-0.010	0.00027
DN 80 (3")	-0.006	0.00019
DN 100 (4")	-0.009	0.00024
DN 150 (6")	-0.035	0.00045

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Technical data

Pressure loss

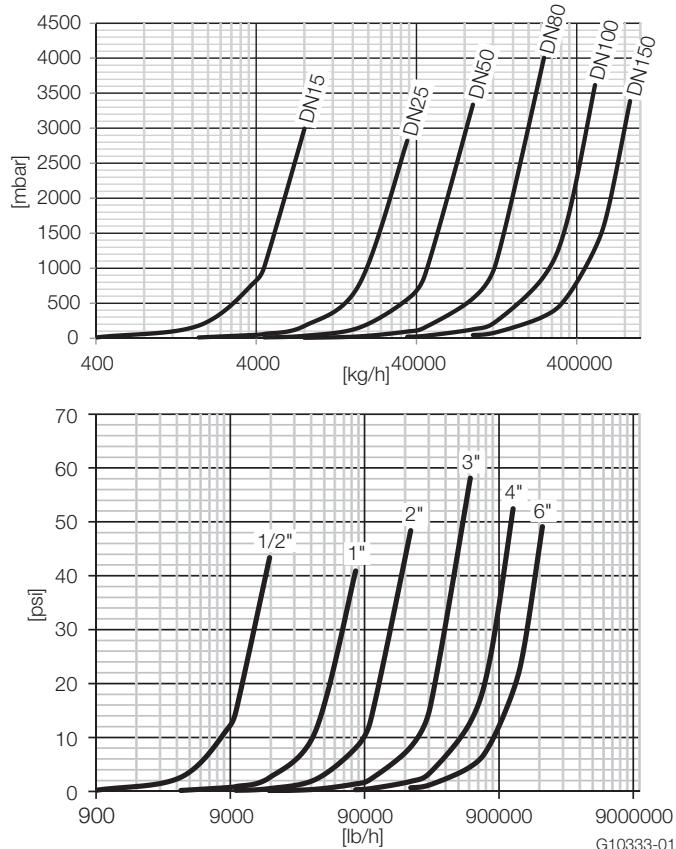


Fig. 13: Pressure loss curve (measured with water, viscosity: 1 mPas)

Viscosity range

If you are working with dynamic viscosities $\geq 1 \text{ Pas}$ ($1000 \text{ mPas} = 1000 \text{ cP}$), please contact ABB.

Temperature limits °C (°F)

IMPORTANT (NOTE)

When using the device in hazardous areas, note the additional temperature data in the chapter titled "Technical data relevant to hazardous areas"!

Temperature range of the medium being measured

FCx350: -50 ... 160 °C (-58 ... 320 °F)

FCx350: -50 ... 200 °C (-58 ... 392 °F)

Ambient temperature range

Standard: -20 ... 60 °C (-4 ... 140 °F)

Optional: -40 ... 60 °C (-40 ... 140 °F)

Process connections

- Flange design according to EN / ASME / JIS
- Tri-Clamp according to DIN 32676 (ISO 2852)
- DN 15 ... 100 (1/2 ... 4"): Series 3
- BPE Tri-Clamp
- DN 15 ... 100 (1/2 ... 4")

Pressure rating

PN 16, PN 40, PN 100, PN 160
CL 150, CL 300, CL 600, CL 900, CL 1500

The maximum permissible operating pressure is determined by the respective process connection, the temperature of the medium to be measured, the screws, and the gasket material.

Enclosure as protective device (optional)

Standard:

- Maximum burst pressure 60 bar (870 psi)

Optional:

- Higher bursting pressure resistant housings possible up to 100 bar (1450 psi) for meter sizes DN15 .. DN100 (1/2" ... 4").
- Higher bursting pressure resistant housings possible up to 150 bar (2175 psi) for meter sizes DN15 ... DN80 (1/2" ... 3")
- Purge fittings can be provided on request.

Pressure Equipment Directive

Conformity assessment according to Category III, fluid group 1, gas

Check the corrosion resistance of the meter tube materials against the measuring medium.

NAMUR standard lengths

The FCB300 is the ideal NAMUR standard device. Beside other standards, specifically the NAMUR standard lengths can be ordered with the order code "S5". The exact lengths can be found in the tables in chapter "Dimensions".

Materials for transmitters

Enclosure

Varnished alloy casting
Enclosure color
– Mid-section: RAL 7012
– Cover: RAL 9002
Varnish layer thickness: 80 ... 120 µm

Materials for flowmeter sensors

Wetted parts

Stainless steel
– 1.4404 (AISI 316L)
Stainless steel, polished
– 1.4404 (AISI 316L) or 1.4435 (AISI 316L) certified to EHEDG with flowmeter sensor material (AISI 316L)
– Nickel-Alloy C4 ¹⁾ (2.4610) oder Nickel-Alloy C22 ¹⁾ (2.4602)
Optional: Manufacture in accordance with NACE MR0175 and MR0103 (ISO 15156)

Housing²⁾

Stainless steel 1.4404 (AISI 316L), 1.4301 (AISI 304), 1.4308 (ASTM CF8)
--

- 1) Hastelloy C is a registered trademark of Haynes International. Nickel-Alloy C4 and C22 is equal to Hastelloy C4 and Hastelloy C22.
2) If the sensor wetted parts are Nickel-Alloy based, parts of the sensor housing are Nickel-Alloy based too.

Material load for process connections

Design	Nominal diameter	PS _{max}	TS _{max}	TS _{min}
Threaded pipe connection (DIN 11851)	DN 15 ... 40 (1/2 ... 1 1/2")	40 bar (580 psi)	140 °C (284 °F)	-40 °C (-40 °F)
	DN 50 ... 100 (2 ... 4")	25 bar (363 psi)	140 °C (284 °F)	-40 °C (-40 °F)
Tri-Clamp (DIN 32676)	DN 15 ... 50 (1/2 ... 2")	16 bar (232 psi)	120 °C (248 °F)	-40 °C (-40 °F)
	DN 65 ... 100 (2 1/2 ... 4")	10 bar (145 psi)	120 °C (248 °F)	-40 °C (-40 °F)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Material load curves for flange devices

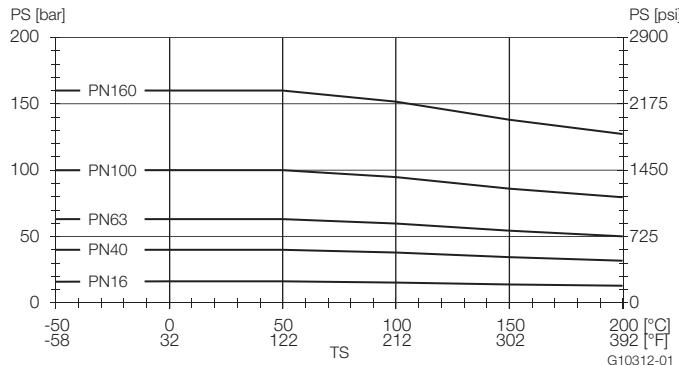


Fig. 14: Stainless steel DIN flange 1.4571 / 1.4404 (316Ti / 316L) up to DN 200 (8")

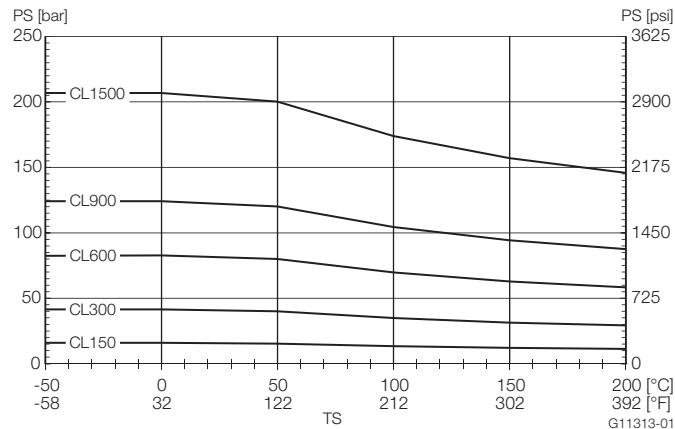


Fig. 15: Stainless steel ASME flange 1.4571 / 1.4404 (316Ti / 316L) up to DN 200 (8")

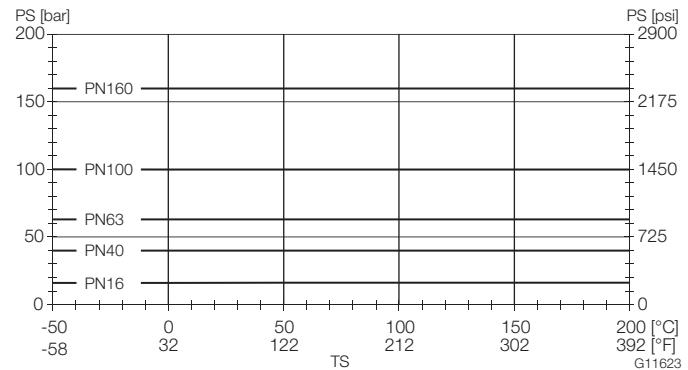


Fig. 16: DIN flange Nickel-Alloy C4 (2.4610) or Nickel-Alloy C22 up to DN 200 (8")

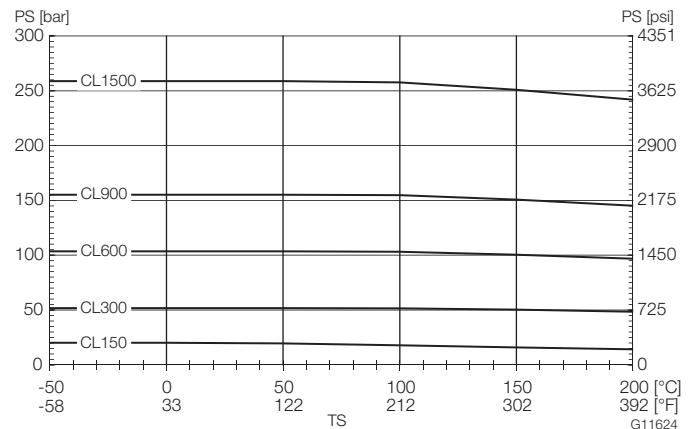
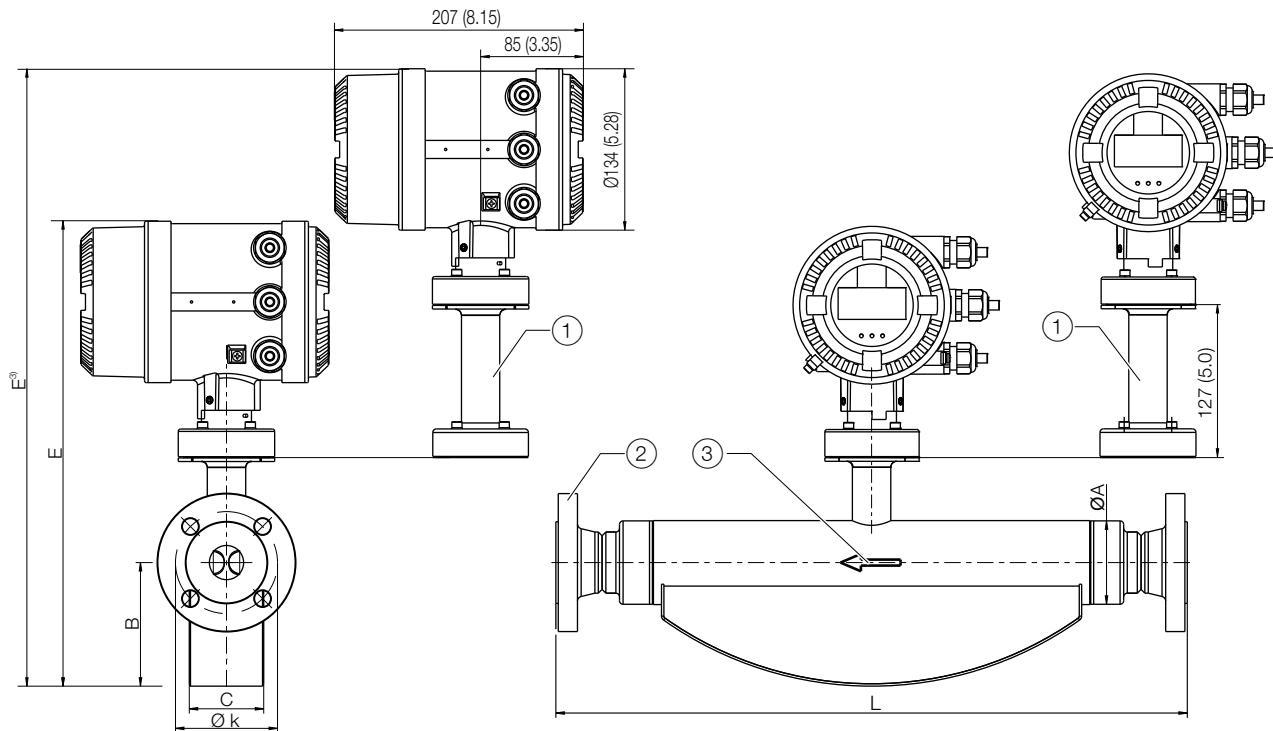


Fig. 17: ASME flange Nickel-Alloy C4 (2.4610) or Nickel-Alloy C22 up to DN 200 (8")

Dimensions for devices with integral mount design

Devices with meter tube nominal diameter DN 15 ... 50 and flange DN 10 ... 65

All specified dimensions and weights are in mm (inch) or kg (lb).



G10845-01

Fig. 18: Devices with integral mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 (1/2")							Approx. weight	
DN / process connection	L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	SST ²⁾
10 (3/8)	PN 40 (EN 1092-1)	385 (15.2)	60 (2.4)	44.5 (1.8)	77 (3.0)	46 (1.8)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾	9 / 10 ³⁾ (19.8 / 22 ³⁾
	JIS 10K	385 (15.2)	65 (2.6)					
15 (1/2)	PN 40 (EN 1092-1)	385 (15.2)	65 (2.6)					12 / 13 ³⁾ (26.5 / 28.7 ³⁾
	PN 63 (EN 1092-1)	403 (15.9)	75 (3.0)					
	PN 100 (EN 1092-1)							
	CL150 (ASME B16.5)	435 (17.1)	60.5 (2.4)					
	CL300 (ASME B16.5)	421 (16.6)	66.7 (2.6)					
	CL600 (ASME B16.5)							
	CL900 (ASME B16.5)	421 (16.6)	82.6 (3.3)					
20 (3/4)	CL1500 (ASME B16.5)							
	JIS 10K	385 (15.2)	70 (2.8)					
	JIS 10K	421 (16.6)	75 (3.0)					

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Sensor with measuring agents made from stainless steel								Approx. weight	
Dimensions for sensors featuring meter tubes with nominal diameter DN 25 (1")								Aluminum ¹⁾	SST ²⁾
DN / process connection	L	Ø k	Ø A	B	C	E			
20 (3/4)	PN 40 (EN 1092-1)	576 (22.7)	75 (3.0)	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾)	11 / 12 ³⁾ (24,3 / 26.5 ³⁾)	14 / 15 ³⁾ (30.9 / 33.1 ³⁾)
	CL150 (ASME B16.5)	575 (22.6)	69.9 (2.8)						
	JIS 10K	576 (22.7)	75 (3.0)						
25 (1)	PN 40 (EN 1092-1)	525 (20.7)	85 (3.3)						
	PN 63 (EN 1092-1)	564 (22.2)	100 (3.9)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	575 (22.6)	79.2 (3.1)						
	CL300 (ASME B16.5)	575 (22.6)	88.9 (3.5)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	575 (22.6)	82.6 (3.25)						
40 (1 1/2)	CL1500 (ASME B16.5)								
	JIS 10K	525 (20.7)	90 (3.54)						
	PN 40 (EN 1092-1)	576 (22.7)	110 (4.33)						
	PN 63 (EN 1092-1)	572 (22.5)	125 (4.92)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	576 (22.7)	98.6 (3.88)						
	CL300 (ASME B16.5)	576 (22.7)	114.3 (45.0)						
JIS 10K	CL600 (ASME B16.5)								
	JIS 10K	576 (22.7)	105 (4.13)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 50 (2")							Approx. weight		
DN / process connection		L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	SST ²⁾
40 (1 1/2)	PN 40 (EN 1092-1)	763 (30)	110 (4.33)	99 (3.9)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾)	27 / 28 ³⁾ (59,5 / 61,7 ³⁾)	30 / 31 ³⁾ (66,1 / 68,3 ³⁾)
	PN 63 (EN 1092-1)	745 (29.33)	125 (4.92)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	763 (30)	98.6 (3.88)						
	CL300 (ASME B16.5)	756 (29.76)	114.3 (4.5)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	780 (30.71)	124 (4.88)						
	CL1500 (ASME B16.5)								
50 (2)	JIS 10K	763 (30)	105 (4.13)						
	PN 40 (EN 1092-1)	715 (28.15)	125 (4.92)						
	PN 63 (EN 1092-1)	745 (29.33)	135 (5.31)						
	PN 100 (EN 1092-1)	757 (29.8)	145 (5.71)						
	CL150 (ASME B16.5)	715 (28.15)	120.7 (4.75)						
	CL300 (ASME B16.5)	763 (30)	127 (5.0)						
	CL600 (ASME B16.5)	773 (30.43)	127 (5.0)						
	CL900 (ASME B16.5)	790 (31.1)	165.1 (6.5)						
	CL1500 (ASME B16.5)								
65 (2 1/2)	JIS 10K	715 (28.15)	120 (4.72)						
	PN 40 (EN 1092-1)	763 (30)	145 (5.71)						
	CL150 (ASME B16.5)	763 (30)	139.7 (5.5)						
	CL900 (ASME B16.5)	800 (31.5)	190.5 (7.5)						
	CL1500 (ASME B16.5)								
	JIS 10K	763 (30)	140 (5.51)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 80 and flange DN 65 ... 100

All specified dimensions and weights are in mm (inch) or kg (lb).

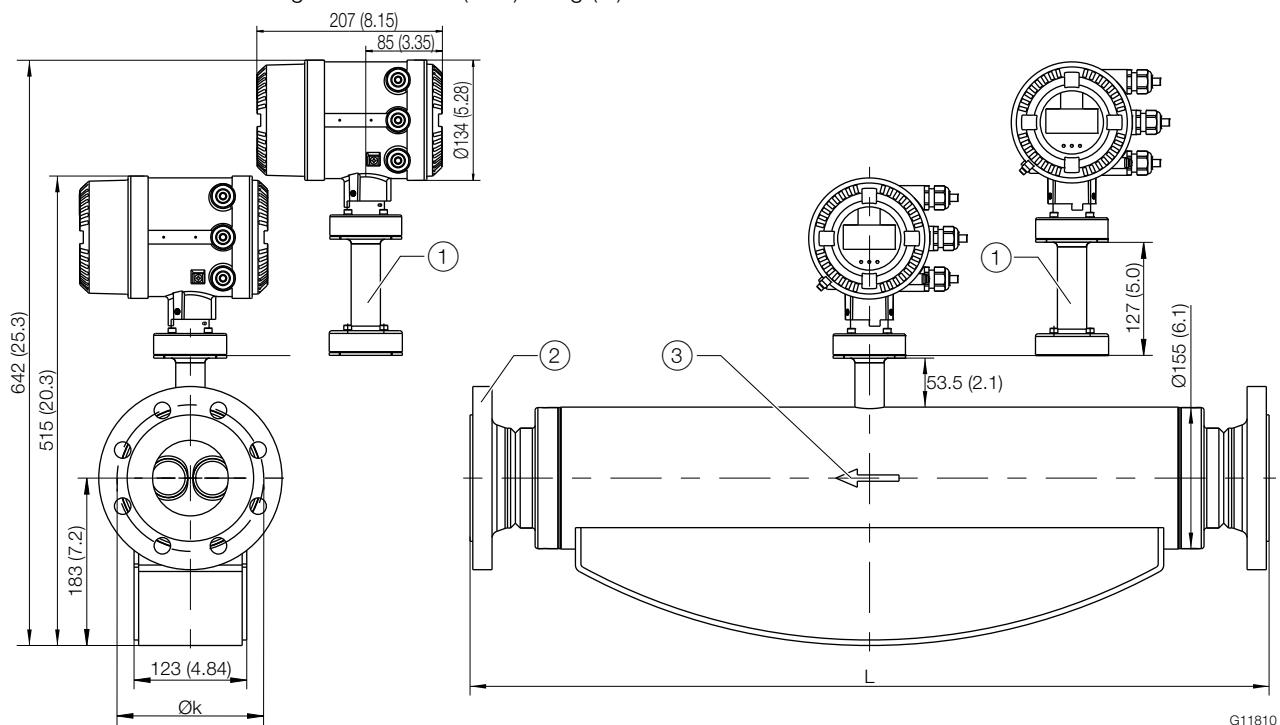


Fig. 19: Devices with remote mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 80 (3")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
65 (2 1/2")	PN 16 (EN 1092-1)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	PN 40 (EN 1092-1)	910 (35.83)	145 (5.71)	70 / 71 ³⁾ (154.3 / 156.5 ³⁾
	PN 63 (EN 1092-1)		160 (6.30)	74 / 75 ³⁾ (163.1 / 165.4 ³⁾
	PN 100 (EN 1092-1)		170 (6.69)	78 / 79 ³⁾ (172 / 174.2 ³⁾
	CL150 (ASME B16.5)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	CL300 (ASME B16.5)	920 (36.22)	149.4 (5.88)	72 / 73 ³⁾ (158.7 / 160.9 ³⁾
	CL600 (ASME B16.5)		—	73 / 74 ³⁾ (160.9 / 163.1 ³⁾
	CL900 (ASME B16.5)	965 (37.99)	190.5 (7.50)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
	CL1500 (ASME B16.5)		—	93 / 94 ³⁾ (205.3 / 207.23 ³⁾

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) On request

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 80 (3")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
80 (3")	PN 16 (EN 1092-1)	870 (34.25)	160 (6.30)	70 / 71 ³⁾ (154.3 / 156.5 ³⁾
	PN 40 (EN 1092-1)			71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	PN 63 (EN 1092-1)	910 (35.83)	170 (6.69)	75 / 76 ³⁾ (163.1 / 167.6 ³⁾
	PN 100 (EN 1092-1)		180 (7.09)	81 / 82 ³⁾ (178.6 / 180.8 ³⁾
	CL150 (ASME B16.5)	880 (34.65)	152.4 (6.00)	71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	CL300 (ASME B16.5)	895 (35.24)	168.1 (6.62)	75 / 76 ³⁾ (163.1 / 167.6 ³⁾
	CL600 (ASME B16.5)	920 (36.22)		78 / 79 ³⁾ (172.0 / 174.2 ³⁾
	CL900 (ASME B16.5)	1100 (43.31)	190.5 (7.50)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
100 (4")	CL1500 (ASME B16.5)	1130 (44.49)	203.2 (8.00)	102 / 103 ³⁾ (224.9 / 227.0 ³⁾
	PN 16 (EN 1092-1)	875 (34.45)	190 (7.48)	71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	PN 40 (EN 1092-1)			73 / 74 ³⁾ (161 / 163 ³⁾
	PN 63 (EN 1092-1)	1060 (41.73)	200 (7.87)	82 / 83 ³⁾ (180.8 / 183.0 ³⁾
	PN 100 (EN 1092-1)	1080 (42.52)	210 (8.27)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
	CL150 (ASME B16.5)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	CL300 (ASME B16.5)	1075 (42.32)	200.2 (7.88)	87 / 88 ³⁾ (191.8 / 194.0 ³⁾
	CL600 (ASME B16.5)	1100 (43.31)	215.9 (8.50)	97 / 98 ³⁾ (213.9 / 216.1 ³⁾
	CL900 (ASME B16.5)	1130 (44.49)	234.9 (9.25)	107 / 108 ³⁾ (235.9 / 238.1 ³⁾
	CL1500 (ASME B16.5)	1150 (45.28)	241.3 (9.50)	122 / 123 ³⁾ (269.0 / 271.2 ³⁾

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) On request

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 100 and flange DN 80 ... 100

All specified dimensions and weights are in mm (inch) or kg (lb).

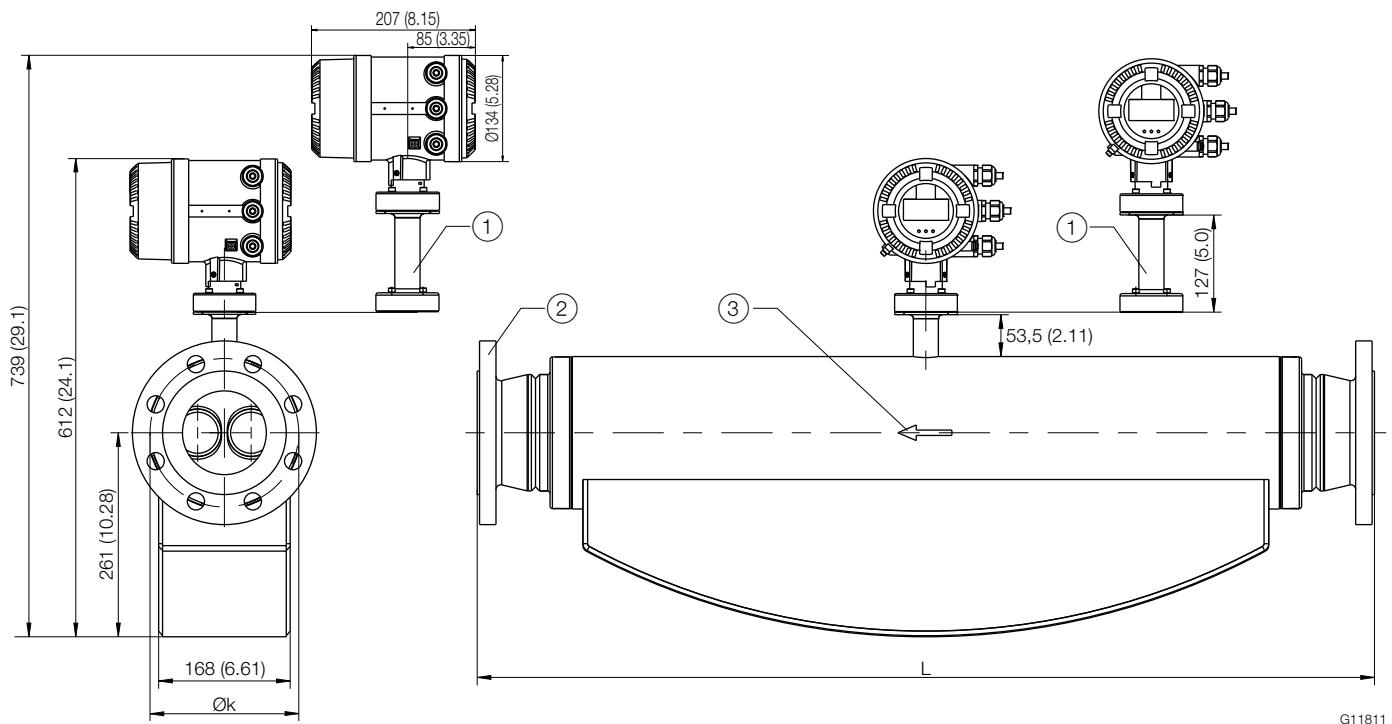


Fig. 20: Devices with integral mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 100 (4")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
80 (3")	PN 16 (EN 1092-1)	1222 (48.11)	160 (6.30)	122 / 1233 (269 / 2713))
	PN 40 (EN 1092-1)			123 / 1243 (271 / 2733))
	PN 63 (EN 1092-1)	1234 (48.58)	170 (6.69)	127 / 1283 (280 / 2823))
	PN 100 (EN 1092-1)		180 (7.09)	129 / 1303 (284 / 2873))
CL150 (ASME B16.5)	1244 (48.98)	152.4 (6.00)	124 / 1253 (273 / 2763))	126 / 1273 (278 / 2803))
		168.1 (6.62)	132 / 1333 (291 / 2933))	134 / 1353 (295 / 2983))
		168.1 (6.62)	135 / 1363 (298 / 3003))	137 / 1383 (302 / 3043))
CL900 (ASME B16.5)	1130 (44.49)	190.5 (7.50)	138 / 1393 (304 / 3063))	140 / 1413 (307 / 3113))
CL1500 (ASME B16.5)	1360 (45.67)	203.2 (8.00)	150 / 1513 (331 / 3353))	152 / 1533 (355 / 3373))

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 100 (4")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
100 (4")	PN 16 (EN 1092-1)	1122 (44.17)	180 (7.09)	119 / 1203 (262 / 2653))
	PN 40 (EN 1092-1)	1144 (45.04)	190 (7.48)	122 / 1233 (269 / 2713))
	PN 63 (EN 1092-1)	1304 (51.34)	138 (5.43)	129 / 1303 (248 / 2873))
	PN 100 (EN 1092-1)	1334 (52.52)	150 (5.91)	137 / 1383 (302 / 3043))
	CL150 (ASME B16.5)	1144 (45.04)	190.5 (7.50)	123 / 1243 (271 / 2733))
	CL300 (ASME B16.5)	1324 (52.13)	200.2 (7.88)	135 / 1363 (298 / 3003))
	CL600 (ASME B16.5)	1354 (53.31)	215.9 (8.50)	137 / 1383 (302 / 3043))
	CL900 (ASME B16.5)	1380 (54.33)	234.9 (9.25)	157 / 1583 (346 / 3483))
	CL1500 (ASME B16.5)	1400 (55.12)	241.3 (9.50)	171 / 1723 (377 / 3793))
150 (6")	PN 16 (EN 1092-1)	1300 (51.18)	240 (9.44)	128 / 1293 (282 / 2843))
	PN 40 (EN 1092-1)		250 (9.84)	136 / 1373 (300 / 3023))

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 150 and flange DN 150

All specified dimensions and weights are in mm (inch) or kg (lb).

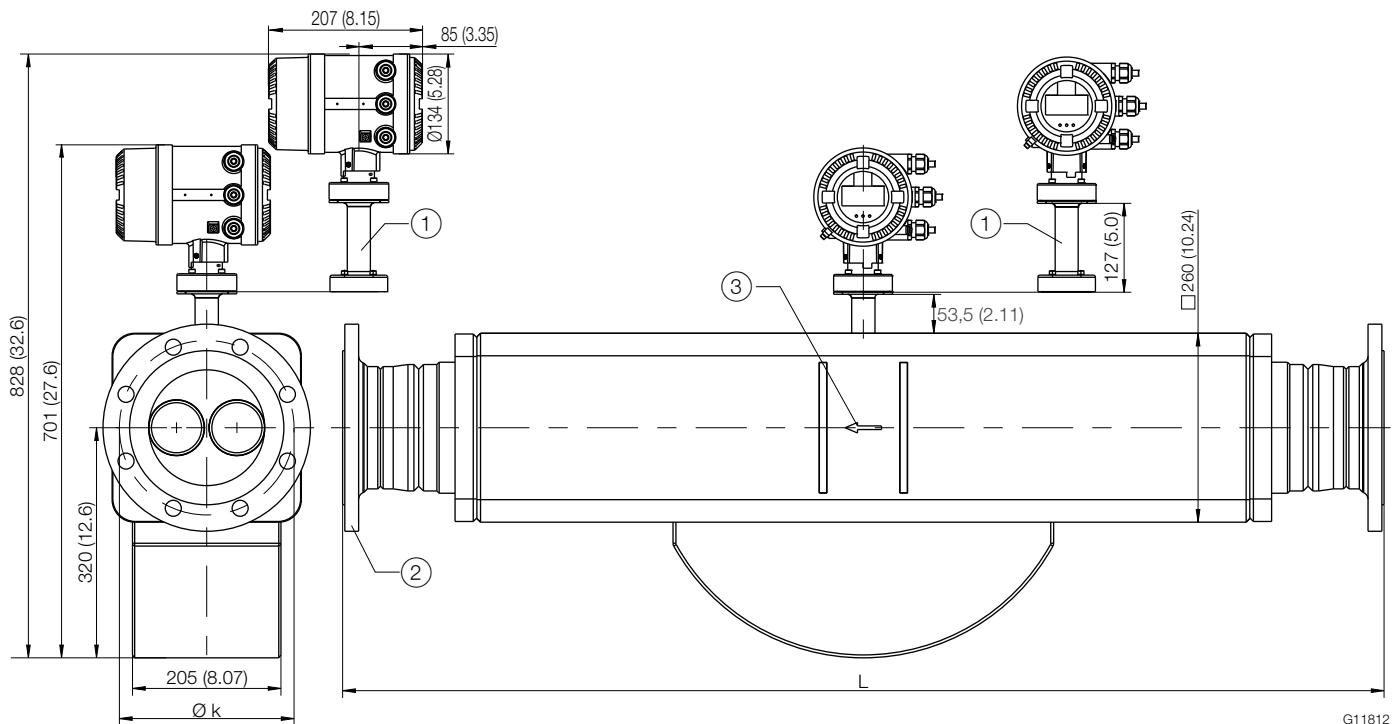


Fig. 21: Devices with integral mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 150 (6")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
150 (6")	PN 16 (EN 1092-1)	1421 (55.94)	240 (9.45)	174 / 175 ³⁾ (384 / 386 ³⁾)
	PN 40 (EN 1092-1)	1461 (57.52)	250 (9.84)	182 / 183 ³⁾ (401 / 403 ³⁾)
	CL150 (ASME B16.5)	1485 (58.46)	241.3 (9.50)	181 / 182 ³⁾ (399 / 401 ³⁾)
	CL300 (ASME B16.5)	1505 (59.25)	269.7 (10.62)	199 / 200 ³⁾ (439 / 441 ³⁾)
	CL600 (ASME B16.5)	1555 (61.22)	292.1 (11.50)	221 / 222 ³⁾ (487 / 489 ³⁾)
	CL900 (ASME B16.5)	1605 (63.19)	317.5 (12.5)	245 / 246 ³⁾ (540 / 542 ³⁾)
	CL1500 (ASME B16.5)	1665 (65.55)		287 / 288 ³⁾ (633 / 635 ³⁾)

1) Devices with transmitter housing made from aluminum.

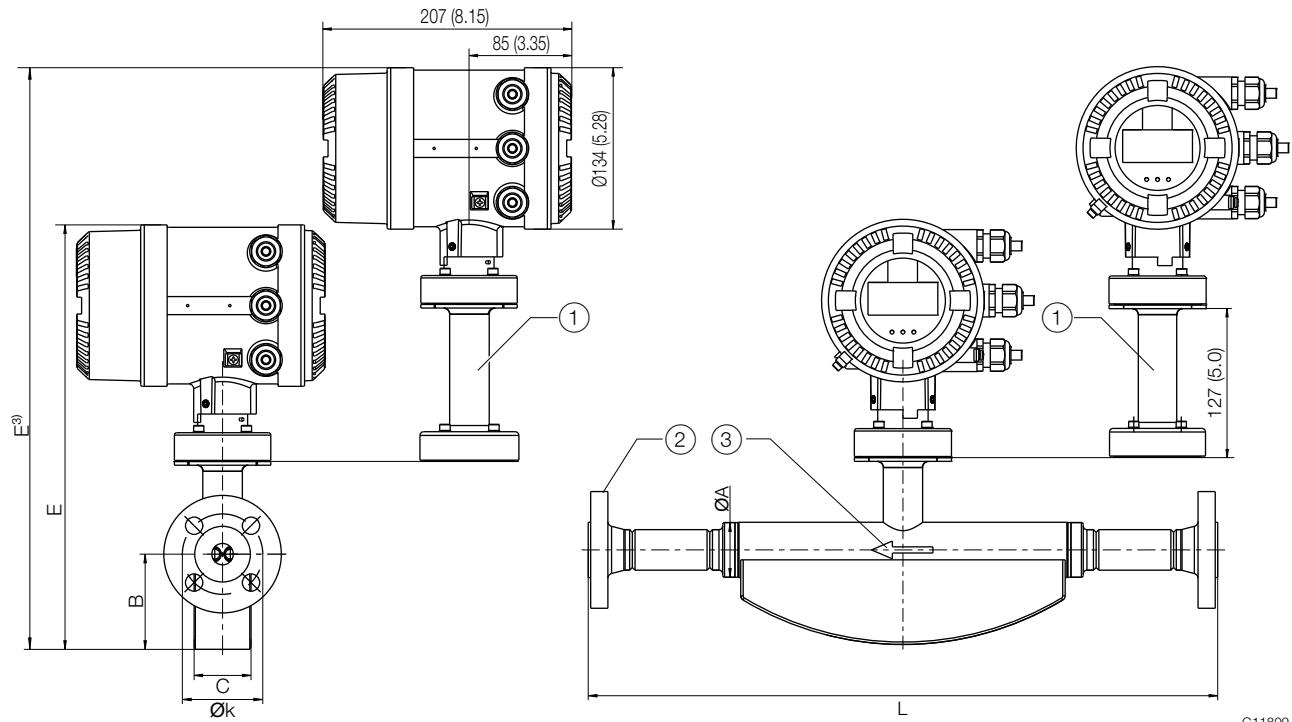
2) Devices with transmitter housing made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -5 mm (+0 / -0.2 inch)

Devices DN 15 ... 150 in NAMUR standard installation lengths (order option S5)

All specified dimensions and weights are in mm (inch) or kg (lb).



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Fig. 22: Devices with integral mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1 (3) flow direction

Sensor with measuring agents made from stainless steel

Meter tube	Process connection	L	$\varnothing k$	$\varnothing A$	B	C	E	Approx. weight	
								Aluminum ¹⁾	Stainless steel ²⁾
DN 15 (1/2")	DN 15 (1/2") / PN 40 (EN 1092-1)	510 (20.08)	60 (2.4) (20.08)	44.5 (1.8)	77 (3.0)	46 (1.8) (3.0)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾	9.5 / 10.5 ³⁾ (20.9 / 23.2 ³⁾	12.5 / 13.5 ³⁾ (27.6 / 29.8 ³⁾
DN 25 (1")	DN 25 (1") / PN 40 (EN 1092-1)	600 (23.62)	75 (3.0) (23.62)	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾	11 / 12 ³⁾ (24.3 / 26.53)	14 / 15 ³⁾ (30.9 / 33.1 ³⁾
DN 50 (1")	DN 50 (1") / PN 40 (EN 1092-1)	715 (28.15)	125 (4.92)	99 (3.9)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾	27 / 28 ³⁾ (59.5 / 61.7 ³⁾	30 / 31 ³⁾ (66.1 / 68.3 ³⁾
DN 80 (3")	DN 80 (3") / PN 40 (EN 1092-1)	915 (36.02)	160 (6.30)	155 (6.1)	183 (7.2)	123 (4.84)	502 / 629 ³⁾ (19.76 / 24.76 ³⁾	70 / 71 ³⁾ (154 / 157 ³⁾	73 / 74 ³⁾ (161 / 163 ³⁾
DN 100 (4")	DN 100 (4") / PN 16 (EN 1092-1)	1400 (55.12)	180 (7.09)	195 (7.68)	261 (10.28)	168 (6.61)	612 / 739 ³⁾ (24.1 / 29.1 ³⁾	119 / 120 ³⁾ (262 / 265 ³⁾	122 / 123 ³⁾ (269 / 271 ³⁾
DN 150 (6")	DN 150 (6") / PN 16 (EN 1092-1)	1700 (66.93)	240 (9.45)	260 (10.24)	320 (12.6)	205 (8.07)	701 / 828 ³⁾ (27.6 / 32.6 ³⁾	174 / 175 ³⁾ (384 / 386 ³⁾	177 / 178 ³⁾ (390 / 392 ³⁾

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 15 ... 80 and connections in accordance with DIN 11851, DIN 32676, DIN ISO 228, ASME BPE and ASME B 1.20.1

All specified dimensions and weights are in mm (inch) or kg (lb).

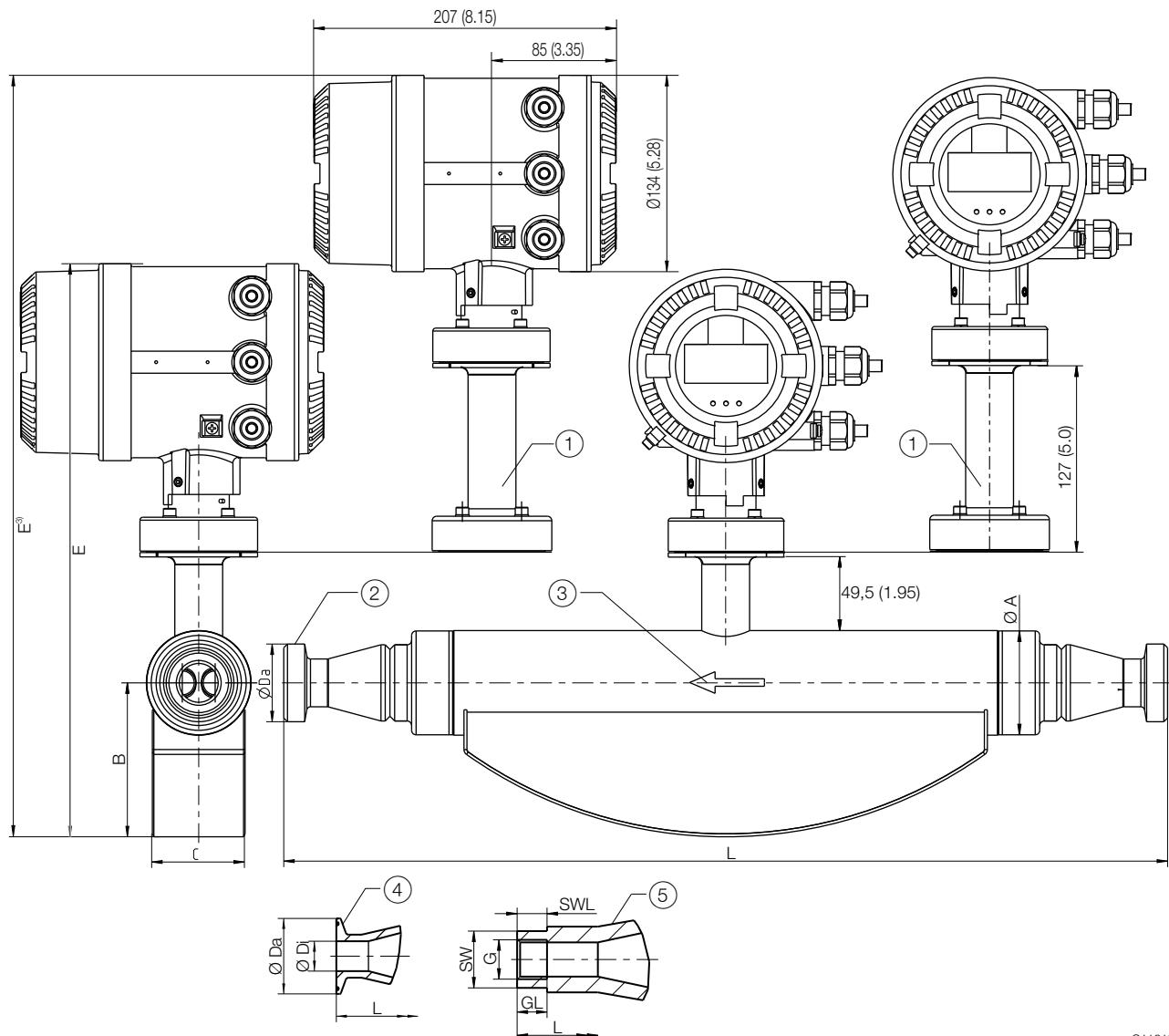


Fig. 23: Devices with integral mount design

- ① Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- ② Threaded spud in accordance with DIN 11851
- ③ Flow direction
- ④ Terminal in accordance with DIN 32676 and ASME BPE
- ⑤ Internal-thread connection in accordance with DIN ISO 228 and ASME B 1.20.1

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN 11851

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	10 (3/8")	40	413 (16.3)	RD 28x1/8"	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	15 (1/2")			RD 34x1/8"	16 (0.63)						
	20 (3/4")			RD 44x1/6"	20 (0.79)						
25 (1")	20 (3/4")	590 (23.2)	590 (23.2)	RD 44x1/6"	20 (0.79)	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾)	11 / 12 ³⁾ (24 / 27 ³⁾)	14 / 15 ³⁾ (31 / 33 ³⁾)
	25 (1")			RD 52x1/6"	26 (1.02)						
	40 (1 1/2")			RD 65x1/6"	38 (1.5)						
50 (2")	40 (1 1/2")	25	763 (30.0)	RD 65x1/6"	38 (1.5)	99 (3.46)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾)	27 / 28 ³⁾ (60 / 62 ³⁾)	30 / 31 ³⁾ (66 / 68 ³⁾)
	50 (2")			RD 78x1/6"	50 (1.97)						
	65 (2 1/2")			RD 95x1/6"	66 (2.6)						
80 (3")	65 (2 1/2")	990 (39.0)	990 (39.0)	RD 95x1/6"	66 (2.6)	155 (6.10)	183 (7.20)	123 (4.84)	502 / 629 ³⁾ (19.76 / 24.76 ³⁾)	68 / 69 ³⁾ (150 / 152 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)
	80 (3")			RD 110x1/4"	81 (3.19)						
	100 (4")			RD 130x1/4"	100 (3.94)						

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN 32676

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	10 (3/8")	40	410 (16.1)	34 (1.34)	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	15 (1/2")				16 (0.63)						
	20 (3/4")				20 (0.79)						
25 (1")	20 (3/4")	590 (23.2)	590 (23.2)	50.5 (1.99)	20 (0.79)	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾)	11 / 12 ³⁾ (24 / 27 ³⁾)	14 / 15 ³⁾ (31 / 33 ³⁾)
	25 (1")				26 (1.02)						
	40 (1 1/2")				38 (1.5)						
50 (2")	40 (1 1/2")	763 (30.0)	763 (30.0)	38 (1.5)	38 (1.5)	99 (3.46)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾)	27 / 28 ³⁾ (60 / 62 ³⁾)	30 / 31 ³⁾ (66 / 68 ³⁾)
	50 (2")				64 (2.52)						
	65 (2 1/2")				91 (3.58)						
80 (3")	65 (2 1/2")	10	950 (37.4)	66 (2.6)	66 (2.6)	155 (6.10)	183 (7.20)	123 (4.84)	502 / 629 ³⁾ (19.76 / 24.76 ³⁾)	68 / 69 ³⁾ (150 / 152 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)
	80 (3")				81 (3.19)						
	100 (4")				119 (4.69)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with ASME BPE

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	3/8"-Type A	10	—	—	—	44.5 (1.75)	77 (3.03)	46 (1.81)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	1/2"-Type A		433 (17.05)	25 (0.98)	9.4 (0.37)						
	3/4"-Type A		—	—	—						
25 (1")	3/4"-Type A		—	—	—	69.5 (2.74)	103 (4.06)	62 (2.44)	387 / 514 ³⁾ (15.24 / 16.34 ³⁾)	11 / 12 ³⁾ (24 / 27 ³⁾)	14 / 15 ³⁾ (31 / 33 ³⁾)
	1"-Type B		590 (23.23)	50.4 (1.98)	22.1 (0.87)						
	1 1/2"-Type B		—	—	—						
50 (2")	1 1/2"-Type B		—	—	—	99 (3.46)	125 (4.92)	80 (3.15)	424 / 551 ³⁾ (16.69 / 21.69 ³⁾)	27 / 28 ³⁾ (60 / 62 ³⁾)	30 / 31 ³⁾ (66 / 68 ³⁾)
	2"-Type B		740 (29.13)	63.9 (2.52)	47.5 (1.87)						
	2 1/2"-Type B		—	—	—						
80 (3")	2 1/2"-Type B		950 (37.40)	77.4 (3.05)	60.2 (2.37)	155 (6.10)	183 (7.20)	183 (7.20)	502 / 629 ³⁾ (19.76 / 24.76 ³⁾)	68 / 69 ³⁾ (150 / 152 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)
	3"-Type B		910 (35.83)	90.9 (3.19)	72.9 (2.87)						
	4"-Type B		910 (35.83)	118.9 (4.68)	97.4 (3.83)						

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN ISO 228 and ASME B 1.20.1

Meter tube	Process connection		L	GL	WS ⁴⁾	WS L	Ø A	B	C	E	Approx. weight							
	DN / G	PN									Aluminum ¹⁾	Stainless steel ²⁾						
15 (1/2")	8 (1/4") / G 1/4"	100	450 (17.72)	10 (0.39)	19	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	350 / 477 ³⁾ (13.78 / 18.78 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)						
	15 (1/2") / G 1/2"				13.5 (0.53)	27												
	25 (1") / G 1"			490 (19.29)	17 (0.67)	50												
	15 (1/2") / 1/2" NPT					27												

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) Dimension SW: Width across flats specified in mm.

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Dimensions for devices with remote mount design

Devices with meter tube nominal diameter DN 15 ... 50 and flange DN 10 ... 65

All specified dimensions and weights are in mm (inch) or kg (lb).

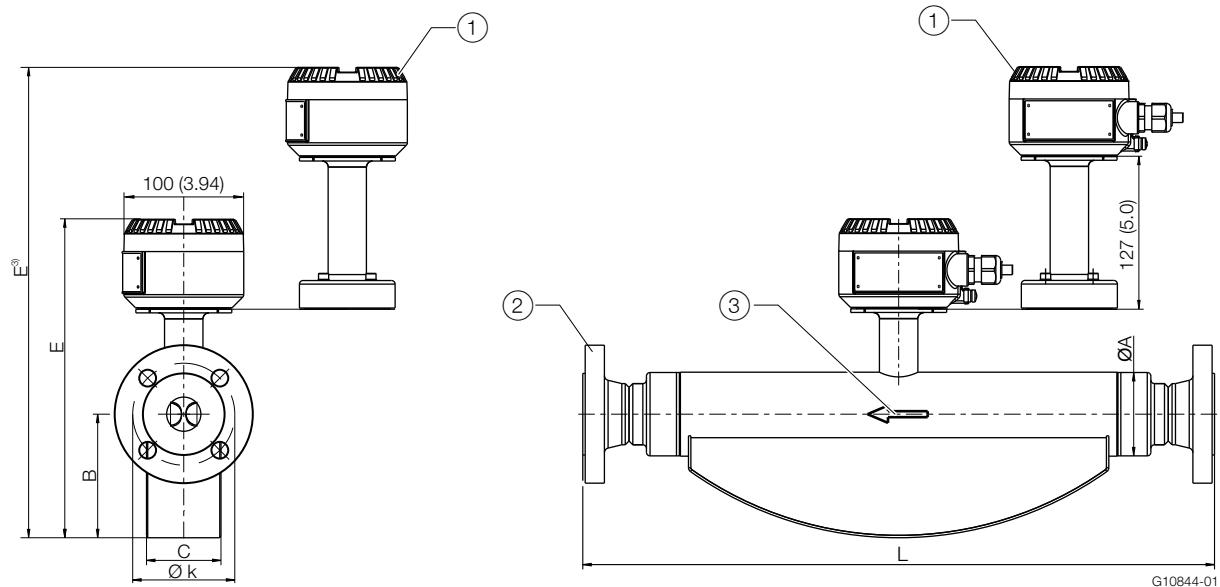


Fig. 24: Devices with remote mount design

(1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"

(2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))

(3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 (1/2")							Approx. weight		
DN / process connection		L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	Stainless steel ^[2]
10 (3/8)	PN 40 (EN 1092-1)	385 (15.2)	60 (2.4)	44.5 (1.8)	77 (3.0)	46 (1.8)	227 / 354 ³⁾ (8.94 / 13.94 ³⁾	9 / 10 ³⁾ (19.8 / 22 ³⁾)	12 / 13 ³⁾ (26.5 / 28.7 ³⁾)
	JIS 10K	385 (15.2)	65 (2.6)						
15 (1/2)	PN 40 (EN 1092-1)	385 (15.2)	65 (2.6)						
	PN 63 (EN 1092-1)	403 (15.9)	75 (3.0)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	435 (17.1)	60.5 (2.4)						
	CL300 (ASME B16.5)	421 (16.6)	66.7 (2.6)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	421 (16.6)	82.6 (3.3)						
20 (3/4)	PN 40 (EN 1092-1)	421 (16.6)	75 (3.0)						
	CL150 (ASME B16.5)	421 (16.6)	69.9 (2.8)						
	JIS 10K	421 (16.6)	75 (3.0)						

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Sensor with measuring agents made from stainless steel								Approx. weight	
Dimensions for sensors featuring meter tubes with nominal diameter DN 25 (1")									
DN / process connection		L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	Stainless steel ²⁾
20 (3/4)	PN 40 (EN 1092-1)	576 (22.7)	75 (3.0)	69.5 (2.74)	103 (4.06)	62 (2.44)	266 / 393 ³⁾ (10.5 / 15.47 ³⁾)	11 / 12 ³⁾ (24.3 / 26.5 ³⁾)	14 / 15 ³⁾ (30.9 / 33.1 ³⁾)
	CL150 (ASME B16.5)	575 (22.6)	69.9 (2.8)						
	JIS 10K	576 (22.7)	75 (3.0)						
25 (1)	PN 40 (EN 1092-1)	525 (20.7)	85 (3.3)						
	PN 63 (EN 1092-1)	564 (22.2)	100 (3.9)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	575 (22.6)	79.2 (3.1)						
	CL300 (ASME B16.5)	575 (22.6)	88.9 (3.5)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	575 (22.6)	82.6 (3.25)						
40 (1 1/2)	PN 40 (EN 1092-1)	576 (22.7)	110 (4.33)						
	PN 63 (EN 1092-1)	572 (22.5)	125 (4.92)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	576 (22.7)	98.6 (3.88)						
	CL300 (ASME B16.5)	576 (22.7)	114.3 (45.0)						
	CL600 (ASME B16.5)								
	JIS 10K	576 (22.7)	105 (4.13)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 50 (2")							Approx. weight		
DN / process connection		L	Ø k	Ø A	B	C	E	Aluminum ¹⁾	Stainless steel ²⁾
40 (1 1/2)	PN 40 (EN 1092-1)	763 (30)	110 (4.33)	99 (3.9)	125 (4.92)	80 (3.15)	303 / 430 ³⁾ (11.9 / 16.93 ³⁾)	27 / 28 ³⁾ (59,5 / 61,7 ³⁾)	30 / 31 ³⁾ (66,1 / 68,3 ³⁾)
	PN 63 (EN 1092-1)	745 (29.33)	125 (4.92)						
	PN 100 (EN 1092-1)								
	CL150 (ASME B16.5)	763 (30)	98.6 (3.88)						
	CL300 (ASME B16.5)	756 (29.76)	114.3 (4.5)						
	CL600 (ASME B16.5)								
	CL900 (ASME B16.5)	780 (30.71)	124 (4.88)						
50 (2)	CL1500 (ASME B16.5)								
	JIS 10K	763 (30)	105 (4.13)						
	PN 40 (EN 1092-1)	715 (28.15)	125 (4.92)						
	PN 63 (EN 1092-1)	745 (29.33)	135 (5.31)						
	PN 100 (EN 1092-1)	757 (29.8)	145 (5.71)						
	CL150 (ASME B16.5)	715 (28.15)	120.7 (4.75)						
	CL300 (ASME B16.5)	763 (30)	127 (5.0)						
	CL600 (ASME B16.5)	773 (30.43)	127 (5.0)						
65 (2 1/2)	CL900 (ASME B16.5)	790 (31.1)	165.1 (6.5)						
	CL1500 (ASME B16.5)								
	JIS 10K	715 (28.15)	120 (4.72)						
	PN 40 (EN 1092-1)	763 (30)	145 (5.71)						
	CL150 (ASME B16.5)	763 (30)	139.7 (5.5)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 80 and flange DN 65 ... 100

All specified dimensions and weights are in mm (inch) or kg (lb).

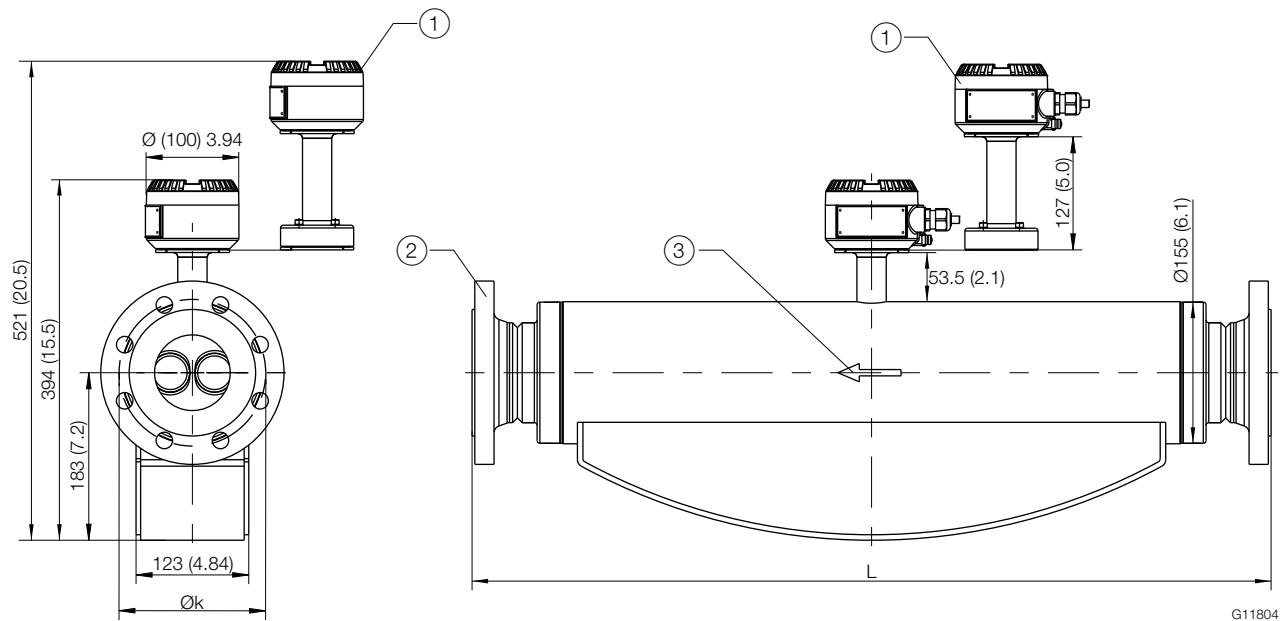


Fig. 25: Devices with remote mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 80 (3")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
65 (2 1/2")	PN 16 (EN 1092-1)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	PN 40 (EN 1092-1)	910 (35.83)	145 (5.71)	70 / 71 ³⁾ (154.3 / 156.5 ³⁾)
	PN 63 (EN 1092-1)		160 (6.30)	74 / 75 ³⁾ (163.1 / 165.4 ³⁾)
	PN 100 (EN 1092-1)		170 (6.69)	78 / 79 ³⁾ (172 / 174.2 ³⁾)
	CL150 (ASME B16.5)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	CL300 (ASME B16.5)	920 (36.22)	149.4 (5.88)	72 / 73 ³⁾ (158.7 / 160.9 ³⁾)
	CL600 (ASME B16.5)			73 / 74 ³⁾ (160.9 / 163.1 ³⁾)
	CL900 (ASME B16.5)	965 (37.99)	190.5 (7.50)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾)
	CL1500 (ASME B16.5)			93 / 94 ³⁾ (205.3 / 207.23 ³⁾)

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) On request

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 80 (3")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
80 (3")	PN 16 (EN 1092-1)	870 (34.25)	160 (6.30)	70 / 71 ³⁾ (154.3 / 156.5 ³⁾
	PN 40 (EN 1092-1)			71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	PN 63 (EN 1092-1)	910 (35.83)	170 (6.69)	75 / 76 ³⁾ (163.1 / 167.6 ³⁾
	PN 100 (EN 1092-1)		180 (7.09)	81 / 82 ³⁾ (178.6 / 180.8 ³⁾
	CL150 (ASME B16.5)	880 (34.65)	152.4 (6.00)	71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	CL300 (ASME B16.5)	895 (35.24)	168.1 (6.62)	75 / 76 ³⁾ (163.1 / 167.6 ³⁾
	CL600 (ASME B16.5)	920 (36.22)		78 / 79 ³⁾ (172.0 / 174.2 ³⁾
	CL900 (ASME B16.5)	1100 (43.31)	190.5 (7.50)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
100 (4")	CL1500 (ASME B16.5)	1130 (44.49)	203.2 (8.00)	102 / 103 ³⁾ (224.9 / 227.0 ³⁾
	PN 16 (EN 1092-1)	875 (34.45)	190 (7.48)	71 / 72 ³⁾ (156.5 / 158.7 ³⁾
	PN 40 (EN 1092-1)			73 / 74 ³⁾ (161 / 163 ³⁾
	PN 63 (EN 1092-1)	1060 (41.73)	200 (7.87)	82 / 83 ³⁾ (180.8 / 183.0 ³⁾
	PN 100 (EN 1092-1)	1080 (42.52)	210 (8.27)	90 / 91 ³⁾ (198.4 / 200.6 ³⁾
	CL150 (ASME B16.5)	— ⁴⁾	— ⁴⁾	— ⁴⁾
	CL300 (ASME B16.5)	1075 (42.32)	200.2 (7.88)	87 / 88 ³⁾ (191.8 / 194.0 ³⁾
	CL600 (ASME B16.5)	1100 (43.31)	215.9 (8.50)	97 / 98 ³⁾ (213.9 / 216.1 ³⁾
	CL900 (ASME B16.5)	1130 (44.49)	234.9 (9.25)	107 / 108 ³⁾ (235.9 / 238.1 ³⁾
	CL1500 (ASME B16.5)	1150 (45.28)	241.3 (9.50)	122 / 123 ³⁾ (269.0 / 271.2 ³⁾

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) On request

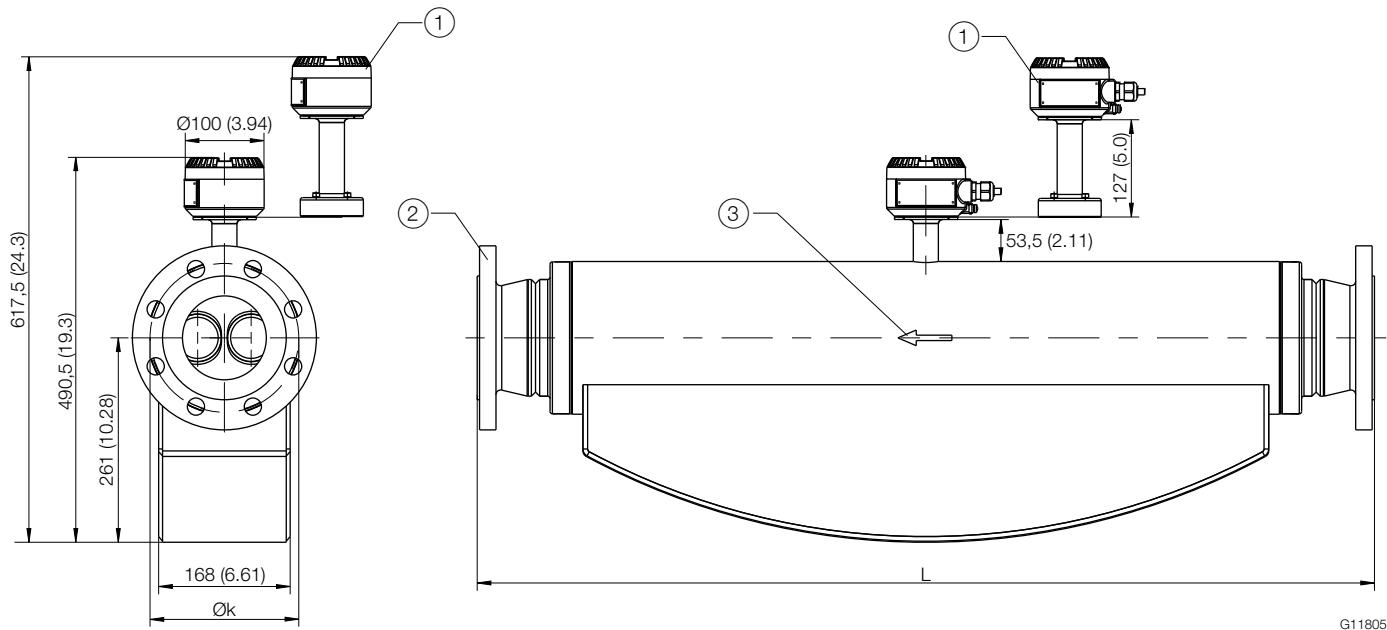
Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 100 and flange DN 80 ... 100

All specified dimensions and weights are in mm (inch) or kg (lb).



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Fig. 26: Devices with remote mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 100 (4")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
80 (3")	PN 16 (EN 1092-1)	1222 (48.11)	160 (6.30)	122 / 1233 (269 / 2713))
	PN 40 (EN 1092-1)			125 / 1263 (276 / 2783))
	PN 63 (EN 1092-1)	1234 (48.58)	170 (6.69)	127 / 1283 (280 / 2823))
	PN 100 (EN 1092-1)		180 (7.09)	129 / 1303 (284 / 2873))
CL150 (ASME B16.5)	1244 (48.98)	152.4 (6.00)	124 / 1253 (273 / 2763))	126 / 1273 (278 / 2803))
		168.1 (6.62)	132 / 1333 (291 / 2933))	134 / 1353 (295 / 2983))
		168.1 (6.62)	135 / 1363 (298 / 3003))	137 / 1383 (302 / 3043))
CL900 (ASME B16.5)	1130 (44.49)	190.5 (7.50)	138 / 1393 (304 / 3063))	140 / 1413 (307 / 3113))
CL1500 (ASME B16.5)	1360 (45.67)	203.2 (8.00)	150 / 1513 (331 / 3353))	152 / 1533 (355 / 3373))

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 100 (4")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
100 (4")	PN 16 (EN 1092-1)	1122 (44.17)	180 (7.09)	119 / 1203 (262 / 2653))
	PN 40 (EN 1092-1)	1144 (45.04)	190 (7.48)	122 / 1233 (269 / 2713))
	PN 63 (EN 1092-1)	1304 (51.34)	138 (5.43)	129 / 1303 (248 / 2873))
	PN 100 (EN 1092-1)	1334 (52.52)	150 (5.91)	137 / 1383 (302 / 3043))
	CL150 (ASME B16.5)	1144 (45.04)	190.5 (7.50)	123 / 1243 (271 / 2733))
	CL300 (ASME B16.5)	1324 (52.13)	200.2 (7.88)	135 / 1363 (298 / 3003))
	CL600 (ASME B16.5)	1354 (53.31)	215.9 (8.50)	137 / 1383 (302 / 3043))
	CL900 (ASME B16.5)	1380 (54.33)	234.9 (9.25)	157 / 1583 (346 / 3483))
	CL1500 (ASME B16.5)	1400 (55.12)	241.3 (9.50)	171 / 1723 (377 / 3793))
150 (6")	PN 16 (EN 1092-1)	1300 (51.18)	240 (9.44)	128 / 1293 (282 / 2843))
	PN 40 (EN 1092-1)		250 (9.84)	136 / 1373 (300 / 3023))

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 150 and flange DN 150

All specified dimensions and weights are in mm (inch) or kg (lb).

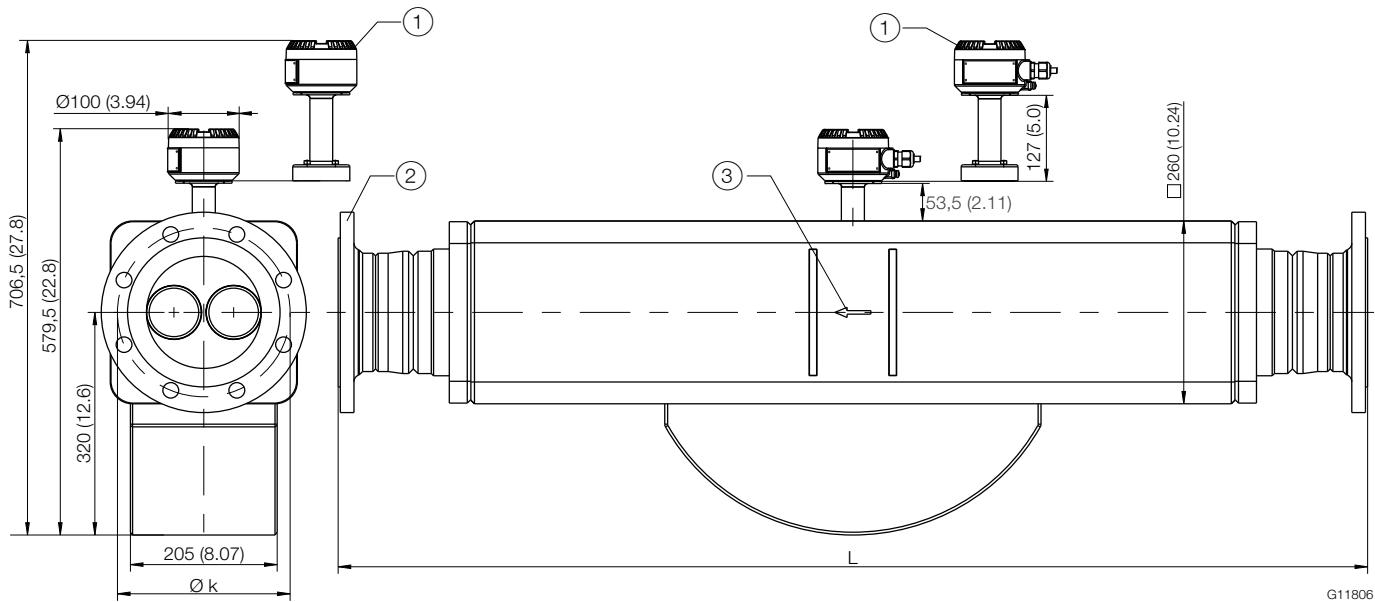


Fig. 27: Devices with remote mount design

- (1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- (2) Flange in accordance with EN 1092-1, ASME B16.5, ISO 7005 (connection dimensions for ASME flanges in accordance with ASME B16.5 (ANSI))
- (3) Flow direction

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 150 (6")			Approx. weight	
DN / process connection	L	Ø k	Aluminum ¹⁾	Stainless steel ²⁾
150 (6")	PN 16 (EN 1092-1)	1421 (55.94)	240 (9.45)	174 / 175 ³⁾ (384 / 386 ³⁾)
	PN 40 (EN 1092-1)	1461 (57.52)	250 (9.84)	182 / 183 ³⁾ (401 / 403 ³⁾)
	CL150 (ASME B16.5)	1485 (58.46)	241.3 (9.50)	181 / 182 ³⁾ (399 / 401 ³⁾)
	CL300 (ASME B16.5)	1505 (59.25)	269.7 (10.62)	199 / 200 ³⁾ (439 / 441 ³⁾)
	CL600 (ASME B16.5)	1555 (61.22)	292.1 (11.50)	221 / 222 ³⁾ (487 / 489 ³⁾)
	CL900 (ASME B16.5)	1605 (63.19)	317.5 (12.5)	245 / 246 ³⁾ (540 / 542 ³⁾)
	CL1500 (ASME B16.5)	1665 (65.55)		287 / 288 ³⁾ (633 / 635 ³⁾)

1) Devices with transmitter housing made from aluminum.

2) Devices with transmitter housing made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -5 mm (+0 / -0.2 inch)

Devices DN 15 ... 150 in NAMUR standard installation lengths (order option S5)

All specified dimensions and weights are in mm (inch) or kg (lb).

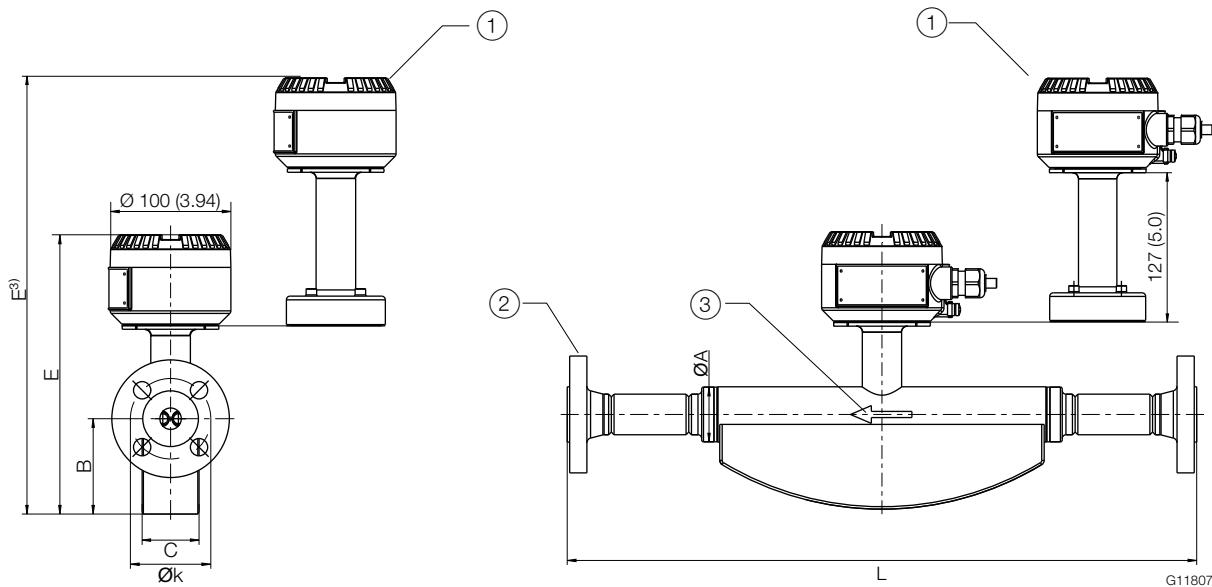


Fig. 28: Devices with remote mount design

(1) Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"

(2) Flange in accordance with EN 1092-1 (3) flow direction

Sensor with measuring agents made from stainless steel

Meter tube	Process connection	L	Ø k	Ø A	B	C	E	Approx. weight	
								Aluminum ¹⁾	Stainless steel ²⁾
DN 15 (1/2")	DN 15 (1/2") / PN 40 (EN 1092-1)	510 (20.08)	60 (2.4) (1.8)	44.5 (1.8)	77 (3.0)	46 (1.8)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾)	9.5 / 10.5 ³⁾ (20.9 / 23.2 ³⁾)	12.5 / 13.5 ³⁾ (27.6 / 29.8 ³⁾)
DN 25 (1")	DN 25 (1") / PN 40 (EN 1092-1)	600 (23.62)	75 (3.0) (2.74)	69.5 (2.46)	103 (4.06)	62 (2.44)	266.5 / 393.5 ³⁾ (10.5 / 15.5 ³⁾)	11 / 12 ³⁾ (24.3 / 26.53))	14 / 15 ³⁾ (30.9 / 33.1 ³⁾)
DN 50 (1")	DN 50 (1") / PN 40 (EN 1092-1)	715 (28.15)	125 (4.92)	99 (3.9)	125 (4.92)	80 (3.15)	303.5 / 430.5 ³⁾ (11.9 / 16.9 ³⁾)	27 / 28 ³⁾ (59.5 / 61.7 ³⁾)	30 / 313) (66.1 / 68.3 ³⁾)
DN 80 (3")	DN 80 (3") / PN 40 (EN 1092-1)	915 (36.02)	160 (6.30)	155 (6.1)	183 (7.2)	123 (4.84)	394.5 / 521.5 ³⁾ (15.5 / 20.5 ³⁾)	70 / 71 ³⁾ (154 / 157 ³⁾)	73 / 74 ³⁾ (161 / 163 ³⁾)
DN 100 (4")	DN 100 (4") / PN 16 (EN 1092-1)	1400 (55.12)	180 (7.09)	195 (7.68)	261 (10.28)	168 (6.61)	490.5 / 617.5 ³⁾ (19.3 / 24.3 ³⁾)	119 / 120 ³⁾ (262 / 265 ³⁾)	122 / 123 ³⁾ (269 / 271 ³⁾)
DN 150 (6")	DN 150 (6") / PN 16 (EN 1092-1)	1700 (66.93)	240 (9.45)	260 (10.24)	320 (12.6)	205 (8.07)	579.5 / 706.5 ³⁾ (22.8 / 27.8 ³⁾)	174 / 175 ³⁾ (384 / 386 ³⁾)	177 / 178 ³⁾ (390 / 392 ³⁾)

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

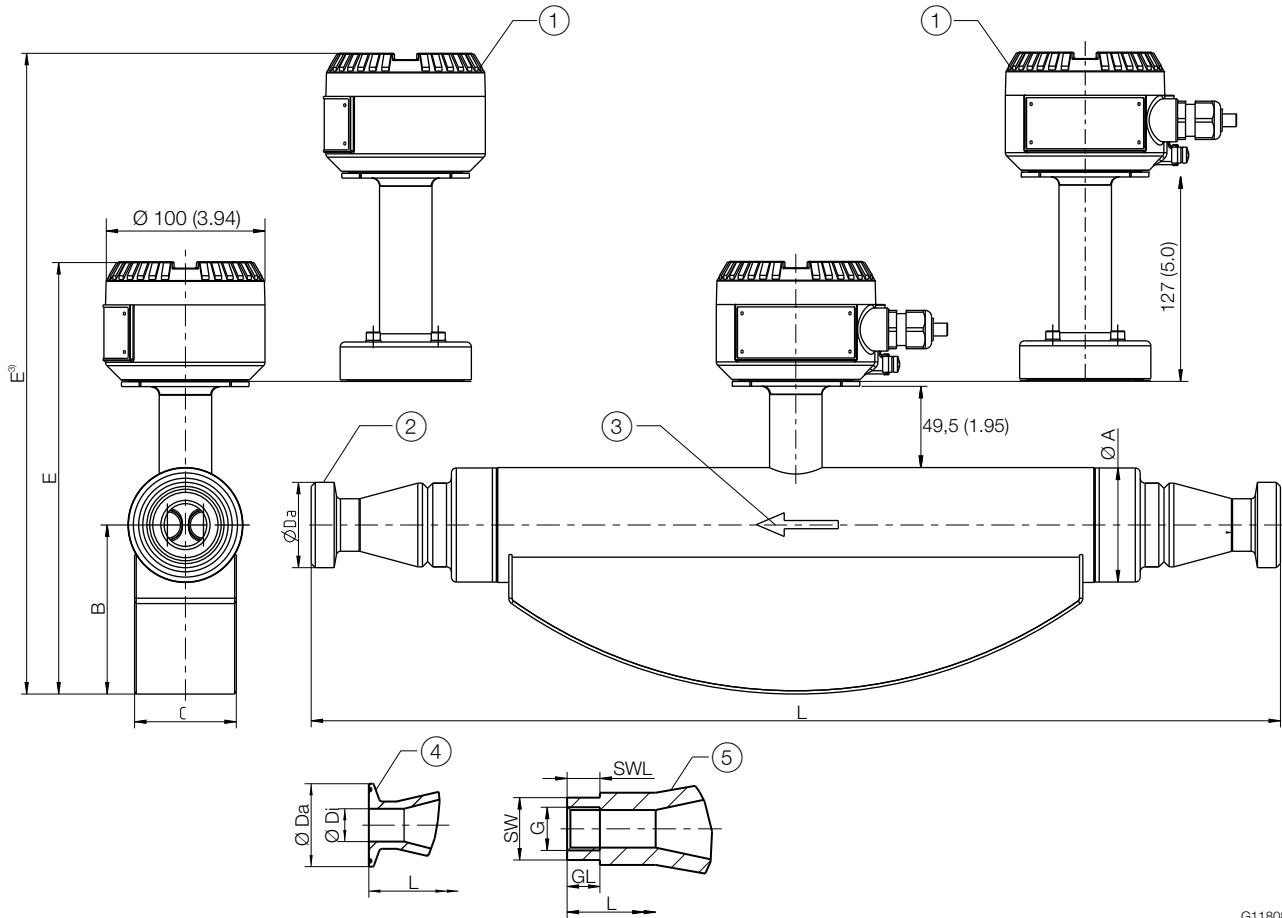
Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Devices with meter tube nominal diameter DN 15 ... 80 and connections in accordance with DIN 11851, DIN 32676, DIN ISO 228, ASME BPE and ASME B 1.20.1

All specified dimensions and weights are in mm (inch) or kg (lb).



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Fig. 29: Devices with remote mount design

- ① Option TE1 "Extended tower length" or option PR4 / PR5 / PR6 / PR7 "Pressure-resistant sensor housing"
- ② Threaded spud in accordance with DIN 11851 ③ Flow direction ④ Terminal in accordance with DIN 32676 and ASME BPE
- ⑤ Internal-thread connection in accordance with DIN ISO 228 and ASME B 1.20.1

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN 11851

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	10 (3/8")	40	413 (16.3)	RD 28x1/8"	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾	9 / 10 ³⁾ (20 / 22 ³⁾	12 / 13 ³⁾ (27 / 29 ³⁾
	15 (1/2")			RD 34x1/8"	16 (0.63)						
	20 (3/4")			RD 44x1/6"	20 (0.79)						
25 (1")	20 (3/4")	590 (23.2)	590 (23.2)	RD 44x1/6"	20 (0.79)	69.5 (2.74)	103 (4.06)	62 (2.44)	266.5 / 393.5 ³⁾ (10.5 / 15.5 ³⁾	11 / 12 ³⁾ (24 / 27 ³⁾	14 / 15 ³⁾ (31 / 33 ³⁾
	25 (1")			RD 52x1/6"	26 (1.02)						
	40 (1 1/2")			RD 65x1/6"	38 (1.5)						
50 (2")	40 (1 1/2")	25	763 (30.0)	RD 65x1/6"	38 (1.5)	99 (3.46)	125 (4.92)	80 (3.15)	303.5 / 430.5 ³⁾ (11.9 / 16.9 ³⁾	27 / 28 ³⁾ (60 / 62 ³⁾	30 / 31 ³⁾ (66 / 68 ³⁾
	50 (2")			RD 78x1/6"	50 (1.97)						
	65 (2 1/2")			RD 95x1/6"	66 (2.6)						
80 (3")	65 (2 1/2")	990 (39.0)	990 (39.0)	RD 95x1/6"	66 (2.6)	155 (6.10)	183 (7.20)	123 (4.84)	394.5 / 521.5 ³⁾ (15.5 / 20.5 ³⁾	68 / 69 ³⁾ (150 / 152 ³⁾	71 / 72 ³⁾ (157 / 159 ³⁾
	80 (3")			RD 110x1/4"	81 (3.19)						
	100 (4")			RD 130x1/4"	100 (3.94)						

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN 32676

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	10 (3/8")	40	410 (16.1)	34 (1.34)	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾	9 / 10 ³⁾ (20 / 22 ³⁾	12 / 13 ³⁾ (27 / 29 ³⁾
	15 (1/2")				16 (0.63)						
	20 (3/4")				20 (0.79)						
25 (1")	20 (3/4")	590 (23.2)	590 (23.2)	20 (0.79)	69.5	103 (4.06)	62 (2.44)	266.5 / 393.5 ³⁾ (10.5 / 15.5 ³⁾	11 / 12 ³⁾ (24 / 27 ³⁾	14 / 15 ³⁾ (31 / 33 ³⁾	
	25 (1")				26 (1.02)						
	40 (1 1/2")				38 (1.5)						
50 (2")	40 (1 1/2")	763 (30.0)	763 (30.0)	38 (1.5)	99	125 (4.92)	80 (3.15)	303.5 / 430.5 ³⁾ (11.9 / 16.9 ³⁾	27 / 28 ³⁾ (60 / 62 ³⁾	30 / 31 ³⁾ (66 / 68 ³⁾	
	50 (2")				50.5 (1.99)						
	65 (2 1/2")				66 (2.6)						
80 (3")	65 (2 1/2")	10	950 (37.4)	66 (2.6)	155	183 (7.20)	123 (4.84)	394.5 / 521.5 ³⁾ (15.5 / 20.5 ³⁾	68 / 69 ³⁾ (150 / 152 ³⁾	71 / 72 ³⁾ (157 / 159 ³⁾	
	80 (3")				81 (3.19)						
	100 (4")				100 (3.94)						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with ASME BPE

Meter tube	Process connection		L	Ø DA	Ø Di	Ø A	B	C	E	Approx. weight	
	DN	PN								Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	3/8"-Type A	10	—	—	—	44.5 (1.75)	77 (3.03)	46 (1.81)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	1/2"-Type A		433 (17.05)	25 (0.98)	9.4 (0.37)						
	3/4"-Type A		—	—	—						
25 (1")	3/4"-Type A	590 (23.23)	—	—	—	69.5 (2.74)	103 (4.06)	62 (2.44)	266.5 / 393.5 ³⁾ (10.5 / 15.5 ³⁾)	11 / 12 ³⁾ (24 / 27 ³⁾)	14 / 15 ³⁾ (31 / 33 ³⁾)
	1"-Type B		590 (23.23)	50.4 (1.98)	22.1 (0.87)						
	1 1/2"-Type B		—	—	—						
50 (2")	1 1/2"-Type B	740 (29.13)	—	—	—	99 (3.46)	125 (4.92)	80 (3.15)	303.5 / 430.5 ³⁾ (11.9 / 16.9 ³⁾)	27 / 28 ³⁾ (60 / 62 ³⁾)	30 / 31 ³⁾ (66 / 68 ³⁾)
	2"-Type B		740 (29.13)	63.9 (2.52)	47.5 (1.87)						
	2 1/2"-Type B		—	—	—						
80 (3")	2 1/2"-Type B	950 (37.40)	77.4 (3.05)	60.2 (2.37)	155 (6.10)	183 (7.20)	183 (7.20)	394.5 / 521.5 ³⁾ (15.5 / 20.5 ³⁾)	68 / 69 ³⁾ (150 / 152 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)	71 / 72 ³⁾ (157 / 159 ³⁾)
	3"-Type B		910 (35.83)	90.9 (3.19)	72.9 (2.87)						
	4"-Type B		910 (35.83)	118.9 (4.68)	97.4 (3.83)						

Sensor with measuring agents made from stainless steel

Dimensions for sensors featuring meter tubes with nominal diameter DN 15 ... 80 (1/2" ... 3") and process connection in accordance with DIN ISO 228 and ASME B 1.20.1

Meter tube	Process connection		L	GL	WS ⁴⁾	WS L	Ø A	B	C	E	Approx. weight	
	DN	DN / G									Aluminum ¹⁾	Stainless steel ²⁾
15 (1/2")	8 (1/4") / G 1/4"	100	450 (17.72)	10 (0.39)	19	10 (0.39)	44.5 (1.75)	77 (3.03)	46 (1.81)	227.5 / 354.5 ³⁾ (9.0 / 14.0 ³⁾)	9 / 10 ³⁾ (20 / 22 ³⁾)	12 / 13 ³⁾ (27 / 29 ³⁾)
	15 (1/2") / G 1/2"			13.5 (0.53)	27	15 (0.59)						
	25 (1") / G 1"			490 (19.29)	17 (0.67)	50						
	15 (1/2") / 1/2" NPT			450 (17.72)	15.6 (0.61)	27						

1) Devices with terminal boxes made from aluminum.

2) Devices with terminal boxes made from stainless steel.

3) Devices with option TE1 "extended tower length" or option PR4 / PR5 / PR6 / PR7 "pressure-resistant sensor housing".

4) Dimension SW: Width across flats specified in mm.

Tolerance for dimension L: +0 / -3 mm (+0 / -0.018 inch)

Dimensions for devices with measuring agents made from nickel alloy

Sensor with measuring agents made from C4 or C22 nickel alloy

For devices with measuring agents made from C4 or C22 nickel alloy, the installation length (L) is different from previous tables. All other dimensions and the weight are unchanged. All dimensions specified in mm (inch).

Dimensions for sensors with process connection in accordance with EN 1092-1 and ASME B16.5 (ANSI)

Meter tube nominal diameter	Process connection	L						JIS 10K		
		EN 1092-1		PN 16	PN 40	PN 63	PN 100	ASME CL		
								CL150	CL300	CL600
DN 15 (1/2")	DN 10 (1/4")	—	449 (17.7)	449 (17.7)	449 (17.7)	—	—	—	449 (17.7)	
	DN 15 (1/2")	—	442 (17.4)	442 (17.4)	442 (17.4)	442 (17.4)	442 (17.4)	442 (17.4)	442 (17.4)	
	DN 20 (3/4")	—	428 (16.9)	428 (16.9)	428 (16.9)	428 (16.9)	428 (16.9)	428 (16.9)	428 (16.9)	
DN 25 (1")	DN 20 (3/4")	—	646 (25.4)	646 (25.4)	646 (25.4)	646 (25.4)	646 (25.4)	646 (25.4)	646 (25.4)	
	DN 25 (1")	—	614 (24.2)	614 (24.2)	614 (24.2)	614 (24.2)	614 (24.2)	614 (24.2)	614 (24.2)	
	DN 40 (1 1/2")	—	576 (22.7)	576 (22.7)	576 (22.7)	576 (22.7)	576 (22.7)	576 (22.7)	576 (22.7)	
DN 50 (2")	DN 40 (1 1/2")	—	814 (32.0)	814 (32.0)	814 (32.0)	814 (32.0)	814 (32.0)	814 (32.0)	814 (32.0)	
	DN 50 (2")	—	764 (30.1)	764 (30.1)	764 (30.1)	764 (30.1)	764 (30.1)	764 (30.1)	764 (30.1)	
	DN 65 (2 1/2")	—	819 (32.2)	819 (32.2)	819 (32.2)	792 (31.2)	792 (31.2)	792 (31.2)	819 (32.2)	
DN 80 (3")	DN 65 (2 1/2")	—	1021 (40.2)	1021 (40.2)	1021 (40.2)	1021 (40.2)	1021 (40.2)	1021 (40.2)	1021 (40.2)	
	DN 80 (3")	—	971 (38.2)	—	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	
	DN 100 (4")	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	971 (38.2)	
DN 100 (4")	DN 80 (3")	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	1357 (53.4)	
	DN 100 (4")	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	1280 (50.4)	
	DN 150 (6")	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	1261 (49.6)	
DN 150 (6")	DN 100 (4")	1592 (62.7)	1592 (62.7)	1632 (64.3)	1632 (64.3)	1592 (62.7)	1632 (64.3)	1632 (64.3)	1592 (62.7)	
	DN 150 (6")	1502 (59.1)	1502 (59.1)	1542 (60.7)	1542 (60.7)	1502 (59.1)	1542 (60.7)	1542 (60.7)	1502 (59.1)	

L dimension tolerance:

- Meter tube nominal diameter DN 15 ... 50 (1/2" ... 2"): +0 / -3 mm (+0 / -0.018 inch)
- Meter tube nominal diameter DN 80 (3"): +0 / -5 mm (+0 / -0.2 inch)
- Meter tube nominal diameter DN 100 ... 150 (4" ... 6"): +0 / -8 mm (+0 / -0.31 inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Ordering information

Main ordering information CoriolisMaster FCB330, FCB350

Base model

CoriolisMaster FCB330 Coriolis Mass Flowmeter	FCB330	XX	XX	XXXXX	XX	XX	X	X	XX	XX	X
CoriolisMaster FCB350 Coriolis Mass Flowmeter	FCB350	XX	XX	XXXXX	XX	XX	X	X	XX	XX	X

Explosion Protection Certification

General Purpose	Y0		Continued see next page
ATEX / IECEx, (Zone 2 / 22)	A2		
ATEX / IECEx, (Zone 1 / 21)	A1		
cFMus version Class 1 Div. 2 (Zone 2 / 21)	F2		
cFMus version Class 1 Div. 1 (Zone 1 / 21)	F1		
NEPSI (Zone 2 / 22)	S2		
NEPSI (Zone 1 / 21)	S1		

Connection Design / Connection Box Material / Cable Glands

Integral, defined by Transmitter housing	Y0	
Remote / Stainless Steel / 1 x M20 x 1.5	A1	
Remote / Stainless Steel / 1 x NPT 1/2 in.	A2	

Meter Size / Connection Size

DN 15 (1/2 in.) / DN 10 (1/4 in.)	015E1	
DN 15 (1/2 in.) / DN 15 (1/2 in.)	015R0	
DN 15 (1/2 in.) / DN 20 (3/4 in.)	015R1	
DN 25 (1 in.) / DN 20 (3/4 in.)	025E1	
DN 25 (1 in.) / DN 25 (1 in.)	025R0	
DN 25 (1 in.) / DN 40 (1-1/2 in.)	025R2	
DN 50 (2 in.) / DN 40 (1-1/2 in.)	050E1	
DN 50 (2 in.) / DN 50 (2 in.)	050R0	
DN 50 (2 in.) / DN 65 (2-1/2 in.)	050R1	
DN 80 (3 in.) / DN 65 (2-1/2 in.)	080E1	
DN 80 (3 in.) / DN 80 (3 in.)	080R0	
DN 80 (3 in.) / DN 100 (4 in.)	080R1	
DN 100 (4 in.) / DN 80 (3 in.)	100E1	
DN 100 (4 in.) / DN 100 (4 in.)	100R0	
DN 100 (4 in.) / DN 150 (6 in.)	100R2	
DN 150 (6 in.) / DN 100 (4 in.)	150E2	
DN 150 (6 in.) / DN 150 (6 in.)	150R0	
DN 150 (6 in.) / DN 200 (8 in.)	150R2	

Main ordering information

CoriolisMaster FCB330 Coriolis Mass Flowmeter	XX	XX	X	X	XX	XX	X
CoriolisMaster FCB350 Coriolis Mass Flowmeter	XX	XX	X	X	XX	XX	X
Process Connection Type							
Flanges DIN PN 16	D2						Continued see next page
Flanges DIN PN 40	D4						
Flanges DIN PN 63	D5						
Flanges DIN PN 100	D6						
Flanges EN 1092-1 PN 40, NAMUR length (DN 15: 510 mm, DN 25: 600 mm, DN 50: 715 mm)	S5						
Flanges with groove PN40 EN1092-10-D	S6						
Flanges EN 1092-1 PN 16, NAMUR length (DN 15: 510 mm, DN 25: 600 mm, DN 50: 715 mm)	S7						
Flanges ANSI / ASME B16.5 Class 150	A1						
Flanges ANSI / ASME B16.5 Class 300	A3						
Flanges ANSI / ASME B16.5 Class 600	A6						
Flanges ANSI / ASME B16.5 Class 900 (p-t rating Cl 600)	A7						
Flanges ANSI / ASME B16.5 Class 1500 (p-t rating Cl 600)	A8						
Flanges JIS 10K	J1						
Tri-Clamp acc. DIN 32676	T1						
Tri-Clamp acc. BPE	T3						
Food industry fittings acc. DIN 11851	F1						
Female NPT thread	N5						
Female G thread	M5						
Others	Z9						
Material of Wetted Parts							
Stainless steel	A1						
Ni-Alloy	C1						
Flow Calibration							
Flow forward +/- 0,40 % of flow rate, Gas 1 % of flow rate	1)	A					
Flow forward +/- 0,25 % of flow rate, Gas 1 % of flow rate	1)	B					
Flow forward +/- 0,15 % of flow rate, Gas 0,5 % of flow rate	2)	C					
Flow forward +/- 0,10 % of flow rate, Gas 0,5 % of flow rate	2)	D					
Flow forward / reverse +/- 0,40 % of flow rate, Gas 1 % of flow rate	1)	J					
Flow forward / reverse +/- 0,25 % of flow rate, Gas 1 % of flow rate	1)	K					
Flow forward / reverse +/- 0,15 % of flow rate, Gas 0,5 % of flow rate	2)	L					
Flow forward / reverse +/- 0,10 % of flow rate, Gas 0,5 % of flow rate	2)	M					
Others	Z						
Density Calibration							
Density 10 g/l	1)	1					
Density 2 g/l	2)	3					
Density 1 g/l	2)	4					
Others	9						

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Main ordering information

CoriolisMaster FCB330 Coriolis Mass Flowmeter	XX	XX	X
CoriolisMaster FCB350 Coriolis Mass Flowmeter	XX	XX	X
Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands			
Integral / Dual compartment / Aluminium / 3 x M20 x 1.5	D1		
Integral / Dual compartment / Aluminium / 3 x NPT 1/2 in.	D2		
Remote / Not specified	Y0		
Others	Z9		
Outputs			
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive, no HART	A1		
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A2		
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A3		
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive + HART	H1		
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H2		
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H3		
Without	Y0		
Others	Z9		
Power Supply			
100 ... 230 V AC	A		
24 V AC / DC	B		
Without	Y		

Additional ordering information

CoriolisMaster FCB330 Coriolis Mass Flowmeter	XX	XX
CoriolisMaster FCB350 Coriolis Mass Flowmeter	XX	XX
Certificates		
Test report 2.2 acc. EN 10204 confirmation of material	C1	
Material monitoring with inspection certificate 3.1 acc. EN 10204	C2	
Material monitoring with inspection certificate 3.2 acc. EN 10204	C3	
Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204	CN	
Declaration of compliance with the order 2.1 acc. EN 10204	C4	
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test	C6	
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (confirmation only)	CA	
Pressure test acc. AD2000	CB	
Test package (pressure test, non-destructive test, welder & welding procedure certificate)	CT	
Inspection certificate 3.1 acc. EN 10204 for NDE of welds	C8	
Certificate of accuracy 2.1 acc. EN 10204	CM	
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (inclusive heat analysis)	CR	
Others	CZ	

Special Operation Mode

Standard + DensiMass concentration measurement	2)	N6
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Additional ordering information

CoriolisMaster FCB330 Coriolis Mass Flowmeter	XX	XXX	XXX	XX	XXX	XXX
CoriolisMaster FCB350 Coriolis Mass Flowmeter	XX	XXX	XXX	XX	XXX	XXX
Documentation Language						
German	M1					
English	M5					
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)	MW					
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)	ME					
Others	MZ					
Pressure Rating of Sensor Secondary Containment						
Maximum burst pressure 6 MPa / 60 bar / 870 psi inclusive tower length extension	PR5					
Maximum burst pressure 10 MPa / 100 bar / 1450 psi inclusive tower length extension	PR6					
Maximum burst pressure 15 MPa / 150 bar / 2175 psi inclusive tower length extension	PR7					
Signal Cable Length						
Without	SC0					
5 m (approx. 15 ft)	SC1					
10 m (approx. 30 ft)	SC2					
20 m (approx. 66 ft)	SC4					
25 m (approx. 82 ft)	SC5					
30 m (approx. 98 ft)	SC6					
40 m (approx. 131 ft)	SC8					
50 m (approx. 164 ft)	SCA					
Others	SC9					
Device Identification Plate						
Stainless steel plate with TAG no.	T1					
Others	TZ					
Ambient Temperature Range						
-40 ... 60 °C (-40 ... 140 °F)	TA4					
Extended Tower Length						
Tower length extension - meter insulation capability	TE1					

- 1) Only with CoriolisMaster FCB330
2) Only with CoriolisMaster FCB350

Accessories

Description	Order no.
FCB330, FCB350 Connection Cable (Price per Meter)	D173D148U02

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Main ordering information CoriolisMaster FCH330, FCH350

Base model											
CoriolisMaster FCH330 Coriolis Mass Flowmeter	FCH330	XX	XX	XXXXX	XX	XX	X	X	XX	XX	X
CoriolisMaster FCH350 Coriolis Mass Flowmeter	FCH350	XX	XX	XXXXX	XX	XX	X	X	XX	XX	X
Explosion Protection Certification											
General Purpose		Y0									
ATEX / IECEx, (Zone 2 / 22)		A2									
ATEX / IECEx, (Zone 1 / 21)		A1									
cFMus version Class 1 Div. 2 (Zone 2 / 21)		F2									
cFMus version Class 1 Div. 1 (Zone 1 / 21)		F1									
NEPSI (Zone 2 / 22)		S2									
NEPSI (Zone 1 / 21)		S1									
Connection Design / Connection Box Material / Cable Glands											
Integral, defined by Transmitter housing		Y0									
Remote / Stainless Steel / 1 x M20 x 1.5		A1									
Remote / Stainless Steel / 1 x NPT 1/2 in.		A2									
Meter Size / Connection Size											
DN 25 (1 in.) / DN 20 (3/4 in.)			025E1								
DN 25 (1 in.) / DN 25 (1 in.)			025R0								
DN 25 (1 in.) / DN 40 (1-1/2 in.)			025R2								
DN 50 (2 in.) / DN 40 (1-1/2 in.)			050E1								
DN 50 (2 in.) / DN 50 (2 in.)			050R0								
DN 50 (2 in.) / DN 65 (2-1/2 in.)			050R1								
DN 80 (3 in.) / DN 65 (2-1/2 in.)			080E1								
DN 80 (3 in.) / DN 80 (3 in.)			080R0								
DN 80 (3 in.) / DN 100 (4 in.)			080R1								
Process Connection Type											
Tri-Clamp acc. DIN 32676			T1								
Tri-Clamp acc. ASME BPE			T3								
Food industry fittings acc. DIN 11851			F1								
Others			Z9								
Material of Wetted Parts											
Stainless steel, polished 1.4404 / 1.4435 (316L)			H2								
Continued see next page											

Main ordering information

CoriolisMaster FCH330 Coriolis Mass Flowmeter	X	X	XX	XX	X
CoriolisMaster FCH350 Coriolis Mass Flowmeter	X	X	XX	XX	X

Flow Calibration

Flow forward +/- 0,40 % of flow rate, Gas 1 % of flow rate	1)	A			
Flow forward +/- 0,25 % of flow rate, Gas 1 % of flow rate	1)	B			
Flow forward +/- 0,15 % of flow rate, Gas 0,5 % of flow rate	2)	C			
Flow forward +/- 0,10 % of flow rate, Gas 0,5 % of flow rate	2)	D			
Flow forward / reverse +/- 0,40 % of flow rate, Gas 1 % of flow rate	1)	J			
Flow forward / reverse +/- 0,25 % of flow rate, Gas 1 % of flow rate	1)	K			
Flow forward / reverse +/- 0,15 % of flow rate, Gas 0,5 % of flow rate	2)	L			
Flow forward / reverse +/- 0,10 % of flow rate, Gas 0,5 % of flow rate	2)	M			
Others		Z			

Density Calibration

Density 10 g/l	1)	1		
Density 2 g/l	2)	3		
Density 1 g/l	2)	4		
Others		9		

Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands

Integral / Dual compartment / Aluminium / 3 x M20 x 1.5	D1
Integral / Dual compartment / Aluminium / 3 x NPT 1/2 in.	D2
Remote / Not specified	Y0
Others	Z9

Outputs

Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive, no HART	A1
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A2
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A3
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive + HART	H1
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H2
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H3
Without	Y0
Others	Z9

Power Supply

100 ... 230 V AC	A
24 V AC / DC	B
Without	Y

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Additional ordering information

CoriolisMaster FCH330 Coriolis Mass Flowmeter	XX	XX	XX	XXX
CoriolisMaster FCH350 Coriolis Mass Flowmeter	XX	XX	XX	XXX
Certificates				
Test report 2.2 acc. EN 10204	C1			
Material monitoring with inspection certificate 3.1 acc. EN 10204	C2			
Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204	CN			
Declaration of compliance with the order 2.1 acc. EN 10204	C4			
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test	C6			
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (confirmation only)	CA			
Pressure test acc. AD2000	CB			
Test package (pressure test, non-destructive test, welder & welding procedure certificate)	CT			
Certificate of compliance for calibration 2.1 acc. EN 10204	CM			
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI (inclusive heat analysis)	CR			
Others	CZ			
Special Operation Mode				
Standard + DensiMass concentration measurement	2)	N6		
Documentation Language				
German	M1			
English	M5			
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)	MW			
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)	ME			
Others	MZ			
Pressure Rating of Sensor Secondary Containment				
Maximum burst pressure 4 MPa / 40 bar / 580 psi inclusive tower length extension				PR4

Additional ordering information

CoriolisMaster FCH330 Coriolis Mass Flowmeter	XXX	XX	XXX	XXX
CoriolisMaster FCH350 Coriolis Mass Flowmeter	XXX	XX	XXX	XXX
Signal Cable Length				
Without	SC0			
5 m (approx. 15 ft)	SC1			
10 m (approx. 30 ft)	SC2			
20 m (approx. 66 ft)	SC4			
25 m (approx. 82 ft)	SC5			
30 m (approx. 98 ft)	SC6			
40 m (approx. 131 ft)	SC8			
50 m (approx. 164 ft)	SCA			
Others	SC9			
Device Identification Plate				
Stainless steel plate with TAG no.	T1			
Others	TZ			
Ambient Temperature Range				
-40 ... 60 °C (-40 ... 140 °F)	TA4			
Extended Tower Length				
Tower length extension - meter insulation capability	TE1			

- 1) Only with CoriolisMaster FCB330
 2) Only with CoriolisMaster FCB350

Accessories

Description	Order no.
FCB330, FCB350 Connection Cable (Price per Meter)	D173D148U02

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Transmitter

Technical data



G10320

Fig. 30: FCT3xx transmitter in field enclosure

Measuring range

The measuring range can be set at will between 0.01 ... 1 Qmax.

Degree of protection

IP 65 / IP 67, NEMA 4X

Electrical connections

Cable gland M20 x 1.5 or 1/2" NPT

The maximum signal cable length for the remote mount design is 50 m (164 ft) (longer lengths on request).

Power supply

Supply voltage	100 ... 230 V AC, 47 ... 63 Hz (tolerance -15 % / +10 %)
	20.4 ... 26.4 V AC, 47 ... 63 Hz
	20.4 ... 31.2 V DC (ripple: ≤ 5 %)
Power consumption	S ≤ 25 VA

Response time

As step function 0 ... 99 % (corr. to 5 τ) \geq 1 s

Ambient temperature

Standard: -20 ... 60 °C (-4 ... 140 °F)

Optional: -40 ... 60 °C (-40 ... 140 °F)

At operation below -20 °C (-4 °F), the LCD can no longer be read and the electronic unit should be operated with as few vibrations as possible.

Full functionality is assured at temperatures above -20 °C (-4 °F).

Housing design

Enclosure

Varnished alloy casting

Enclosure color

— Mid-section: RAL 7012

— Cover: RAL 9002

Varnish layer thickness: 80 ... 120 μ m

Forward/reverse flow metering

The flow direction is indicated by the arrows on the transmitter LCD and via the digital switching output (if configured).

LCD display

LCD, 2 lines, backlit

Both lines of the LCD are freely configurable.

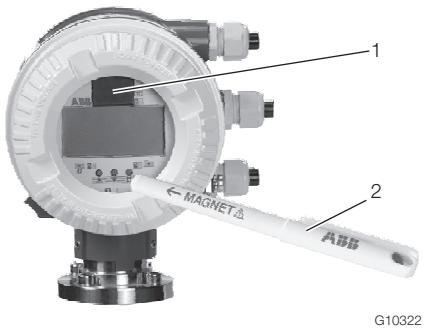
The following values can be displayed:

- Mass flow
- Volume flow
- Density or temperature
- Flow count, 7-digit with overflow counter and specification of physical unit for mass or volume.

On integral mount design devices, the transmitter enclosure can be rotated through approx. 180° in any direction. The LCD can be rotated to four positions to ensure optimum readability.

Operation

Three buttons on the transmitter are used to operate the device and enter parameters. Alternatively, if the enclosure cover on the transmitter is closed, operators can use a magnetic pen.



G10322

Fig. 31: Operation with magnetic pen
1 FRAM (plug-in) | 2 Magnetic pen

Data backup

Data is backed up to an FRAM integrated in the transmitter. Data is saved for a period of 10 years without power supply. Hardware and software are identified according to NAMUR recommendation NE53.

IMPORTANT (NOTE)

The device meets the requirements of the EMC directive 2004/108/EC (EN 61326) and the low-voltage directive 2006/95/EC (EN 61010-1).

DensiMass concentration measurement (FCB350 only)

The transmitter can calculate the current concentration from the measured density and temperature using concentration matrices.

The following concentration matrices are preconfigured in the transmitter as standard:

- Concentration of sodium hydroxide in water
- Concentration of alcohol in water
- Concentration of sugar in water
- Concentration of corn starch in water
- Concentration of wheat starch in water

The user can enter two more user-defined matrices containing up to 100 values.

Accuracy of concentration measurement

The accuracy of the concentration measurement is determined in the first instance by the quality of the matrix data entered. However, as the calculation is based on temperature and density (the input variables), the accuracy of the concentration measurement is ultimately determined by the measuring accuracy of temperature and density.

Example:

Density of 0 % alcohol in water at 20 °C (68 °F): 998.23 g/l

Density of 100 % alcohol in water at 20 °C (68 °F): 789.30 g/l

Concentration	Density
100 %	208.93 g/l
0.48 %	1 g/l
0.69 %	2 g/l

The accuracy class of the density measurement thus directly determines the accuracy of the concentration measurement.

See the device operating instructions for detailed information.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Electrical data

Current outputs

Current output 1, active

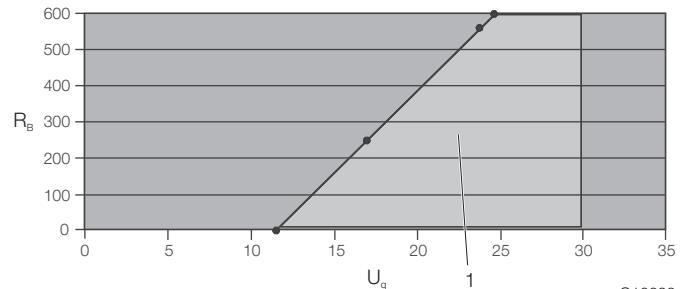
Output signal	Active, 0 ... 20 mA or 4 ... 20 mA switchable
Load	$0 \Omega \leq R_B \leq 560 \Omega$
Measurement uncertainty	< 0.1 % of measured value
Terminals	31 / 32
Measured values	Mass flow, volume flow, density, and temperature (freely configurable via software)

Current output 1, passive

Output signal	4 ... 20 mA passive
Load	$0 \Omega \leq R_B \leq 600 \Omega$
Source voltage	$12 V \leq U_q \leq 30 V$
Measurement uncertainty	< 0.1 % of measured value
Terminals	31 / 32
Measured values	Mass flow, volume flow, density, and temperature (freely configurable via software)

Current output 2, passive

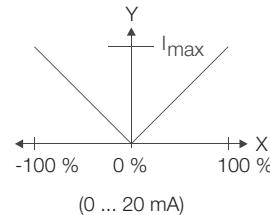
Output signal	4 ... 20 mA passive
Load	$0 \Omega \leq R_B \leq 600 \Omega$
Source voltage	$12 V \leq U_q \leq 30 V$
Measurement uncertainty	< 0.1 % of measured value
Terminals	33 / 34
Measured values	Mass flow, volume flow, density, and temperature (freely configurable via software)



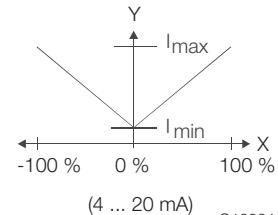
G10323

Fig. 32: Permissible source voltage as a function of load resistance, where $I_{max} = 22 \text{ mA}$

1 Permissible range



(0 ... 20 mA)



(4 ... 20 mA)

G10324

Fig. 33

IMPORTANT (NOTE)

Failure information according to NAMUR recommendation NE43.

Pulse output

Scaled pulse output (maximum 5 kHz) with configurable pulse factor between 0.001 and 1000 pulses per unit. The pulse width is configurable from 0.1 ... 2000 ms. The output is electrically isolated from the current outputs.

	Passive	Active
Operating voltage	$16 V \leq U_{CEH} \leq 30 V \text{ DC}$ $0 V \leq U_{CEL} \leq 2 V$	$16 V \leq U \leq 30 V \text{ DC}$ Load $\geq 150 \Omega$
Operating current	$0 \text{ mA} \leq I_{CEH} \leq 0.2 \text{ mA}$ $2 \text{ mA} \leq I_{CEL} \leq 220 \text{ mA}$	-
fmax	5 kHz	5 kHz
Pulse width	0.1 ... 2000 ms	0.1 ... 2000 ms
Terminals	51 / 52	51 / 52

IMPORTANT (NOTE)

If you are using a mechanical totalizer, we recommend setting a pulse width of $\geq 30 \text{ ms}$ and a maximum frequency of $f_{max} \leq 3 \text{ kHz}$.

Digital switching outputs

The switching function can be selected via the software.

Switching function	<ul style="list-style-type: none"> – System monitoring (normally closed contact or normally open contact) – Forward / reverse (closed for forward) – Min. /max. alarm (normally closed contact or normally open contact)
Output "closed"	$0 \text{ V} \leq U_{\text{CEL}} \leq 2 \text{ V}$ $2 \text{ mA} \leq I_{\text{CEL}} \leq 220 \text{ mA}$
Output "open"	$16 \text{ V} \leq U_{\text{CEH}} \leq 30 \text{ V DC}$ $0 \text{ mA} \leq I_{\text{CEH}} \leq 0.2 \text{ mA}$
Terminals	41 / 42

Digital switching inputs

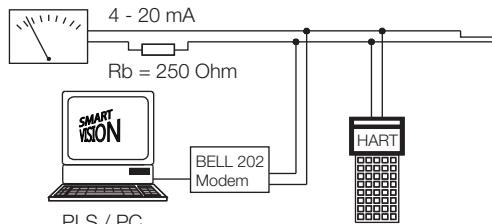
The switching function can be selected via the software.

Switching function	<ul style="list-style-type: none"> – External output zero return – External totalizer reset
Input "On"	$16 \text{ V} \leq U_{\text{KL}} \leq 30 \text{ V}$
Input "Off"	$0 \text{ V} \leq U_{\text{KL}} \leq 2 \text{ V}$
Internal resistance	$R_i = 2 \text{ k}\Omega$
Terminals	81 / 82

All inputs and outputs are electrically isolated from one other.

HART protocol

The device is registered with the HART Communication Foundation.



G10052

Fig. 34: Communication via HART protocol

HART protocol

Configuration	<ul style="list-style-type: none"> – Directly on the device – Via software DSV401 + HART-DTM
Transmission	FSK modulation on voltage output 4 ... 20 mA according to Bell 202 standard
Baud rate	1200 baud
Display	Logic 1: 1200 Hz Logic 0: 2200 Hz
Maximum signal amplitude	1.2 mAss
Load at current output	250 ... 560 Ω (in hazardous area: maximum 300 Ω)

Cable

Design	Two-wire cable AWG 24, twisted
Maximum length	1500 m (4921 ft)

See the interface description for detailed information.

System integration:

Communication (configuration, parameterization) can be performed with the DTM (Device Type Manager) available for the device and the corresponding framework applications as per FDT 0.98 or 1.2 (DSV401 R2).

Other tool/system integrations (e.g., Emerson AMS/Siemens PCS7) are available on request.

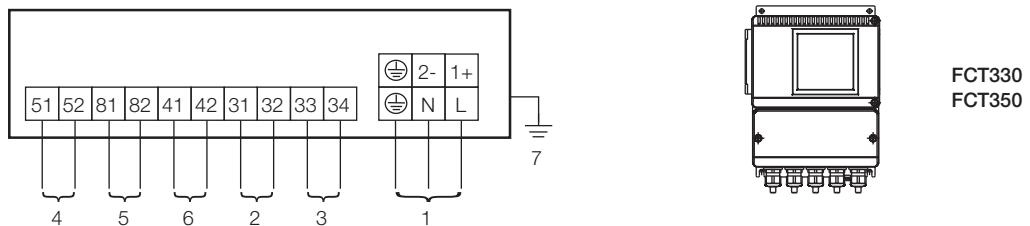
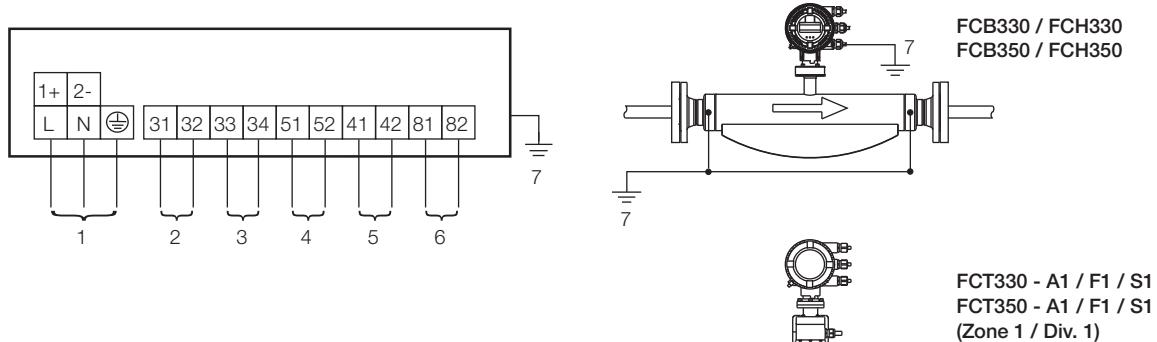
The necessary DTMs can also be downloaded from www.abb.com/flow.

CoriolisMaster FCB330, FCB350, FCH330, FCH350 Coriolis mass flowmeter

Electrical connections

Connection of transmitter models to peripherals

Models FCB330, FCB350, FCH330, FCH350, FCT330, FCT350



G10331-02

Fig. 35

1 Power supply | 2 Current output 1 | 3 Current output 2 | 4 Pulse output | 5 Digital switching output |
6 Digital switching input | 7 Equipotential bonding (PA)

IMPORTANT (NOTE)

When using the device in hazardous areas, note the additional connection data in the chapter titled "Ex relevant specifications"!

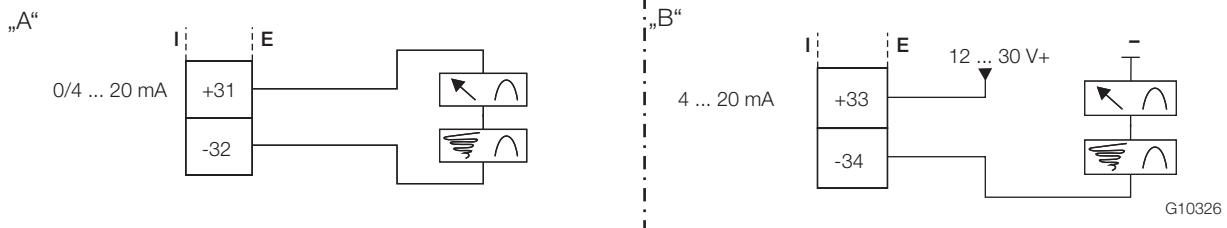
Terminal	Function
L / N / PE	Power supply, 100 ... 230 V AC, 50/60 Hz
1+ / 2- / PE	Power supply — 24 V AC, 50/60 Hz — 24 V DC
31 / 32	Current output 1, active 0/4 ... 20 mA , (0 Ω ≤ R _B ≤ 560 Ω, FCT300-A1/F1:1 0 Ω ≤ R _B ≤ 300 Ω)
	Current output 1, passive 4 ... 20 mA (0 Ω ≤ R _B ≤ 600 Ω), source voltage 12 ≤ U _q ≤ 30 V
33 / 34	Current output 2, passive 4 ... 20 mA (0 Ω ≤ R _B ≤ 600 Ω), source voltage 12 ≤ U _q ≤ 30 V
51 / 52	Pulse output, passive fmax = 5 kHz, pulse width = 0.1 ... 2000 ms, 0.001 ... 1000 pulses/unit — "Closed": 0 V ≤ U _{CEL} ≤ 2 V, 2 mA ≤ I _{CEL} ≤ 220 mA — "Open": 16 V ≤ U _{CEH} ≤ 30 V DC, 0 mA ≤ I _{CEH} ≤ 0.2 mA
	Pulse output active, U = 16 ... 30 V, load ≥ 150 Ω, fmax = 5 kHz
41 / 42	Digital switching output, passive — "Closed": 0 V ≤ U _{CEL} ≤ 2 V, 2 mA ≤ I _{CEL} ≤ 220 mA — "Open": 16 V ≤ U _{CEH} ≤ 30 V DC, 0 mA ≤ I _{CEH} ≤ 0.2 mA
81 / 82	Digital switching input, passive — Input "On": 16 V ≤ UKL ≤ 30 V — Input "Off": 0 V ≤ UKL ≤ 2 V
-	Equipotential bonding "PA" When the FCT300 transmitter is connected to the FCB3xx / FCH3xx flowmeter sensor, the transmitter must also be connected to "PA".

CoriolisMaster FCB330, FCB350, FCH330, FCH350

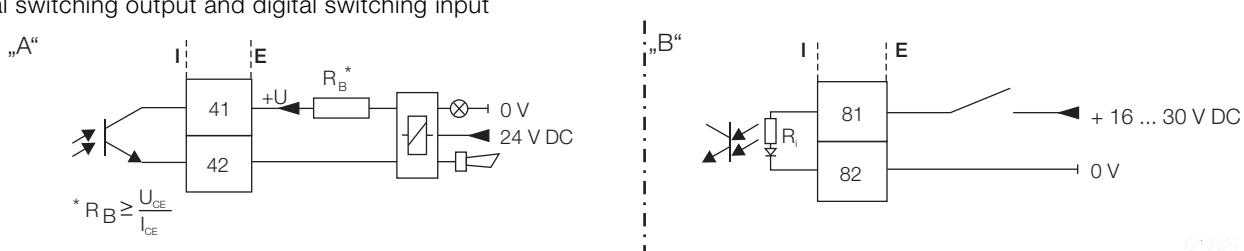
Coriolis mass flowmeter

Connection examples for the peripherals

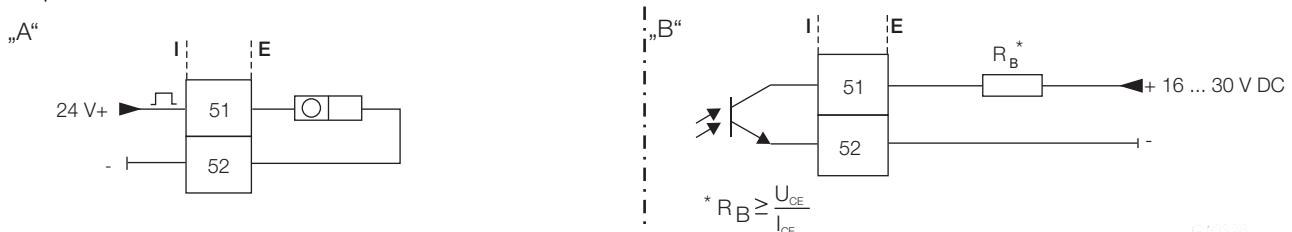
Current outputs (including HART communication)



Digital switching output and digital switching input



Pulse output



Connection of transmitter to flowmeter sensor

FCT330, FCT350 transmitter to FCB330, FCB350, FCH330, FCH350 flowmeter sensor

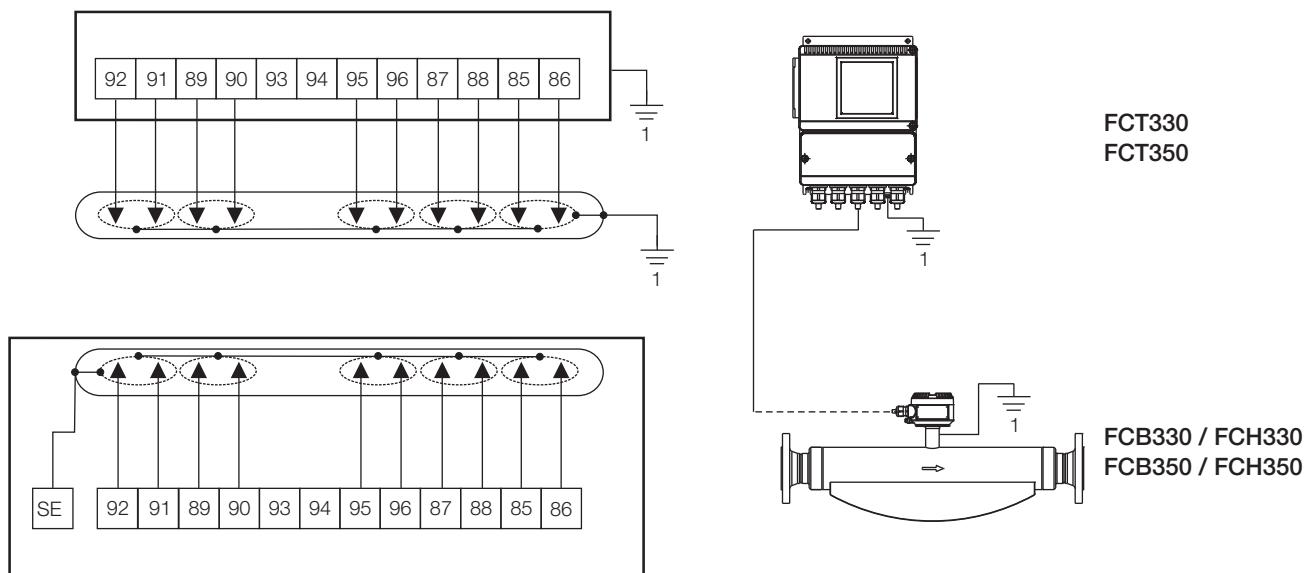


Fig. 39
1 Equipotential bonding (PA)

Terminal	Corresponding wire color	Function
85	White	Sensor 1
86	Brown	Sensor 1
87	Green	Sensor 2
88	Yellow	Sensor 2
89	Black	Temperature
90	Violet	Temperature

Terminal	Corresponding wire color	Function
91	Gray	Driver
92	Pink	Driver
93	-	Not used
94	-	Not used
95	Blue	Temperature
96	Red	Temperature

IMPORTANT (NOTE)

The precise position of the PA terminals may vary according to the device type. Each terminal is marked accordingly. When the FCT330, FCT350 transmitter is connected to the FCB330, FCB350, FCH330, FCH350 flowmeter sensor, the transmitter must also be connected to "PA".

The following flowmeter sensor / transmitter combinations are permitted:

- FCB330, FCH330 flowmeter sensor with FCT330 transmitter
- FCB350, FCH350 flowmeter sensor with FCT350 transmitter

CoriolisMaster FCB330, FCB350, FCH330, FCH350 Coriolis mass flowmeter

Connection of transmitter to flowmeter sensor in Zone 1 / Div. 1

FCT330, FCT350 transmitter to FCB330, FCB350, FCH330, FCH350 flowmeter sensor

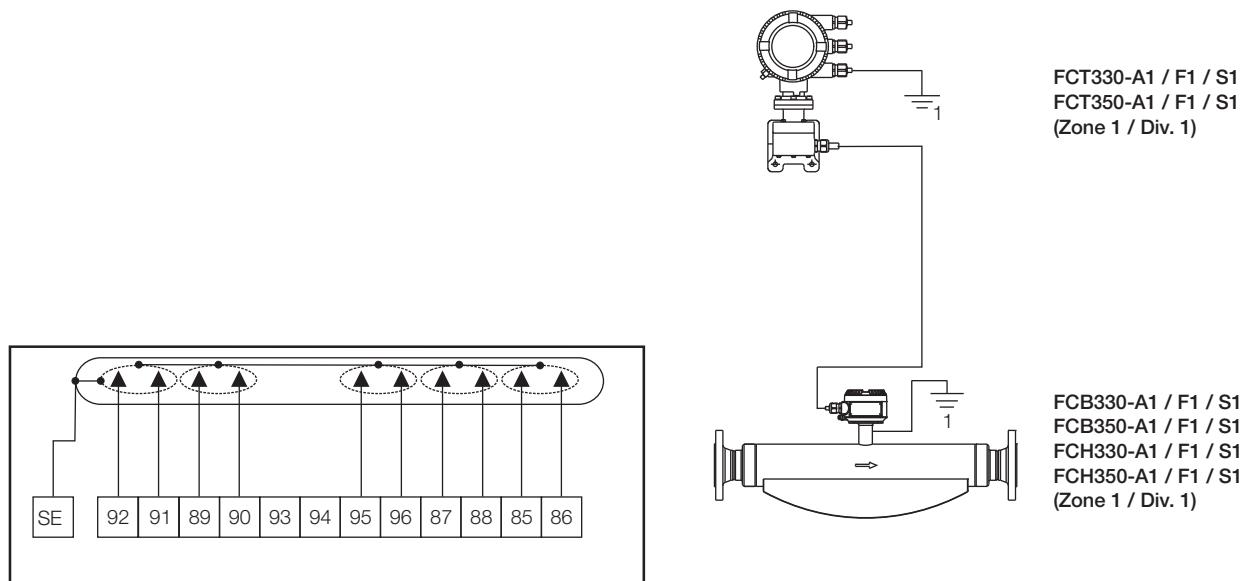


Fig. 40
1 Equipotential bonding (PA)

G10330-02

Terminal	Corresponding wire color	Function
85	White	Sensor 1
86	Brown	Sensor 1
87	Green	Sensor 2
88	Yellow	Sensor 2
89	Black	Temperature
90	Violet	Temperature

Terminal	Corresponding wire color	Function
91	Gray	Driver
92	Pink	Driver
93	-	Not used
94	-	Not used
95	Blue	Temperature
96	Red	Temperature

IMPORTANT (NOTE)

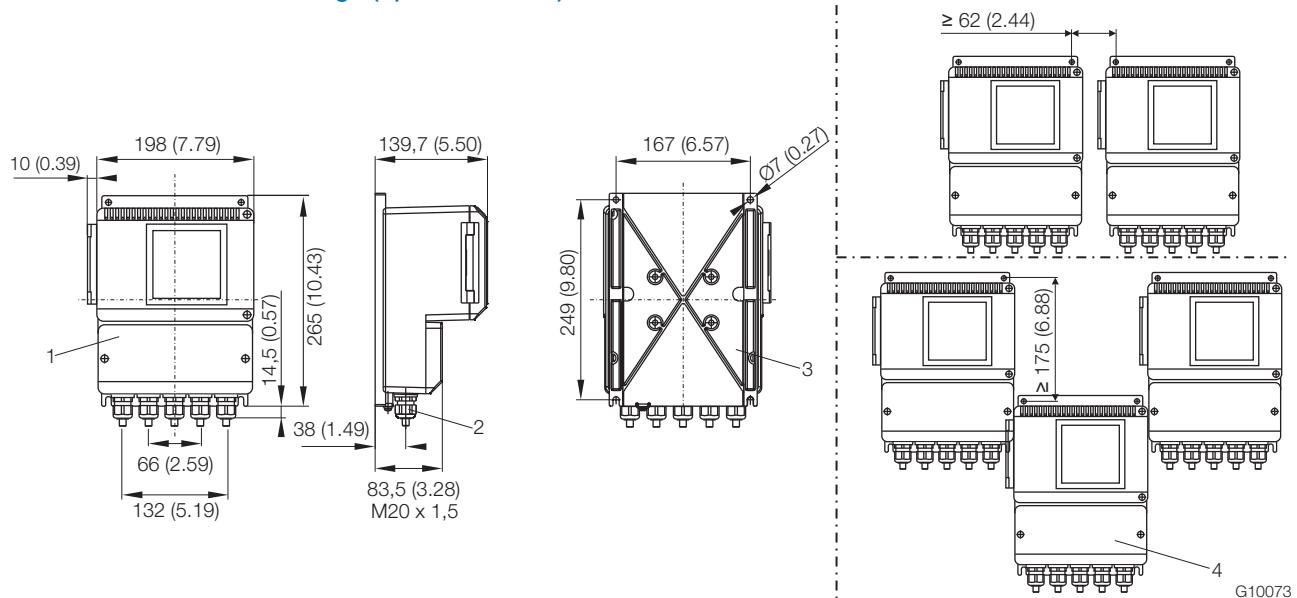
The wires must be connected in pairs in order to ensure EMC protection.

The following flowmeter sensor / transmitter combinations are permitted:

- FCB330, FCH330 flowmeter sensor with FCT330 transmitter
- FCB350, FCH350 flowmeter sensor with FCT350 transmitter

Dimensions

Transmitter in remote mount design (option F1 or F2)



Transmitter in remote mount design (option R1 or R2)

IP 65 / 67, NEMA 4X

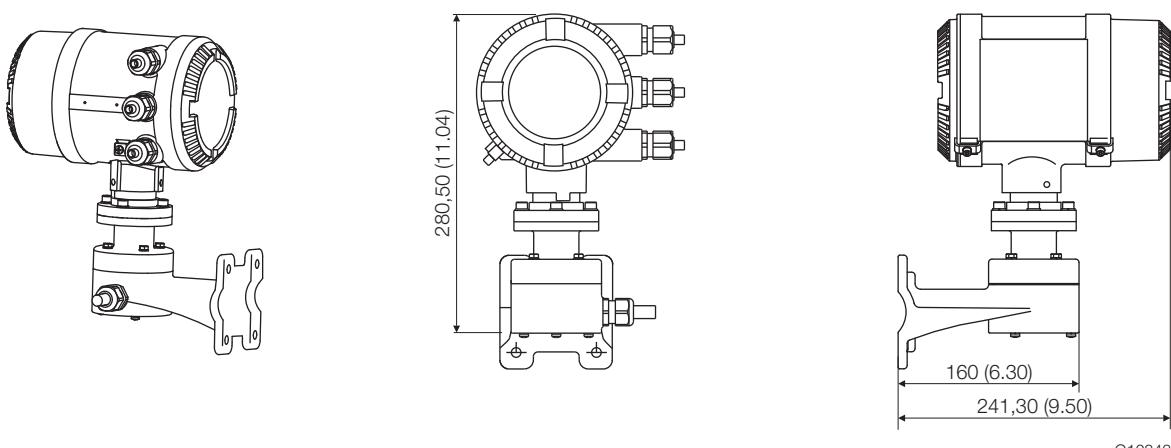


Fig. 42: Dimensions in mm (inch)

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Ordering information

Main ordering information CoriolisMaster FCT330

	FCT330	XX	XX	XX	X
Base model					
CoriolisMaster FCT330 Coriolis Mass Flowmeter Transmitter					
Explosion Protection Certification					
General Purpose					
ATEX / IECEx, (Zone 2 / 22)	Y0				
ATEX / IECEx, (Zone 1 / 21)	A2				
cFMus version Class 1 Div. 2 (Zone 2 / 21)	A1				
cFMus version Class 1 Div. 1 (Zone 1 / 21)	F2				
NEPSI (Zone 2 / 22)	F1				
NEPSI (Zone 1 / 21)	S2				
	S1				
Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands					
Remote / Dual compartment, wall mounted / Aluminium / 4 x M20 x 1.5				R1	
Remote / Dual compartment, wall mounted / Aluminium / 4 x NPT 1/2 in.				R2	
Remote / Dual compartment, wall mounted (field) / Aluminium / 5 x M20 x 1.5				F1	
Remote / Dual compartment, wall mounted (field) / Aluminium / 5 x NPT 1/2 in.				F2	
Others				Z9	
Outputs					
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive, no HART					A1
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART					A2
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART					A3
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive + HART					H1
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive + HART					H2
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive + HART					H3
Others					Z9
Power Supply					
100 ... 230 V AC					A
24 V AC / DC					B

Additional ordering information CoriolisMaster FCT330

	XX	XX	XX
Mounting Bracket Shape / Material			
For 2 in. pipe mounting / Carbon steel		B1	
Documentation Language			
German			M1
English			M5
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)			MW
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)			ME
Others			MZ
Device Identification Plate			
Stainless steel plate with TAG no.			T1

Main ordering information CoriolisMaster FCT350

Base model	FCT350	XX	XX	XX	X
CoriolisMaster FCT350 Coriolis Mass Flowmeter Transmitter					
Explosion Protection Certification					
General Purpose	Y0				
ATEX / IECEx, (Zone 2 / 22)	A2				
ATEX / IECEx, (Zone 1 / 21)	A1				
cFMus version Class 1 Div. 2 (Zone 2 / 21)	F2				
cFMus version Class 1 Div. 1 (Zone 1 / 21)	F1				
NEPSI (Zone 2 / 22)	S2				
NEPSI (Zone 1 / 21)	S1				
Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands					
Remote / Dual compartment, wall mounted / Aluminium / 4 x M20 x 1.5	R1				
Remote / Dual compartment, wall mounted / Aluminium / 4 x NPT 1/2 in.	R2				
Remote / Dual compartment, wall mounted (field) / Aluminium / 5 x M20 x 1.5	F1				
Remote / Dual compartment, wall mounted (field) / Aluminium / 5 x NPT 1/2 in.	F2				
Others	Z9				
Outputs					
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive, no HART	A1				
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A2				
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive, no HART	A3				
Current output 1 active, Current output 2 passive, Pulse active, Contact in- and output passive + HART	H1				
Current output 1 active, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H2				
Current output 1 passive, Current output 2 passive, Pulse passive, Contact in- and output passive + HART	H3				
Others	Z9				
Power Supply					
100 ... 230 V AC	A				
24 V AC / DC	B				

Additional ordering information CoriolisMaster FCT350

	XX	XX	XX
Mounting Bracket Shape / Material			
For 2 in. pipe mounting / Carbon steel	B1		
Documentation Language			
German	M1		
English	M5		
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)	MW		
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)	ME		
Others	MZ		
Device Identification Plate			
Stainless steel plate with TAG no.	T1		

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Ex relevant specifications acc. to ATEX / IECEX / NEPSI

Electrical data

Overview of the different output options

Versions	ATEX, IECEX, NEPSI Zone 2	ATEX, IECEX, NEPSI Zone 1
Version I Output option A1, A2, H1, H2 in the order number	<ul style="list-style-type: none"> — Current output 1: Active — Current output 2: Passive — Pulse output: Active / passive, switchable — Switching input and output: Passive 	<ul style="list-style-type: none"> — Current output 1: Active — Current output 2: Passive — Pulse output: Passive — Switching input and output: Passive
Version II Output option A3, H3 in the order number		<ul style="list-style-type: none"> — Current output 1: Passive — Current output 2: Passive — Pulse output: Passive — Switching input and output: Passive

Version I: Active / passive current outputs

Model FCx3xx-A1, FCT3xx-A1 or FCx3xx-A2, FCT3xx-A2 or FCx3xx-S2, FCT3xx-S2												
Current output 1, active Terminals 31 / 32 Terminal 32 is connected to "PA"	Type of protection "nA" (Zone 2)		General operating values		Type of protection "e" (Zone 1)		Type of protection "ib" (Zone 1)					
	U _i (V)	I _i (mA)	U _b (V)	I _b (mA)	U (V)	I (mA)	U _o (V)	I _o (mA)	P _o (mW)	C _o (nF)	C _{o pa} (nF)	
	30	30	30	30	60	35	20	100	500	217	0	3.8
Current output 2, passive Terminals 33 / 34 Terminal 34 is connected to "PA"	30	30	30	30	60	35	U _i (V)	I _i (mA)	P _i (mW)	C _i (nF)	C _{i pa} (nF)	L _i (mH)
							60	100	500	2.4	2.4	0.17
Pulse output, passive Terminals 51 / 52	30	65	30	65	60	35	15	30	115	2.4	2.4	0.17
Switching output, passive Terminals 41 / 42	30	65	30	65	60	35	15	30	115	2.4	2.4	0.17
Switching input, passive Terminals 81 / 82	30	10	30	10	60	35	30	60	500	2.4	2.4	0.17

All inputs and outputs are electrically isolated from one other and from the power supply. Only current outputs 1 and 2 in zone 1 design are not electrically isolated from one another.

Version II: Passive / passive current outputs

Model FCx3xx-A1, FCT3xx-A1 or FCx3xx-A2, FCT3xx-A2 or FCx3xx-S2, FCT3xx-S2

	Type of protection "nA" (Zone 2)		General operating values		Type of protection "e" (Zone 1)		Type of protection "ia" (Zone 1)					
	U _i (V)	I _i (mA)	U _b (V)	I _b (mA)	U (V)	I (mA)	U _i (V)	I _i (mA)	P _i (mW)	C _i (nF)	C _i pa (nF)	L _i (mH)
Current output 1, passive Terminals 31 / 32	30	30	30	30	60	35	60	300	2000	0.47	0.47	0.17
Current output 2, passive Terminals 33 / 34	30	30	30	30	60	35	60	300	2000	0.47	0.47	0.17
Pulse output, passive Terminals 51 / 52	30	65	30	65	60	35	60	300	2000	0.47	0.47	0.17
Switching output, passive Terminals 41 / 42	30	65	30	65	60	35	60	300	2000	0.47	0.47	0.17
Switching input, passive Terminals 81 / 82	30	10	30	10	60	35	60	300	2000	0.47	0.47	0.17

All inputs and outputs are electrically isolated from one other and from the auxiliary power.

Special connection conditions

The output circuits are designed so that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits.

It is not permitted to combine intrinsically safe and non-intrinsically safe circuits. When changing the type of protection, refer to the chapter titled "Changing the type of protection" in the commissioning instructions (CI/FCB300/FCH300) or the operating instructions (OI/FCB300/FCH300).

On intrinsically-safe circuits, equipotential bonding must be in place along the entire length of the cable used for the current outputs.

The rated voltage of the non-intrinsically safe circuits is U_M = 60 V.

The switching output and the pulse output (terminals 41 / 42 and 51 / 52) can be wired internally as a NAMUR contact for the purpose of connecting a NAMUR amplifier.

The cable glands are supplied in black by default. If the signal outputs are wired to intrinsically-safe circuits, we recommend that you use the light blue caps supplied for the appropriate cable entries.

IMPORTANT (NOTE)

If the protective conductor (PE) is connected in the flowmeter's terminal box, you must ensure that no dangerous potential difference can arise between the protective conductor (PE) and the equipotential bonding (PA) in the hazardous area.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Flowmeter sensor model FCB3xx / FCH3xx

Temperature class

Model FCx3xx-A1Y... or FCx3xx-S1Y... Zone 1			
Ambient temperature	≤40 °C (≤104 °F)	≤50 °C (≤122 °F)	≤60 °C (≤140 °F)
Temperature class			
T1	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)
T2	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)
T3	185 °C (365 °F)	180 °C (356 °F)	180 °C (356 °F)
T4	125 °C (257 °F)	120 °C (248 °F)	120 °C (248 °F)
T5	85 °C (185 °F)	85 °C (185 °F)	75 °C (167 °F)
T6	65 °C (149 °F)	65 °C (149 °F)	60 °C (140 °F)

Model FCx3xx-A2Y... or FCx3xx-S2Y... Zone 2			
Ambient temperature	≤40 °C (≤104 °F)	≤50 °C (≤122 °F)	≤60 °C (≤140 °F)
Temperature class			
T1	200 °C (392 °F)	200 °C (392 °F)	180 °C (356 °F)
T2	200 °C (392 °F)	200 °C (392 °F)	180 °C (356 °F)
T3	180 °C (356 °F)	180 °C (356 °F)	180 °C (356 °F)
T4	115 °C (239 °F)	115 °C (239 °F)	115 °C (239 °F)
T5	80 °C(176 °F)	80 °C(176 °F)	75 °C (167 °F)
T6	60 °C (140 °F)	60 °C (140 °F)	60 °C (140 °F)

Ambient and process conditions:

T_{amb}	-20 ... 60 °C (-4 ... 140 °F)
$T_{amb, optional}$	-40 ... 60 °C (-40 ... 140 °F) (only for integral mount design devices)
T_{medium}	-50 ... 200 °C (-58 ... 392 °F)
Protection class	IP 65, IP 67, and NEMA 4X

Hazardous area approval ATEX / IECEEx / NEPSI

Specific marking according to ATEX, IECEEx and NEPSI applies depending on the design of the flowmeter sensor (integral or remote mount design).

IMPORTANT (NOTE)

ABB reserves the right to make changes to the Ex-marking. The exact marking can be found at the name plate of the meter.

Modell FCx3xx-A2A... or FCx3xx-S2A... (remote mount design in Zone 2)

Approval	Marking	Comment
ATEX	II 3 G Ex nA IIC T6 ... T2 II 2 D Ex tD IIIC T85°C .. Tmedium	-
IECEEx or NEPSI	Ex nA IIC T6 ... T2 Gc Ex tb IIIC T85°C Tmedium	-

Model FCx3xx-A1A... or FCx3xx-S1A... (remote mount design in Zone 1)

Approval	Marking	Comment
ATEX	II 1 G Ex ia IIC T6 ... T2 II 1 D Ex ia IIIC T85°C... Tmedium	-
IECEEx or NEPSI	T2 Ga Ex ia IIIC T85°C .. Tmedium Da	-

Model FCx3xx-A2Y... or FCx3xx-S2Y... (integral mount design in Zone 2)

Approval	Marking	Comment
ATEX	II 3 G Ex nA nR IIC T6 ... T2 II 2 D Ex tD IIIC T85°C .. Tmedium	-
IECEEx or NEPSI	Ex nA nR IIC T6 .. T2 Gc Ex tb IIIC T85°C Tmedium Db	-

Modell FCx3xx-A1Y... or FCx3xx-S1Y... (integral mount design in Zone 1)

Approval	Marking	Comment
ATEX		
Version II	II 1/2 G Ex d e ia IIC T6 .. T2 II 2 D Ex ia tb IIIC T85°C .. Tmedium	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	II 1/2 G Ex d e ia ib IIC T6 .. T2 or II 1/2 G Ex d e ia IIC T6 .. T2 II 2 D Ex ia ia tb IIIC T85°C .. Tmedium or II 2 D Ex ia tb IIIC T85°C .. Tmedium	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.
IECEEx or NEPSI		
Version II	Ex d e ia IIC T6 .. T2 Ga/Gb Ex ia tb IIIC T85°C .. Tmedium	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	Ex d e ia ib IIC T6 .. T2 Ga/Gb or Ex d e ia IIC T6 .. T2 Ga/Gb Ex ia ib tb IIIC T85°C .. Tmedium or Ex ia tb IIIC T85°C .. Tmedium	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Transmitter model FCT300 in remote mount design

Ambient and process conditions:

T_{amb} -20 ... 60 °C (-4 ... 140 °F)

Protection class IP 65, IP 67, and NEMA 4X / Type 4X

Hazardous area approval ATEX / IECEx / NEPSI

Specific marking according to ATEX, IECEx and NEPSI applies depending on the design of the flowmeter sensor (integral or remote mount design).

IMPORTANT (NOTE)

ABB reserves the right to make changes to the Ex-marking. The exact marking can be found at the name plate of the meter.

Model FCT3xx-Y0... (Transmitter outside the hazardous area, Sensor in Zone 0, 1 or 2)		
Approval	Marking	Comment
ATEX	II (1) G [Ex ia] IIC	-
IECEx or NEPSI	[Ex ia Ga] IIC	-

Model FCT3xx-A2... or FCT3xx-S2... (Transmitter in Zone 2, Sensor in Zone 0, 1 or 2)		
Approval	Marking	Comment
ATEX	II 3(2) G Ex nA nR [ia] IIC T6 II 2 D Ex tb [ia] IIIC T85°C	-
IECEx or NEPSI	Ex nA nR [ia] IIC T6 Gc (Gb) Ex tb [ia] IIIC T85°C Db	-

Modell FCT3xx-A1... or FCT3xx-S1... (Transmitter in Zone 1, Sensor in Zone 0, 1 or 2)		
Approval	Marking	Comment
ATEX		
Version II	II 2 (1) G Ex d e ia IIC T6 II 2 (1) D Ex ia tb IIIC T85°C	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	II 2 (1) G Ex d e ib [ia] IIC T6 or II 2 (1) G Ex d e [ia] IIC T6 II 2 (1) D Ex ib tb [ia] IIIC T85°C or II 2 (1) D Ex tb [ia] IIIC T85°C	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.
IECEx or NEPSI		
Version II	Ex d e ia IIC T6 Gb (Ga) Ex ia tb IIIC T85°C Db (Da)	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	Ex d e ib [ia Ga] IIC T6 Gb or Ex d e [ia Ga] IIC T6 Gb Ex ib tb [ia Da] IIIC T85°C Db or Ex tb [ia Da] IIIC T85°C Db	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.

Ex relevant specifications acc. to cFMus

Overview of the different output options

Versions	Class I Div. 2	Class I Div. 1
Version I Output option A1, A2, H1, H2 in the order number	<ul style="list-style-type: none"> – Current output 1: Active – Current output 2: Passive – Pulse output: Active / passive, switchable – Switching input and output: Passive 	<ul style="list-style-type: none"> – Current output 1: Active – Current output 2: Passive – Pulse output: Passive – Switching input and output: Passive
Version II Output option A3, H3 in the order number		<ul style="list-style-type: none"> – Current output 1: Passive – Current output 2: Passive – Pulse output: Passive – Switching input and output: Passive

Electrical data for Div. 2 / Zone 2

Version I: Active / passive current outputs and Version II: passive / passive current outputs

Model FCx3xx-F2, FCT3xx-F2	Type of protection NI	
	Vmax _o (V)	I _{max} _o (mA)
Current output 1 Terminals 31 / 32	30	30
Current output 2 Terminals 33 / 34	30	30
Pulse output Terminals 51 / 52	30	65
Switching output Terminals 41 / 42	30	65
Switching input Terminals 81 / 82	30	10

All inputs and outputs are electrically isolated from one other and from the power supply.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Electrical data for Div. 1 / Zone 1

Version I: Active / passive current outputs

Model FCx3xx-F1, FCT3xx-F1								
	Type of protection non IS		Type of protection IS					
	Vmax _o (V)	I _{max} _o (mA)	Vmax _o (V)	I _{max} _o (mA)	P _o (mW)	C _o (nF)	C _{o PA} (nF)	L _o (mH)
Current output 1, active Terminals 31 / 32	30	30	20	100	500	217	0	3.8
			VMax (V)	I _{Max} (mA)	P _j (mW)	C _j (nF)	C _{j PA} (nF)	L _j (mH)
			60	100	500	2.4	2.4	0.17
Current output 2, passive Terminals 33 / 34	30	30	30	100	760	2.4	2.4	0.17
Pulse output, active or passive Terminals 51 / 52	30	65	15	30	115	2.4	2.4	0.17
Switching output, passive Terminals 41 / 42	30	65	15	30	115	2.4	2.4	0.17
Switching input, passive Terminals 81 / 82	30	10	30	60	500	2.4	2.4	0.17

All inputs and outputs are electrically isolated from one other and from the power supply. Only current outputs 1 and 2 are not electrically isolated from one another.

Version II: Passive / passive current outputs

Model FCx3xx-F1, FCT3xx-F1

	Type of protection non IS		Type of protection IS					
	Vmax (V)	I _{max} (mA)	Vmax (V)	I _{max} (mA)	P _i (mW)	C _i (nF)	C _{i PA} (nF)	L _i (mH)
Current output 1, passive Terminals 31 / 32	30	30	60	300	2000	0.47	0.47	0.17
Current output 2, passive Terminals 33 / 34	30	30	60	300	2000	0.47	0.47	0.17
Pulse output, active or passive Terminals 51 / 52	30	65	60	300	2000	0.47	0.47	0.17
Switching output, passive Terminals 41 / 42	30	65	60	300	2000	0.47	0.47	0.17
Switching input, passive Terminals 81 / 82	30	10	60	300	2000	0.47	0.47	0.17

All inputs and outputs are electrically isolated from one other and from the power supply.

Special connection conditions

The output circuits are designed so that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits.

It is not permitted to combine intrinsically-safe and non-intrinsically safe circuits. When changing the type of protection, refer to the chapter titled "Changing the type of protection" in the commissioning instructions (CI/FCB300/FCH300) or the operating instructions (OI/FCB300/FCH300).

On intrinsically-safe circuits, equipotential bonding must be in place along the entire length of the cable used for the current outputs.

The rated voltage of the non-intrinsically-safe circuits is U_M = 60 V.

Provided that rated voltage U_M = 60 V is not exceeded if connections are established to non-intrinsically-safe external circuits, intrinsic safety is retained.

IMPORTANT (NOTE)

The transmitter and flowmeter sensor enclosures must be connected to equipotential bonding PA. The operator must ensure that when connecting the protective conductor PE no potential differences can occur between the protective conductor PE and the equipotential bonding PA.

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Flowmeter sensor model FCB300 / FCH300

Temperature class

Model FCx3xx-F1..., in Class I Div. 1			
Ambient temperature	≤40 °C (≤104 °F)	≤50 °C (≤122 °F)	≤60 °C (≤140 °F)
Temperature class			
T1	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)
T2	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)
T3	185 °C (365 °F)	180 °C (356 °F)	180 °C (356 °F)
T4	125 °C (257 °F)	120 °C (248 °F)	120 °C (248 °F)
T5	85 °C (185 °F)	85 °C (185 °F)	75 °C (167 °F)
T6	65 °C (149 °F)	65 °C (149 °F)	60 °C (140 °F)

Model FCx3xx-F2..., in Class I Div. 2			
Ambient temperature	≤40 °C (≤104 °F)	≤50 °C (≤122 °F)	≤60 °C (≤140 °F)
Temperature class			
T1	200 °C (392 °F)	200 °C (392 °F)	180 °C (356 °F)
T2	200 °C (392 °F)	200 °C (392 °F)	180 °C (356 °F)
T3	180 °C (356 °F)	180 °C (356 °F)	180 °C (356 °F)
T4	115 °C (239 °F)	115 °C (239 °F)	115 °C (239 °F)
T5	80 °C (176 °F)	80 °C (176 °F)	75 °C (167 °F)
T6	60 °C (140 °F)	60 °C (140 °F)	60 °C (140 °F)

Ambient and process conditions:

T_{amb} -20 ... 60 °C (-4 ... 140 °F)

T_{amb} , optional -40 ... 60 °C (-40 ... 140 °F) (only for integral mount design devices)

T_{medium} -50 ... 200 °C (-58 ... 392 °F)

Protection class IP 65, IP 67, and NEMA 4X / Type 4X

IMPORTANT (NOTE)

In the case of the remote mount design, the signal cable between the flowmeter sensor and the transmitter must measure at least 5 m (16.4 ft) in length. Install conduit seals within 18" (45 cm).

Hazardous area approval cFMus

Specific marking according to FM applies depending on the design of the flowmeter sensor (integral or remote mount design).

IMPORTANT (NOTE)

ABB reserves the right to make changes to the Ex-marking. The exact marking can be found at the name plate of the meter.

Model FCx3xx-F2A... (remote mount design in Zone 2, Div 2)

Approval	Marking	Comment
FM (marking US)	NI: CL I,II,III, DIV 2, GPS ABCDEFG CL I, ZN2, AEx nA IIC T6 ... T2 ZN 21 AEx tb IIIC T85°C ... T165°C	-
FM (marking Canada)	NI: CL I, II, III, Div 2 GPS ABCDEFG Ex nA IIC T6 ... T2	-

Model FCx3xx-F2Y... (integral mount design in Zone 2, Div 2)

Approval	Marking	Comment
FM (marking US)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP : CL III, Div 1,2 CL I, ZN 2, AEx nA nR IIC T6 ... T2 ZN 21 AEx tb IIIC T85°C ... T165°C	-
FM (marking Canada)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP : CL III, Div 1,2 Ex nA nR IIC T6 ... T2	-

Model FCx3xx-F1A... (remote mount design in Zone 1, Div 1)

Approval	Marking	Comment
FM (marking US)	CL I, II, III, Div 1, GPS ABCDEFG CL I, ZN0, AEx ia IIC T6 ... T2 ZN 20 AEx ia IIIC T85°C ... T165°C	-
FM (marking Canada)	CL I, II, III, Div 1, GPS ABCDEFG Ex ia IIC T6 ... T2	-

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Model FCx3xx-F1Y... (integral mount design in Zone 1, Div 1)		
Approval	Marking	Comment
FM (marking US)		
Version II	IS: CL I, Div 1, GPS ABCD NI: CL I,II,III, DIV2, GPS ABCDEFG XP: CL I, Div 1, GPS ABCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 CL I, ZN1, AEx d ia IIC T6 ZN 21 AEx ia tb IIIC T85°C to T165°C	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, DIV2, GPS ABCDEFG XP: CL I, Div 1, GPS ABCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 CL I, ZN 1, AEx d ia ib IIC T6 or CL I, ZN 1, AEx d ia IIC T6 ZN 21 AEx ib ia tb IIIC T85°C or ZN21 AEx tb ia IIC T6	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.
FM (marking Canada)		
Version II	IS: CL I, Div 1, GPS ABCD NI: CL I,II,III, Div 2, GPS ABCDEFG XP: CL I, Div 1, GPS BCD DIP CL II, Div 1, GPS EFG DIP CL III, Div 1, 2 Ex d ia IIC T6	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, Div 2, GPS ABCDEFG XP: CL I, Div 1, GPS BCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 Ex d ia ib IIC T6 or Ex d ia IIC T6	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.

Transmitter model FCT300 in remote mount design

Ambient and process conditions:

T_{amb} -20 ... 60 °C (-4 ... 140 °F)

Protection class IP 65, IP 67, and NEMA 4X / Type 4X

Hazardous area approval cFMus

Specific coding according to FM applies depending on the design of the flowmeter sensor (integral or remote mount design).

IMPORTANT (NOTE)

ABB reserves the right to make changes to the Ex-marking. The exact marking can be found at the name plate of the meter.

Model FCT3xx-Y0... (Transmitter in General Purpose and Sensor in Zone 2, Div 2 or Zone 0, Div 1)

Approval	Marking	Comment
FM (marking US)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP: CL III, Div 1,2	-
FM (marking Canada)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP: CL III, Div 1,2	-

Model FCT3xx-F2... (Transmitter and Sensor in Zone 2, Div 2)

Approval	Marking	Comment
FM (marking US)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP: CL III, Div 1,2 CL I, ZN 2, AEx nA nR [ia] IIC T6 ZN 21 AEx tb [ia] IIIC T85°C	-
FM (marking Canada)	NI: CL I, II, III, Div 2 GPS ABCDEFG DIP: CL II Div 1 GPS EFG DIP: CL III, Div 1,2 Ex nA nR [ia] IIC T6	-

CoriolisMaster FCB330, FCB350, FCH330, FCH350

Coriolis mass flowmeter

Model FCT3xx-F1... (Transmitter in Zone 1, Div 1, Sensor in Zone 0, 1 or 2, Div 2 oder Div 1)

Approval	Marking	Comment
FM (marking US)		
Version II	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, DIV2, GPS ABCDEFG XP: CL I, Div 1, GPS ABCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 CL I, ZN1, AEx d ia IIC T6 ZN 21 AEx ia tb IIIC T85°C	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, DIV2, GPS ABCDEFG XP: CL I, Div 1, GPS ABCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 CL I, ZN 1, AEx d ib [ia] IIC T6 or CL I, ZN1, AEx d [ia] IIC T6 ZN21 AEx ib tb [ia] IIIC T85°C or ZN21 AEx tb [ia] IIC T6	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.
FM (marking Canada)		
Version II	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, Div 2, GPS ABCDEFG XP: CL I, Div 1, GPS BCD DIP: CL II, Div 1, GPS EFG DIP: CL III, Div 1, 2 Ex d ia IIC T6	2 passive analog outputs, outputs "ia" / "e", depending on user wiring.
Version I	IS: CL I, Div 1, GPS ABCD NI: CL I, II, III, Div 2, GPS ABCDEFG XP: CL I, Div 1, GPS BCD DIP: CL II, Div 1, GPS EFG DIP CL III, Div 1, 2 Ex d ib [ia] IIC T6 or Ex d [ia] IIC T6	Active / passive analog outputs, outputs "ib" / "e", depending on user wiring.

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Questionnaire

Customer:	Date:
Ms. / Mr.:	Department:
Telephone:	Fax:

Measuring medium:	Liquid content:	Gas content:
Flow rate: (min., max., operating point)	kg/h	
Density: (min., max., operating point)	kg/m ³	
Dynamic viscosity: (min., max., operating point)	mPas/cP	
Fluid temperature: (min., max., operating point)	°C	
Ambient temperature	°C	
Pressure: (min., max., operating point)	bar	
Rate of flow:	<input type="checkbox"/> Steady	<input type="checkbox"/> Pulsating
Batch operation:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Concentration calculation:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Transmitter design:	<input type="checkbox"/> Integral mount design	<input type="checkbox"/> Remote mount design
Explosion protection:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Power supply:	<input type="checkbox"/> 100 ... 230 V AC, 50/60 Hz	<input type="checkbox"/> 24 V AC/DC, 50/60 Hz
Electrical outputs:	Communication: <input type="checkbox"/> Current output I: 0/4 ... 20 mA <input type="checkbox"/> HART protocol <input type="checkbox"/> Current output II: 0/4 ... 20 mA <input type="checkbox"/> Pulse output, active <input type="checkbox"/> Pulse output, passive	
Additional specifications:	Pipeline diameter: mm Process connection:	

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3KXF411008R1001



Sales



Service



Software

FV4000, FS4000 Vortex Flowmeter / Swirl Flowmeter

2-wire Compact Design
Digital Signal Processor
Converter Technology



For metering liquids, gases and steam

FV4000 Vortex flowmeter

FS4000 Swirl flowmeter for very short steadyng zones

Approvals for explosion protection

- ATEX
- IEC
- c FM_{us}
Zone 1, Zone 2, dust ignition protection

Magnetic pen operation

- Configuration also possible with closed housing

Integrated switching output

- Used as limit contact or pulse output

Compensation of temperature influences by means of
temperature measurement integrated as an option

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1 Principles of measurement

1.1 Principle of measurement for Vortex flowmeter

The operating principle of the Vortex flowmeter is based on the Karman street. As the fluid flows over and under the solid body, vortices are shed alternately above and below. The shedding of these vortices due to the flow forms a vortex trail (Karman street).

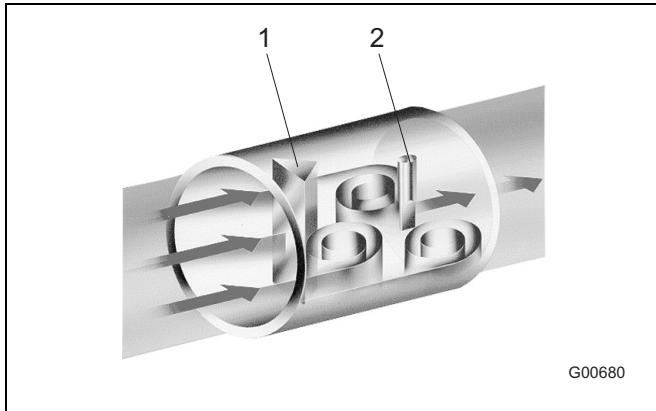


Fig. 1: Principle of measurement, FV4000

1 Solid body 2 Piezo sensor

The frequency f of vortex shedding is proportional to the flow velocity v and inversely proportional to the width of the solid body d :

$$f = St \times \frac{v}{d}$$

St , known as the Strouhal number, is a dimensionless number which has a decisive impact on the quality of vortex flow measurement.

If the solid body is dimensioned appropriately, the Strouhal number St will be constant across a very wide range of the Reynolds number Re (Fig. 2).

$$Re = \frac{v \times D}{\nu}$$

= Kinematic viscosity

D = Nominal size of meter tube

Consequently, the vortex shedding frequency to be evaluated is dependent solely upon the flow velocity and not at all upon media density and viscosity.

The local changes in pressure induced by vortex shedding are detected by a piezo sensor and converted into electrical pulses corresponding to the vortex frequency.

The frequency signal from the flowmeter sensor, which is proportional to the flow, undergoes downstream processing in the transmitter.

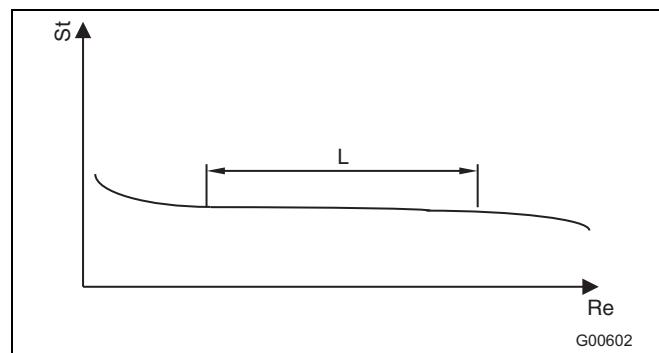


Fig. 2: How the Strouhal number is dependent upon the Reynolds number

St Strouhal number

Re Reynolds number

L Linear flow area

1.2 Principle of measurement for Swirl flowmeter

The inlet pipe converts the axial flow of the incoming media into rotational movement. In the center of this rotation a vortex core is formed which is forced into a secondary spiral-shaped rotation by the backflow.

The frequency of this secondary rotation is proportional to the flow and, if the internal geometry of the meter exhibits an optimum design, will be linear over a wide flow range. This frequency is measured by a piezo sensor. The frequency signal from the flowmeter sensor, which is proportional to the flow, undergoes downstream processing in the transmitter.

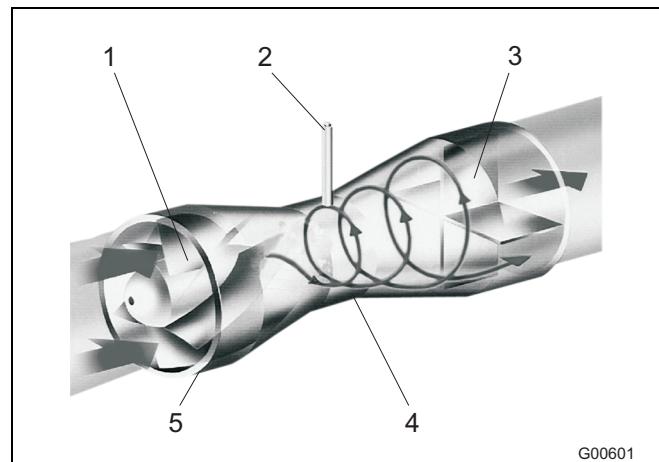
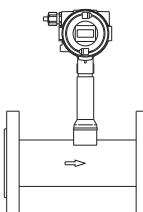
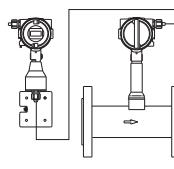
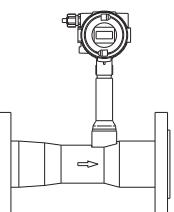
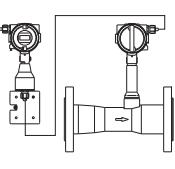


Fig. 3

1 Inlet pipe
2 Piezo sensor
3 Outlet pipe

4 Stagnation point
5 Housing

2 Overview of flowmeters

	FV4000-VT4 (TRIO-WIRL VT)	FV4000-VR4 (TRIO-WIRL VR)	FS4000-ST4 (TRIO-WIRL ST)	FS4000-SR4 (TRIO-WIRL SR)
	 G00740	 G00742	 G00741	 G00743
Measured value error	Fluids	$\leq \pm 0.75\%$ of flow rate under reference conditions		$\leq \pm 0.5\%$ of flow rate under reference conditions
	Gases and steam	$\leq \pm 1\%$ of flow rate under reference conditions		
Reproducibility	DN 15 $\leq \pm 0.3\%$ of flow rate		DN 15 $\leq \pm 0.3\%$ of flow rate DN 20 or higher $\leq \pm 0.2\%$ of flow rate	
	DN 15 to DN 150 $\leq \pm 0.2$ of flow rate			
	DN 200 or higher $\leq \pm 0.25\%$ of flow rate			
Permissible viscosity for fluids (> 7.5 mPa s, field calibration required for FS4000)	DN 15 ≤ 4 mPa s		DN 15 to DN 32 ≤ 5 mPa s	
	DN 25 ≤ 5 mPa s		DN 40 to DN 50 ≤ 10 mPa s	
	DN 40 or higher ≤ 7.5 mPa s		DN 80 or higher ≤ 30 mPa s	
Typical span	1:20		1:25	
Typical inflow / outflow sections	15 x DN / 5 x DN		3 x DN / 1 x DN	

Sensor

Process connection (DIN, ANSI, JIS)	Flange	DN 15 to DN 300 (1/2" to 12")		DN 15 to DN 400 (1/2" to 16")
	Wafer flange	DN 15 to DN 150 (1/2" to 6")		-
Sensor design	Single sensor	Yes, optional with integrated temperature measurement (DN 50 or higher)		
	Double sensor			
Fluid temperature	Standard	-55 ... 280 °C (-67 ... 536 °F)		-55 ... 280 °C (-67 ... 536 °F)
	High temperature (DN 25 or higher)	-55 ... 400 °C (-67 ... 752 °F)		-
Ingress protection	IP 65 / IP 67 / Nema 4X			
Materials	Sensor	Stainless steel opt. Hast. C / Titan		Stainless steel opt. Hast. C / Titan
	Inlet / outlet pipe	-		Stainless steel opt. Hast. C
	Solid body	Stainless steel opt. Hast. C		-
	Meter housing	Stainless steel opt. Hast. C		Stainless steel opt. Hast. C
	Sensor gasket	Graphite, Kalrez, Viton, PTFE		Graphite, Kalrez, Viton, PTFE
Only FVR4000 or FSR4000	Signal cable length between sensor and transmitter	-	max. 10 m (32.8 ft)	-
				max. 10 m (32.8 ft)

Transmitter

Supply power	For analog output 4 ... 20 mA	14 ... 46 V (Ex ib ≤ 28 V)					
	For PROFIBUS PA and FOUNDATION fieldbus	I ≤ 10 mA (9 ... 32 V; Ex ia ≤ 24 V)					
Sealing concept	Dual sealing acc. to ANSI / ISA-12.27.01 (VT43/VR43/ST43/SR43)						
Display	2 x 8-digit / 2 x 16-digit	Local display / totalization with magnetic pen operation / Parameters via HART protocol / PROFIBUS PA / FOUNDATION fieldbus adjustable					
External FRAM	Yes, for saving transmitter parameterization data as well as flowmeter sensor calibration data						
Contact output	(Optocoupler for standard) NAMUR contact (Ex ia / ib)	Can be parameterized as limit contact (flow, temperature), alarm output or pulse output					
Saturated steam calculation / Temperature compensation	Yes, if sensor is fitted with temperature measurement device						
Communication	HART protocol, PROFIBUS PA (Profile 3.0), FOUNDATION fieldbus						

Designs

There are generally two different designs.

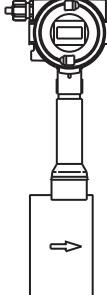
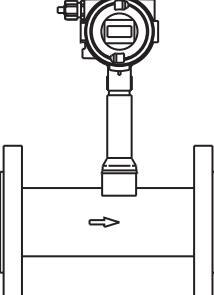
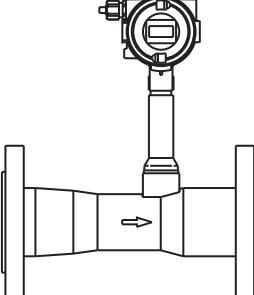
		
G00699		
Vortex flowmeter FV4000-VT4 Wafer flange design	Vortex flowmeter FV4000-VT4 Flange design	Swirl flowmeter FS4000-ST4 Flange design

Fig. 4: Integral mount design: The transmitter is installed directly on the sensor.

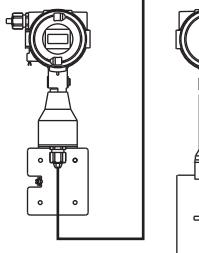
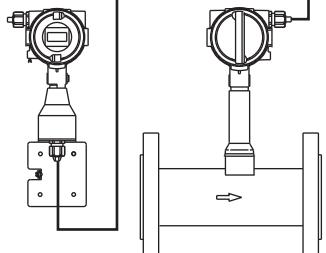
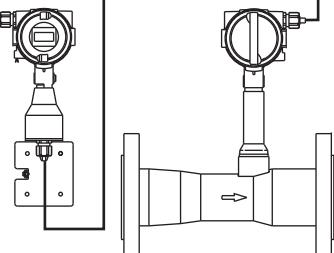
		
G00700		
Vortex flowmeter FV4000-VR4 Wafer flange design	Vortex flowmeter FV4000-VR4 Flange design	Swirl flowmeter FS4000-SR4 Flange design

Fig. 5: Remote mount design: The transmitter can be installed up to 10 m away from the flowmeter sensor. The cable is permanently connected to the transmitter. It can be made shorter if required.

3 General specifications

3.1 Nominal diameter selection

The nominal diameter is selected on the basis of the maximum operating flow $Q_v \text{ max}$. If maximum spans are to be achieved, this should not be less than half the maximum flowrate for each nominal diameter ($Q_v \text{ max DN}$), although reduction to approx. 0.15 $Q_v \text{ max DN}$ is possible. The linear lower range limit value is dependent upon the Reynolds number (see accuracy information).

If the flow to be measured is the standard flow (standard condition: 0 °C (32 °F), 1,013 mbar) or mass flowrate, this must be converted to the operating flow and the most appropriate nominal device diameter must be selected from the flow range tables (Tables 1, 2, 3).

= Operating density (kg/m³)

ρ_n = Standard density (kg/m³)

P = Operating pressure (bar)

T = Operating temperature (°C)

Q_v = Operating flow (m³/h)

Q_n = Standard flow (m³/h)

Q_m = Mass flowrate (kg/h)

= Dynamic viscosity (Pas)

= Kinematic viscosity (m²/s)

1. Conversion of standard density (n) --> operating density (ρ)

$$\rho = \rho_n \times \frac{1,013 + p}{1,013} \times \frac{273}{273 + T}$$

2. Conversion to operating flow (Q_v)

a) From standard flow (Q_n) -->

$$Q_v = Q_n \frac{\rho_n}{\rho} = Q_n \frac{1,013}{1,013 + p} \times \frac{273 + T}{273}$$

b) From mass flowrate (Q_m) -->

$$Q_v = \frac{Q_m}{\rho}$$

3. Dynamic viscosity (η) --> kinematic viscosity (ν)

$$\nu = \frac{\eta}{\rho}$$

Calculating the Reynolds number:

$$Re = \frac{Q}{(2827 \cdot v \cdot d)}$$

Q = Flow in m³/h

d = Pipe diameter in m

= Kinematic viscosity m²/s (1 cst = 10⁻⁶ m²/s)

The current Reynolds number can also be calculated using our AP-Calc calculation program.

3.2 Measured value deviation for flow measurement

Deviation in percentage terms from the measured value under reference conditions (including the transmitter) in the linear measuring range between Re min and Qmax (see "Measuring ranges" table).

	FV4000-VT4/VR4	FS4000-ST4/SR4
Fluids	≤ ± 0,75 %	± 0,5 %
Gases / Steam	≤ ± 1 %	
Current output		
Additional measurement uncertainty	< 0,1 %	
Temperature effect	< 0,05 % / 10 K	

Misalignment associated with installation or deinstallation may affect the measuring error.

Additional measuring errors may occur if there are deviations from the reference conditions.

3.2.1 Reproducibility as a percentage of the measured value

DN	Inch	FV4000-VT4/VR4	FS4000-ST4/SR4
15	1/2"	0,3 %	
25 ... 250	1" ... 6"	0,2 %	
200 ... 300	8" ... 12"	0,25 %	0,2 %

3.3 Measured value deviation for temperature

Measured value deviation (including transmitter)

± 2 °C

Reproducibility

≤ 0,2 % of measured value

Product selection and dimensioning program



Important

The ABB "AP-Calc" program can be used free of charge when selecting an appropriate flowmeter for a given application. The program runs in a Microsoft WINDOWS® environment.

3.4 Permissible pipeline vibrations

Guide values: The values specified for acceleration g are intended as guide values. The actual limits will depend on the nominal diameter, the measuring range within the entire measuring span, and the frequency of the vibrations. Therefore, the acceleration value g has only limited meaning.

FV4000:

Fluid: max. 1.0 g, 0 ... 130 Hz

Gas / steam: max. 0.3 g, 0 ... 130 Hz

FS4000:

Fluid: max. 0.3 g, 0 ... 130 Hz

Gas / steam: max. 0.3 g, 0 ... 130 Hz

3.5 Reference conditions for flow measurement

	FV4000-VT4/VR4	FS4000-ST4/SR4
Set flow range	0.5 ... 1 x QvmaxDN	
Ambient temperature	20 °C (68 °F) ± 2K	
Humidity	65 % rel. humidity ± 5 %	
Air pressure	86 ... 106 kPa	
Supply power	24 V DC	
Signal cable length	10 m (32.8 ft) (FV4000-VR or FS4000-SR only)	
Current output load	250 Ω (4 ... 20 mA only)	
Fluid for calibration	Water: approx. 20 °C (68 °F), 2 bar (29 psi)	
Calibration loop internal diameter	= internal diameter of meter	
Unobstructed straight upstream section	15 x DN	3 x DN
Downstream section	5 x DN	1 x DN
Pressure measurement	3 ... 5 x DN downstream of meter	
Temperature measurement	2 ... 3 x DN downstream after pressure measurement	

3.6 FV4000-VT4 / VR4 flowrates

3.6.1 Fluid flowrates

DN		DIN pipe			ANSI pipe			
		Re min	Q _v maxDN (m ³ /h)	Frequency (Hz) at Q _v max	Re min	Q _v maxDN (m ³ /h)	Q _v maxDN (US gal/min)	Frequency (Hz) at Q _v max
15	1/2"	10000	6	370	11000	5,5	24	450
25	1"	20000	18	240	23000	18	79	400
40	1 1/2"	20000	48	270	23000	48	211	270
50	2"	20000	70	180	22000	66	291	176
80	3"	43000	170	140	48000	160	704	128
100	4"	33000	270	100	44000	216	951	75
150	6"	67000	630	50	80000	530	2334	50
200	8"	120000	1100	45	128000	935	4117	40
250	10"	96000	1700	29	115000	1445	6362	36
300	12"	155000	2400	26	157000	2040	8982	23

The flowrates apply for fluids at 20 °C (68 °F), 1,013 mbar (14.69 psi), $\rho = 998 \text{ kg/m}^3$ (62.30 lb/ft³).

3.6.2 Gas / Steam flowrates

DN		DIN pipe			ANSI pipe			
		Re min	Q _v maxDN (m ³ /h)	Frequency (Hz) at Q _v max	Re min	Q _v maxDN (m ³ /h)	Q _v maxDN (ft ³ /min)	Frequency (Hz) at Q _v max
15	1/2"	10000	24	1520	11000	22	13	1980
25	1"	20000	150	2040	23000	82	48	1850
40	1 1/2"	20000	390	2120	23000	340	200	1370
50	2"	20000	500	1200	22000	450	265	1180
80	3"	43000	1200	1000	48000	950	559	780
100	4"	33000	1900	700	44000	1800	1059	635
150	6"	67000	4500	480	80000	4050	2384	405
200	8"	120000	8000	285	128000	6800	4002	240
250	10"	96000	14000	260	115000	12000	7063	225
300	12"	155000	20000	217	157000	17000	10006	195

The flowrates apply for gas at $\rho = 1.2 \text{ kg/m}^3$ (0.075 lb/ft³).

3.7 FS4000-ST4 / SR4 flowrates

3.7.1 Fluid flowrates

DN		Re min	Q _v maxDN (m ³ /h)	Q _v maxDN (US gal/min)	Frequency (Hz) at Q _v maxDN
15	1/2"	2100	1,6	7,0	185
20	3/4"	3500	2	8,8	100
25	1"	5200	6	26	135
32	1 1/4"	7600	10	44	107
40	1 1/2"	13500	16	70	110
50	2"	17300	25	110	90
80	3"	15000	100	440	78
100	4"	17500	150	660	77
150	6"	43000	370	1620	50
200	8"	44000	500	2200	30
300	12"	115000	1000	4400	16
400	16"	160000	1800	7920	13

The flowrates apply for fluids at 20 °C (68 °F), 1,013 mbar (14.69 psi), $\mu = 1 \text{ cSt}$, $\rho = 998 \text{ kg/m}^3$ (62.30 lb/ft³).

3.7.2 Gas / Steam flowrates

DN		Q _v min (m ³ /h)	Q _v maxDN (m ³ /h)	Q _v min (ft ³ /min)	Q _v maxDN (ft ³ /min)	Frequency (Hz) at Q _v maxDN
15	1/2"	2.5	16	1.4	9.4	1900
20	3/4"	5	25	2.9	14	1200
25	1"	5	50	2.9	29	1200
32	1 1/4"	8	130	4.7	76	1300
40	1 1/2"	12	200	7.0	117	1400
50	2"	18	350	10	206	1200
80	3"	60	850	35	500	690
100	4"	65	1500	38	882	700
150	6"	150	3600	88	2110	470
200	8"	200	4900	117	2880	320
300	12"	530	10000	311	5880	160
400	16"	1050	20000	618	11770	150

The flowrates apply for gas / steam at $\rho = 1.2 \text{ kg/m}^3$ (0.075 lb/ft³).

The frequency information is for orientation purposes only. For individual nominal diameters and designs, ranges are supplied in which typical frequencies lie.

3.8 Static overpressure in the case of fluids

To avoid cavitation, a static overpressure is required downstream of the flowmeter (downstream pressure). This can be estimated using the following formula:

$$p_2 \geq 1,3 \times p_{Dampf} + 2,6 \times \Delta p'$$

p_2 = Static overpressure downstream of the flowmeter (mbar)

p_{Dampf} = Steam pressure of fluid at operating temperature (mbar)

$\Delta p'$ = Pressure drop, medium (mbar)

3.9 Overload capability

Gases

15 % above maximum flow

Fluids

15 % above maximum flow (no cavitation permitted!)

3.10 Temperature of medium



Important

Please note the information in the section titled "Explosion protection".

Compliance with the permissible temperature range for the gaskets is mandatory.

	FV4000-VT4/VR4	FS4000-ST4/SR4
Standard	-55 ... 280 °C (-67 ... 536 °F)	
HT design	-55 ... 400 °C (-67 ... 752 °F)	-

3.11 Flowmeter insulation

The pipeline may be insulated up to a maximum of 100 mm (4 inch) upper edge.

Use of trace heating

Trace heating may be used under the following conditions:

- If it is fixed directly on or around the pipeline
- If, in the case of existing pipeline insulation, it is installed inside the insulation (the maximum height of 100 mm (4 inch) must not be exceeded)
- If the maximum temperature the trace heating is able to produce \leq the maximum temperature of the medium

The requirements to be met by integrators set out in EN 60079-14 must be complied with!

Please note that the use of trace heaters will not impair EMC protection or generate additional vibrations.

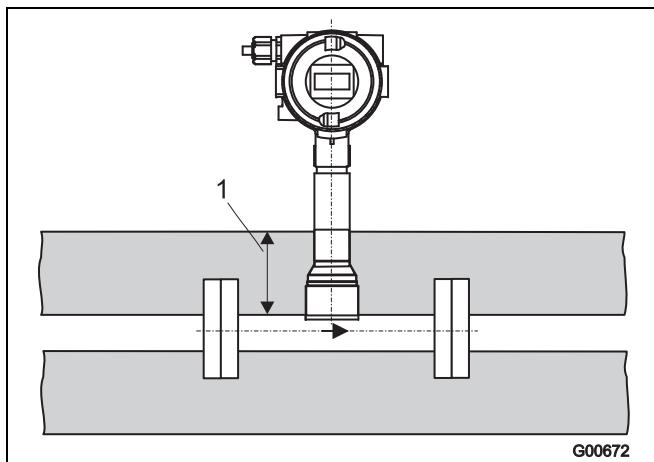


Fig. 6: Flowmeter insulation

1 Maximum 100 mm (4 inch)

3.12 Ambient conditions

Resistance to climate to DIN 40040

Permissible ambient temperature range

Explosion protection / Model	Temperature range
None /	-20 ... 70 °C (-4 ... 158 °F)
VT40 and VR40 / ST40 and SR40	-55 ... 70 °C (-67 ... 158 °F)
Ex ib /	-20 ... 70 °C (-4 ... 158 °F) ¹⁾
VT41 and VR41 / ST41 and SR41	-40 ... 70 °C (-67 ... 158 °F) ¹⁾
Ex ia /	-20 ... 60 °C (-4 ... 140 °F)
VT4A and VR4A / ST4A and SR4A	-30 ... 60 °C (-40 ... 140 °F)
Ex d /	-20 ... 60 °C (-4 ... 140 °F)
VT42 and VR42 / ST42 and SR42	-40 ... 60 °C (-40 ... 140 °F)
cFM _{us} /	-20 ... 70 °C (-4 ... 158 °F)
VT43 and VR43 / ST43 and SR43	-45 ... 70 °C (-49 ... 158 °F)

1) Category 2D (dust-ignition proof) maximum 60° C (140° F)

Permissible air humidity

Design	Humidity
Standard	Relative humidity max. 85 %, annual mean \leq 65 %
Climate-proof	Relative humidity \leq 100 % permanent

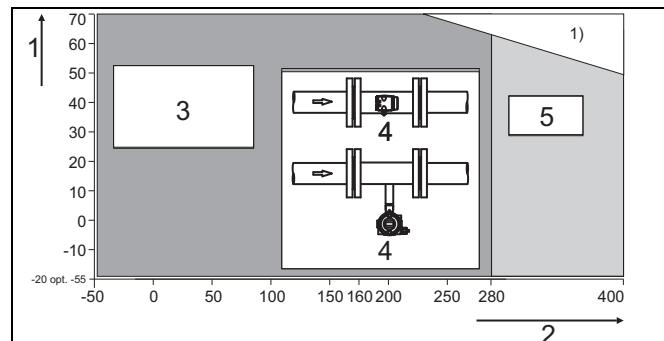


Fig. 7: Relationship between the temperature of the fluid and the ambient temperature

- | | | | |
|---|---|---|--|
| 1 | Ambient temperature | 4 | Installation for medium temperature $> 150^{\circ}\text{C}$ (302 °F) |
| 2 | Media temperature | 5 | HT design ($\leq 400^{\circ}\text{C} (\leq 752^{\circ}\text{F})$), FV4000-VT4 only |
| 3 | Permissible temperature range for standard design ($\leq 280^{\circ}\text{C} (\leq 536^{\circ}\text{F})$) | | |

- 1) For the supply circuit (terminals 31 / 32) and the switching outputs 41 and 42, cables suitable for temperatures up to $T = 110^{\circ}\text{C}$ (230 °F) may be used without restriction. Cables which are only suitable for temperatures up to $T = 80^{\circ}\text{C}$ (176 °F) restrict the temperature ranges. These restrictions also apply to the VR version (remote design) and the PROFIBUS PA design with plug connector.



Important

The legibility of the display can be impaired at temperatures $< 0^{\circ}\text{C}$ ($< 32^{\circ}\text{F}$) and $> 55^{\circ}\text{C}$ ($> 131^{\circ}\text{F}$). The functionality of the meter and the outputs remains unaffected by this. Please refer to the order information for ambient temperatures $< -20^{\circ}\text{C}$ ($< -4^{\circ}\text{F}$).

Please note the information in the section titled 5 „Transmitter specifications”.

3.13 Installation Requirements

A Vortex or Swirl flowmeter can be installed at any point in the pipeline system. However, the following installation conditions must be considered:

- Compliance with the ambient conditions
- Compliance with the recommended inflow/outflow sections
- The flow direction must correspond to that indicated by the arrow on the flowmeter sensor.
- Compliance with the required minimum interval for removing the transmitter and replacing the sensor
- Avoidance of mechanical vibrations of the pipeline (by fitting supports if necessary)
- The internal diameter of the flowmeter sensor and the pipe must be identical.
- Avoidance of pressure vibrations at zero flow by fitting gates at intervals in long pipeline systems
- Attenuation of alternating (pulsating) flow during piston pump or compressor conveying by using appropriate damping devices. The residual pulse must not exceed 10 %. The frequency of the conveying equipment must not be within the range of the measuring frequency of the flowmeter.
- Valves / gates should normally be arranged in the flow direction downstream of the flowmeter (typically: 3 x DN). If the medium is conveyed through piston/plunger pumps or compressors (pressures for fluids > 10 bar (145 psi)), it may be subject to hydraulic vibration in the pipeline when the valve is closed. If this does occur, the valve absolutely has to be installed in the flow direction upstream of the flowmeter. Suitable damping devices (e.g. air vessels) might need to be fitted.
- When fluids are measured, the sensor must always be filled with media and must not run dry.
- When fluids are measured and during damping there must be no evidence of cavitation.
- The relationship between the temperature of the media and the ambient temperature has to be taken into account (see "Ambient conditions" in the section titled "Technical data").
- At high media temperatures > 150 °C (302 °F), the flowmeter sensor must be installed so that the electronics are pointing to the side or downward.

3.14 Recommended inflow and outflow sections

3.14.1 Vortex flowmeter

In order to maximize operational reliability, the flow profile at the inflow end must not be distorted if at all possible. Provision should be made for an inflow section measuring approx. 15 times the nominal diameter. At elbows, the inflow section should measure at least 25 times the nominal diameter, at round elbows 40 times the nominal diameter and where shutoff valves appear in the inflow section, 50 times the nominal diameter. A value 5 times the size of the nominal diameter is required at the outflow end.

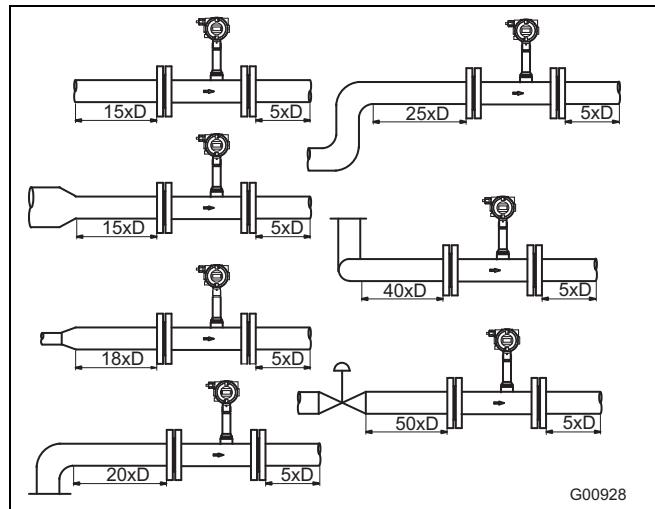


Fig. 8: Recommended inflow and outflow sections

3.14.2 Swirl flowmeter

On account of its operating principle, the Swirl flowmeter functions virtually without inflow and outflow sections. The figure below shows the recommended inflow and outflow sections for various installations. Inflow and outflow sections are not required if the elbow radius of single or double pipe elbows upstream and downstream of the meter is greater than 1.8 x D. Similarly, additional inflow and outflow sections are not required downstream of reductions with flange transition pieces conforming to DIN 28545 ($a/2 = 8$).

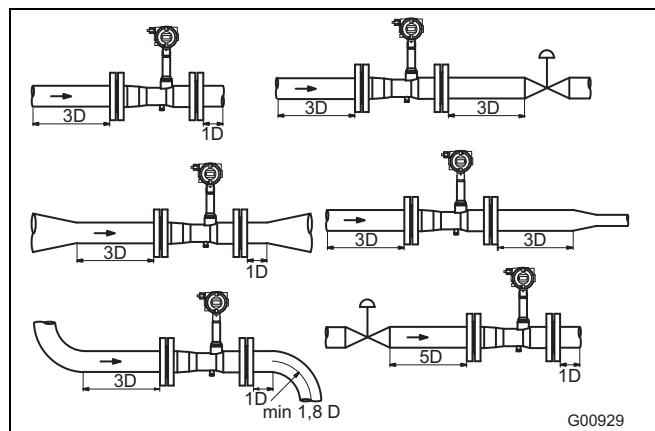


Fig. 9: Recommended inflow and outflow sections

3.15 Installation at high media temperatures > 150°C (302°F)

At high media temperatures > 150°C (302 F) the flowmeter sensor must be installed so that the transmitter is pointing to the side or downward (see the figure below).

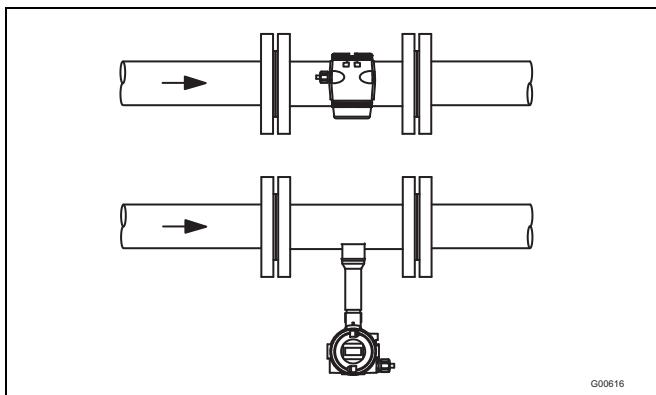


Fig. 10

3.16 Installation for pressure and temperature measurement

As an option, the flowmeter can be fitted with a Pt100 for direct temperature measurement. This temperature measurement supports, for example, the monitoring of the media temperature or the direct measurement of saturated steam in mass flow units.

If pressure and temperature are to be compensated externally (e.g. with the "Sensycal"), the measuring points must be installed as illustrated in the figure below.

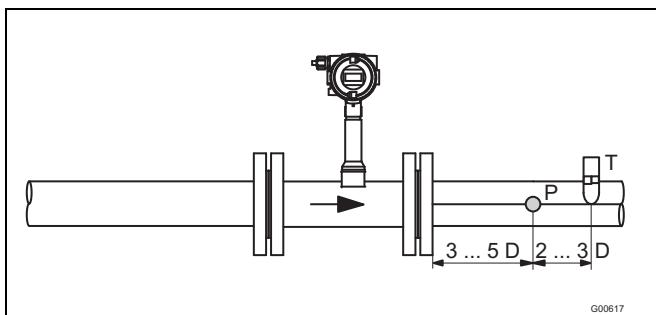


Fig. 11: Arrangement of temperature and pressure measuring points

3.17 Installation of final controlling equipment

Final controlling equipment must be arranged at the outflow end spaced at a minimum 5 x DN.

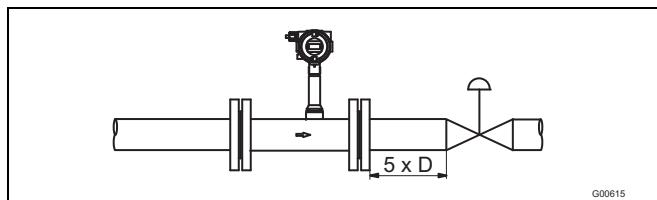


Fig. 12: Installation of final controlling equipment

If the medium is conveyed through piston / plunger pumps or compressors (pressures for fluids > 10 bar (145 psi)), it may be subject to hydraulic vibration in the pipeline when the valve is closed. If this does occur, the valve absolutely has to be installed in the flow direction upstream of the flowmeter. The FS4000 Swirl flowmeter is particularly suited to such scenarios. Suitable dampers (e.g. air vessels in the case of pumping using a compressor) might need to be used.

3.18 Process connections

	Flange design		Wafer flange design	
	Process connection	Operating pressure	Process connection	Operating pressure
FV4000-VT4/VR4	DN15 ... DN300	O-ring gasket: DIN PN 10 ... PN 40, option up to PN 160 ASME Class 150 / 300, option up to 900 lb Flat gasket (graphite): Maximum PN 64 / ASME Class 300 lb	DN25 ... DN150	O-ring gasket: DIN PN 64, option up to PN 100 ASME Class 150 / 300, option up to 600 lb Flat gasket (graphite): Maximum PN 64 / ASME Class 300 lb
FS4000-ST4/SR4	DN 15 ... DN 200 ¹⁾	DIN PN 10 ... PN 40 ASME Class 150/300	-	-
	DN 300 ... DN 400 ¹⁾	DIN PN 10 ... PN 16 ASME Class 150		

1) Other designs on request.

3.19 Materials

Component	Material	Temperature range	
		FV4000-VT4/VR4	FS4000-ST4/SR4
Meter housing	Stainless steel 1.4571 (316Ti) / 316L / CF8 / CF8C, Option: Hastelloy C	-55 ... 400 °C (-67 ... 752 °F)	-55 ... 280 °C (-67 ... 536 °F)
Swirl body / Inlet/outlet pipes	Stainless steel 1.4571 (316Ti) / 316L / CF8 / CF8C, Option: Hastelloy C	(CF8: -55 ... 300 °C (-67 ... 572 °F))	
Sensor	Stainless steel 1.4571, Option: Hastelloy C		
Sensor gasket ¹⁾	Kalrez (3018) o-ring	0 ... 280 °C (32 ... 536 °F)	0 ... 280 °C (32 ... 536 °F)
	Kalrez (6375) o-ring	-20 ... 275 °C (-4 ... 527 °F)	20 ... 275 °C (68 ... 527 °F)
	Viton o-ring	-55 ... 230 °C (-67 ... 446 °F)	-55 ... 230 °C (-67 ... 446 °F)
	PTFE o-ring	-55 ... 200 °C (-67 ... 392 °F)	-55 ... 200 °C (-67 ... 392 °F)
	Graphite	-55 ... 280 °C (-67 ... 536 °F)	-55 ... 280 °C (-67 ... 536 °F)
	Graphite special	-55 ... 400 °C (-67 ... 752 °F) (High temperature)	-
Housing, electronics	Cast aluminum, varnished		

1) Other designs on request.

3.20 Weights

The dimension tables contain weight details.

3.20.1 Permissible operating pressures FV4000

Process connection DIN flange

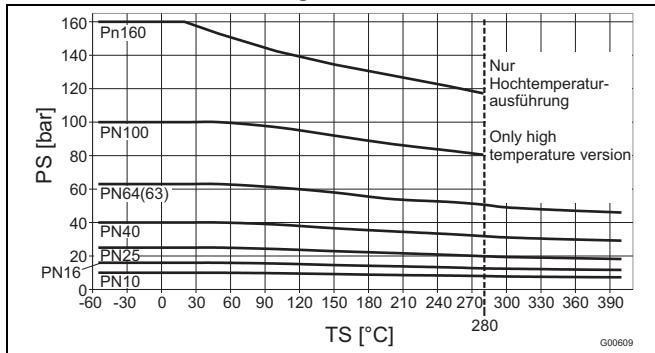


Fig. 13: High temperature design only, version FV4000 (TRIO-WIRL VT / VR)

PS Pressure (bar) TS Temperature (°C)

Process connection ASME flange

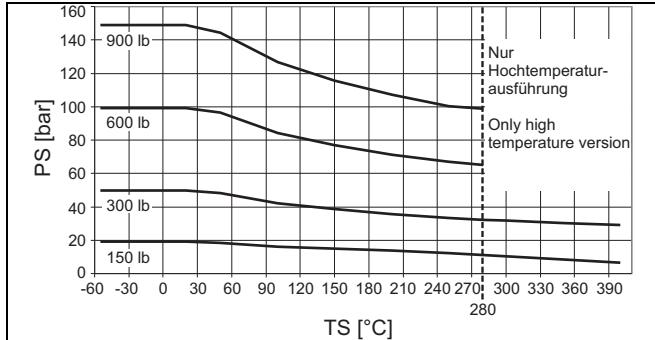


Fig. 14: High temperature design only, version FV4000 (TRIO-WIRL VT / VR)

PS Pressure (bar) TS Temperature (°C)

Aseptic flange to DIN 11864-2

- DN 25 to DN 40:
PS = 25 bar to TS = 140 °C if suitable gasket materials are selected
- DN 50 and DN 80:
PS = 16 bar to TS = 140 °C if suitable gasket materials are selected

Process connection DIN wafer

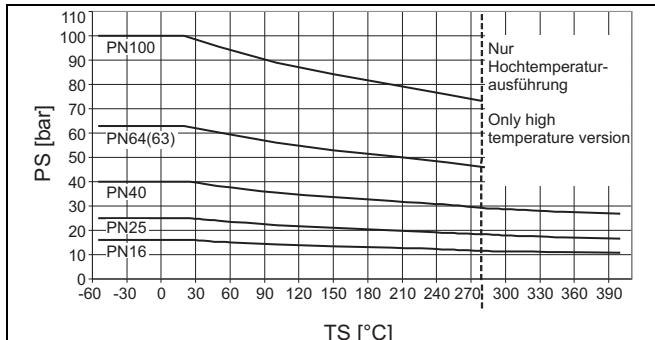
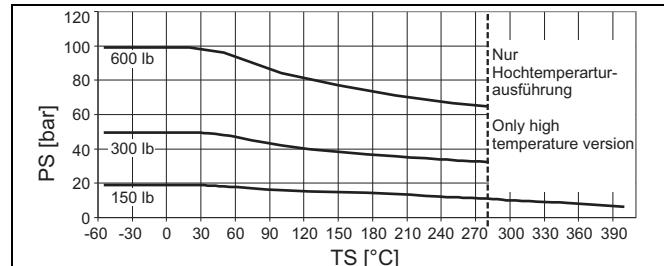


Fig. 15: High temperature design only

PS Pressure (bar) TS Temperature (°C)

Process connection ASME wafer



3.20.2 Permissible operating pressures FS4000

Process connection DIN flange

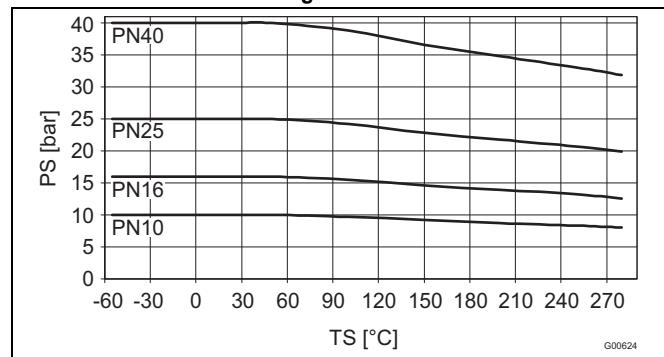


Fig. 17

Process connection ASME flange

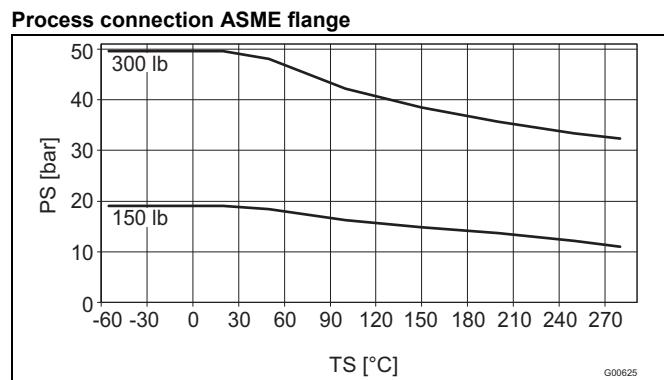
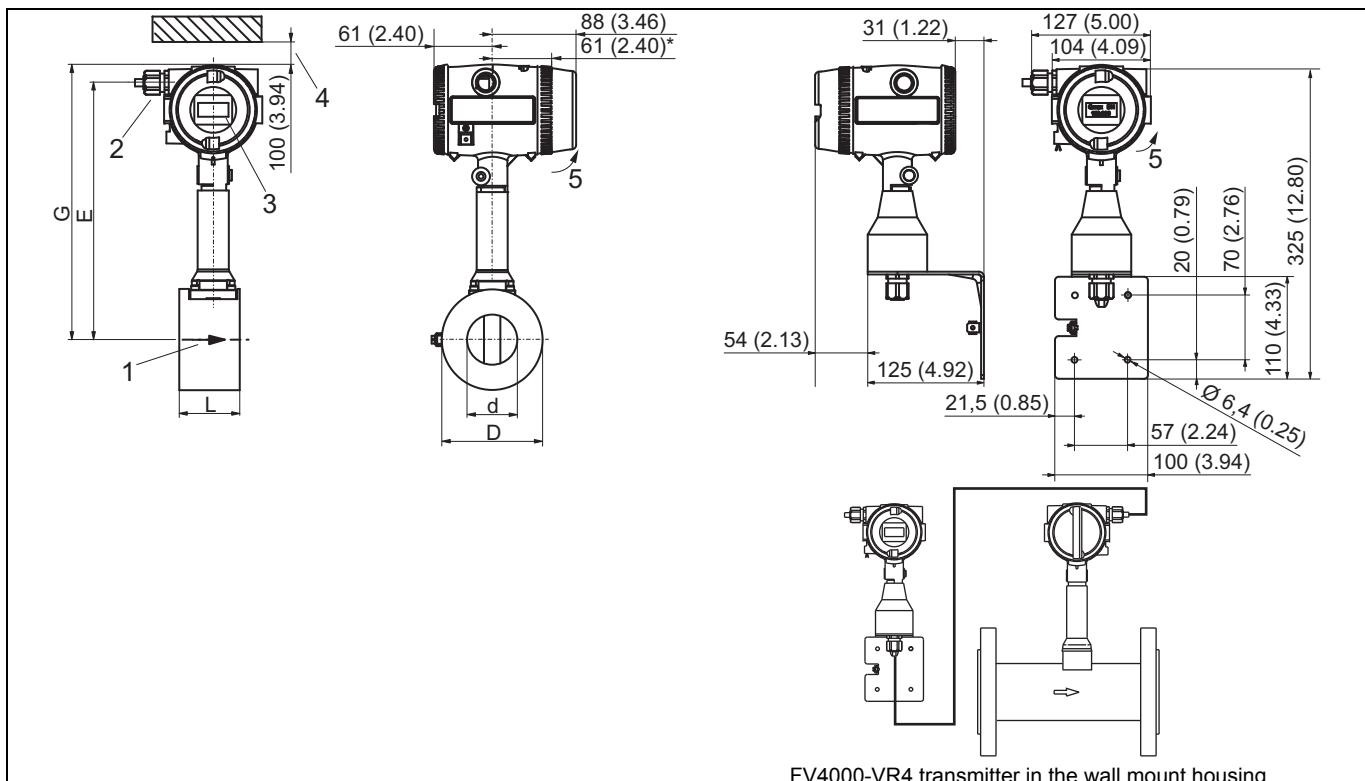


Fig. 18

4 Dimensions

4.1 FV4000-VR4/VR4 (TRIO-WIRL V), wafer design



FV4000-VR4 transmitter in the wall mount housing

Fig. 19: Dimensions in mm (inch), projection in accordance with ISO method E

- 1 Flow direction
- 2 Power supply
- 3 Display with VT4 design only

- 4 Required minimum distance for removing the transmitter and disassembling the sensor unit
- 5 Can be rotated 330°

*) Reduced dimension for VR4 design with remote transmitters

Nominal diameter DN	Nominal pressure PN	Dimensions in mm (inch)					Weight in kg (lb)
		L	E	D	G	d	
		T _{max} 280 °C (536 °F)					
25	64	65 (2,56)	274 (10,79)	73 (2,87)	293 (11,54)	28,5 (1,12)	4,1 (9,0)
40	64	65 (2,56)	290 (11,42)	94 (3,70)	309 (12,17)	43 (1,69)	4,8 (10,6)
50	64	65 (2,56)	298 (11,73)	109 (4,29)	317 (12,48)	54,4 (2,14)	5,6 (12,4)
80	64	65 (2,56)	312 (12,28)	144 (5,67)	331 (13,03)	82,4 (3,24)	7,6 (16,8)
100	64	65 (2,56)	320 (12,6)	164 (6,46)	339 (13,35)	106,8 (4,20)	8,5 (18,7)
150	64	65 (2,56)	352 (13,86)	220 (8,66)	371 (14,61)	159,3 (6,27)	13 (28,7)

Nominal diameter DN	Pressure PN		Dimensions in mm (inch)					Weight in kg (lb)
			L	E	D	G	d	
	Lb	Schedule	T _{max} 280 °C					
1"	300	80	112,5 (4,43)	284 (11,18)	70,5 (2,78)	303 (11,93)	24,3 (0,96)	5,1 (11,2)
1 1/2"	300	80	113 (4,45)	290 (11,42)	89,5 (3,52)	309 (12,17)	38,1 (1,50)	6,1 (13,5)
2"	150 / 300	80	112,5 (4,43)	296 (11,65)	106,5 (4,19)	315 (12,40)	49,2 (1,94)	8,4 (18,5)
3"	300	80	111 (4,37)	312 (12,28)	138,5 (5,45)	331 (13,03)	73,7 (2,90)	11,2 (24,7)
4"	300	80	116 (4,57)	325 (12,80)	176,5 (6,95)	344 (13,54)	97,2 (3,83)	17,2 (37,9)
6"	300	80	137 (5,39)	352 (13,86)	222,2 (8,75)	371 (14,61)	146,4 (5,76)	25,7 (56,7)

4.2 FV4000-VT4/VR4 (TRIO-WIRL V), flange design, DIN

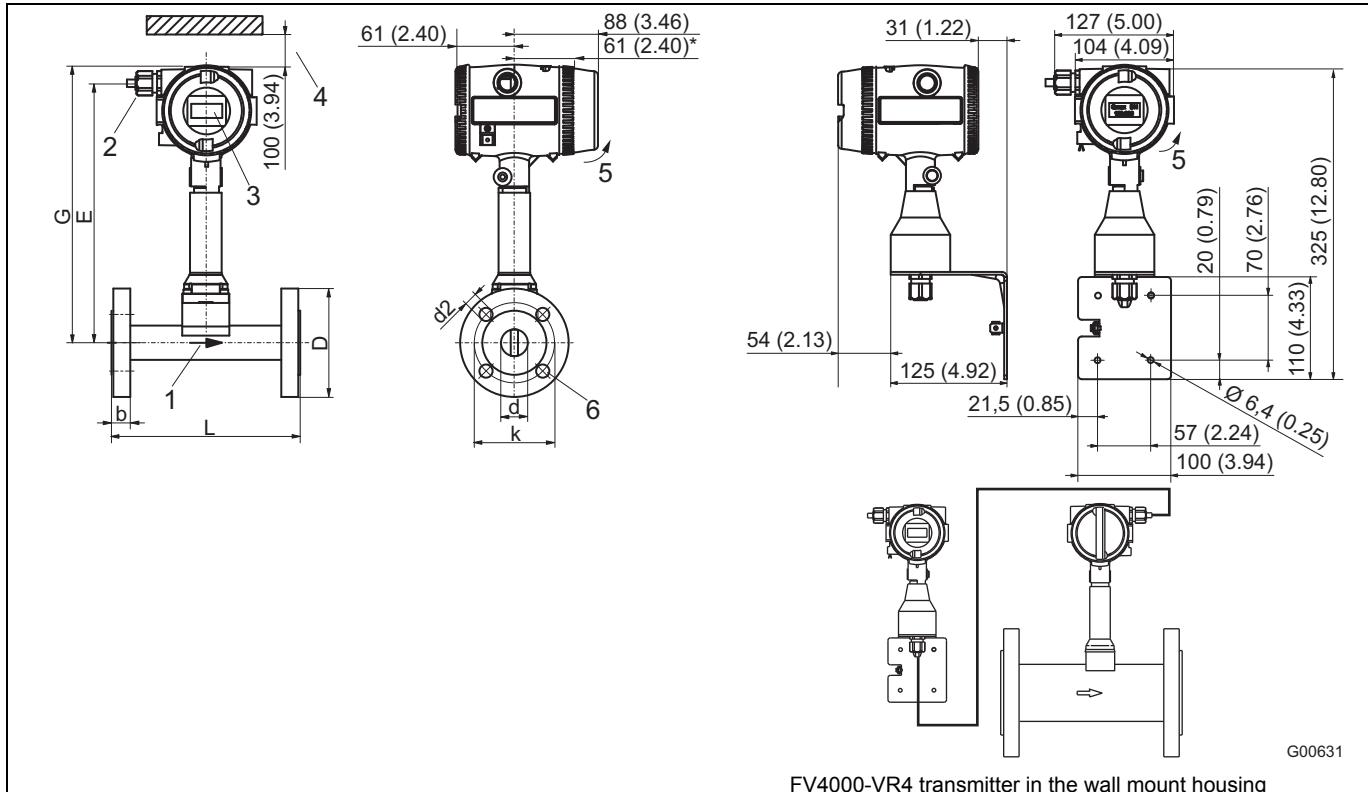


Fig. 20: Dimensions in mm (inch), projection in accordance with ISO method E

- 1 Flow direction
- 2 Power supply
- 3 Display with VT4 design only
- 4 Required minimum distance for removing the transmitter and disassembling the sensor unit
- 5 Can be rotated 330°
- 6 Number of holes N

*) Reduced dimension for VR4 design with remote transmitters

Nominal diameter DN	Nominal pressure DN	Dimensions in mm (inch)				Weight in kg (lb)		
		L ¹⁾	E	D	G			
		T _{max} 280 °C / 536 °F						
15	10 ... 40	200 (7,87)	296 (11,65)	95 (3,74)	315 (12.40)	4,5 (9,9)		
	64 / 100	200 (7,87)		105 (4,13)		5,4 (11,9)		
	160	200 (7,87)		105 (4,13)		5,4 (11,9)		
25	10 ... 40	200 (7,87)	313 (12,32)	115 (4,53)	332 (13.07)	5,1 (11,2)		
	64	210 (8,27)		140 (5,51)		7,8 (17,2)		
	100							
	160							
40	10 ... 40	200 (7,87)	291 (11,46)	150 (5,91)	310 (12.20)	6,6 (14,6)		
	64	220 (8,66)		170 (6,69)		10,1 (22,3)		
	100	220 (8,66)		170 (6,69)		10,5 (23,2)		
	160	225 (8,86)		165 (6,50)		8,7 (19,2)		
50	10 ... 40	200 (7,87)	298 (11,73)	180 (7,09)	317 (12.48)	12,2 (26,9)		
	64	220 (8,66)		195 (7,68)		15,1 (33,3)		
	100	230 (9,06)		195 (7,68)		15,6 (34,4)		
	160	245 (9,65)		200 (7,87)		13,1 (28,9)		
80	10 ... 40	200 (7,87)	316 (12,44)	215 (8,46)	335 (13.19)	17 (37,5)		
	64	250 (9,84)		230 (9,06)		21,4 (47,2)		
	100	260 (10,24)		230 (9,06)		22,9 (50,5)		
	160	280 (11,02)		220 (8,66)		14 (30,9)		
100	10 ... 16	250 (9,84)	325 (12,80)	235 (9,25)	344 (13.54)	17,8 (39,2)		
	25 ... 40	250 (9,84)		250 (9,84)		24,1 (53,1)		
	64	270 (10,63)		265 (10,43)		32,2 (71,0)		
	100	300 (11,81)		265 (10,43)		34,4 (75,9)		
	160	320 (12,60)		285 (11,22)		25,4 (56,0)		
150	10 ... 16	300 (11,81)	352 (13,86)	300 (11,81)	371 (14.61)	33,6 (74,1)		
	25 ... 40	300 (11,81)		345 (13,58)		53,8 (118,6)		
	64	330 (12,99)		355 (13,98)		70,4 (155,2)		
	100	370 (14,57)		355 (13,98)		75 (165,4)		
	160	390 (15,35)		340 (13,39)		45,3 (99,9)		
200	10	350 (13,78)	414 (16,30)	340 (13,39)	433 (17.05)	45,3 (99,9)		
	16	350 (13,78)		360 (14,17)		66,3 (146,2)		
	25	350 (13,78)		375 (14,76)		66,3 (146,2)		
	40	350 (13,78)		415 (16,34)		93,1 (205,3)		
	64	370 (14,57)		395 / 405 (15,55 / 15,94)	458 (18.03)	67,4 (148,6)		
250	10 / 16	450 (17,72)	439 (17,28)	425 / 450 (16,73 / 17,72)		106,4 (234,6)		
	25 / 40	450 (17,72)		470 (18,50)		135,6 (299,0)		
	64	450 (17,72)		445 / 460 (17,52 / 18,11)	483 (19.02)	77,2 (170,2)		
300	10 / 16	500 (19,69)	464 (18,27)	485 / 515 (19,09 / 20,28)		123,2 (271,6)		
	25 / 40	500 (19,69)		530 (20,87)		170,6 (376,1)		
	64	500 (19,69)						

1) Dimension tolerance: DN 15 ... DN 200 +0 / -3 mm; DN 300 ... DN 400: +0 / -5 mm

4.3 FV4000-VT4/VR4 (TRIO-WIRL V), flange design, ASME

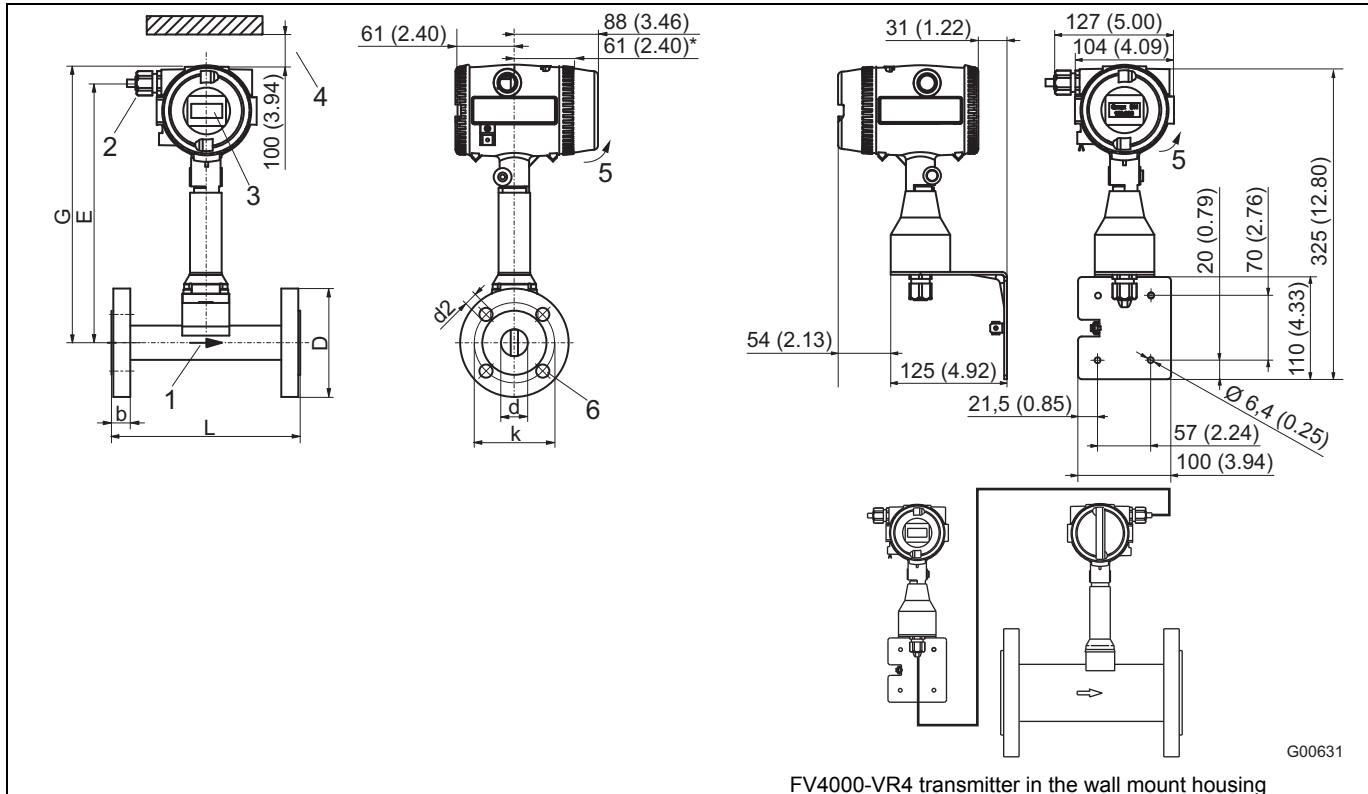


Fig. 21: Dimensions in mm (inch), projection in accordance with ISO method E

- 1 Flow direction
- 2 Power supply
- 3 Display with VT4 design only

- 4 Required minimum distance for removing the transmitter and disassembling the sensor unit
- 5 Can be rotated 330°
- 6 Number of holes N

*) Reduced dimension for VR4 design with remote transmitters

Nominal diameter DN	Pressure PN		Dimensions in mm (inch)			Weight in kg (lb)
	lb	Schedule	L T _{max} 280 °C / 536 °F	E	D	
1/2"	150	40	200 (7,87)	296 (11,65)	88,9 (3,5)	315 (12,4)
	300	40	200 (7,87)		95,2 (3,75)	
	600	40	200 (7,87)		95,3 (3,75)	
	900	40	200 (7,87)		120,6 (4,75)	
1"	150	80	200 (7,87)	313 (12,32)	108 (4,25)	332 (13,07)
	300	80	200 (7,87)		124 (4,88)	
	600	80	200 (7,87)		124 (4,88)	
	900	80	240 (9,45)		149,3 (5,88)	
1 1/2"	150	80	200 (7,87)	291 (11,46)	127 (5,0)	310 (12,2)
	300	80	200 (7,87)		155,6 (6,13)	
	600	80	235 (9,25)		155,6 (6,13)	
	900	80	260 (10,24)		177,8 (7,0)	
2"	150	80	200 (7,87)	298 (11,73)	152,4 (6,0)	317 (12,8)
	300	80	200 (7,87)		165 (6,5)	
	600	80	240 (9,45)		165 (6,5)	
	900	80	300 (11,81)		215,9 (8,5)	
3"	150	80	200 (7,87)	316 (12,44)	190,5 (7,5)	335 (13,19)
	300	80	200 (7,87)		209,5 (8,25)	
	600	80	265 (10,43)		209,5 (8,25)	
	900	80	305 (12,01)		241,3 (9,5)	
4"	150	80	250 (9,84)	325 (12,8)	228,6 (9,0)	344 (13,54)
	300	80	250 (9,84)		254 (10,0)	
	600	80	315 (12,40)		273,1 (10,75)	
	900	80	340 (13,39)		292,1 (11,5)	
6"	150	80	300 (11,81)	352 (13,86)	279,4 (11,0)	371 (14,61)
	300	80	300 (11,81)		317,5 (12,5)	
	600	80	365 (14,37)		355,6 (14)	
	900	80	410 (16,14)		381 (15)	
8"	150	80	350 (13,78)	414 (16,30)	343 (13,5)	433 (17,05)
	300	80	350 (13,78)		381 (15)	
	600	80	415 (16,34)		419,1 (16,5)	
	900	80	470 (18,5)		469,9 (18,5)	
10"	150	40	450 (17,72)	439 (17,28)	406,4 (16)	458 (18,03)
	300	40	450 (17,72)		444,5 (17,5)	
	600	80	470 (18,50)		508 (20)	
12"	150	40	500 (19,69)	464 (18,27)	482,6 (19)	483 (19,02)
	300	40	500 (19,69)		520,7 (20,5)	
	600	80	500 (19,69)		558,8 (22)	

4.4 FS4000-ST4/SR4 (TRIO-WIRL S)

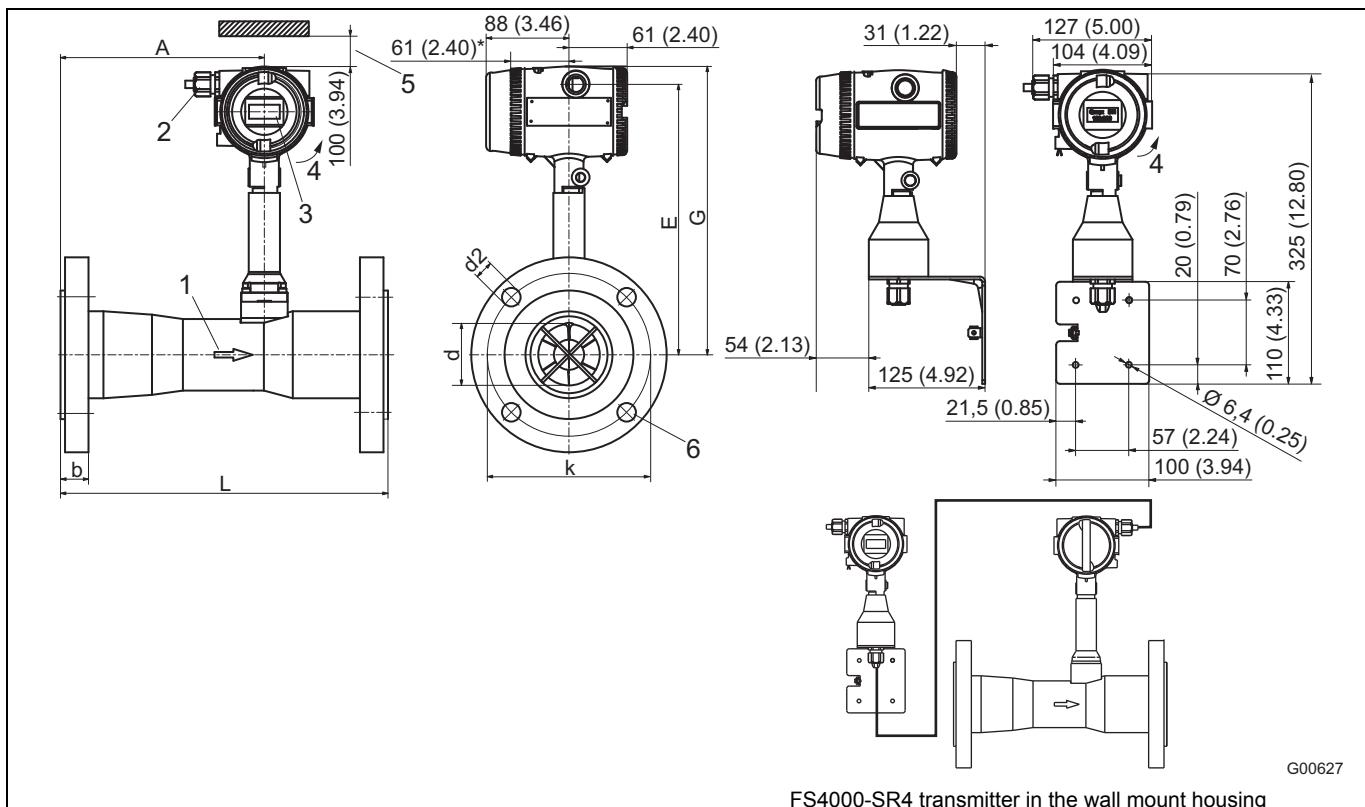


Fig. 22: All dimensions in mm (inch), projection in accordance with ISO method E

- 1 Flow direction
- 2 Power supply
- 3 Display with ST4 design only

- 4 Can be rotated 330°
- 5 Required minimum distance for removing the transmitter and disassembling the sensor unit
- 6 Number of holes N

*) Reduced dimension for SR4 design with remote transmitters

Nominal diameter DN	Nominal pressure PN	Dimensions in mm (inch)						Weight in kg (lb)
		L ¹⁾	G	E	A	D	d	
15	10 ... 40	200 (7,87)	319 (12,56)	300 (11,81)	83 (3,27)	95 (3,74)	17,3 (0,68)	5,8 (12,8)
20	10 ... 40	200 (7,87)	322 (12,68)	303 (11,93)	68 (2,68)	105 (4,13)	22,6 (0,89)	2,4 (5,3)
25	10 ... 40	150 (5,91)	321 (12,64)	302 (11,89)	67 (2,64)	115 (4,53)	28,1 (1,11)	3,5 (7,7)
32	10 ... 40	150 (5,91)	319 (12,56)	300 (11,81)	68 (2,68)	140 (5,51)	37,1 (1,46)	4,7 (10,4)
40	10 ... 40	200 (7,87)	323 (12,72)	304 (11,97)	79 (3,11)	150 (5,91)	42,1 (1,66)	8 (17,6)
50	10 ... 40	200 (7,87)	326 (12,83)	307 (12,09)	106 (4,17)	165 (6,50)	51,1 (2,01)	7,2 (15,9)
80	10 ... 40	300 (11,81)	329 (12,95)	310 (12,20)	159 (6,26)	200 (7,87)	82,6 (3,25)	12,2 (26,9)
100	10 ... 16	350 (13,78)	333 (13,11)	314 (12,36)	189 (7,44)	220 (8,66)	101,1 (3,98)	14,2 (31,3)
	25 ... 40	350 (13,78)			189 (7,44)	235 (9,25)	101 (3,98)	18 (39,7)
150	10 ... 16	480 (18,90)	357 (14,06)	338 (13,31)	328 (12,91)	285 (11,22)	150,1 (5,91)	28,5 (62,8)
	25 ... 40	480 (18,90)			328 (12,91)	300 (11,81)	150,1 (5,91)	34,5 (76,1)
200	10 / 16	600 (23,62)	377 (14,84)	358 (14,09)	436 (17,17)	340 (13,39)	203,1 (8,00)	50 (110,2)
	25 / 40	600 (23,62)			436 (17,17)	360 / 375 (14,17 / 14,76)	203,1 (8,00)	59 / 66 (130,1 / 145,5)
300	10 / 16	1000 (39,37)	423 (16,65)	404 (15,91)	662 (26,06)	445 / 460 (17,52 / 18,11)	309,7 (12,19)	171 / 186 (377,0 / 410,1)
400	10 / 16	1274 (50,16)	459 (18,07)	440 (17,32)	841 (33,11)	565 / 580 (22,24 / 22,83)	390,4 (15,37)	245 / 266 (540,1 / 586,4)

(1) Dimension tolerance: DN 15 ... DN 200 +0 / -3 mm; DN 300 ... DN 400: +0 / -5 mm

Nominal diameter DN	Nominal pressure lb	Dimensions in mm (inch)						Weight in kg (lb)
		L ¹⁾	G	E	A	D	d	
1/2"	150	200 (7,87)	319 (12,56)	300 (11,81)	83 (3,27)	88,9 (3,5)	15,8 (0,62)	5,3 (11,7)
	300	200 (7,87)			83 (3,27)	95,2 (3,75)		5,8 (12,8)
3/4"	150	220 (8,66)	322 (12,68)	303 (11,93)	68 (2,68)	98,4 (3,87)	22,6 (0,89)	2,1 (4,6)
	300	230 (9,06)			68 (2,68)	117,5 (4,63)	22,6 (0,89)	3,0 (6,6)
1"	150	150 (5,91)	321 (12,64)	302 (11,89)	67 (2,64)	108 (4,25)	28,1 (1,1)	3,4 (7,5)
	300	150 (5,91)			67 (2,64)	124 (4,88)	28,1 (1,1)	3,6 (7,9)
1 1/4"	150	150 (5,91)	319 (12,56)	300 (11,81)	68 (2,68)	118 (4,65)	37,1 (1,46)	3,7 (8,2)
	300	150 (5,91)			68 (2,68)	133 (5,24)		5,4 (11,9)
1 1/2"	150	200 (7,87)	323 (12,72)	304 (11,97)	79 (3,11)	127 (5)	42,1 (1,66)	6,8 (15)
	300	200 (7,87)			79 (3,11)	155,6 (6,13)	42,1 (1,66)	8,9 (19,6)
2"	150	200 (7,87)	326 (12,83)	307 (12,09)	106 (4,17)	152,4 (6)	51,1 (2,01)	7,1 (15,7)
	300	200 (7,87)			106 (4,17)	165 (6,5)	51,1 (2,01)	9,8 (21,61)
3"	150	300 (11,81)	329 (12,95)	310 (12,2)	159 (6,26)	190,5 (7,5)	82,6 (3,25)	11,7 (25,8)
	300	300 (11,81)			159 (6,26)	209,5 (8,25)	82,6 (3,25)	16,2 (35,7)
4"	150	350 (13,78)	333 (13,11)	314 (12,2)	189 (7,44)	228,6 (9)	101,1 (3,98)	18,0 (39,7)
	300	350 (13,78)			189 (7,44)	254 (10)	101,1 (3,98)	27,5 (60,6)
6"	150	480 (18,9)	357 (14,06)	338 (13,31)	328 (12,9)	279,4 (11)	150,1 (5,91)	30,0 (66,1)
	300	480 (18,9)			328 (12,9)	317,5 (12,5)	150,1 (5,91)	46,0 (101,4)
8"	150	600 (23,62)	377 (14,84)	358 (14,09)	436 (17,17)	343 (13,5)	203,1 (8)	45,0 (99,2)
	300	600 (23,62)			436 (17,17)	381 (15)	203,1 (8)	75 (165,4)
12"	150	1000 (39,37)	423 (16,65)	404 (15,91)	662 (26,1)	482,6 (19)	309,7 (12,19)	182 (401,2)
16"	150	1274 (50,16)	459 (18,07)	440 (17,32)	841 (33,1)	596,9 (23,5)	390,4 (15,37)	260 (573,2)

1) Dimension tolerance: DN 15 ... DN 200 +0 / -3 mm; DN 300 ... DN 400: +0 / -5 mm

5 Transmitter specifications

5.1.1 General specifications

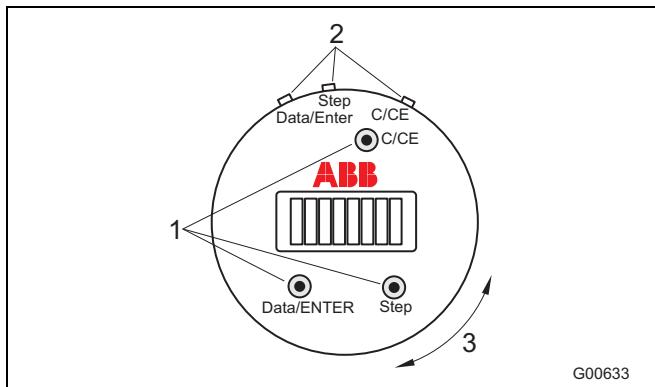


Fig. 23: Transmitter keypad and LCD display

- 1 Magnet sensors
- 2 Control buttons for direct entry
- 3 Can be rotated +/- 90 °

Measuring ranges

The full-scale value can be set at any point between the maximum possible upper range value $1.15 \times Q_{\max DN}$ and $0.15 \times Q_{\max DN}$.

Parameter setting

Data can be entered using 3 control buttons (not with the Ex "d" hazardous area design) or, if the housing is sealed, directly from an external location using a magnetic pen.

Data is entered in plain text with the display or using digital communication via the HART protocol or PROFIBUS PA/FOUNDATION fieldbus.

Flow operating modes

The following operating modes can be selected dependent upon the design purchased (with or without Pt100):

Fluid medium:

- Operating flow
- Mass flow with constant or temperature-dependent density

Gas/steam medium:

- Operating flow
- Mass flow with constant or temperature-dependent density (at constant pressure)
- Standard flow with constant or temperature-dependent standard factor (at constant pressure)
- Mass flow with saturated steam and temperature-driven density

Data backup

Counter readings and parameters for specific measuring points backed up in FRAM (more than 10 years without supply power) in the case of shutdown or should the supply voltage fail.

Damping

Configurable from 1 ... 100 s, corresponds to 5 τ.

$Q_v \min$ (low flow)

Configurable between 2 ... 25 % of $Q_{\max DN}$ (max. operating flow per nominal size). The actual low flow is determined by application and installation.

Function tests

Software-internal function tests can be used to test individual internal modules. For the purpose of commissioning and testing, the current output (4 ... 20 mA design) or the digital output signal (fieldbus designs) can be simulated in line with flowrates selected by the user (manual process control). The switching output can also be controlled directly for the purpose of function testing.

Electrical connection

Screw-type terminals, plug-in connection on PROFIBUS PA (option) cable gland: -standard-, Ex "ib" / Ex "ia": M20 x 1.5; NPT 1/2 " -Ex "d": NPT 1/2"

Ingress protection

IP 67 to EN 60529

Display

High-contrast LCD display, 2 x 8-digit (4 ... 20 mA design) or 4 x 16-digit (PROFIBUS PA / FOUNDATION fieldbus design). Shows the instantaneous flowrate along with the totalized flow or temperature of the medium (option).

On the 4 ... 20 mA design, the multiplex function enables 2 values (e.g., flowrate and totalized flow) to be displayed virtually in parallel. Up to 4 values can be displayed on the fieldbus design.

Switching output terminals 41 / 42

(standard on all designs)

The function can be selected via the software:

- Max./min. alarm for flow or temperature
- System alarm
- Pulse output: f_{\max} : 100 Hz; t_{on} : 1 ... 256 ms

Contact type:

- Standard and Ex "d": Optocoupler $U_H = 16 \dots 30 V$
 $I_L = 2 \dots 15 mA$
- Ex "ib" / Ex "ia": Configured as NAMUR contact

EMC protection

The flowmeter corresponds to NAMUR recommendations NE21. Electromagnetic compatibility of equipment for process and lab control technology 5/93 and EMC Directive 2004/108/EC (EN 61326-1). Note: EMC protection and protection against accidental contact are limited when the housing cover is open.

6 Communication

6.1 2-wire technology design

The design of the Vortex or Swirl flowmeter transmitter features 2-wire technology, i.e., the power supply and digital communication for the fieldbus interface both use the same wires. An additional switching output is also available for use at the same time.

All stored data is preserved in the event of a power failure. The SMART VISION program can be used for operation and configuration purposes. SMART VISION is a piece of universal communication software for intelligent field devices based on FDT / DTM technology.

Data can be exchanged with a comprehensive range of field devices using various means of communication. The main applications include parameter display, configuration, diagnostics, recording, and data management for all intelligent field devices that specifically meet the communication requirements involved.

6.2 4 ... 20 mA / HART

6.2.1 Electrical connection for 4 ... 20 mA / HART

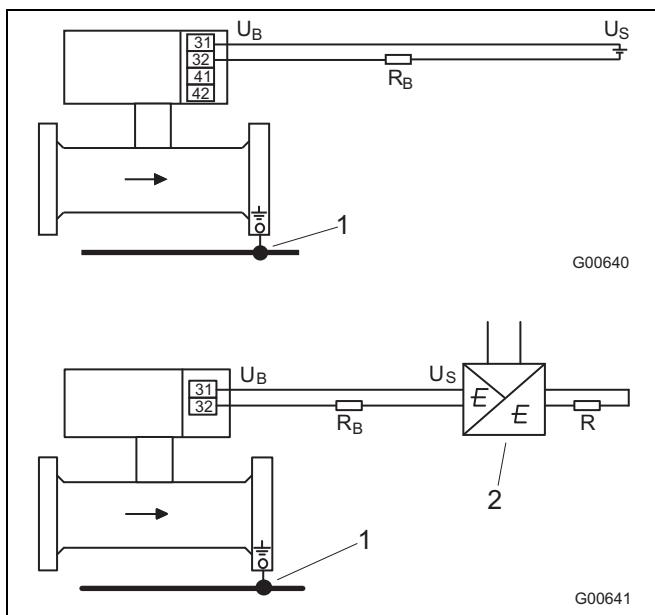


Fig. 24: Supply power from central power supply, supply power (DC or AC) from power supply unit

1 Functional ground 2 Power supply unit

UB = Supply voltage = min. 14 V DC

US = Supply voltage = 14 ... 46 V DC

RB = Maximum permissible load for the power supply unit (e.g. display, load)

R = Maximum permissible load for the output circuit (determined by the power supply unit)

Supply power (terminals 31 / 32)

Standard	14 ... 46 V DC
Hazardous area design	See Chapter 7, "Ex relevant specifications for transmitter".
Residual ripple	Maximum 5 % or. ± 1.5 Vpp
Power consumption	< 1 W

Electrical connection for FV4000-VR4, FS4000-SR4

With these designs, the sensor and transmitter are separated by a signal cable of up to 10 m in length. The signal cable is permanently connected to the transmitter and can be made shorter if required. Fig. 24 shows how the supply power connection is arranged for the transmitter.

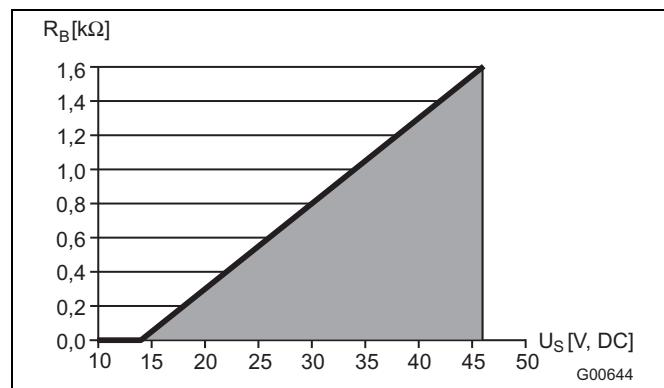


Fig. 25: Load diagram for current output, load via supply power

In HART communication, the smallest load is 250 Ω. The load R_E is calculated on the basis of the available supply voltage U_S and the selected signal current as follows:

$$R_E = \frac{U_S}{I_B}$$

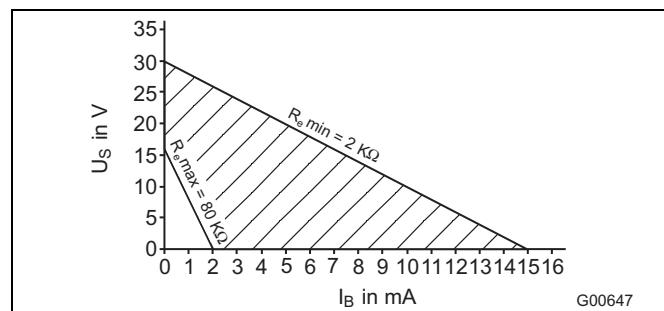


Fig. 26: Load resistance of the switching output as a function of current and voltage

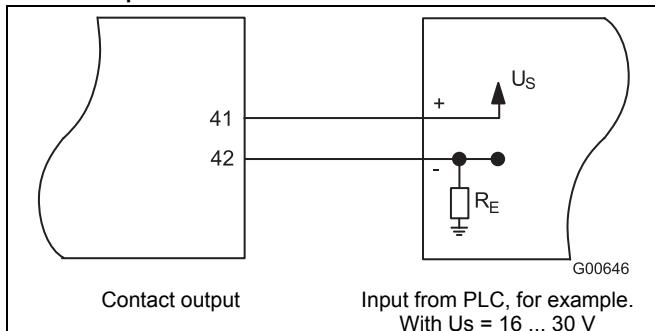
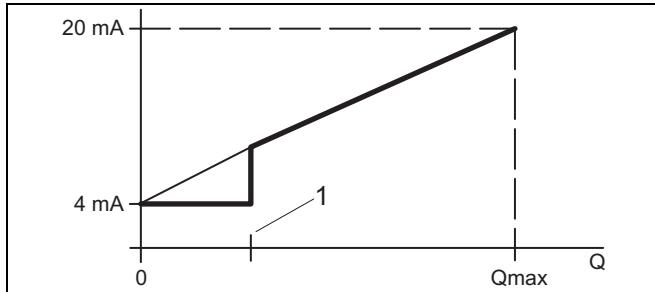
Contact output

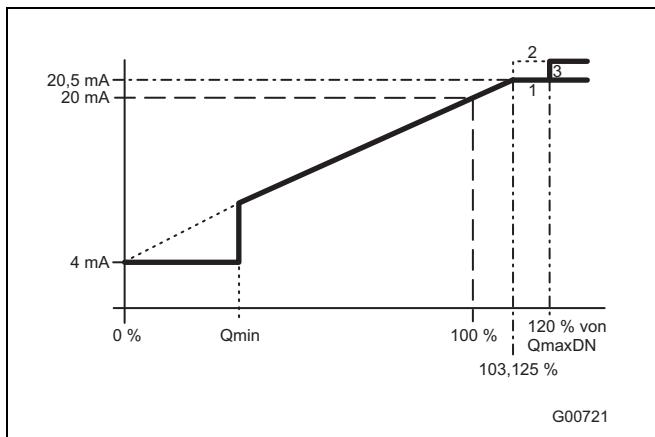
Fig. 27: Electrical connection



The measurement value output at the current output is as shown in the figure: Above the low flow, the current is a straight line that would have 4 mA in $Q = 0$ and 20 mA in $Q = Q_{\text{max}}$ operating mode. Due to low flow cutoff, the flow is set to 0 below $x \% Q_{\text{max}}$ or the low flow (in other words, the current is 4 mA).

6.2.2 Current output for alarm

21 ... 23 mA in accordance with Namur NE43

**6.2.3 HART protocol communication**

The HART protocol is used for digital communication between a process control system / PC, a handheld terminal, and the Vortex or Swirl flowmeter.

It can be used to send all device and measuring point parameters from the transmitter to the process control system or PC. Conversely, it also provides a means of reconfiguring the transmitter. Digital communication utilizes an alternating current superimposed on the analog output (4 ... 20 mA) that does not affect any meters connected to the output.

Transmission method

FSK modulation at current output of 4 ... 20 mA based on the Bell 202 standard. Max. signal amplitude: 1.2 mA ss.

Current output load

Min. > 250 Ω , max. 750 Ω

Max. cable length: 1,500 m; AWG 24 twisted and shielded

Baud rate

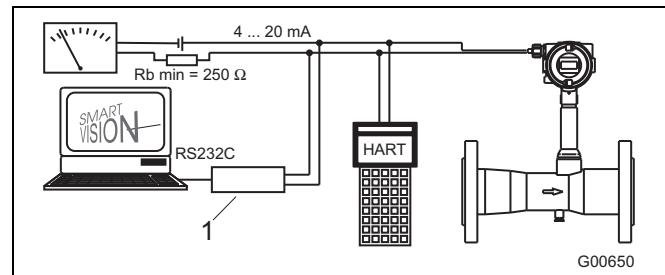
1,200 baud

Display

Logic 1: 1,200 Hz, Logic 0: 2,200 Hz

Current output for alarm

High = 21 ... 23 mA, adjustable (NE43)



6.3 PROFIBUS PA

6.3.1 PROFIBUS PA electrical connection

1) Terminals 31, 32

Function PA+, PA-

Connection for PROFIBUS PA to IEC 1158-2

$U = 9 \dots 24 \text{ V}$, $I = 10 \text{ mA}$ (normal operation)

13 mA (in the event of an error / FDE)

2) Terminals 41, 42

Function C9, E9

Switching output: Function can be selected via software as a pulse output (fmax: 100 Hz, 1 ... 256 ms), min. / max. alarm or system alarm.

Configured as NAMUR contact to DIN 19234.

Closed: $1 \text{ k}\Omega$

Open: $> 10 \text{ k}\Omega$

M12 plug-in connector

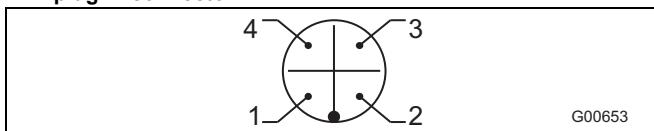


Fig. 31: Assignment for connection using optional M12 plug-in connector

Pin	Assignment
1	PA+ (31)
2	NC
3	PA- (32)
4	Shield

6.3.2 PROFIBUS PA communication

The transmitter is suitable for connection to DP/PA segment couplers and the ABB MB204 multibarrier.

PROFIBUS PA protocol

Output signal: in accordance with EN 50170 Volume 2,

PROFIBUS transmission method: IEC 1158-2/EN 61158-2

Transmission speed: 31.25 KByte/s

PROFIBUS profile: Version 3.0

Ident Number

05DC hex

Function blocks

2 x AI,

1 x TOT

GSD files

- PA139700 (1 x AI)
- PA139740 (1 x AI, 1 x TOT)
- ABB_05DC (2 x AI, 1 x TOT + manufacturer-specific data)

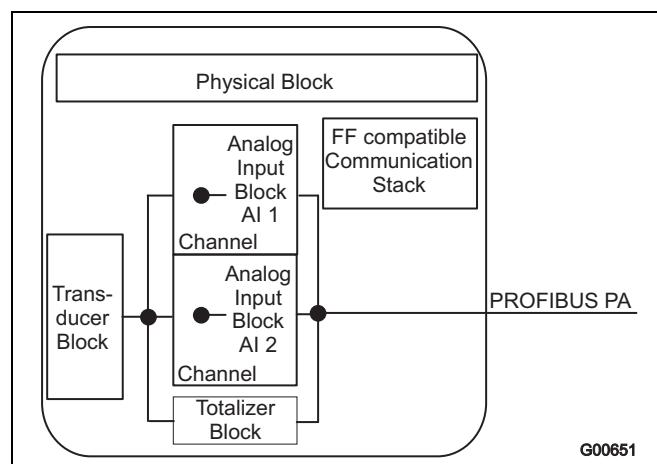


Fig. 32: Block structure for PROFIBUS PA

6.3.3 Example: PROFIBUS PA communication

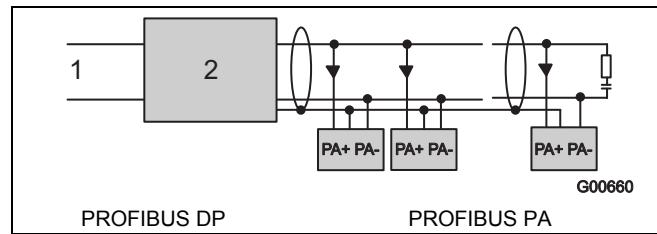


Fig. 33: Example for PROFIBUS PA interface connection

1 H2 bus

2 Segment coupler (incl. bus supply and termination)

6.4 FOUNDATION fieldbus

6.4.1 FOUNDATION fieldbus electrical connection

1) Terminals 31, 32

Function FF+, FF-

Connection for FOUNDATION fieldbus (H1) to IEC 1158-2

$U = 9 \dots 24 \text{ V}$, $I = 10 \text{ mA}$ (normal operation)

13 mA (in the event of an error / FDE)

2) Terminals 41, 42

Function C9, E9

Switching output: Function can be selected via software as a pulse output ($f_{\max}: 100 \text{ Hz}$, $1 \dots 256 \text{ ms}$), min. / max. alarm or system alarm.

Configured as NAMUR contact to DIN 19234.

Closed: $1 \text{ k}\Omega$

Open: $> 10 \text{ k}\Omega$

6.4.2 FOUNDATION fieldbus communication

The transmitter is suitable for connection to special power supply units, a linking device, and the ABB MB204 multibarrier.

FOUNDATION fieldbus protocol

Output signal: in accordance with the FOUNDATION fieldbus protocol

Specification: 1.4 / ITK 4.01 for the H1 bus

Transmission method: IEC 1158-2 / EN 61158-2

Transmission speed: 31.25 KByte/s

Manufacturer ID: 0x000320 Device ID: 0x0015

Reg. number: IT013600

Function blocks

2 x analog inputs

Stack

With LAS functionality

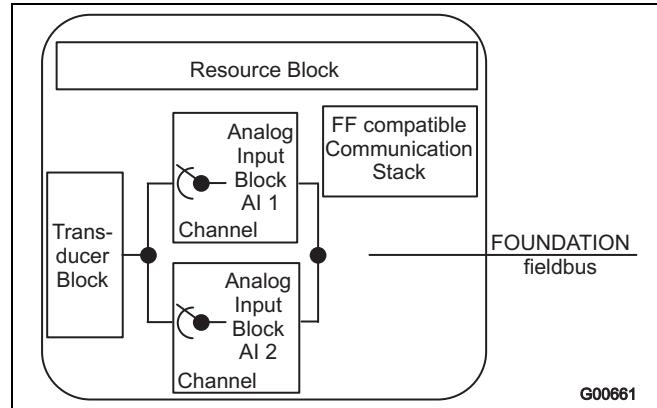


Fig. 34: Block structure for FOUNDATION fieldbus

The channel selector can be used to select the initial variable (volume / mass / standard flow, counter or temperature).

6.4.3 Example: FOUNDATION fieldbus communication

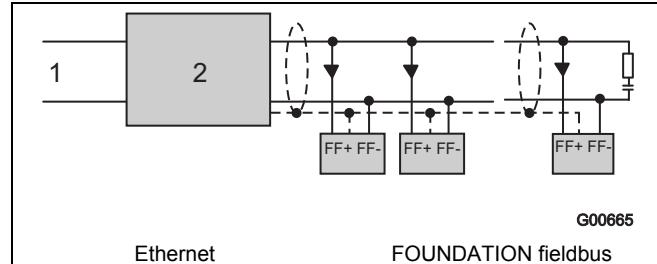


Fig. 35: Example for FOUNDATION fieldbus interface connection

1 HSE bus

2 Linking device (incl. bus supply and termination)

7 Ex relevant specifications for transmitter

7.1 Ex "ib" / Ex "n" design for VT41/ST41 and VR41/SR41 (4 ... 20 mA / HART)



Important

The devices may only be operated in explosive areas if the housing covers have been fully closed.

EC type-examination certificate TÜV 08 ATEX 554808 X / TÜV 10 ATEX 387786 X¹⁾

Designation:

II 2G Ex ib IIC T4

II 2D Ex tD A21 T85°C...T_{medium} IP 67

Declaration of conformity TÜV 08 ATEX 554833 X / TÜV 10 ATEX 556214 X¹⁾

Designation:

II 3G Ex nA [nL] IIC T4

II 3D Ex tD A22 T85°C...T_{medium} IP 67

Certificate of conformity IECEx TUN 07.0014 X / TUN 10.0024 X

Designation:

Ex ib IIC T4...T1

Ex nA [nL] IIC T4...T1

Ex tD A21 IP6X TX°C

- 1) Not for Shanghai production site

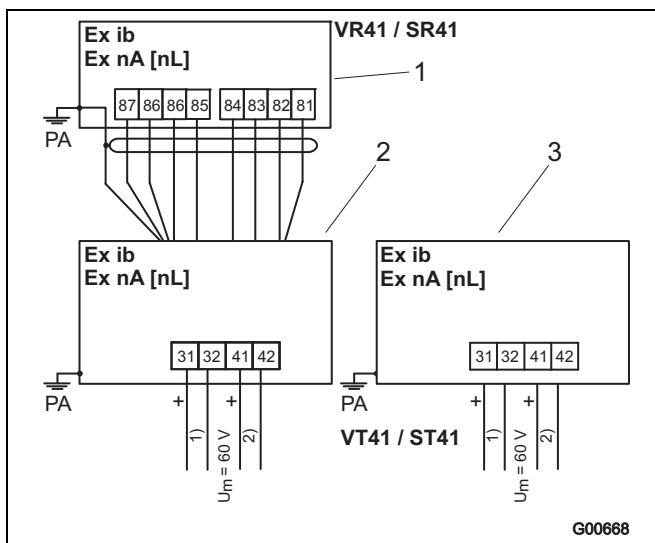


Fig. 36: Electrical connection for VT41 / ST41 and VR41 / SR41

1 Flowmeter sensor

3 Flowmeter

2 Transmitter

Flowmeter sensor wire colors

Terminal	Wire color
81	Red
82	Blue
83	Pink
84	Gray
85	Yellow
86	Green
86	Brown
87	White

- 1) Supply power terminals 31 / 32

a) Ex ib: $U_i = 28 \text{ V DC}$

b) Ex nA [nL] $U_B = 14 \dots 46 \text{ V DC}$

- 2) Switching output, terminals 41/ 42

The switching output (passive) optocoupler is designed as a NAMUR contact (to DIN 19234).

When the contact is closed, the internal resistance is approx. $1,000 \Omega$. When the contact is open, it is $> 10 \text{ k}\Omega$. The switching output can be changed over to "optocoupler" if required.

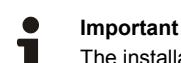
a) NAMUR with switching amplifier

b) Switching output (optocoupler)

- Ex ib: $U_i = 15 \text{ V}$

- Ex nA [nL]: $U_B = 16 \dots 30 \text{ V}$

$I_B = 2 \dots 15 \text{ mA}$



Important

The installation instructions in accordance with EN 60079-14 must be complied with.

When commissioning the flowmeter, refer to IEC 61241-1-2 regarding use in areas with combustible dust. The transmitter housing cover must be secured by means of the safety locking device. After switching off the supply power, wait $t > 2$ minutes before opening the transmitter housing.

7.1.1 Supply power or supply current

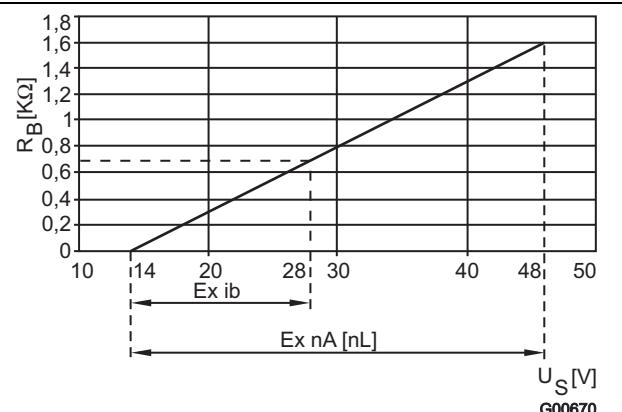


Fig. 37

The minimum voltage U_S of 14 V is based on a load of 0Ω .

U_S = supply voltage

R_B = Maximum permissible load in power supply circuit, e.g., indicator, recorder or power resistor

7.1.2 Approval data for hazardous areas

Power supply circuit	Terminals 31, 32
Type of protection $U_m = 60 \text{ V}$	Zone 1: Ex ib IIC $T_{amb} = (-40 \text{ }^{\circ}\text{C}) -20 \dots 70 \text{ }^{\circ}\text{C}$ $U_i = 28 \text{ V}$ $I_i = 110 \text{ mA}$ $P_i = 770 \text{ mW}$ Effective internal capacitance: 14.6 nF Effective internal capacitance to ground: 24.4 nF Effective internal inductance: 0.27 mH
	Zone 2: Ex nA [nL] IIC $T_{amb} = (-40 \text{ }^{\circ}\text{C}) -20 \dots 70 \text{ }^{\circ}\text{C}$ $U_B = 14 \dots 46 \text{ V}$
	Zone 21 / 22: Ex tD A21 / Ex tD A22 $T_{amb} = -20 \text{ }^{\circ}\text{C} \dots 60 \text{ }^{\circ}\text{C}$

Power supply circuit	Terminals 41, 42
Type of protection $U_m = 60 \text{ V}$	Zone 1: Ex ib IIC $U_i = 15 \text{ V}$ $I_i = 30 \text{ mA}$ $P_i = 115 \text{ mW}$ Effective internal capacitance: 11.6 nF Effective internal capacitance to ground: 19.6 nF Effective internal inductance: 0.14 mH
	Zone 2: Ex nA [nL] IIC $U_B = 16 \dots 30 \text{ V}$ $I_B = 2 \dots 15 \text{ mA}$
	Zone 21 / 22: Ex tD A21 / Ex tD A22 $T_{amb} = -20 \text{ }^{\circ}\text{C} \dots 60 \text{ }^{\circ}\text{C}$

The devices must be installed in a protected environment in accordance with the specific conditions on the test certificate. Pollution degree 3 (see IEC 60664-1) must not be exceeded for the macro environment of the device. The devices conform to degree of protection IP 65 / IP 67. If the device is installed as intended, this requirement is met by the housing as standard.

When connected to the line supply / not connected to the line supply, the electrical circuits must not exceed overvoltage category III / II.

7.1.3 Medium temperatures / Temperature classes

For the supply circuit "Terminals 31, 32" and the switching outputs "Terminals 41, 42", cables suitable for temperatures up to $T = 110 \text{ }^{\circ}\text{C}$ ($T = 230 \text{ }^{\circ}\text{F}$) can be used without restriction.

Category 2/3G

For cables suitable only for temperatures up to $T = 80 \text{ }^{\circ}\text{C}$ ($T = 176 \text{ }^{\circ}\text{F}$), the interconnection of both circuits needs to be taken into account in the event of a fault. Otherwise, the restricted temperature ranges listed in the following table shall apply.

Category 2D

For cables suitable only for temperatures up to $T = 80 \text{ }^{\circ}\text{C}$ ($T = 176 \text{ }^{\circ}\text{F}$), the restricted temperature ranges listed in the following table shall apply.

Ambient temperature ²⁾	Max. temperature at used connecting cable, "Terminals 31, 32", "Terminals 41, 42"	Max. permissible medium temperature
(-40) -20 ... 70 $\text{ }^{\circ}\text{C}$ ³⁾ ((-40) -4 ... 158 $\text{ }^{\circ}\text{F}$) ³⁾	110 $\text{ }^{\circ}\text{C}$ (230 $\text{ }^{\circ}\text{F}$) 80 $\text{ }^{\circ}\text{C}$ (176 $\text{ }^{\circ}\text{F}$)	280 $\text{ }^{\circ}\text{C} / 400 \text{ }^{\circ}\text{C}$ ¹⁾ (536 $\text{ }^{\circ}\text{F} / 752 \text{ }^{\circ}\text{F})$ ¹⁾
(-40) -20 ... 70 $\text{ }^{\circ}\text{C}$ ³⁾ ((-40) -4 ... 158 $\text{ }^{\circ}\text{F}$) ³⁾		160 $\text{ }^{\circ}\text{C}$ (320 $\text{ }^{\circ}\text{F}$)
(-40) -20 ... 60 $\text{ }^{\circ}\text{C}$ ((-40) -4 ... 140 $\text{ }^{\circ}\text{F}$)		240 $\text{ }^{\circ}\text{C}$ (464 $\text{ }^{\circ}\text{F}$)
(-40) -20 ... 55 $\text{ }^{\circ}\text{C}$ ((-40) -4 ... 131 $\text{ }^{\circ}\text{F}$)		280 $\text{ }^{\circ}\text{C}$ (536 $\text{ }^{\circ}\text{F}$)
(-40) -20 ... 50 $\text{ }^{\circ}\text{C}$ ((-40) -4 ... 122 $\text{ }^{\circ}\text{F}$)		320 $\text{ }^{\circ}\text{C}$ (608 $\text{ }^{\circ}\text{F}$) ¹⁾
(-40) -20 ... 40 $\text{ }^{\circ}\text{C}$ ((-40) -4 ... 104 $\text{ }^{\circ}\text{F}$)		400 $\text{ }^{\circ}\text{C}$ (752 $\text{ }^{\circ}\text{F}$) ¹⁾

1) Medium temperatures > 280 $\text{ }^{\circ}\text{C}$ (> 536 $\text{ }^{\circ}\text{F}$) with FV4000 Vortex flowmeter only

2) The permissible limits for the ambient temperature are approval- and order-specific (standard: -20 $\text{ }^{\circ}\text{C}$ (-4 $\text{ }^{\circ}\text{F}$)).

3) Category 2D (dust-ignition proof) maximum 60 $\text{ }^{\circ}\text{C}$ (140 $\text{ }^{\circ}\text{F}$)

Maximum medium temperature	Temperature class
130 $\text{ }^{\circ}\text{C}$ (266 $\text{ }^{\circ}\text{F}$)	T4
195 $\text{ }^{\circ}\text{C}$ (383 $\text{ }^{\circ}\text{F}$)	T3
290 $\text{ }^{\circ}\text{C}$ (554 $\text{ }^{\circ}\text{F}$)	T2
400 $\text{ }^{\circ}\text{C}$ (752 $\text{ }^{\circ}\text{F}$)	T1

7.2 Ex "d" / Ex "ib" / Ex "n" design for VT42/ST42 and VR42/SR42 (4 ... 20 mA / HART)

i **Important**
The devices may only be operated in explosive areas if the housing covers have been fully closed.

EC type-examination certificate TÜV 08 ATEX 554955 X / TÜV 10 ATEX 387788 X¹

Designation

- Transmitter / flowmeter
 - II 2G Ex d [ib] IIC T6
 - II 2G Ex ib IIC T4
 - II 2D Ex tD A21 T 85 °C ... T_{medium} IP 67
- Flowmeter sensor
 - II 2G Ex ib IIC T4
 - II 2D Ex tD A21 T 85 °C ... T_{medium} IP 67

Declaration of conformity TÜV 08 ATEX 554956 X / TÜV 10 ATEX 556215 X¹

Designation on sensor / transmitter / flowmeter:

- II 3G Ex nA [nL] IIC T4
- II 3D Ex tD A22 T85°C...T_{medium} IP 67

Certificate of conformity IECEx TUN 08.0010 X / TUN 10.0025 X

Designation:

- Ex d [ib] IIC T6 to T1
- Ex ib IIC T4 to T1
- Ex tD A21 IP6X T85°C...T_{medium}
- Ex nA [nL] IIC T4 to T1

- 1) Not for Shanghai production site

Flowmeter sensor wire colors

Terminal	Wire color
81	Red
82	Blue
83	Pink
84	Gray
85	Yellow
86	Green
86	Brown
87	White

- 1) Supply power terminals 31 / 32
 - a) Ex ib: U_i = 28 V DC
 - b) Ex d [ib] / Ex nA [nL]: U_B = 14 ... 46 V DC

- 2) Switching output, terminals 41 / 42

The switching output (passive) is designed as an optocoupler. If required, the switching output (passive) can be designed as a NAMUR contact (to DIN 19234).

- a) NAMUR with switching amplifier
- b) Switching output (optocoupler)
 - Ex ib: U_i = 15 V
 - Ex d [ib] / Ex nA [nL]: U_B = 16 ... 30 V
I_B = 2 ... 15 mA



Important

Supply current (supply power) and switching output must be either only intrinsically safe or only non-intrinsically safe. A combination of the two is not permitted. On intrinsically safe circuits, equipotential bonding must be in place along the entire length of the cable used.

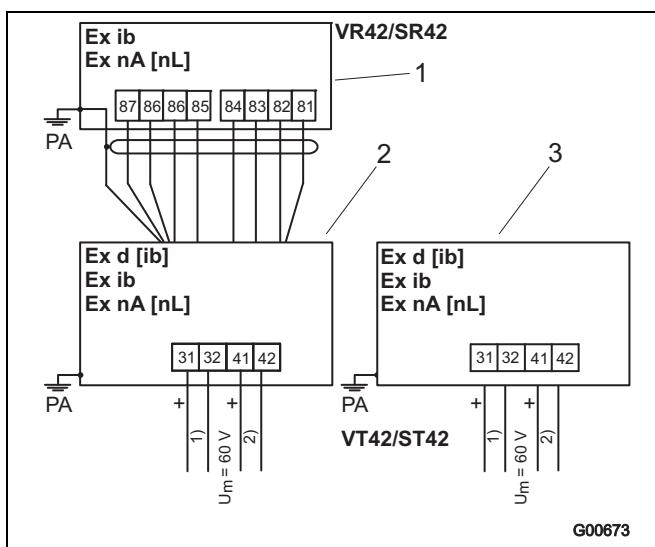


Fig. 38: Electrical connection for VT42 / ST42 and VR42 / SR42

- | | |
|--------------------|-------------|
| 1 Flowmeter sensor | 3 Flowmeter |
| 2 Transmitter | |

7.2.1 Supply power or supply current

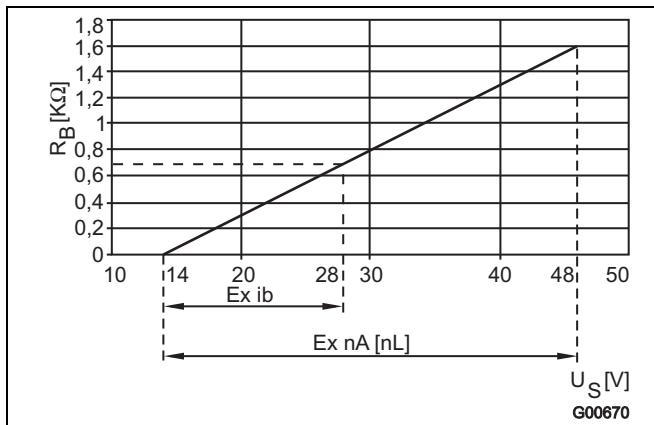


Fig. 39

The minimum voltage U_S of 14 V is based on a load of 0Ω .

U_S = supply voltage

R_B = Maximum permissible load in power supply circuit, e.g., indicator, recorder or power resistor



Important

The installation instructions in accordance with EN 60079-14 must be complied with.

When commissioning the flowmeter, refer to IEC 61241-1-2 regarding use in areas with combustible dust. The transmitter housing cover must be secured by means of the safety locking device. After switching off the supply power, wait $t > 2$ minutes before opening the transmitter housing.

7.2.2 Approval data for hazardous areas

Power supply circuit	Terminals 31, 32
	Zone 1: Ex d [ib] IIC $T_{amb} = (-40 \text{ }^{\circ}\text{C}) -20 \dots 60 \text{ }^{\circ}\text{C}$ Zone 2: Ex nA [nL] IIC $T_{amb} = (-40 \text{ }^{\circ}\text{C}) -20 \dots 70 \text{ }^{\circ}\text{C}$ $U_B = 14 \dots 46 \text{ V}$
Type of protection $U_m = 60 \text{ V}$	Zone 1: Ex ib IIC $T_{amb} = (-40 \text{ }^{\circ}\text{C}) -20 \dots 70 \text{ }^{\circ}\text{C}$ $U_i = 28 \text{ V}$ $I_i = 110 \text{ mA}$ $P_i = 770 \text{ mW}$ Effective internal capacitance: 14.6 nF Effective internal capacitance to ground: 24.4 nF Effective internal inductance: 0.27 mH
	Zone 21 / 22: Ex td A21 / Ex tD A22 $T_{amb} = -20 \dots 60 \text{ }^{\circ}\text{C}$

Power supply circuit	Terminals 41, 42
	Zone 1: Ex d [ib] IIC Zone 2: Ex nA [nL] IIC $U_B = 16 \dots 30 \text{ V}$ $I_B = 2 \dots 15 \text{ mA}$
Type of protection $U_m = 60 \text{ V}$	Zone 1: Ex ib IIC $U_i = 15 \text{ V}$ $I_i = 30 \text{ mA}$ $P_i = 115 \text{ mW}$ Effective internal capacitance: 11.6 nF Effective internal capacitance to ground: 19.6 nF Effective internal inductance: 0.14 mH
	Zone 21 / 22: Ex td A21 / Ex tD A22 $T_{amb} = -20 \dots 60 \text{ }^{\circ}\text{C}$

When connected to the line supply / not connected to the line supply, the electrical circuits must not exceed overvoltage category III / II.

7.2.3 Medium temperatures / Temperature classes

For the supply circuit "Terminals 31, 32" and the switching outputs "Terminals 41, 42", cables suitable for temperatures up to $T = 110^{\circ}\text{C}$ ($T = 230^{\circ}\text{F}$) can be used without restriction.

Category 2/3G (Ex ib IIC)

For cables suitable only for temperatures up to $T = 80^{\circ}\text{C}$ ($T = 176^{\circ}\text{F}$), the interconnection of both circuits needs to be taken into account in the event of a fault. Otherwise, the restricted temperature ranges listed in the following table shall apply.

Category 2D

For cables suitable only for temperatures up to $T = 80^{\circ}\text{C}$ ($T = 176^{\circ}\text{F}$), the restricted temperature ranges listed in the following table shall apply.

Ambient temperature ²⁾	Max. temperature at used connecting cable, "Terminals 31, 32", "Terminals 41, 42"	Max. permissible medium temperature
(-40) -20 ... 60 °C (-40) -4 ... 140 °F)	110 °C (230 °F)	280 °C / 400 °C ¹⁾ (536 °F / 752 °F) ¹⁾
(-40) -20 ... 60 °C (-40) -4 ... 140 °F)		240 °C (464 °F)
(-40) -20 ... 55 °C (-40) -4 ... 131 °F)		280 °C (536 °F)
(-40) -20 ... 50 °C (-40) -4 ... 122 °F)		320 °C (608 °F) ¹⁾
(-40) -20 ... 40 °C (-40) -4 ... 104 °F)		400 °C (752 °F) ¹⁾

- 1) Medium temperatures > 280 °C (> 536 °F) with FV4000 Vortex flowmeter only
- 2) The permissible lower limits for the ambient temperature are approval- and order-specific (standard: -20 °C (-4 °F)).

Hazardous area design	Maximum medium temperature	Temperature class
Ex d [ib] IIC	80 °C (176 °F)	T6 3)
	95 °C (203 °F)	T5 3)
Ex ib IIC bzw. Ex nA [nL]	130 °C (266 °F)	T4
	195 °C (383 °F)	T3
	290 °C (554 °F)	T2
	400 °C (752 °F)	T1

3) Not possible for flowmeter sensor version VR42 / SR42

7.3 FM approval design for the USA and Canada for VT43/ST43 and VR43/SR43 (4 ... 20 mA / HART)

Important

The devices may only be operated in explosive areas if the housing covers have been fully closed.

Designation

Explosion-proof	XP/Class I/Div 1/BCD/T4 Ta = 70 °C Type 4X
Dust-ignition-proof	DIP/Class II,III/Div 1/EFG/T4 Ta = 70 °C Type 4X
Intrinsic safety	IS/Class I, II,III/Div 1/ABCDEFG/T4 Ta = 70 °C Entity Type 4X
Non-incendive	NI/Class I/Div 2/ABCD/T4 Ta = 70 °C Type 4X
Suitable	S/Class II,III/Div 2/FG/T4 Ta = 70 °C Type 4X

The devices must be installed in a protected environment in accordance with the specific conditions on the test certificate. Pollution degree 3 (see IEC 60664-1) must not be exceeded for the macro environment of the device. The devices conform to degree of protection IP65 / IP67. If the device is installed as intended, this requirement is met by the housing as standard.

When connected to the line supply / not connected to the line supply, the electrical circuits must not exceed overvoltage category III / II.

IS Entity see: SD-50-2681 (Fig. 35)

Parameters: Vmax, Imax, Pi, Li, Ci

Enclosure: Type 4X

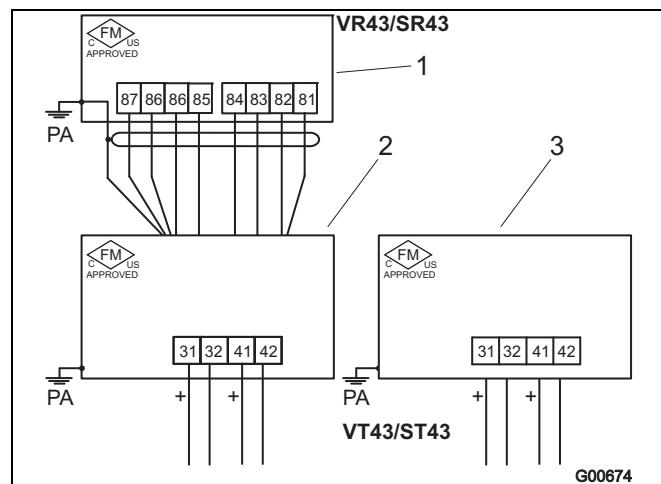


Fig. 40: Electrical connection for VT43 / ST43 and VR43 / SR43

1 Flowmeter sensor

3 Flowmeter

2 Transmitter

Flowmeter sensor wire colors

Terminal	Wire color
81	Red
82	Blue
83	Pink
84	Gray
85	Yellow
86	Green
86	Brown
87	White

7.3.1 Supply power or supply current

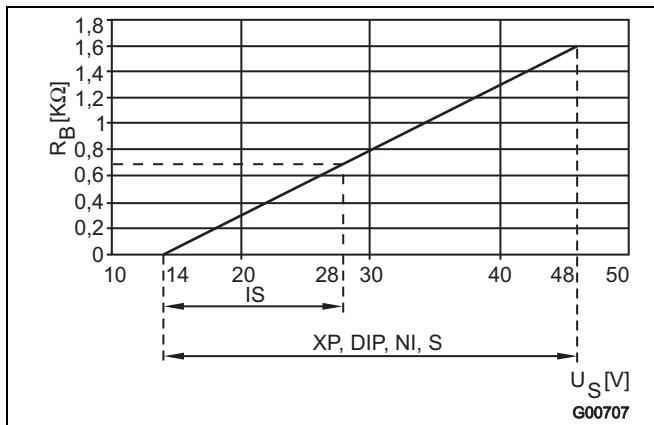


Fig. 41

The minimum voltage U_S of 14 V is based on a load of 0 Ω .

U_S = supply voltage

R_B = Maximum permissible load in power supply circuit, e.g., indicator, recorder or power resistor

7.3.2 Medium temperatures / Temperature classes

For the supply circuit "Terminals 31, 32" and the switching outputs "Terminals 41, 42", cables suitable for temperatures up to $T = 110^\circ\text{C}$ ($T = 230^\circ\text{F}$) can be used without restriction.

For cables suitable only for temperatures up to $T = 80^\circ\text{C}$ ($T = 176^\circ\text{F}$), the restricted temperature ranges listed in the following table shall apply.

Ambient temperature	Max. temperature at used connecting cable, "Terminals 31, 32", "Terminals 41, 42"	Max. permissible medium temperature
(-45) -20 ... 70 °C (-49) -4 ... 158 °F)	80 °C (176 °F)	280 °C / 400 °C ¹⁾ (536 °C / 752 °F) ¹⁾
(-45) -20 ... 60 °C (-49) -4 ... 140 °F)		240 °C (464 °F)
(-45) -20 ... 55 °C (-49) -4 ... 131 °F)		280 °C (536 °F)
(-45) -20 ... 50 °C (-49) -4 ... 122 °F)		320 °C (608 °F) ¹⁾
(-45) -20 ... 40 °C (-49) -4 ... 104 °F)		400 °C (752 °F) ¹⁾

1) Medium temperatures > 280 °C (> 536 °F) with VT43 / VR43 Vortex flowmeter only

7.3.3 Approval data for hazardous areas

Supply circuit terminals 31, 32

Explosion-proof	XP/Class I/Div 1/BCD/T4 Ta = 70 °C Type 4X	
Dust-ignition-proof	DIP/Class II,III/Div 1/EFG/T4 Ta = 70 °C Type 4X DIP/Class II,III /Div 2 /EFG /T4 Ta=70°C Type 4X	$U_B = 14 \dots 46 \text{ V}$
Intrinsic safety	IS/Class I, II,III/Div 1 ABCDEFG/T4 Ta = 70 °C Entity Type 4X	$V_{\max} = 28 \text{ V}$ $I_{\max} = 110 \text{ mA}$ $P_i = 770 \text{ mW}$ Effective internal capacitance: 14.6 nF Effective internal inductance: 0.27 mH
Non-incendive	NI/Class I/Div 2/ABCD/T4 Ta = 70 °C Type 4X	$U_B = 14 \dots 46 \text{ V}$

Supply circuit terminals 41, 42

Explosion-proof	XP/Class I/Div 1/BCD/T4 Ta = 70 °C Type 4X	$U_B = 16 \dots 30 \text{ V}$
Dust-ignition-proof	DIP/Class II,III/Div 1/EFG/T4 Ta = 70 °C Type 4X DIP/Class II,III /Div 2 /EFG /T4 Ta=70°C Type 4X	$I_B = 2 \dots 15 \text{ mA}$
Intrinsic safety	IS/Class I, II,III/Div 1 ABCDEFG/T4 Ta = 70 °C Entity Type 4X	$V_{\max} = 15 \text{ V}$ $I_{\max} = 30 \text{ mA}$ $P_i = 115 \text{ mW}$ Effective internal capacitance: 11 nF Effective internal inductance: 0.14 mH
Non-incendive	NI/Class I/Div 2/ABCD/T4 Ta = 70 °C Type 4X	$U_B = 16 \dots 30 \text{ V}$ $I_B = 2 \dots 15 \text{ mA}$

7.3.4 Trio-Wirl control drawing

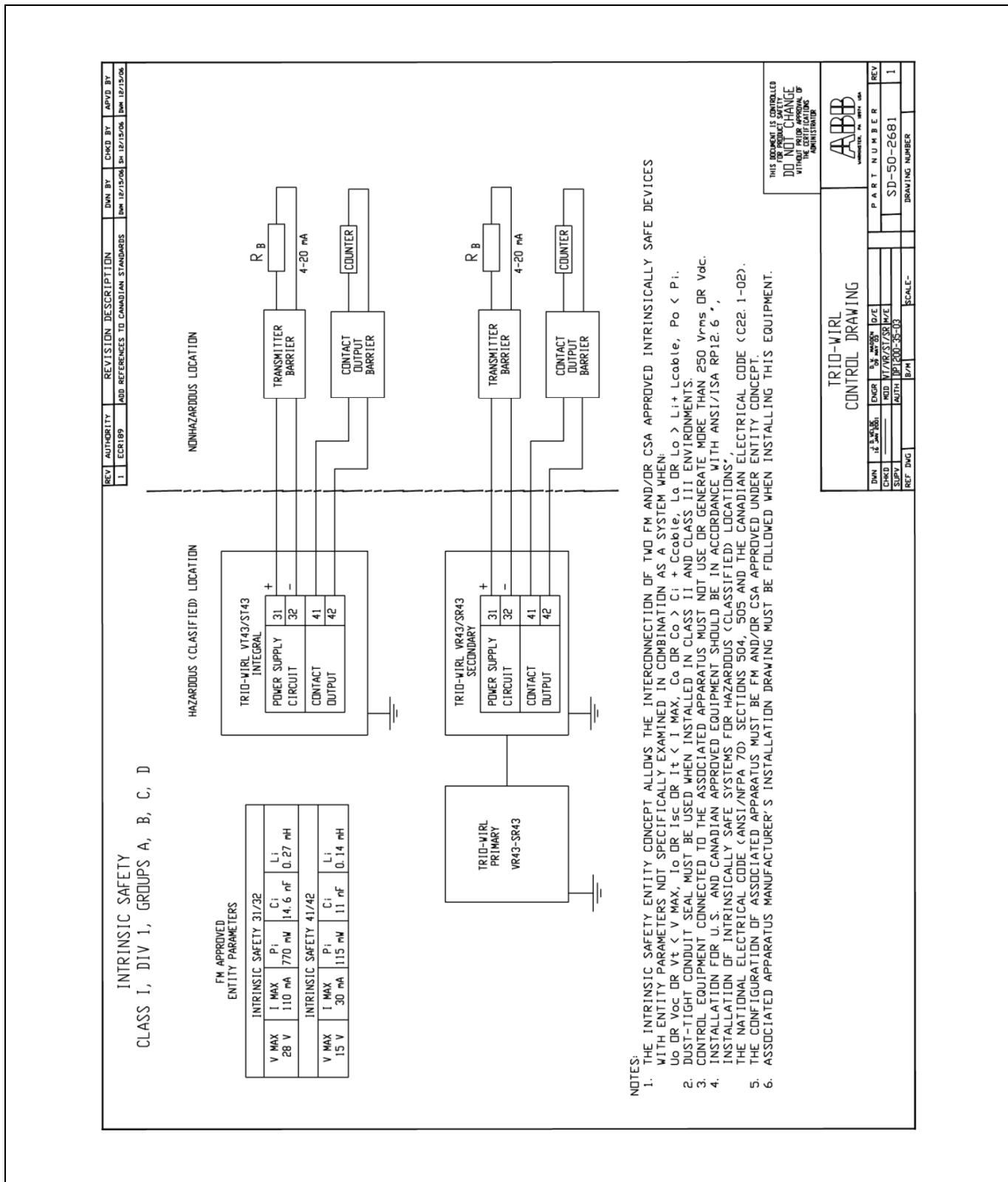


Fig. 42: Electrical connection and connection data, VT43 / VR43 and ST43 / SR43

7.4 Ex "ia" design for VT4A/ST4A and VR4A/SR4A (fieldbus)

Important
The devices may only be operated in explosive areas if the housing covers have been fully closed.

EC type-examination test certificate TÜV 10 ATEX 556309 X / TÜV 10 ATEX 387782 X¹⁾

Designation

II 2G Ex ia IIC T4 Gb
II 2 D Ex ta IIIC T85°C ... T_{medium} Db IP67 (type VT4A. / ST4A.)
II 2 D Ex ta IIIC T85°C Db IP67 (type VR4A. / SR4A.)

Certificate of conformity IECEx CoC TUN 10.0028 X /
CoC TUN 10.0029 X

Designation

Ex ia IIC T4 Gb
Ex ia IIIC T85°C ... T_{medium} Db IP67 (type VT4A. / ST4A. / VR4A. / SR4A.)
Ex ia IIIC T85°C Db IP67 (type VR4A. / SR4A.)

The hazardous area design is based on the PTB's FISCO model (FISCO = fieldbus intrinsically safe concept).

- 1) Not for Shanghai production site

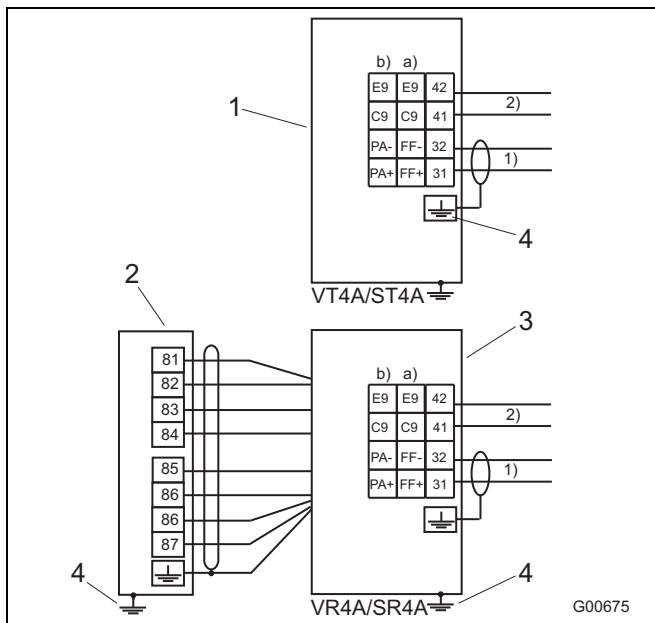


Fig. 43: Electrical connection for PROFIBUS PA interface connection

- | | |
|--------------------|---------------------|
| 1 Flowmeter | 3 Transmitter |
| 2 Flowmeter sensor | 4 Functional ground |

Flowmeter sensor wire colors

Terminal	Wire color
81	Red
82	Blue
83	Pink
84	Gray
85	Yellow
86	Green
86	Brown
87	White

7.4.1 PROFIBUS PA electrical connection

1) Terminals 31, 32

Function PA+, PA-
Connection for PROFIBUS PA to IEC 1158-2
U = 9 ... 24 V, I = 10 mA (normal operation)
13 mA (in the event of an error / FDE)

2) Terminals 41, 42

Function C9, E9
Switching output: Function can be selected via software as a pulse output (fmax: 100 Hz, 1 ... 256 ms), min. / max. alarm or system alarm.
Configured as NAMUR contact to DIN 19234.
Closed: 1 KΩ
Open: > 10 KΩ

M12 plug-in connector

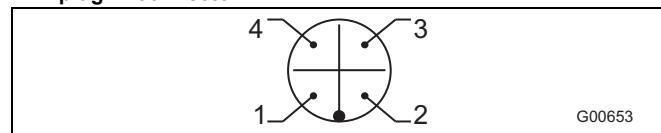


Fig. 44: Assignment for connection using optional M12 plug-in connector

Pin	Assignment
1	PA+ (31)
2	NC
3	PA- (32)
4	Shield

7.4.2 FOUNDATION fieldbus electrical connection

1) Terminals 31, 32

Function FF+, FF-
Connection for FOUNDATION fieldbus (H1) to IEC 1158-2
U = 9 ... 24 V, I = 10 mA (normal operation)
13 mA (in the event of an error / FDE)

2) Terminals 41, 42

Function C9, E9
Switching output: Function can be selected via software as a pulse output (fmax: 100 Hz, 1 ... 256 ms), min. / max. alarm or system alarm.
Configured as NAMUR contact to DIN 19234.
Closed: 1 KΩ
Open: > 10 KΩ

Important

The installation instructions in accordance with EN 60079-14 must be complied with.

When commissioning the flowmeter, refer to IEC 61241-1-2 regarding use in areas with combustible dust. The transmitter housing cover must be secured by means of the safety locking device. After switching off the supply power, wait t > 2 minutes before opening the transmitter housing.

7.4.3 Approval data for hazardous areas

II 2D T 85 °C ... T_{medium} IP 67 /

T_{amb} = -20 °C ... 60 °C

Power supply circuit	Terminals 31/32
Type of protection	II 2G Ex ia IIC T4 / T _{amb} = (-40 °C) -20 ... 70 °C U _i = 24 V I _i = 380 mA P _i = 9.12 W The effective internal capacitance and inductance are negligibly low.

Power supply circuit	Terminals 41/42
Type of protection	II 2G Ex ia IIC T4 U _i = 15 V I _i = 30 mA P _i = 115 mW Effective internal capacitance: 3.6 nF Effective internal capacitance to ground: 3.6 nF Effective internal inductance: 0.14 mH

VR4A / SR4A only

Type of protection	II 2G Ex ia IIC T4
Piezo sensor	U ₀ = 8.5 V
Terminals 85, 86, 86, 87	I ₀ = 1,073 mA
Pt100 circuit, terminals 81, 82, 83, 84	P ₀ = 2,280 mW



Important (Note)

The devices must be installed in a protected environment in accordance with the specific conditions on the test certificate. Pollution degree 3 (see IEC 60664-1) must not be exceeded for the macro environment of the device. The devices conform to protection type IP 65 / IP 67. If the device is installed as intended, this requirement is met by the housing as standard. When connected to the line supply / not connected to the line supply, the electrical circuits must not exceed overvoltage category III / II.

7.4.4 Medium temperatures / Temperature classes

For the supply circuit "Terminals 31, 32" and the switching outputs "Terminals 41, 42", cables suitable for temperatures up to T = 110 °C (T = 230 °F) can be used without restriction.

Category 2/3G

For cables suitable only for temperatures up to T = 80 °C (T = 176 °F), the interconnection of both circuits needs to be taken into account in the event of a fault. Otherwise, the restricted temperature ranges listed in the following table shall apply.

Category 2D

For cables suitable only for temperatures up to T = 80 °C (T = 176 °F), the restricted temperature ranges listed in the following table shall apply.

Ambient temperature ²⁾	Max. temperature at used connecting cable, "Terminals 31, 32", "Terminals 41, 42"	Max. permissible medium temperature
(-30) -20 ... 70 °C ((-22) -4 ... 158 °F)	80 °C (176 °F)	280 °C / 400 °C ¹⁾ (536 °C / 752 °F) ¹⁾
(-30) -20 ... 70 °C ((-22) -4 ... 158 °F)		160 °C (320 °F)
(-30) -20 ... 60 °C ((-22) -4 ... 140 °F)		240 °C (464 °F)
(-30) -20 ... 55 °C ((-22) -4 ... 131 °F)		280 °C (536 °F)
(-30) -20 ... 50 °C ((-22) -4 ... 122 °F)		320 °C (608 °F) ¹⁾
(-30) -20 ... 40 °C ((-22) -4 ... 104 °F)		400 °C (752 °F) ¹⁾

1) Medium temperatures > 280 °C (> 536 °F) with FV4000 Vortex flowmeter only

2) The permissible limits for the ambient temperature are approval- and order-specific (standard: -20 °C (-4 °F)).

Maximum medium temperature	Temperature class
130 °C (266 °F)	T4
195 °C (383 °F)	T3
290 °C (554 °F)	T2
400 °C (752 °F)	T1

8 Ordering information

8.1 FV4000-VT4/VR4 Vortex flowmeter

		Main order number																				Add. order no.	
		Version number	1 - 3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Vortex flowmeter	Remote mount design	VR4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
FV4000-VT4/VR4	Integral mount design	VT4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Ex Approval																							
None																							
IECEx / ATEX Cat. 2 (Zone 1 / 21),																							
Ex ib / Ex td (for HART)																							
IECEx / ATEX Cat. 2 (Zone 1 / 21),																							
Ex d + Ex ib / Ex td (for HART)																							
FM approval (Class 1 / Div. 1) (for HART)																							
IECEx / ATEX Cat. 2 (Zone 1 / 21, FISCO model), Ex ia / Ex td (for PA / FF)																							
FM Approval Electric Safety Standard (Class 3810/NEMA 250) PA / FF																							
Others																							
Process Connection																							
Flange																							
Flange with groove (DIN 2512) (max. PN 40)																							
Wafer type (max. DN 150 (6 inch), max. PN 64 / ASME CL300)																							
Others																							
Fluid																							
Liquid																							
Gas																							
Steam																							
Oxygen																							
Others																							
Material Housing / Bluff Body (Shedder) / Sensor																							
Stainless steel																							
Stainless steel / Hastelloy C / stainless steel																							
Hastelloy C / Hastelloy C / Hastelloy C																							
Stainless steel / Hastelloy C / Hastelloy C																							
Others																							
Meter Size																							
DN 15 (1/2 inch)																							
DN 25 (1 inch)																							
DN 40 (1-1/2 inch)																							
DN 50 (2 inch)																							
DN 80 (3 inch)																							
DN 100 (4 inch)																							
DN 150 (6 inch)																							
DN 200 (8 inch)																							
DN 250 (10 inch)																							
DN 300 (12 inch)																							
Pressure Rating																							
PN 10																							
PN 16																							
PN 25																							
PN 40																							
PN 63																							
ASME CL 150																							
ASME CL 300																							
ASME CL 600																							
Others																							
Gasket Surface Roughness																							
Standard																							
Others																							

Continued on next page

- 1) Design is also certified for use in Zone 2 (II 3G Ex n [L] IIC T4).
- 2) Design is also certified for use in Zone 2 (II 3G Ex n [L] IIC T4) and Zone 1 (II 2G Ex ib IIC T4).
- 3) Chinese production IECEx only.
- 4) For US production only.
- 5) Sensor cleaned and marked for Oxygen application.
- 6) Flange Design only.

Continued

		Main order number																				Add. order no.	
		Version number	1 - 3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Vortex flowmeter	Remote mount design	VR4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	xx
FV4000-VT4/VR4	Integral mount design	VT4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX
Sensor Design																							
Standard single sensor (Tmax = 280 °C [536 °F])		1																					
Standard single sensor with integrated temperature sensor (Tmax = 280 °C [536 °F])		2																					
Standard double sensor (Tmax = 280 °C [536 °F]) (min. DN 50 (2 in.))		3																					
Standard double sensor with integral temperature sensor (Tmax = 280 °C [536 °F]) (min. DN 50 (2 in.))		4																					
High temperature single sensor (< 400 °C [< 752 °F])		A																					
Others		Z																					
Sensor Seals / Fluid Temperature Range																							
Graphite / -55 ... 280 °C (-67 ... 536 °F) (Max. PN 64 / ASME CL 300)		1																					
Graphite special / -55 ... 400 °C (-67 ... 752 °F) (Max. PN 64 / ASME CL 300) (only for high temperature sensor)		2																					
Kalrez (3018) O-Ring / 0 ... 280 °C (32 ... 536 °F)		3																					
Viton O-Ring / -55 ... 230 °C (-67 ... 446 °F) (not for steam)		4																					
PTFE O-Ring / -55 ... 200 °C (-67 ... 392 °F)		5																					
Kalrez (6375) O-Ring / -20 ... 275 °C (-4 ... 527 °F)		8																					
Certificates																							
Standard		A																					
Inspection certificate 3.1 acc. EN 10204		B																					
Material certificate 3.1 acc. EN 10204 with pressure test acc. AD2000		C																					
Pressure test acc. AD2000		D																					
Communication																							
With display with HART		2																					
With display with PROFIBUS PA		4																					
With display with FOUNDATION fieldbus		6																					
Others		9																					
Name Plate																							
German		G																					
English		E																					
French		F																					
Chinese		7) C																					
Design Level / Software Level																							
(Specified by ABB)		X																					
Accessories																							
Without		0																					
2-inch pipe mounting		1																					
Climate-proof version		2																					
Climate-proof version + 2-inch pipe mounting		3																					
Operating Mode																							
Continuous flowrate metering		A																					
Cable Gland																							
M20 x 1.5 (not for Ex approval Code 2 or 3)		A																					
1/2-inch NPT		B																					
Plug connection M12 (Only for communication 4 and Ex approval 0 or A)		8) C																					
Others		Z																					
Calibration																							
Test certificate		9) A																					
Calibration certificate		10) B																					
Others		Z																					
Ambient temperature range																							
-20 ... 70 °C (standard for Ex approval Code 0, 1, or A)		1																					
-55 ... 70 °C (extended temperature range for Ex approval Code 0 or 1)		2																					
-20 ... 60 °C (standard for Ex approval Code 2)		3																					

- 7) For Chinese production only.
 - 8) Socket NPE300-NE is not included in the scope of delivery. Please order separately, if needed (Part No. 9890116).
 - 9) Test certificate with k-factors.
 - 10) Test certificate with k-factors and error curve.

Continued

Version number	Main order number																						Add. order no.
	1 - 3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22			
	VR4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	VT4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Certificates: PED Meter tube with PED certificate (Pressure Equipment Directive 97 / 23 / EC)	CP1
Other Explosion Protection Certification and Approvals China: NEPSI certificate	7) ES1

- 7) For Chinese production only.

8.2 FS4000-ST4/SR4 Swirl flowmeter

		Main order number																				Add. order no.	
		Version number	1 - 3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Swirl flowmeter	Remote mount design	SR4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
FS4000-ST4/SR4	Integral mount design	ST4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Ex Approval																							
Without																							
IECEx / ATEX Cat. 2 (Zone 1 / 21),	0																						
Ex ib / Ex td (for HART)	1)	1																					
IECEx / ATEX Cat. 2 (Zone 1 / 21),	2)	2																					
Ex d + Ex ib / Ex td (for HART)	3)	3																					
FM approval (Class 1 / Div. 1) (for HART)	4)	F																					
IECEx / ATEX Cat. 2 (Zone 1 / 21, FISCO model), Ex ia / Ex td (for PA / FF)	5)	A																					
FM Approval Electric Safety Standard (Class 3810/NEMA 250) PA / FF	6)																						
Others	9)																						
Process Connection																							
Flange	1																						
Flange with groove (DIN 2512)	2																						
Other	9																						
Fluid																							
Liquid	1																						
Gas	2																						
Steam	3																						
Oxygen	5)	6																					
Other	9																						
Material Housing // Inlet / Outlet Guide // Sensor																							
AISI 316Ti SST (1.4571) / AISI 316Ti SST (1.4571) /	1																						
AISI 316Ti SST (1.4571)																							
AISI 316Ti SST (1.4571) / Hastelloy C / AISI 316Ti SST (1.4571)	2																						
Hastelloy C / Hastelloy C / Hastelloy C	3																						
AISI 316Ti SST (1.4571) / Hastelloy C / Hastelloy C	4																						
Others	9																						
Meter Size																							
DN 15 (1/2 inch)	1	5																					
DN 20 (3/4 inch)	2	0																					
DN 25 (1 inch)	2	5																					
DN 32 (1-1/4 inch)	3	2																					
DN 40 (1-1/2 inch)	4	0																					
DN 50 (2 inch)	5	0																					
DN 80 (3 inch)	8	0																					
DN 100 (4 inch)	1	H																					
DN 150 (6 inch)	1	F																					
DN 200 (8 inch)	2	H																					
DN 300 (12 inch)	3	H																					
DN 400 (16 inch)	4	H																					
Pressure Rating																							
PN 10																							
PN 16																							
PN 25																							
PN 40																							
ASME CL 150																							
ASME CL 300																							
Others																							
Gasket Surface Roughness																							
Standard																							
Others																							

Continued on next page

- 1) Design is also certified for use in Zone 2 (II 3G Ex n [L] IIC T4).
- 2) Design is also certified for use in Zone 2 (II 3G Ex n [L] IIC T4) and Zone 1 (II 2G Ex ib IIC T4).
- 3) China production IECEx only.
- 4) For US production only.
- 5) Flowmeter sensor for oxygen use, cleaned and labeled.

Continued

- 6) For Chinese production only.
 - 7) Socket NPE300-NE is not included in the scope of delivery. Please order separately, if needed (Part No. 9890116).
 - 8) Test certificate with k-factors.
 - 9) Test certificate with k-factors and error curve.

Continued

Version number	Main order number																					Add. order no.
	1 - 3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
SR4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	xx	
ST4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	

Other Explosion Protection Certification and Approvals

China: NEPSI Certificate

6) ES1

- 6) For Chinese production only.

9 Accessories

If P/T compensation is required, see the "Sensycal measurement computer" data sheet.



Important

The flowmeter must be connected to the Sensyflow via a power input card. This will then also be responsible for the supply function.

Connection via the pulse output is not possible, as the pulse output delivers pulse packets rather than a steady frequency.

Wafer accessories (optional)

Depending on the nominal diameter / nominal pressure, some centering elements are also included in the standard accessories (bolts, nuts, spring washers) available as an option.

Important

Seals are not included in the accessories.

Nominal diameter	Nominal pressure rating	Order number	No centering aids required	With centering sleeves	With centering	With centering segments
DN 25	PN 64 ... PN 100	D614L384U11			x	
DN 25	ASME 150	D614L414U01	x			
DN 25	ASME 300 ... 600	D614L414U02		x		
DN 40	PN 10 ... PN 40	D614L384U02	x			
DN 40	PN 64	D614L384U14		x		
DN 40	ASME 150	D614L414U03	x			
DN 40	ASME 300 ... 600	D614L414U04		x		
DN 50	PN 10 ... PN 40	D614L384U03	x			
DN 50	PN 64	D614L384U13		x		
DN 50	ASME 150	D614L414U05	x			
DN 50	ASME 300	D614L414U06		x		
DN 50	ASME 600	D614L414U14		x		
DN 80	PN 10 ... PN 40	D614L384U04	x			
DN 80	PN 64	D614L384U12			x	
DN 80	ASME 150	D614L414U07	x			
DN 80	ASME 300 ... 600	D614L414U08			x	
DN 100	PN 10 ... PN 16	D614L384U05	x			
DN 100	PN 25 ... PN 40	D614L384U06		x		
DN 100	PN 64	D614L384U16			x	
DN 100	ASME 150	D614L414U09	x			
DN 100	ASME 300	D614L414U10			x	
DN 100	ASME 600	D614L414U13			x	
DN 150	PN 10 ... PN 16	D614L384U07	x			
DN 150	PN 25 ... PN 40	D614L384U08		x		
DN 150	PN 64	D614L384U17			x	
DN 150	ASME 150	D614L414U11	x			
DN 150	ASME 300	D614L414U12			x	
DN 150	ASME 600	D614L414U15			x	

10 Questionnaire

Customer:	Date:
Ms./Mr.:	Department:
Phone:	Fax:

Measuring system:	<input type="checkbox"/> FV4000 Vortex flowmeter <input type="checkbox"/> FS4000 Swirl flowmeter	<input type="checkbox"/> Integrated Pt100 (for measuring media temperature recording or saturated steam mass calculation)
--------------------------	---	---

Fluid: Aggregate state	<input type="checkbox"/> Oxygen <input type="checkbox"/> Steam / gas	<input type="checkbox"/> Fluid
Flowrate: (min., max., operating point)	<input type="checkbox"/> m ³ /h <input type="checkbox"/> US gal/min <input type="checkbox"/> ft ³ /min <input type="checkbox"/> kg/h <input type="checkbox"/> lb/h	<input type="checkbox"/> Standard condition <input type="checkbox"/> Mass <input type="checkbox"/> Operating mode
Density: (min., max., operating point)	<input type="checkbox"/> kg/m ³ <input type="checkbox"/> lb/ft ³	<input type="checkbox"/> Standard condition <input type="checkbox"/> Operating mode
Viscosity: (min., max., operating point)	<input type="checkbox"/> mPas (cp) <input type="checkbox"/> cst	(Please specify for fluids)
Fluid temperature: (min., max., operating point)	<input type="checkbox"/> °C <input type="checkbox"/> °F	
Ambient temperature: (min., max., operating point)	<input type="checkbox"/> °C <input type="checkbox"/> °F	
Pressure: (min., max., operating point)	<input type="checkbox"/> bar <input type="checkbox"/> psi	
Nominal diameter/nominal pressure rating of the pipeline:	<input type="checkbox"/> DN <input type="checkbox"/> PN	
Eff. inside diameter of the pipeline:	<input type="checkbox"/> mm <input type="checkbox"/> inch	

Transmitter design / communication:	<input type="checkbox"/> 4 ... 20 mA (2-wire) HART (standard)	<input type="checkbox"/> 2-wire PROFIBUS PA	<input type="checkbox"/> 2-wire FOUNDATION fieldbus
Explosion protection	<input type="checkbox"/> Without <input type="checkbox"/> 2G Ex "ib" <input type="checkbox"/> 2G Ex "d" <input type="checkbox"/> 3G Ex "nA [L]"	<input type="checkbox"/> Without <input type="checkbox"/> 2G Ex "ia"	<input type="checkbox"/> Without <input type="checkbox"/> 2G Ex "ia"

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Sensyflow FMT500-IG

Thermal Mass Flowmeter



Direct mass flow measurement of gases

- No additional pressure and temperature compensation

Digital measured value processing with improved signal quality

Wide measuring range up to 1:150

- Factory calibration with optional DAkkS / ILAC certificate
- Process gas calibration with clean gases and gas mixtures (optional)

High measuring accuracy

Quick response time ≤ 0.5 s

Negligible pressure loss

No moving parts, no wear, maintenance-free

Defined and reproducible mounting position in the middle of the pipeline

- Pipe components for DN 25 ... DN 200 (1 ... 8")
- Weld-on adapters for larger diameters and rectangular ducts
- Reliable and convenient hot tap fittings

Integral mount design with illuminated display

Remote mount design with separate wall-mounted housing

Communication

- PROFIBUS DPV1 or analog / HART signal

Diagnostic and alarm functions

Approvals for explosion protection

- ATEX
- FM / CSA
- GOST Russia

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1 General information

1.1 Principle of operation and construction

Sensyflow FMT500-IG is a thermal flowmeter for gases. The measuring principle (hot-film anemometer) allows the direct determination of mass flow and gas temperature. Taking the standard density of the gases into consideration, the standard volume flow rate can be displayed without additional pressure and temperature compensation.

The integral mount design of the Sensyflow FMT500-IG metering system comprises a transmitter, flowmeter sensor and a pipe component. In the remote design the flowmeter sensor and the transmitter are connected via a max. 50 m (164 ft.) long cable. Depending on the version, the flowmeter sensor provides the measuring signals either as PROFIBUS or as analog / HART signals. The unit is operated either remotely via PROFIBUS / HART communication or locally by using a magnetic pen.

The pipe component is available for nominal pipe sizes ranging from DN 25 ... DN 200 and in various designs. It is also possible to install the flowmeter sensor directly in square ducts or pipes with any diameter via a weld-on adapter.

For many years, thermal gas-mass flowmeters with analog design have been established as complete process measuring devices in the chemical industry. The digital Sensyflow FMT500-IG represents a logical step in the consequent development of this well-proven technology.

Physics of measurement

Thermal flow metering procedures use different ways to evaluate the flow dependent cooling of a heated resistor as measuring signal. In a hotfilm anemometer with temperature difference control, the heated platinum resistor is maintained at a constant overtemperature in relation to an unheated platinum sensor inside the gas flow. The heating power required for maintaining the overtemperature depends directly on the flow rate and the material properties of the gas. With a known (and constant) gas composition the mass-flow can be determined by electronically evaluating the heater current / mass-flow curve without additional pressure and temperature compensation. When using the constant power method, the temperature difference is measured which results from a constant heating power and depends on the heat quantity dissipated by the gas mass flow as well. Together with the standard density of the gas this results directly in the standard volume flow. Considering the high measuring range dynamics up to 1:150, an accuracy smaller than 1 % of the measuring value is achieved.

The digital Sensyflow method

With the patented digital Sensyflow method there are 4 signals available to the evaluation electronics. These include, besides the heating power, the temperatures of the fluid and the heated sensor element, which can thus be used to compensate the temperature dependency on gas characteristics. By storing the gas data in the measuring system it is possible to calculate and perform an optimum adaptation at any operating time.

Advantages of the digital concept

- By providing several primary and secondary signals these signals can be output in parallel via the fieldbus connection. This makes a gas temperature measurement unnecessary.
- Through the implementation of complete digital signal processing it is possible to adapt the sensor control and signal conditioning to the process. This means that it is possible to achieve optimum measuring dynamics at all times, even under changing operating conditions.
- The digital Sensyflow method is capable of providing a further enhanced measuring range.

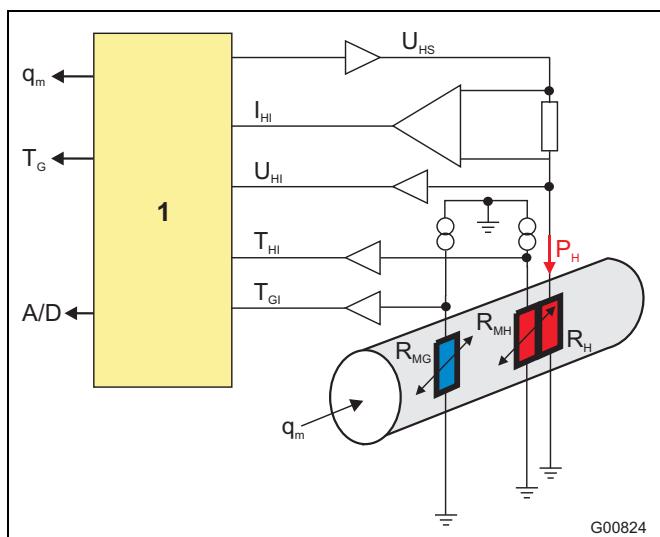


Abb. 1: Digital measuring principle of FMT500-IG

1 CPU and signal processing

q_m	Gas mass flow
T_G	Gas temperature
A/D	Alarms, diagnostics
U_{HS}	Heater setpoint
I_{HI}	Process value of heater
U_{HI}	Process value of heater
T_{HI}	Process value of heater
T_{GI}	Process value of gas
R_{MG}	Gas temperature measuring resistor
R_{MH}	Heater temperature measuring resistor
R_H	Heating resistor
P_H	Heating power

- While controlling the heater power at the same time, the temperature measurement of the heating resistor sets a limit of this temperature. If errors occur in the system resulting in gas temperatures beyond the specification, the heating power is switched off and the device sends a substitute value with an additional warning signal. Both measures result in a significant prolongation of the service life for high-temperature operation and enhanced equipment safety for the user.
- The most significant application and cost advantage results from the diagnostic features of the digital Sensyflow. The functions provided allow for preventive maintenance of the measuring system and the equipment, as operating times, temperature peaks and loads in the system can be evaluated, stored, and reported. This leads to direct cost savings by preventing failures and equipment downtime.

Typical applications

- Gas volume measurement in chemical industry and process technology
- Compressed air balancing
- Gas burner control systems
- Biogas and activation air measurement in sewage plants
- Gas measurement at air decomposers
- Hydrogen measurement in the process

1.2 Type overview

Type	FMT500-IG	FMT500-IG Ex version
Application	Process engineering	
Measured gases	Gases and gas mixtures with known composition	
Explosion protection	Manufacturer's declaration ATEX II 3 G and II 3 D, Zone 2/22	Certificate KEMA 03ATEX2100 ATEX II 1/2 G and II 2 D, Zone 0, 1, 21 GOST Russia Zone 0 and 1 FM/CSA Cl.1 Div. 1 or Cl.1 Div. 2
Design / Dimensions / Weight	dependent on nominal size	
Materials (standard)	Stainless steel, ceramic sensor (other materials on request)	
Process connection (standard)	Flange according to EN1092-1 Form B1, PN 40 (DIN 2635 Form C) or ASME B 16.5 Cl. 150 / 300	
System components	Transmitter Flowmeter sensor Pipe component design 1 or 2 or weld-on adapter	
Standard nominal pipe sizes	Pipe component design 1: wafer flange DN 40, 50, 65, 80, 100, 125, 150, 200 – ASME 1 1/2“, 2“, 3“, 4“, 6“, 8“ Pipe component design 2: partial measuring section DN 25, 40, 50, 65, 80 – ASME 1“, 1 1/2“, 2“ Weld-on adapter for square ducts or pipe diameters ≥ DN 100 (4“)	
Degree of protection	IP 67 (IP 66 for flowmeter sensor remote design)	

Device configuration and functions

- Illuminated graphic display, 120 x 32 pixels
- Measurement of mass or standard volume flow, measured values are displayed as numbers or in bar charts
- Totalizer function with start / stop, reset and preset function
- Measurement of gas temperature
- 4 characteristic curves for different gases or pipe diameters (optional)
- Max. / Min. value storage for flow, gas temperature, and housing temperature
- Alarm and limit value functions
- Status and diagnostic signals
- Operating hours counter
- Simulation of measured values and status signals
- Users can adjust measured values locally
- Password-protected data entry menus
- Menu navigation in 4 languages
- Local operation with magnet stick
- FDT / DTM for parameterization with ASSET VISION DAT200 and DTM400 or control system
- Easy setup menu (analog / HART version) makes getting started easy
- Manufacturer's declaration regarding safety-related information according to IEC 61508 for analog / HART version (optional)

PROFIBUS DPV1 version communication

- According to PA profile 3.0, max. transmission rate 1.5 Mbaud, direct connection to intrinsically safe PROFIBUS DP possible in hazardous areas

Signal outputs and inputs analog / HART version

- HART communication via 4 ... 20 mA analog signal
- Current output for flow value
- 2 open-collector digital outputs, can be parameterized as:
 - Frequency output for flow and gas temperature
 - Pulse output for totalizer
 - Switching output for limit values and single or collective alarm
- 2 digital inputs, can be parameterized as:
 - External characteristic curve switchover
 - Totalizer start / stop or reset
- 24 V DC output for input/output wiring or transmitter power supply (30 mA max., not for hazardous area versions)

1.3 Overview of Sensyflow FMT500-IG

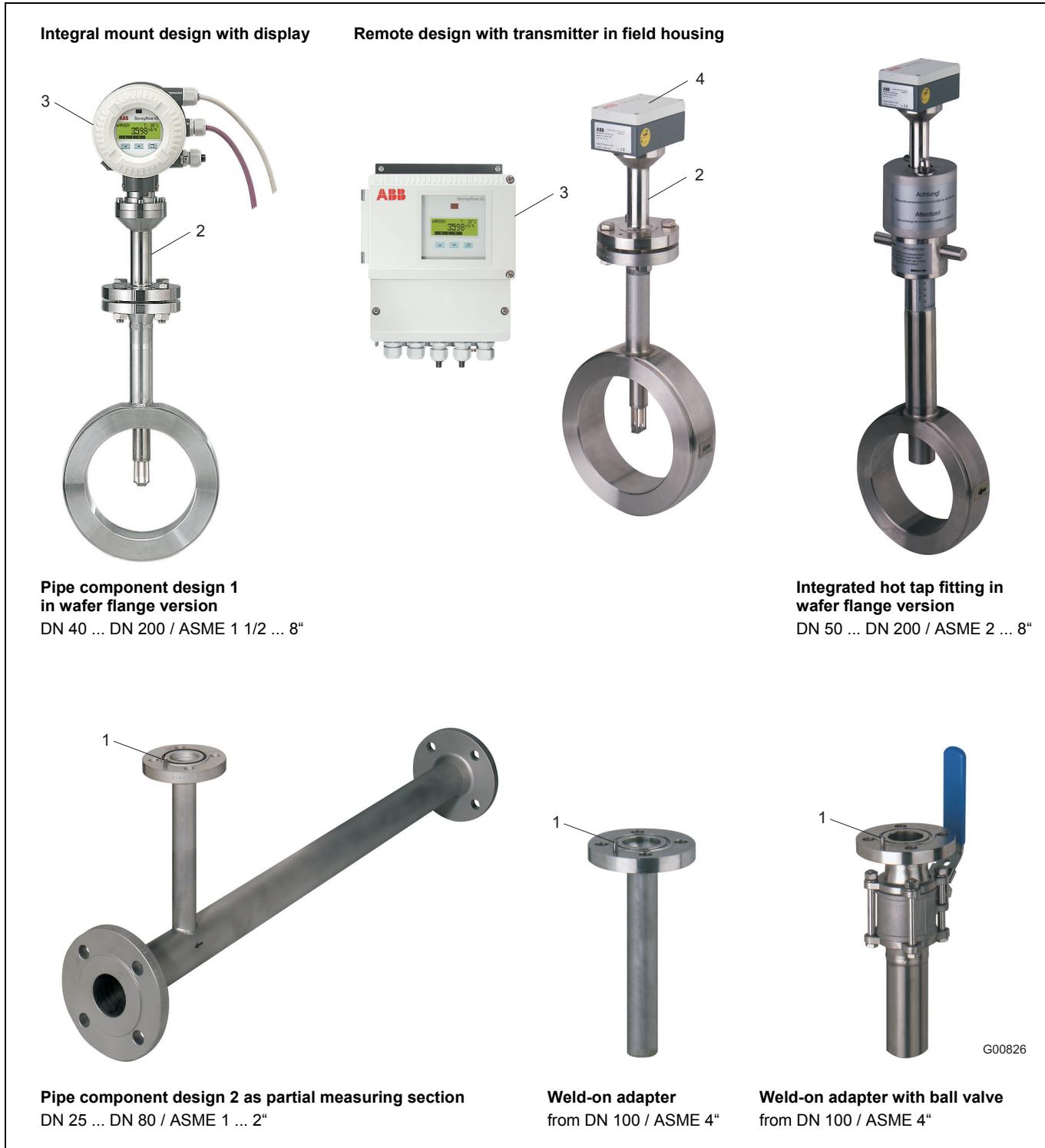


Abb. 2

- 1 Centering pin on outlet side
2 Flowmeter sensor FMT500-IG

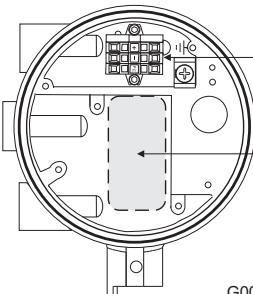
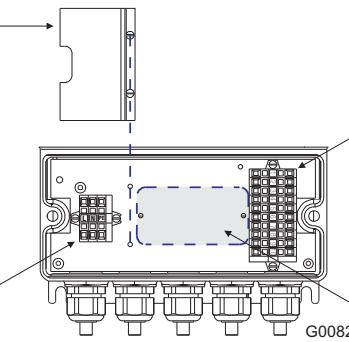
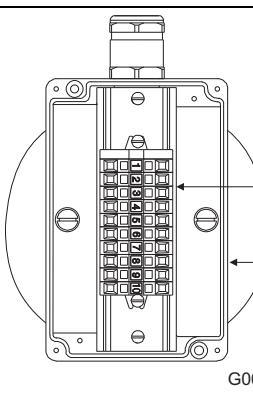
- 3 Transmitter
4 Connection box

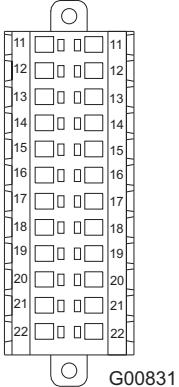
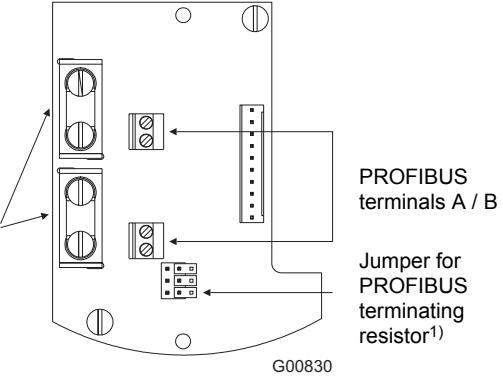
2 Specifications

Type	FMT500-IG				FMT500-IG Hazardous area design			
Measured variable (measured gases)	Flow of gases and gas mixtures with known composition							
Measuring ranges Nominal diameters (DN)	q_{min} kg/h	q_{max} kg/h	q_{min} Nm³/h	q_{max} Nm³/h	q_{min} kg/h	q_{max} kg/h	q_{min} Nm³/h	q_{max} Nm³/h
DN 25	0 ... 180	0 ... 140	0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 160	0 ... 120	0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 120
DN 40	0 ... 450	0 ... 350	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 430	0 ... 330	0 ... 540	0 ... 540
DN 50	0 ... 750	0 ... 580	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 700	0 ... 920	0 ... 920	0 ... 920
DN 65	0 ... 1,400	0 ... 1,100	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 1,200	0 ... 1,300	0 ... 2,300	0 ... 2,300
DN 80	0 ... 2,000	0 ... 1,500	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 1,700	0 ... 3,000	0 ... 3,900	0 ... 3,900
DN 100	0 ... 3,200	0 ... 2,500	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 3,000	0 ... 6,200	0 ... 10,000	0 ... 10,000
DN 125	0 ... 5,600	0 ... 4,300	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 5,100	0 ... 13,000	0 ... 21,00,000	0 ... 21,00,000
DN 150	0 ... 9,000	0 ... 7,000	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 8,000	0 ... 2,700,000	0 ... 2,700,000	0 ... 2,700,000
DN 200	0 ... 15,000	0 ... 12,000	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 13,000	0 ... 12,000	0 ... 10,000	0 ... 10,000
Up to 3000 mm (rectangular ducts and larger diameters on request)	0 ... 3,000,000	0 ... 2,300,000	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)	0 ... 2,700,000	0 ... 2,100,000	0 ... 2,100,000	0 ... 2,100,000
Measuring ranges Nominal diameters (inch)	q_{min} lbs/h	q_{max} lbs/h	q_{min} SCFM	q_{max} SCFM	q_{min} lbs/h	q_{max} lbs/h	q_{min} SCFM	q_{max} SCFM
1.0	0 ... 350	0 ... 75	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	0 ... 310	0 ... 65	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)
1.5	0 ... 880	0 ... 190	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	0 ... 860	0 ... 185	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)
2.0	0 ... 1,500	0 ... 330	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	0 ... 1,400	0 ... 310	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)
3.0	0 ... 4,000	0 ... 860	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	0 ... 3,300	0 ... 720	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)
4.0	0 ... 6,400	0 ... 1,400	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	0 ... 6,000	0 ... 1,300	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)
6.0	0 ... 18,500	0 ... 4,000	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	0 ... 16,500	0 ... 3,600	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)
8.0	0 ... 32,000	0 ... 6,900	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	0 ... 27,500	0 ... 6,000	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)
120.0	0 ... 6,600,000	0 ... 1,400,000	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	0 ... 6,000,000	0 ... 1,300,000	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)
Notes regarding measuring ranges	<p>The above values are reference values for applications involving air or nitrogen under atmospheric conditions (other gases available upon request).</p> <p>The values for q_{max} can be increased by approx. 10 % upon request (with lower accuracy in the extended range).</p> <p>For hydrogen and helium, the measuring range lower limit is typically approx. 10 % of the upper limit.</p>							
Measuring errors	Under calibration conditions in specified measuring range							
Air, nitrogen	$\leq \pm 0.9\%$ of the measured value $\pm 0.05\%$ of the possible end value in this nominal diameter (see measuring ranges)							
other gases	$\leq \pm 1.8\%$ of the measured value $\pm 0.10\%$ of the possible end value in this nominal diameter (see measuring ranges)							
	Special calibration on request							
Reproducibility	$< 0.2\%$ of the measured value, t _{meas} = 10 s							
Effect of the temperature of the measured medium	$< 0.05\% / K$ of the measured value (depending on the type of gas)							
Effect of the pressure of the measured medium	$< 0.2\% / 100\text{ kPa} (/ \text{bar})$ of the measured value (depending on the type of gas)							
Response time	T ₆₃ = 0.5 s T ₆₃ = 2 s for zone 2/22 version with constant power method				T ₆₃ = 2 s			

Type	FMT500-IG	FMT500-IG Ex version
Operating conditions		
Recommended inlet and outlet runs	According to DIN EN ISO 5167-1 Minimum inlet run 15 x pipe diameter D, outlet run 5 x pipe diameter D	
Environmental conditions		
Ambient temperature Transmitter	-25 ... 50 °C (-13 ... 122 °F) for zone 2/22 versionen: -20...50 °C (-4 ... 122 °F)	-20 ... 50 °C (-4 ... 122 °F)
Flowmeter sensor remote design	-25 ... 80 °C (-13 ... 176 °F) for zone 2/22 versionen: -20 ... 80 °C (-4 ... 176 °F)	-20 ... 80 °C (-4 ... 176 °F)
	Other ambient temperatures on request	
Storage temperature	-25 ... 85 °C (-13 ... 185 °F)	
Type of protection	IP 67 (IP 66 for flowmeter sensor remote design)	
Process conditions		
Operating temperature Measuring medium (flowmeter sensor)	Standard range: -25 ... 150 °C (-13 ... 302 °F) Extended range: -25 ... 300 °C (-13 ... 572 °F) Zone 2/22 version: -20 ... 150 °C (-4 ... 302 °F)	acc. to temperature classes of Ex certificates max. -20 ... 150 °C (-4 ... 302 °F) (-40 °C version on request)
Operating pressure	4 x 10 ⁶ Pa (40 bar [580 psi])	
Pressure loss (logarithmic diagram)	< 1.0 kPa (10 mbar [0.1450 psi]), typical value 0.1 kPa (1 mbar [0.0145 psi])	
	<p style="text-align: center;">↑ Pressure drop [mbar]</p> <p style="text-align: right;">G00796</p>	
Power supply		
Voltage	Universal power supply unit: 110 ... 230 V AC/DC ± 10 % (f = 48 ... 62 Hz) Low-voltage power supply unit: 24 V AC/DC ± 20 % (f = 48 ... 62 Hz)	
Power consumption	20 VA, current consumption 800 mA, slow-blow fuse of at least 2 A required	
Cable entry	M20 x 1.5 or 1/2" NPT	
Output		
Analog- / HART version		
Analog output	0/4 ... 20 mA, load < 600 Ω (IG-Ex < 400 Ω), electrical isolated, alert < 3.5 or > 22 mA	
Digital outputs	2 x passive optocoupler (approx. 100 mA) can be used as frequency, pulse or contact output	
Digital inputs	2 x 24 V lin typ. 10 mA (low < 2 mA, high > 10 mA) contact input	
Installation class	Overvoltage category III, degree of pollution 2	

3 Electrical connections

<p>Transmitter with integral mount design</p> <p>L / + Phase / + terminal N / - Neutral / - terminal PE Grounding</p> <p>Wide-range power supply unit 110 ... 230 V AC / DC $\pm 10\%$ or Low-voltage power supply unit 24 V AC / DC $\pm 20\%$</p>	 <p>Power supply PROFIBUS or analog / HART module Grounding</p> <p>G00827</p>
<p>Transmitter with remote mount design</p> <p>L / + Phase / + terminal N / - Neutral / - terminal PE Grounding</p> <p>Wide-range power supply unit 110 ... 230 V AC / DC $\pm 10\%$ or Low-voltage power supply unit 24 V AC / DC $\pm 20\%$</p> <p>1:1 cable connection from transmitter terminal block to flowmeter sensor terminal block, terminals 1 ... 10 (terminal 6 not assigned).</p>	 <p>Terminal cover Transmitter terminal block Power supply Analog / HART or PROFIBUS module</p> <p>G00828</p>
<p>Flowmeter sensor with remote mount design</p> <p>Flowmeter sensor Terminals 1 ... 10 Cable Min. 9 wires Min. cross section Min. 0.5 mm² AWG 20 Max. cable length 50 m (164 ft.) (25 m [82 ft.] for Zone 2/22 version with constant power method)</p> <p>1:1 cable connection from transmitter terminal block to flowmeter sensor terminal block, terminals 1 ... 10 (terminal 6 not assigned).</p> <p>Place one side of the cable shield in the metal cable gland for the terminal box.</p>	 <p>Flowmeter sensor terminal block Terminal box</p> <p>G00829</p>

Analog / HART module <p>11 Shield 12 + I_{out} analog output / HART 13 - I_{out} analog output / HART 14 + 24 V DC for external supply, 30 mA max. 15 GND 24 V 16 D_{out} 1 17 D_{out} 2 18 GND D_{out} (D_{out} 1 + 2) 19 D_{in} 1 20 D_{in} 2 21 GND D_{in} (D_{in} 1 + 2) 22 Shield</p>	
PROFIBUS module <p>A PROFIBUS DPV1 in / out signal B PROFIBUS DPV1 in / out signal</p> <p>Note: The system design is such that the entire bus connection will be interrupted if you disconnect the PROFIBUS cable on the device. As an alternative, please consider the version with DP M12 connection socket (Section 3.1.3).</p> <p>¹⁾ Note regarding terminating resistor: The bus termination with jumpers should only be used if just the device is connected to this PROFIBUS line.</p> <p>The incoming and outgoing PROFIBUS cables are connected to terminals A (green cable) and B (red cable) respectively. The other terminal blocks must not be used (CAN bus, for internal use only).</p>	 <p>Cable shield connected to ground (PE) by means of capacitive coupling</p> <p>PROFIBUS terminals A / B</p> <p>Jumper for PROFIBUS terminating resistor¹⁾</p> <p>G00830</p>

3.1.1 Designation

Transmitter with remote mount design	Flowmeter sensor with remote mount design	Integral mount design
 II 3G EEx nA II T4  II 3D IP 67 T 115 °C $T_{\text{amb}} = -20 \dots 50^\circ\text{C} (-4 \dots 122^\circ\text{F})$	 II 3G EEx nA II T4  II 3D IP 66 T 150 °C $T_{\text{amb}} = -20 \dots 80^\circ\text{C} (-4 \dots 176^\circ\text{F})$ $T_{\text{medium}} = -20 \dots 150^\circ\text{C} (-4 \dots 302^\circ\text{F})$	 II 3G EEx nA II T4  II 3D IP 67 T 150 °C $T_{\text{amb}} = -20 \dots 50^\circ\text{C} (-4 \dots 122^\circ\text{F})$ $T_{\text{medium}} = -20 \dots 150^\circ\text{C} (-4 \dots 302^\circ\text{F})$

3.1.2 Examples for connecting peripherals (Analog / HART version)

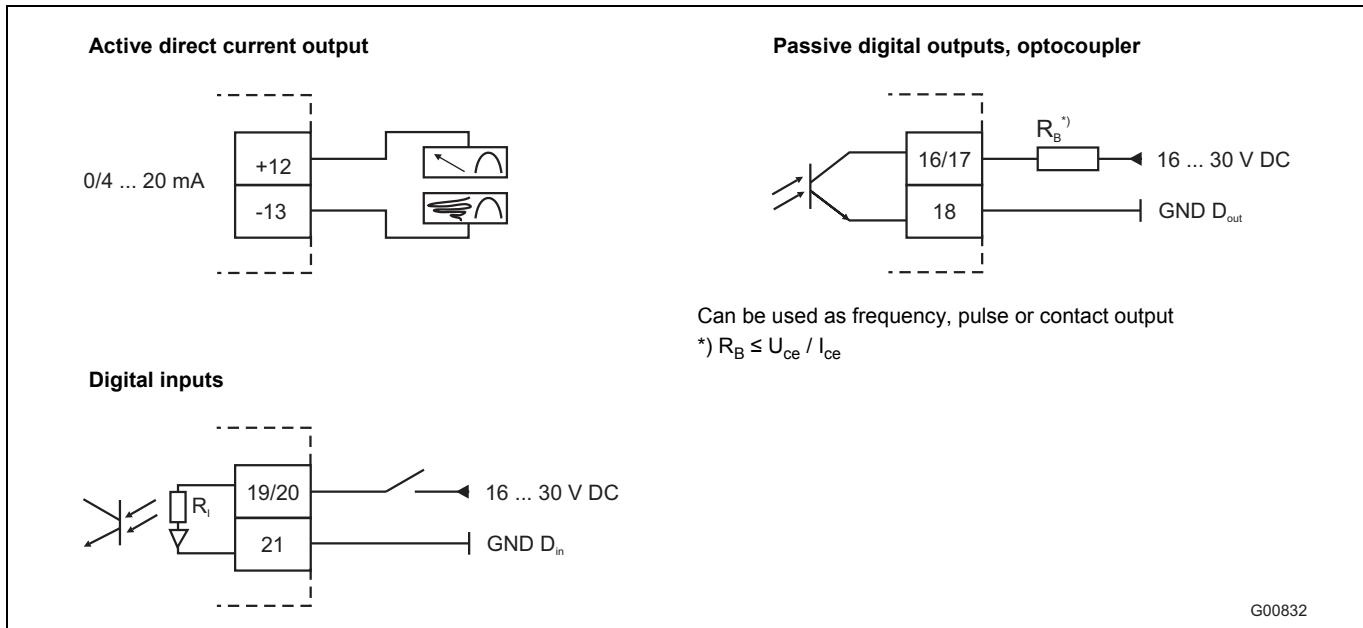


Abb. 3

3.1.3 PROFIBUS DPV1 communication with DP M12 connector socket

The version with PROFIBUS DP M12 connector socket allows disconnection of the device from the bus without interrupting PROFIBUS DP operation. Instead of the center cable gland an assembled and wired DP M12 connector socket is supplied.

For connection to the PROFIBUS DP line you need 1 T-plug, cable socket and cable plug (see accessories).

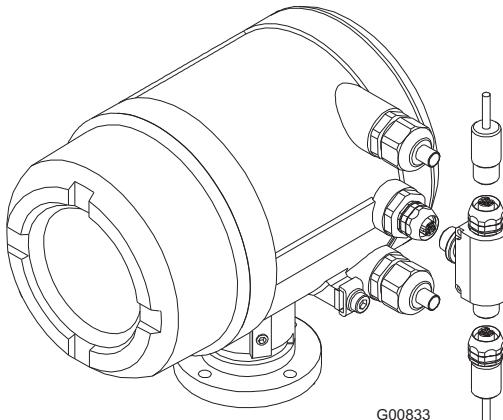
Type of protection of the plug-in connections: IP 66.

Only available for non-Ex devices in integral mount design.

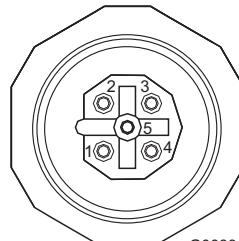
Please refer to Data Sheet 10/63-6.40 for other versions of T-plugs and appropriate DP connector plugs.

Pin assignment of the device

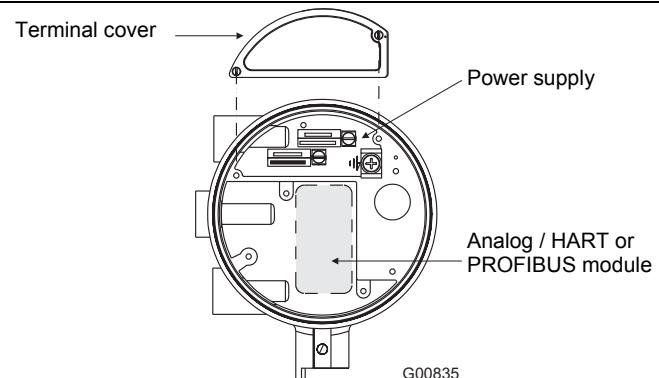
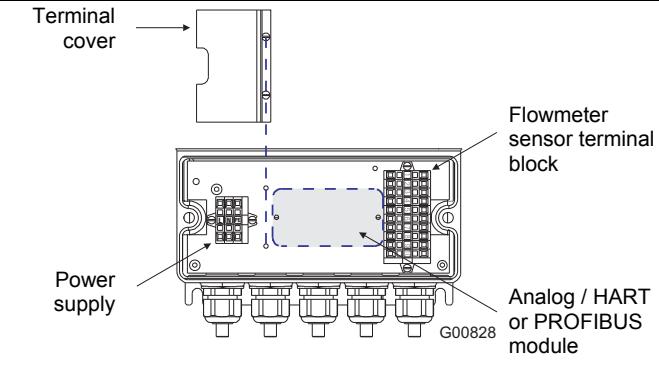
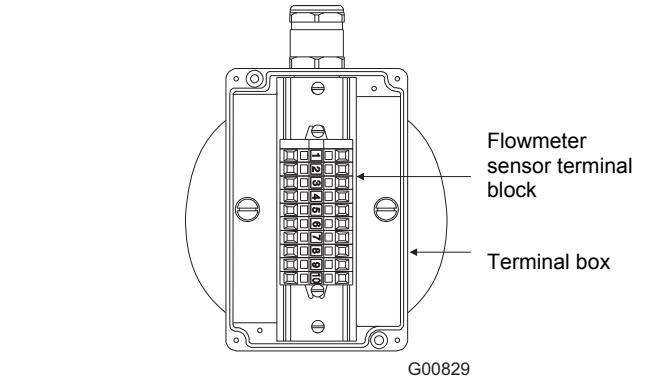
Pin	Signal	Description
1	VP	+ 5 V
2	RxD/TxD-N	Receive / transmit data line A (green wire)
3	DGND	Data transmission potential
4	RxD/TxD-P	Receive / transmit data line B (red wire)
5	Shield	Shield / protective earth
Thread	Shield	Shield / protective earth



G00833



G00834

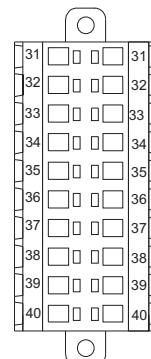
<p>Transmitter with integral mount design</p> <p>L / + Phase / + terminal N / - Neutral / - terminal PA Potential equalization</p> <p>Wide-range power supply unit 110 ... 230 V AC / DC $\pm 10\%$, 20 VA 48 ... 62 Hz, $U_{max} = 250$ V or</p> <p>Low-voltage power supply unit 24 V AC / DC $\pm 20\%$, 20 VA 48 ... 62 Hz, $U_{max} = 29$ V</p> <p>Type of protection for power supply connection: Ex e (ATEX, GOST), XP (FM, CSA)</p> <p>Before opening the cover to the connection area, remove the safety locking device and reattach it after closing the housing.</p>	 <p>Terminal cover Power supply Analog / HART or PROFIBUS module</p> <p>G00835</p>
<p>Transmitter with remote mount design</p> <p>L / + Phase / + terminal N / - Neutral / - terminal PE Grounding</p> <p>Wide-range power supply unit 110 ... 230 V AC / DC $\pm 10\%$, 20 VA 48 ... 62 Hz, $U_{max} = 250$ V or</p> <p>Low-voltage power supply unit 24 V AC / DC $\pm 20\%$, 20 VA 48 ... 62 Hz, $U_{max} = 29$ V</p> <p>1:1 cable connection from transmitter terminal block to flowmeter sensor terminal block, terminals 1 ... 10 (terminal 6 not assigned)</p> <p>Type of protection for flowmeter sensor connection: Ex ia (ATEX, GOST), IS (FM, CSA)</p>	 <p>Terminal cover Power supply Flowmeter sensor terminal block Analog / HART or PROFIBUS module</p> <p>G00828</p>
<p>Flowmeter sensor with remote mount design</p> <p>Type of protection Ex ia (ATEX, GOST), IS (FM, CSA) Flowmeter sensor Terminals 1 ... 10 Cable Min. 9 wires Min. cross section Min. 0.5 mm² AWG 20 Max. cable length 25 m (82 ft.)</p> <p>1:1 cable connection from transmitter terminal block to flowmeter sensor terminal block, terminals 1 ... 10 (terminal 6 not assigned)</p>	 <p>Flowmeter sensor terminal block Terminal box</p> <p>G00829</p>

Analog / HART module

- 31 + I_{out} analog output / HART
- 32 - I_{out} analog output / HART
- 33 D_{out} 1
- 34 GND D_{out} (D_{out} 1)
- 35 D_{out} 2
- 36 GND D_{out} (D_{out} 2)
- 37 D_{in} 1
- 38 GND D_{in} (D_{in} 1)
- 39 D_{in} 2
- 40 GND D_{in} (D_{in} 2)

Type of protection: Ex ib or Ex e (ATEX, GOST), IS or XP, NI (FM, CSA)

When connecting the fieldbus / signal lines, the safety-related parameters in the relevant certificates must be observed.



G00836

PROFIBUS module

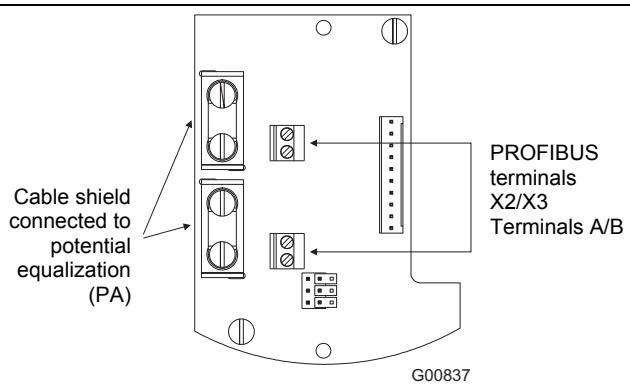
- A PROFIBUS DPV1 in / out signal
- B PROFIBUS DPV1 in / out signal

Type of protection Ex ib (ATEX, GOST), IS (FM, CSA)

Connect to intrinsically safe PROFIBUS DP only (integral and remote mount designs)

Bus termination internally via 150 Ω resistor or externally according to RS485 IS specification

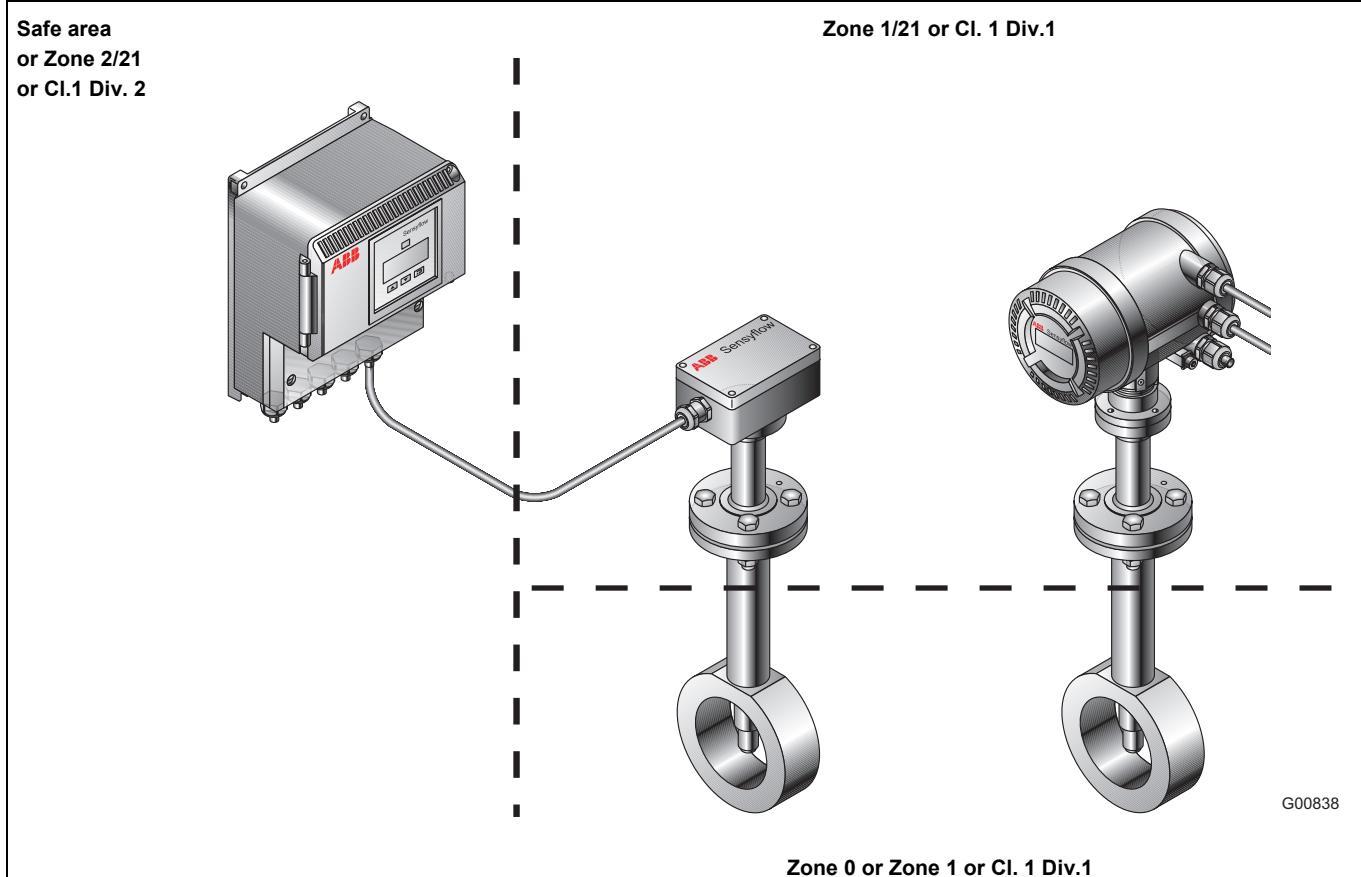
When connecting the fieldbus/signal lines, the safety-related parameters in the relevant certificates must be observed.



G00837

4 Ex relevant specifications

4.1.1 Options regarding installation in potentially explosive atmospheres



4.1.2 ATEX designations

Transmitter, remote mount design	Flowmeter sensor, remote mount design	Integral mount design
Zone 2/21 II 3(1) G EEx nA [ia] [ib] IIC T4 II 2 D T 115 °C $T_{amb} = -20 \dots 50 \text{ }^{\circ}\text{C} (-4 \dots 122 \text{ }^{\circ}\text{F})$ Optional -40 °C for ambient temperature	Terminal box Zone 1, flowmeter sensor Zone 0 II 1/2 G EEx ia IIC T4 II 2 D T 80 °C Terminal box and flowmeter sensor Zone 1 II 2 G EEx ia IIC T4...T1 II 2 D T 100 °C or 200 °C or 300 °C $T_{amb} = -20 \dots 80 \text{ }^{\circ}\text{C} (-4 \dots 176 \text{ }^{\circ}\text{F})$ Optional -40 °C for ambient temperature	Transmitter Zone 1, flowmeter sensor Zone 0 II 1/2 G EEx de [ia] [ib] IIC T4 II 2 D T 115 °C Transmitter and flowmeter sensor Zone 1 II 2 G EEx de [ia] [ib] IIC T4...T1 II 2 D T 115 °C or 200 °C or 300 °C $T_{amb} = -20 \dots 50 \text{ }^{\circ}\text{C} (-4 \dots 122 \text{ }^{\circ}\text{F})$ Optional -40 °C for ambient temperature

4.1.3 GOST R designations (Russia)

Transmitter, remote mount design	Flowmeter sensor, remote mount design	Integral mount design
 2Ex nA [ia] [ib] IIC T4 or 2Ex nA [ia] IIC T4 DIP A21 T _A 115 °C, IP 67	 Terminal box Zone 1, flowmeter sensor Zone 0 Ex ia IIC T4 DIP A21 T_A80 °C, IP 66  Terminal box and flowmeter sensor Zone 1 Ex ia IIC T4...T1 DIP A21 T_A100 / 200 / 300 °C, IP 66 $T_{amb} = -20 \dots 50 \text{ °C } (-4 \dots 122 \text{ °F})$ $T_{amb} = -20 \dots 80 \text{ °C } (-4 \dots 176 \text{ °F})$	 Transmitter Zone 1, flowmeter sensor Zone 0 2Ex de [ia] [ib] IIC T4 or 2Ex de [ia] IIC T4 DIP A21 T_A115 °C, IP 67  Transmitter and flowmeter sensor Zone 1 2Ex de [ia] [ib] IIC T4...T1 or 2Ex de [ia] IIC T4...T1 DIP A21 T_A100 / 200 / 300 °C, IP 67 $T_{amb} = -20 \dots 50 \text{ °C } (-4 \dots 122 \text{ °F})$

4.1.4 Temperature table for ATEX and GOST R versions (Russia)

Sensyflow FMT500-IG, integral mount design				
Temperature class	Surface temperature	Process temperature	Flowmeter sensor	Transmitter
T4	T 115 °C	-20 ... 80 °C (-4 ... 176 °F)	Cat. 1G / Zone 0	Cat. 2G/2D / Zone 1/21
T4	T 115 °C	-20 ... 100 °C (-4 ... 212 °F)	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T3	T 115 °C	-20 ... 100 °C (-4 ... 212 °F)	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T2	T 200 °C ¹⁾	-20 ... 200 °C (-4 ... 392 °F) ¹⁾	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T1	T 300 °C ¹⁾	-20 ... 300 °C (-4 ... 572 °F) ¹⁾	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21

Sensyflow FMT500-IG transmitter, remote mount design				
Temperature class	Surface temperature			Transmitter
T4	T 115 °C			Cat. 3G/2D / Zone 2/21

Sensyflow FMT500-IG flowmeter sensor, remote mount design				
Temperature class	Surface temperature	Process temperature	Flowmeter sensor	Terminal box
T4	T 80 °C	-20 ... 80 °C (-4 ... 176 °F)	Cat. 1G / Zone 0	Cat. 2G/2D / Zone 1/21
T4	T 100 °C	-20 ... 100 °C (-4 ... 212 °F)	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T3	T 100 °C	-20 ... 100 °C (-4 ... 212 °F)	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T2	T 200 °C ¹⁾	-20 ... 200 °C (-4 ... 392 °F) ¹⁾	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21
T1	T 300 °C ¹⁾	-20 ... 300 °C (-4 ... 572 °F) ¹⁾	Cat. 2G / Zone 1	Cat. 2G/2D / Zone 1/21

¹⁾ Temperatures correspond to ATEX and GOST R temperature classes, max. process temperature for flowmeter sensor -20 ... 150 °C (-4 ... 302 °F)

4.1.5 FM designations with temperature information

Transmitter, remote mount design	Flowmeter sensor, remote mount design	Integral mount design
 NI CLASS I DIV2 Group: A,B,C,D, CLASS I Zone 2 AEx nA IIC T4...T1 DIP CLASS II, III DIV1 and 2 Group: E,F,G IS Circuits for CLASS I DIV1 Group: A,B,C,D, CLASS I Zone 0 AEx ia IIC $T_{amb} = -20 \dots 50 \text{ °C } (-4 \dots 122 \text{ °F})$	 IS CLASS I DIV1 Group: A,B,C,D, CLASS I Zone 0 AEx ia IIC T4...T1 DIP CLASS II, III DIV1 and 2 Group: E,F,G NI CLASS I, II, III DIV2, Group: A,B,C,D, CLASS I Zone 2 Group: IIC T4...T1 $T_{amb} = -20 \dots 80 \text{ °C } (-4 \dots 176 \text{ °F})$ $T_{medium} = -20 \dots 150 \text{ °C } (-4 \dots 302 \text{ °F})$ $T4/T3_{medium} = -20 \dots 100 \text{ °C } (-4 \dots 212 \text{ °F})$ $T2_{medium} = -20 \dots 200 \text{ °C } (-4 \dots 392 \text{ °F})$ $T1_{medium} = -20 \dots 300 \text{ °C } (-4 \dots 572 \text{ °F})$	 XP CLASS I DIV1 Group: B,C,D, CLASS I, Zone 1 II B T4...T1 IS Circuits for CLASS I DIV1 Group: B,C,D, CLASS I Zone 0 AEx ia IIC DIP CLASS II,III DIV1 and 2 Group: E,F,G NI CLASS I, II, III DIV2, Group: A,B,C,D,F,G, CLASS I Zone 2 Group: IIC T4...T1 $T_{amb} = -20 \dots 50 \text{ °C } (-4 \dots 122 \text{ °F})$ $T_{medium} = -20 \dots 150 \text{ °C } (-4 \dots 302 \text{ °F})$ $T4/T3_{medium} = -20 \dots 100 \text{ °C } (-4 \dots 212 \text{ °F})$ $T2_{medium} = -20 \dots 200 \text{ °C } (-4 \dots 392 \text{ °F})$ $T1_{medium} = -20 \dots 300 \text{ °C } (-4 \dots 572 \text{ °F})$

4.1.6 CSA designations with temperature information

Transmitter, remote mount design	Flowmeter sensor, remote mount design	Integral mount design
 CLASS I DIV2, Group: A,B,C,D, CLASS I Zone 2 Ex nA II T4...T1 CLASS II, III DIV1 and 2 Group: E,F,G Associated Equipment [Ex ia] CLASS I DIV1 Group: A,B,C,D [Ex ia] IIC $T_{amb} = -20 \dots 50^{\circ}C (-4 \dots 122^{\circ}F)$	 Intrinsically safe Exia CLASS I DIV1 Group: A,B,C,D, Ex ia IIC T4...T1 CLASS II, III DIV1 and 2 Group: E,F,G CLASS I DIV2, Group: A,B,C,D, Ex nA II T4...T1 $T_{amb} = -20 \dots 80^{\circ}C (-4 \dots 176^{\circ}F)$ $T_{medium} = -20 \dots 150^{\circ}C (-4 \dots 302^{\circ}F)$ $T4/T3_{medium} = -20 \dots 100^{\circ}C (-4 \dots 212^{\circ}F)$ $T2_{medium} = -20 \dots 200^{\circ}C (-4 \dots 392^{\circ}F)$ $T1_{medium} = -20 \dots 300^{\circ}C (-4 \dots 572^{\circ}F)$	 CLASS I DIV1 Group: B,C,D,F,G, CLASS I, Zone 1 II B T4...T1 CLASS I Zone 1/0 Ex d [ia] [ib] IIC T4...T1 or Ex d [ia] IIC T4...T1 CLASS II, III DIV1 and 2 Group: E,F,G CLASS I, II, III DIV2, Group: A,B,C,D,F,G, CLASS I Zone 2 Ex nA II T4...T1 $T_{amb} = -20 \dots 50^{\circ}C (-4 \dots 122^{\circ}F)$ $T_{medium} = -20 \dots 150^{\circ}C (-4 \dots 302^{\circ}F)$ $T4/T3_{medium} = -20 \dots 100^{\circ}C (-4 \dots 212^{\circ}F)$ $T2_{medium} = -20 \dots 200^{\circ}C (-4 \dots 92^{\circ}F)$ $T1_{medium} = -20 \dots 300^{\circ}C (-4 \dots 572^{\circ}F)$

4.2 Safety Specifications for the Inputs and Outputs, Model FCM2000-MC27B

4.2.1 PROFIBUS DPV1 communication

Output circuit	ATEX and GOST versions: Intrinsically safe EEx ib IIC / IIB FM/CSA versions: IS acc. to control drawings V14224-6 ... 1222 ..., V14224-6 ... 2222 ..., V14224-7 ... 1122 ..., V14224-7 ... 2122 ...			
PROFIBUS DP	$U_o = \pm 3.72 \text{ V}$			
RS 485_IS interface	I_o	P_o	EEx ib IIC/IIB	
Terminals X2, X3	[mA]	[mW]	$C'[\text{nF/km}]$	$L'/R'[\text{mH}/\Omega]$
Terminal A/B	± 155	± 144.2	≤ 250	≤ 28.5
	Min. cable cross section 0.2 mm Max. input voltage U_i : $\pm 4.20 \text{ V}$ C_i : 0 nF Max. input current I_i : $\pm 2.66 \text{ A}$ L_i : 0 mH Electrical isolation of RS 485_IS PROFIBUS fieldbus signals A and B Cable shield is connected to potential equalization Use approved RS 485_IS interface / barriers only to disconnect intrinsically safe and non-intrinsically safe PROFIBUS connections			

4.2.2 Analog / HART communication

Output circuit	ATEX and GOST versions: Intrinsically safe EEx ib IIC / IIB FM / CSA versions: IS acc. to control drawings V14224-6 ... 1212 ... IS, V14224-6 ... 2212 ... IS, V14224-7 ... 1112 ... IS, V14224-7 ... 2112 ... IS				ATEX and GOST versions: Non-intrinsically safe $U_{max} = 60 \text{ V}$ FM / CSA versions: XP, NI, DIP acc. to control drawings V14224-6 ... 1212 ..., V14224-6 ... 2212 ..., V14224-7 ... 1112 ..., V14224-7 ... 2112 ... $U_{max} = 90 \text{ V}$
	$U_o = 17.2 \text{ V}$ $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$				$U_B = 30 \text{ V}$
Current output Active Terminal 31 + 32	I_o	P_o	EEx ib IIC		$I_B = 30 \text{ mA}$
	[mA]	[mW]	$C_i [\text{nF}]$	$L_i [\text{mH}]$	
	78.3	337	2.0	0.25	
	Characteristic curve: Linear $C_o = 353 \text{ nF}$, $L_o = 4 \text{ mH}$ Connect to passive, intrinsically safe circuits only. Terminal 32 is connected to potential equalization (PA). Use only approved separators / barriers.				
Digital output Passive D_{out1} : Terminal 33 + 34 D_{out2} : Terminal 35 + 36	$U_i = 15 \text{ V}$ $I_i = 30 \text{ mA}$ $P_i = 115 \text{ mW}$	$C_i = 2.0 \text{ nF}$ $L_i = 0.250 \text{ mH}$	$U_B = 30 \text{ V}$ $I_B = 100 \text{ mA}$		
Digital input Passive D_{in1} : Terminal 37 + 38 D_{in2} : Terminal 39 + 40	$U_i = 30 \text{ V}$ $I_i = 250 \text{ mA}$ $P_i = 1.1 \text{ W}$	$C_i = 2.0 \text{ nF}$ $L_i = 0.250 \text{ mH}$	$U_B = 30 \text{ V}$ $I_B = 100 \text{ mA}$		

Special requirements:

The output current circuits are designed such that they can be connected to either intrinsically safe or non-intrinsically safe current circuits. However, intrinsically safe and non-intrinsically safe circuits must not be mixed or combined.

The rated voltage of non-intrinsically safe current circuits is:

- for ATEX and GOST versions $U_m = 60 \text{ V}$
- for FM and CSA versions $U_m = 90 \text{ V}$ (XP, NI, DIP).
- Make sure that the cover of the power terminal box is always closed properly. When using the device with intrinsically safe output current circuits it is permissible to open the terminal box.
- It is recommended to use the enclosed cable glands for the output current circuits, according the type of explosion protection:
intrinsically safe = blue; non-intrinsically safe = black.

- The flowmeter sensor and the transmitter housing must be connected to an equipotential bonding system. When using intrinsically safe current outputs proper equipotential bonding must be ensured along the current circuits.
- Make sure that the measuring pipe materials are resistant to possible corrosive substances in the measuring medium. This is the user's responsibility.

Notice:

The values indicated here are taken from the respective approval certificates. Always observe the specifications and supplements in the approvals (ATEX, FM, CSA, GOST Russia).

5 Communication

5.1 HART

HART protocol Rev. 6.0 is used for digital communication between a process control system or PC, a hand-held terminal and the field device. It can be used to send all device and measuring point parameters from the transmitter to the process control system or PC. Conversely, it also provides a means of reconfiguring the transmitter.

Digital communication utilizes an alternating current superimposed on the analog output (4 ... 20 mA) that does not affect any meters connected to the output.

The ASSET VISION DAT200 and DTM400 program can be used for operation and configuration purposes. This is a piece of universal communication software for intelligent field devices based on FDT / DTM technology. Data can be exchanged with a comprehensive range of field devices using various means of communication. The main applications include parameter display, configuration, diagnostics, recording, and data management for all intelligent field devices that specifically meet the communication requirements involved.

Basic functions (such as the measuring range end value or certain mass flow units) can be parameterized with the universal HART DTM. If you use the FMT500-IG HART DTM, you will have access to the full range of functions.

Transmission method

FSK modulation at current output of 4 ... 20 mA based on the Bell 202 standard. Max. signal amplitude 1.2 mA_{SS}.

Load

Min. 250 Ω, max. 600 Ω (IG-Ex < 400 Ω)

Max. cable length 1,500 m AWG 24, twisted and shielded (for standard and Zone 2/22 devices).

Max. cable length for Ex devices depends on the safety specifications in the certificates.

Baud rate

1,200 baud

Log. 1 representation: 1200 Hz

Log. 0 representation: 2200 Hz

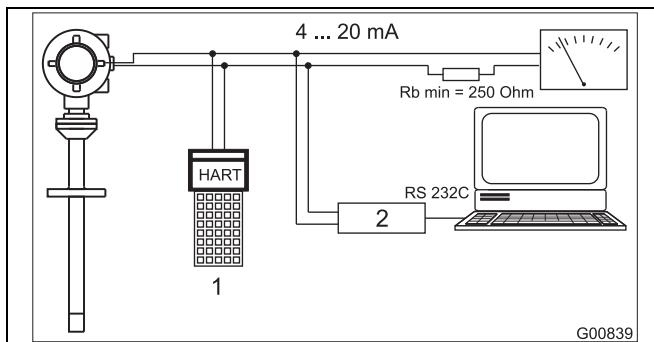


Fig. 4

- 1 Handheld terminal
- 2 FSK modem

5.2 PROFIBUS DPV1

With the Sensyflow FMT500-IG thermal mass flowmeter plus PROFIBUS interface, bus communication is based on the "Profile For Process Control Devices" Version 3.0 (PA Profile 3.0) of October 1999. PROFIBUS DP (RS 485 transmission) is used for the bus interface and the acyclic PROFIBUS DPV1 services are supported.

PROFIBUS interface parameters

- DPV1 communication without alarms
- Master C1 and C2 support
- Max. transmission rate: 1.5 Mbaud
- ID number: 0x05CA
- GSD file name: ABB_05CA.GSD

The cables for the PROFIBUS connection must meet the following parameters in accordance with PROFIBUS specification EN 50170 part 8-2:

Parameter	DP, cable type A, shielded
Surge impedance in Ω	135 ... 165 at a frequency of 3 ... 20 MHz
Effective capacitance (pF/m)	30
Loop resistance (Ω/km)	≤ 110
Solid conductor	AWG 22/1
Flexible conductor	> 0.32 mm ²

As with the analog / HART version, you can parameterize the device using ASSET VISION DAT200 and DTM400 and FMT500-IG PROFIBUS-DT.

Direct connection to intrinsically safe PROFIBUS DP lines is permitted, provided you use approved models and comply with safety-related parameters in accordance with certificates (see figure). The line length and number of bus nodes depend on the Ex barrier used.

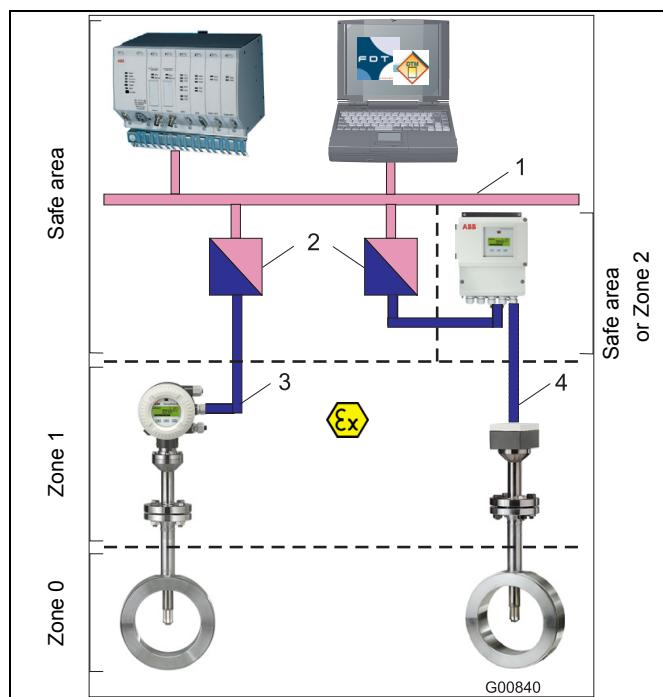
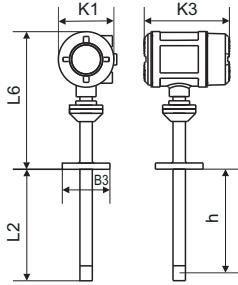
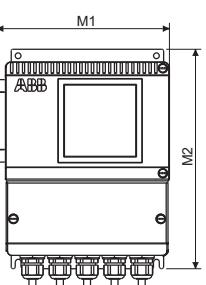
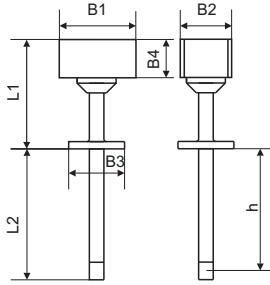
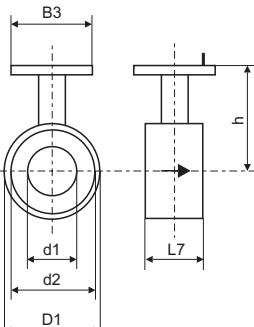
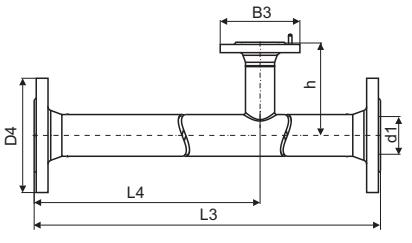
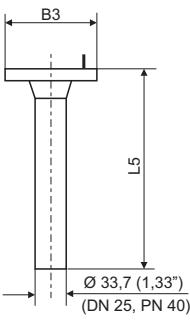


Fig. 5

- 1 PROFIBUS DPV1 non-intrinsically safe
- 2 Ex barrier PROFIBUS DP (RS 485_IS interface)
- 3 PROFIBUS DP intrinsically safe
- 4 Intrinsically safe circuit

6 Dimensions

Flowmeter sensor (integral mount design)	Transmitter (remote mount design)	Flowmeter sensor (remote mount design)
 G00841	 G00842	 G00797
Type 1 pipe component: Wafer type	Type 2 pipe component: Measuring section	Weld-on adapter DN 100 (4") and higher
 G00798	 G00799 optional with integrated flow straightener	 G00800

EN 1092-1 form B1, PN 40									
Nominal diameter	B1	L2	h	D1	d1	d2	D4	L3	L4
DN 25	B1 = 125 (4.92)	269 (10.59)	263 (10.35)	-	28.5 (1.12)	-	115 (4.53)	600 (23.62)	486 (19.13)
DN 40	B2 = 80 (3.15)			94 (3.70)	43.1 (1.70)	88 (3.46)	150 (5.91)	860 (33.86)	731 (28.78)
DN 50	B3 = Ø115 (4.53)			109 (4.29)	54.5 (2.15)	102 (4.02)	165 (6.50)	1000 (39.37)	837 (32.95)
DN 65	B4 = 58 (2.28)			129 (5.08)	70.3 (2.77)	122 (4.80)	185 (7.28)	1400 (55.12)	1190 (46.85)
DN 80	K1 = 150 (5.91)			144 (5.67)	82.5 (3.25)	138 (5.43)	200 (7.87)	1700 (66.93)	1450 (57.09)
DN 100	K3 = 206 (8.11)			170 (6.69)	107.1 (4.22)	162 (6.38)	235 (9.25)	2200 (86.61)	1870 (73.62)
DN 125	L1 = 188 (7.40)			196 (7.72)	131.7 (5.19)	188 (7.40)	270 (10.63)	2700 (106.3)	2300 (90.55)
DN 150	L5 = 450 (17.72)			226 (8.90)	159.3 (6.27)	218 (8.58)	300 (11.81)	3200 (125.98)	2720 (107.09)
DN 200	L6 = 310 (12.20)			293 (11.54)	206.5 (8.13)	285 (11.22)	375 (14.76)	4200 (165.35)	3580 (140.94)
> 350	M2 = 265 (10.43)	431 (16.97)	425 (16.73)						
> 700	M3 = 139 (5.47)	781 (30.75)	775 (30.51)						
ASME B 16.5, Cl. 150 (ANSI), Sch 40 S									
1"	B1= 125 4.92	269 (10.59)	263 (10.35)	-	26.6 (1.05)	-	108 (4.25)	560 (22.05)	454 (17.87)
1 1/2"	B2 = 80 (3.15)			85 (3.35)	40.9 (1.61)	73 (2.87)	127 (5.00)	864 (34.02)	741 (29.17)
2"	B3 = Ø115 (4.53)			103 (4.06)	52.6 (2.07)	92 (3.62)	154 (6.06)	1003 (39.49)	846 (33.31)
3"	B4 = 58 (2.28)			135 (5.31)	78.0 (3.07)	127 (5.00)	-	-	-
4"	K1 = 150 (5.91)			173 (6.81)	102.4 (4.03)	157 (6.18)	-	-	-
6"	K3 = 206 (8.11)			221 (8.70)	154.2 (6.07)	216 (8.50)	-	-	-
8"	L1 = 188 (7.40)			278 (10.94)	202.7 (7.98)	270 (10.63)	-	-	-
> 14"	L5 = 450 (17.72)								
L6 = 310 (12.20)	L7 = 65 (2.56)	431 (16.97)	425 (16.73)						
> 28"	M1 = 208 (8.19)	781 (30.75)	775 (30.51)						

Dimensions in mm (inch)

ASME B 16.5, Cl. 300 (ANSI), Sch 40 S									
1"	B1 = 125 (4.92)	269 (10.59)	263 (10.35)	-	26.6 (1.05)	-	123.9 (4.88)	560 (22.05)	454 (17.87)
1 1/2"	B2 = 80 (3.15)			94 (3.70)	40.9 (1.61)	73 (2.87)	155.4 (6.12)	864 (34.02)	741 (29.17)
2"	B3 = Ø115 (4.53)			110 (4.33)	52.6 (2.07)	92 (3.62)	165.1 (6.50)	1003 (39.49)	846 (33.31)
3"	B4 = 58 (2.28)			148 (5.83)	78.0 (3.07)	127 (5.00)	-	-	-
4"	K1 = 150 (5.91)			180 (7.09)	102.4 (4.03)	157 (6.18)	-	-	-
6"	K3 = 206 (8.11)			249 (9.80)	154.2 (6.07)	216 (8.50)	-	-	-
8"	L1 = 188 (7.40)			307 (12.09)	202.7 (7.98)	270 (10.63)	-	-	-
> 14"	L5 = 450 (17.72)	431 (16.97)	425 (16.73)						
> 28"	L6 = 310 (12.20)	M1 = 208 (8.19)	781 (30.75)	775 (30.51)					
L7 = 65 (2.56)	M2 = 265 (10.43)								
M3 = 139 (5.47)									

Dimensions in mm (inch)

7 Installation instructions

7.1 Weld-on adapter for Sensyflow FMT500-IG

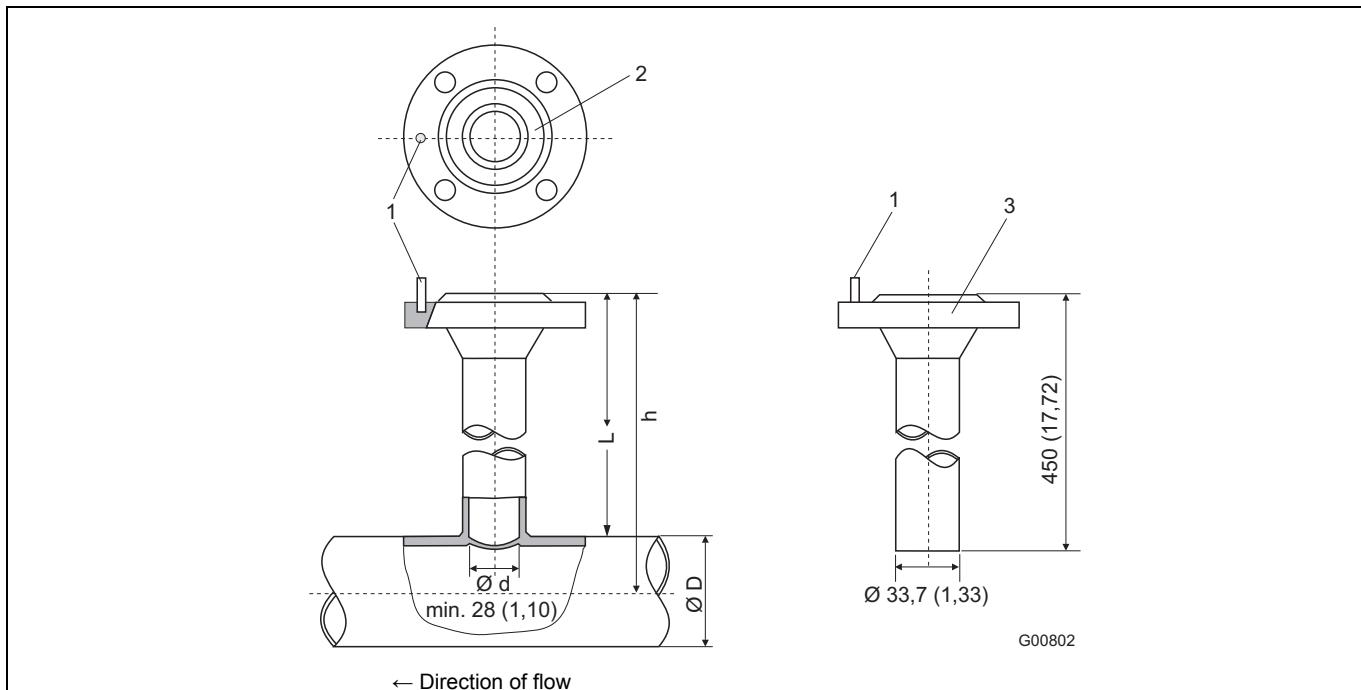


Fig. 6: Dimensions in mm (inch)

1 Centering pin

2 Sealing ring groove

3 Connection flange DN 25 (1")

D Outer pipe diameter

Flowmeter sensor length h in mm (inch)	Outer pipe diameter min. / max. in mm (inch)
263 (10.35)	100 ... 350 (3.94 ... 13.78)
425 (16.73)	> 350 ... 700 (13.78 ... 27.56)
775 (30.51)	> 700 ... 1400 (27.56 ... 55.12) ¹⁾

¹⁾ This maximum pipe diameter specification is only valid when installing the sensor unit centrally in the pipe.
For larger diameters or angular ducts a non-centric sensor position is taken into account for calibration.



IMPORTANT (NOTE)

Prior to mounting the weld-on adapters must be shortened to length: $L = h - 1/2 D_{outer}$.

The distance h between the upper flange edge and the pipe center line must be within a tolerance of ± 2 mm (0.08").

The right angle to the pipe center line must be observed (max. tolerance $\pm 2^\circ$).

The centering pin of the adapter must be aligned centrically with the pipe center line in flow direction (on outlet run side, downstream of the measuring point).

7.2 Weld-on adapter with ball valve for Sensyflow FMT500-IG

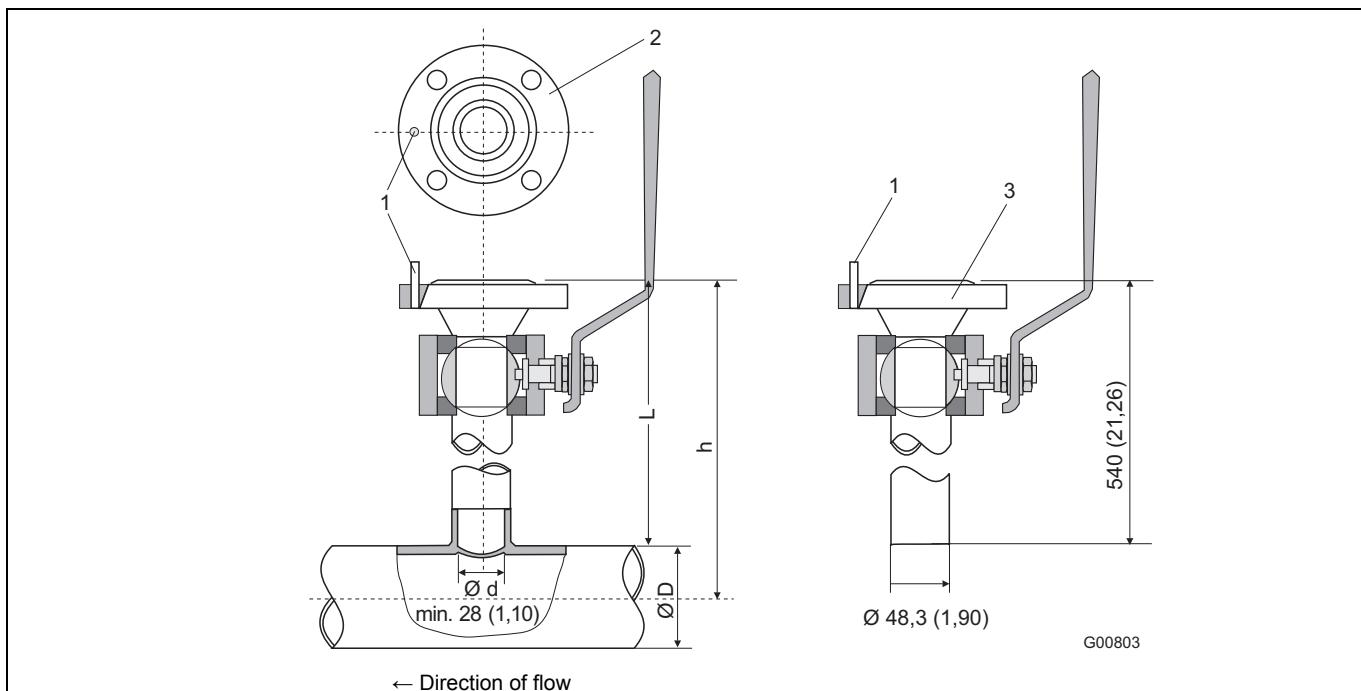


Fig. 7: Dimensions in mm (inch)

- | | |
|-----------------------|--------------------------------|
| 1 Centering pin | 3 Connection flange DN 25 (1") |
| 2 Sealing ring groove | D Outer pipe diameter |

Flowmeter sensor length h in mm (inch)	Outer pipe diameter min. / max. in mm (inch)
263 (10.35)	100 ... 150 (3.94 ... 5.91)
425 (16.73)	> 150 ... 500 (5.91 ... 19.69)
775 (30.51)	> 500 ... 1150 (19.69 ... 45.28) ¹⁾

¹⁾ This maximum pipe diameter specification is only valid when installing the sensor unit centrally in the pipe.
For larger diameters or angular ducts a non-centric sensor position is taken into account for calibration.



IMPORTANT (NOTE)

Prior to mounting the weld-on adapters must be shortened to length: $L = h - 1/2 D_{outer}$.

The distance h between the upper flange edge and the pipe center line must be within a tolerance of ± 2 mm (0.08").

The right angle to the pipe center line must be observed (max. tolerance $\pm 2^\circ$).

The centering pin of the adapter must be aligned centrically with the pipe center line in flow direction (on outlet run side, downstream of the measuring point).

7.3 Integrated hot tap fitting for Sensyflow FMT500-IG

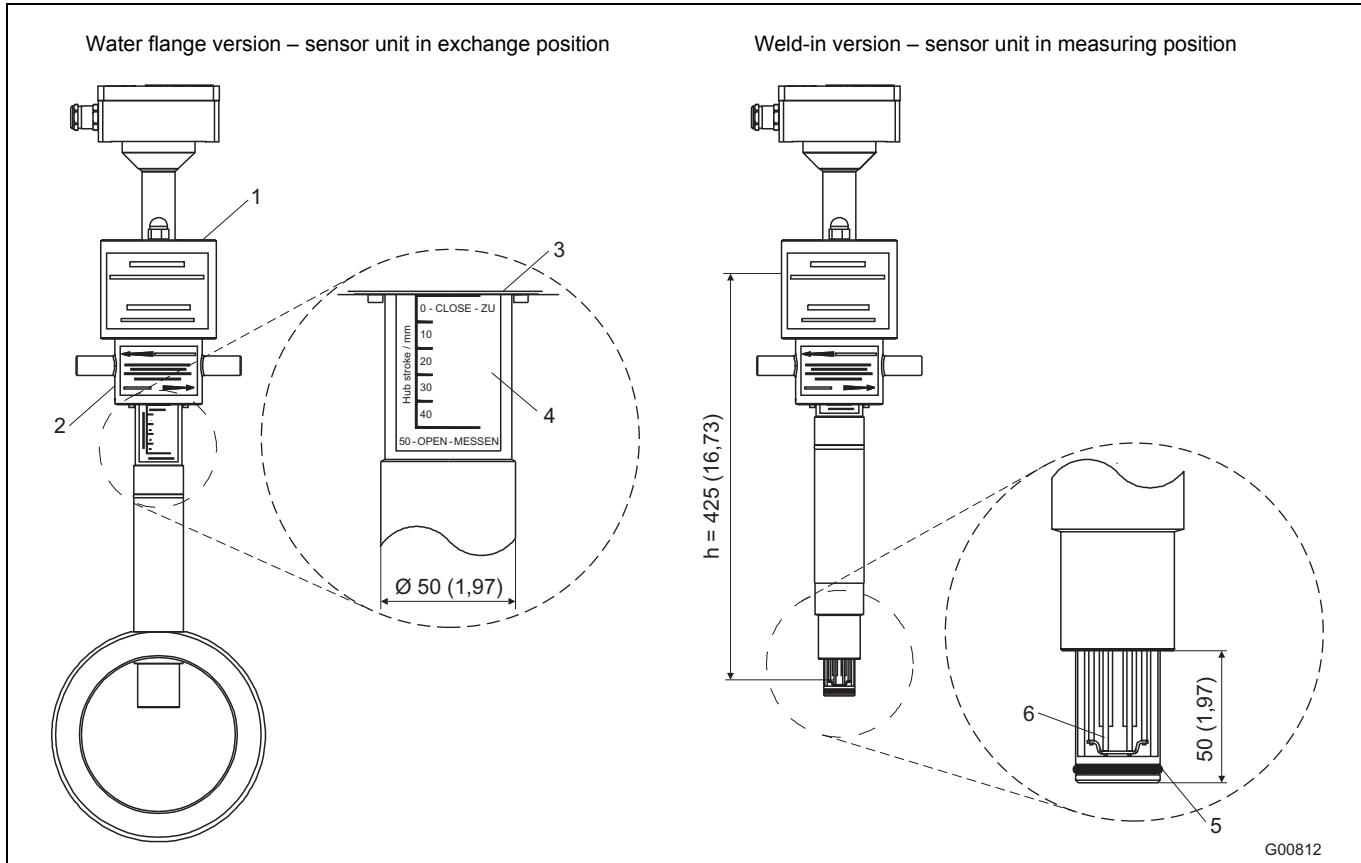


Fig. 8: Dimensions in mm (inch)

- | | | | |
|---|---------------------------|---|---|
| 1 | Covers for DN 25 flange | 4 | Display of sensor unit position, 50 mm (1,97") stroke |
| 2 | Spigot nur | 5 | Sealing ring |
| 3 | Bottom edge of spigot nut | 6 | Sensor elements |

Flowmeter sensor length h	
Water flange version	Weld-in version
$h = 263 \text{ mm (10.35")}$ for DN 50, DN 65 and DN 80 / 2", 3"	$h = \text{always } 425 \text{ mm (16.73")}$
$h = 425 \text{ mm (16.73")}$ for DN 100, DN 125, DN 150 and DN 200 / 4", 6", 8"	

The integrated hot tap fitting is used instead of the pipe component and weld-on adapter assembly described above if the flowmeter sensor must be exchangeable during operation with virtually no gas escaping from the system.

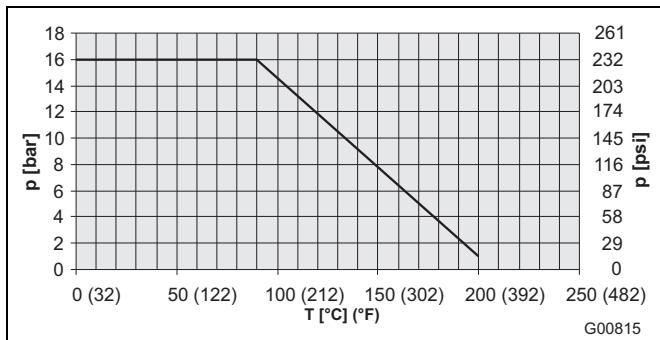


Fig. 9: Maximum pressure/temperature values for the integrated hot tap fitting

It is recommended to use the hot tap fitting for measurements in main conduits (e.g. compressed air systems) or for measuring points which otherwise require rinsing prior to removing the flowmeter sensor. As a rule, hot tap fittings should be preferred for all systems where, otherwise, the entire system or parts of it must be switched off to replace a flowmeter sensor.

Handling:

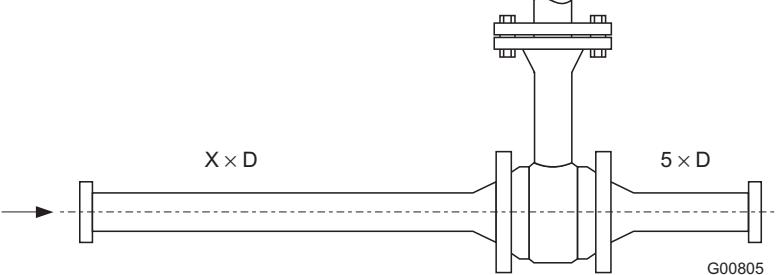
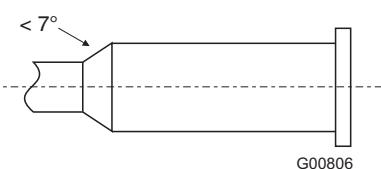
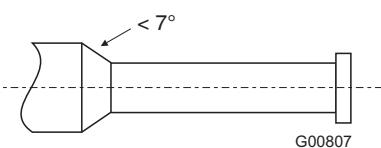
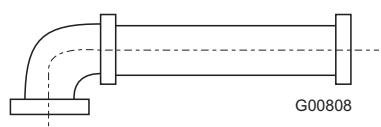
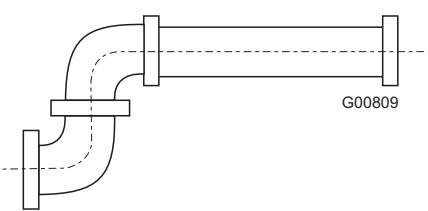
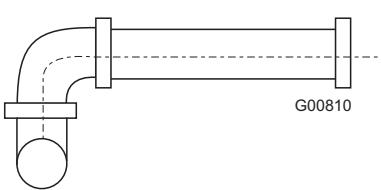
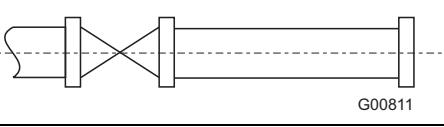
The flowmeter sensor is screwed to the hot tap fitting through the DN 25 flange. Then the cover is put on. The sensor unit is set from the exchange position to the measuring position by turning the spigot nut. The bottom edge of the spigot nut indicates the current sensor unit position (see Detail A, sensor unit is in exchange position). Only when the measuring position 50 – OPEN - MESSEN (lower stop of the spigot nut) is reached, the sensor elements are placed exactly in the center of the pipe and exact measurement is ensured.



IMPORTANT (NOTE)

For integrated hot tap fitting in wafer flange design DN 65, use connection flange PN16 with 4 screw holes on the process side. Wafer flange versions 2 ... 8" only for connection flange ASME B16.5 Cl.150.

8 Recommended steadyng lengths according to DIN EN ISO 5167-1

 <p>$X \times D$</p> <p>$5 \times D$</p> <p>G00805</p>	
 <p>$< 7^\circ$</p> <p>G00806</p>	Expansion $X = 15$
 <p>$< 7^\circ$</p> <p>G00807</p>	Reducer $X = 15$
 <p>G00808</p>	90° elbow $X = 20$
 <p>G00809</p>	Two 90° elbow in one level $X = 25$
 <p>G00810</p>	Two 90°elbow in two levels $X = 40$
 <p>G00811</p>	Valve / slide $X = 50$

To achieve the stated measuring accuracy, the steadyng lengths seen above must be provided. For combinations of inlet run disturbances, e.g. valve and reducer, you must always consider the longer inlet run length. In confined spaces at the mounting location the outlet run length can be shortened to $3 \times D$. The reduction of the minimum inlet run length, however, will impact on the achievable accuracy.

High repeatability of the measuring value is still provided. Under certain circumstances, special calibration can be performed for insufficient steadyng lengths. For this purpose and in individual cases consulting is necessary.

For gases with extremely low density (hydrogen, helium) the steadyng lengths must be doubled.

9 Ordering information

	Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	Main order number	Add. order no.
Sensyflow FMT500-IG Thermal Mass Flowmeter, for gases, intelligent	V14224	X	X	X	X	X	X	X	X	X	X	X		XXX
Version														
Standard, -25 ... 150 °C (-13 ... 302 °F)			1											
High temperature version, -25 ... 300 °C (-13 ... 572 °F)			2											
ATEX version for Zone 2 / 22, -20 ... 150 °C (-4 ... 302 °F)			1)	3										
ATEX version for Zone 1 / 21, -20 ... 150 °C (-4 ... 302 °F)			2)	4										
ATEX version for Zone 0 / 21, -20 ... 80 °C (-4 ... 176 °F)				5										
FM / CSA version Cl. 1 Div 2, -20 ... 150 °C (-4 ... 302 °F) (remote version only)				6										
FM / CSA version Cl. 1 Div 1 / 2, -20 ... 150 °C (-4 ... 302 °F) (compact version only)				7										
GOST Russia, Ex Zone 1 / 21, -20 ... 150 °C (-4 ... 302 °F)					A									
GOST Russia, Ex Zone 0 / 21, -20 ... 80 °C (-4 ... 176 °F)					B									
GOST Kazakhstan, Ex Zone 1 / 21, -20 ... 150 °C (-4 ... 302 °F)					C									
GOST Kazakhstan, Ex Zone 0 / 21, -20 ... 80 °C (-4 ... 176 °F)					D									
GOST Ukraine, Ex Zone 1 / 21, -20 ... 150 °C (-4 ... 302 °F)					E									
GOST Ukraine, Ex Zone 0 / 21, -20 ... 80 °C (-4 ... 176 °F)					F									
GOST Belarus, Ex Zone 1 / 21, -20 ... 150 °C (-4 ... 302 °F)					G									
GOST Belarus, Ex Zone 0 / 21, -20 ... 80 °C (-4 ... 176 °F)					H									
Measured medium														
Gases, gas mixtures and natural gas (with max. 23.5 Vol% O ₂ each)						A								
Oxygen / gas mixtures > 23.5 Vol% O ₂ , oil and grease-free, with O ₂ certificate (max. 150 °C / 302 °F)						B								
Natural gas, with DVGW certificate (max. 80 °C / 176 °F)						C								
Hydrogen, Helium (max. 8 bar / 0.8 MPa / 116 psi, always with process gas calibration)						3)	D							
Ammonia Application							E							
Sensor unit														
Ceramic sensor							1							
Mounting Length / Material														
263 mm (10.4 in.) / AISI 316Ti SST (1.4571) (DN 25 ... DN 350 [1 ... 14 in.])								4)	1					
425 mm (17 in.) / AISI 316Ti SST (1.4571) (> DN 350 ... DN 700 [> 14 ... 28 in.])								4)	2					
775 mm (31 in.) / AISI 316Ti SST (1.4571) (> DN 700 [> 28 in.])								4)	3					
Power supply														
Universal power supply 110 ... 230 V AC / DC								5)	1					
Low voltage power supply 24 V AC / DC								6)	2					
Design														
Compact design with display, controlled via magnetic pen and keypad										1				
Remote design with display, controlled via magnetic pen and keypad (for required cable see accessories)										7)	2			
Communication														
Analog signal 4 ... 20 mA / HART, alarm < 3.5 mA											1			
Analog signal 4 ... 20 mA / HART, alarm > 22 mA											4			
Analog signal 0 ... 20 mA / HART											5			
PROFIBUS DPV1, direct connection of bus cable											2			
PROFIBUS DPV1, with DP M12 connector socket											8)	3		
Cable gland														
M20 x 1.5											1			
1/2 in. NPT											2			
Number of Characteristic Curves														
1 characteristic curve											1			
2 characteristic curves											2			
3 characteristic curves											3			
4 characteristic curves											4			
Certificates: Calibration												0		
Factory certificate												9)	1	
DAkkS certificate, calibration with air (not for process gas calibration)														

Continued on next page

	Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	Main order number	Add. order no.
Sensyflow FMT500-IG Thermal Mass Flowmeter, for gases, intelligent	V14224		X	X	X	X	X	X	X	X	X	X		XXX
Certificates and Material Traceability														
Material certificate 3.1 acc. EN 10204														CBB
Declaration of compliance with the order 2.1 acc. EN 10204														CF3
Certificates: GOST, SIL														
GOST Russia - metrological approval														CG1
GOST Kazakhstan - metrological approval														CG2
SIL1 - Declaration of Conformity														CS1
Signal cable length														
5 m (approx. 15 ft)													10)	SC1
15 m (approx. 45 ft)													10)	SC3
25 m (approx. 75 ft)													10)	SC5
Language of documentation														
German														M1
English														M5
Russian														MB
Language package Western Europe / Scandinavia (languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)														MW
Language package Eastern Europe (languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)														ME

Accessories	Order number
FMT500-IG Special cable between flowmeter sensor and transmitter, cable length 5 m	7962844
FMT500-IG Special cable between flowmeter sensor and transmitter, cable length 15 m	7962845
FMT500-IG Special cable between flowmeter sensor and transmitter, cable length 25 m	7962846
FMT500-IG PROFIBUS DP-T connector plug	7962847
FMT500-IG PROFIBUS DP socket, for customizing the bus cable	7962848
FMT500-IG PROFIBUS DP connector, for customizing the bus cable	7962849
FMT500-IG Documentation CD-ROM	3KXF421002R0800
FMT500-IG Commissioning Instruction, English	3KXF421008R4401
FMT500-IG Commissioning Instruction, German	3KXF421008R4403
FMT500-IG Commissioning Instruction, Language package Eastern Europe	3KXF421008R4494
FMT500-IG Commissioning Instruction, Language package Western Europe / Scandinavia	3KXF421008R4493
FMT500-IG Operating Instruction, Russian	3KXF421008R4222
FMT500-IG SIL-Safety Instructions, English	3KXF421000R4801
FMT500-IG SIL-Safety Instructions, German	3KXF421000R4803

- 1) Manufacturer's declaration
- 2) The max. allowed gas temperature / process temperature depends on the temperature class: T1 / T2 max. 150 °C (302 °F), T3 / T4 max. 100 °C (212 °F)
- 3) With measuring medium H2 or He, lower measuring range limit typical 10% of upper limit, in nominal size DN 25 ... DN 50 (1 ... 2 in.): Please use pipe component design 2 with flow straightener
- 4) Nominal size ranges when using pipe components or weld-on adapters without ball valve
- 5) +/- 10 % (f = 48 ... 62 Hz)
- 6) +/- 20 % (f = 48 ... 62 Hz)
- 7) With ATEX versions: wall housing with operating electronics can be mounted in Ex zone 2
- 8) For non-Ex / compact versions only
- 9) DAkkS- / ILAC-accredited calibration equipment D-K-15081-01-00
- 10) Only for Remote Version

Main order number										Add. order no.
	Version number	1 - 6	7-9	10	11	12	13	14	15	
FMT081 pipe component / weld-on adapter, for Sensyflow FMT500-IG and FMT400-VTS	FMT081	XXX	X	X	X	X	X	X	X	XXX
Mounting Length of the Sensor				263						
263 mm (10.4 in.)				425						
425 mm (17 in.)				775						
775 mm (31 in.)										
Measuring Medium										
Gases, gas mixtures, and natural gas (each max. 23.5 vol% O ₂)										A
Oxygen / gas mixtures > 23.5 Vol% O ₂ , oil and grease-free, with O ₂ certificate (max. 150 °C / 302 °F)										B
Natural gas, with DVGW certificate (max. 80 °C / 176 °F)										C
Hydrogen, Helium										D
										1) D
Design										
Pipe component 1 in wafer flange version										1
Pipe component design 2 as partial measuring section										2
Pipe component design 2 as partial measuring section with integrated flow straigheners										3
Weld-on adapter										2)
Other										9
Nominal Diameter										
Selection for weld-on adapter										Y
DN 25 (1 in.)										3)
DN 40 (1-1/2 in.)										4)
DN 50 (2 in.)										D
DN 65 (2-1/2 in.)										5)
DN 80 (3 in.)										6)
DN 100 (4 in.)										6)
DN 125 (5 in.)										6)
DN 150 (6 in.)										J
DN 200 (8 in.)										6)
Other										7)
Flange Style and Pressure Rating										
Selection for weld-on adapter										0
DIN PN 40, nominal pressure 40 bar (4 MPa / 580 psi)										1
ANSI / ASME CL 150, Schedule 40 S										2
ANSI / ASME CL 300, Schedule 40 S										4)
Other										9
Process Connection for Flowmeter Sensor										
Standard Sensyflow flange with centering pin										8)
With ball valve, max. 150 °C (302 °F) and 16 bar (1.6 MPa / 232 psi)										9)
With integrated hot tap fitting for max. DN 125 (5 in.). Allows gas-tight flowmeter sensor removal / insertion up to 16 bar (1.6 MPa / 232 psi) or 200 °C (392 °F). For DN 65, use connection flanges PN 16 with 4 screw holes (For pipe component DN 50 ... DN 80, apply Sensor Length h = 263 mm, from DN 100 and for weld-on adapter, apply Sensor Length h = 425 mm)										H
With integrated hot tap fitting above DN 125 (5 in.) to max. DN 200 (8 in.) / DN 300 (12 in.) with weld-on adapter. Allows gas-tight flowmeter sensor removal / insertion up to 16 bar (1.6 MPa / 232 psi) or 200 °C (392 °F) (Please apply the correct sensor length)										10)
										11)
Material										
Stainless steel AISI 316Ti (1.4571)										3
Carbon steel S 235 (1.0037)										12)
Plastics PE-HD (Polyethylene high-density)										7)
Blind Flange										
DN 25 blind flange to close flowmeter sensor connection, material stainless steel AISI 316Ti (1.4571)										F3
Certificates and Material Traceability										
Material certificate 3.1 acc. EN 10204										CBB
Declaration of compliance with the order 2.1 acc. EN 10204										CF3

Footnotes see next page

- 1) Max. 8 bar / 0.8 MPa / 116 psi. With DN 25 ... DN 50 (1 ... 2 in.): Please use pipe component 2 with flow straightener.
- 2) From DN 100 (4 in.).
- 3) Not available with pipe component 1 in wafer flange version.
- 4) Not available with hot-tap-fitting.
- 5) Not available with flange style ANSI / ASME.
- 6) Not available with pipe component 2 in combination with flange style ANSI / ASME.
- 7) Please specify exact inner pipe diameter.
- 8) Correct sensor length: For pipe component 1 and 2 without ball valve / hot tap fitting: h = 263 mm. For weld-on adapter and pipe diameter up to 350 mm: h = 263 mm, up to 700 mm: h = 425 mm, > 700 mm: h = 775 mm
- 9) Not available with DVGW certificate. Correct sensor length: For pipe component DN 50 ... DN 100: h = 263 mm, from DN 125: h = 425 mm.
For weld-on adapter up to 150 mm: h = 263 mm, up to 500 mm: h = 425 mm, > 500 mm: h = 775 mm
- 10) Not available with DVGW certificate. Correct sensor length: For pipe component DN 50 ... DN 80: h = 263 mm, for pipe component from DN 100 and weld-on adapter: h = 425 mm.
- 11) Not available with DVGW certificate. Please apply the correct sensor length.
- 12) Only for weld-on adapter without ball-valve. Only without certificates.

9.1 Additional ordering information

FMT500-IG		
Gas component 1	Vol. %	(clear text, for max. 4 characteristics)
Gas component 2	Vol. %	(clear text, for max. 4 characteristics)
Gas component 3	Vol. %	(clear text, for max. 4 characteristics)
Gas component 4	Vol. %	(clear text, for max. 4 characteristics)
Gas component 5	Vol. %	(clear text, for max. 4 characteristics)
Gas component 6	Vol. %	(clear text, for max. 4 characteristics)
Gas component 7	Vol. %	(clear text, for max. 4 characteristics)
Gas component 8	Vol. %	(clear text, for max. 4 characteristics)
Gas component 9	Vol. %	(clear text, for max. 4 characteristics)
Gas component 10	Vol. %	(clear text, for max. 4 characteristics)
		Summe 100 %
Operating temperature		(clear text, for max. 4 characteristics)
Operating pressure		(clear text, for max. 4 characteristics)
Nominal size, Pipe inner diameter		(clear text, for max. 4 characteristics)
Measuring range		(clear text, for max. 4 characteristics)
Unit ¹⁾		(clear text, for max. 4 characteristics)
Standard conditions (e. g. 0 °C, 1013 mbar)		(clear text, for max. 4 characteristics)
Display and menu language (delivered state)		German, English, French, Portuguese
Material of the connected pipes		

- 1) Available flow rate units:

t/d	t/h	t/min	t/s
kg/d	kg/h	kg/min	kg/s
	g/h	g/min	g/s
lb/d	lb/h	lb/min	lb/s
Nm ³ /d	Nm ³ /h	Nm ³ /min	Nm ³ /s
NL/d	Nl/h	Nl/min	Nl/s
SCFD	SCFH	SCFN	SCFS

10 Questionnaire



Questionnaire
Thermal Mass Flowmeter
Sensyflow FMT

Customer address: _____

Company: _____

Zip code and location: _____

Date: _____

Cust. no.: _____

Telephone: _____

Contact person: _____

E-mail: _____

Media data for gaseous, pure media:

Description of media

Mixed gas, gas composition in vol.%¹⁾

Type of gas (no mixtures): _____

Component 1/name/vol.%: _____

Operating pressure (bar abs.)

Component 2/name/vol.%: _____

Min./norm./max., approx. _____

Component 3/name/vol.%: _____

Operating temperature (°C)

Component 4/name/vol.%: _____

Min./norm./max., approx. _____

Component 5/name/vol.%: _____

Flowrate²⁾

Min.: _____ Norm.: _____ Max.: _____

Pipeline/pipe component³⁾

Flow unit:

Standard volume

Mass flow units

DN/PN: _____

Nm³/h

kg/h

ANSI/lbs _____

Nm³/min

kg/min

Diameter [mm] _____

Nl/min

g/min

Inside diameter specified in mm

SCFM

t/h

Wafer flange form 1

Other _____

Other _____

Partial meas. section form 2

Weld-on adapter

Other

²⁾Standard condition, e.g., 0°C/1,013 mbar or _____

Required device designs:

FMT500-IG

FMT700-P⁴⁾

Integral mount design

FMT400-VTS

FMT200-ECO2

Remote design with

FMT400-VTCS

FMT200-D

Cable length 5 m

Output signal:

0/4...20 mA

None

Cable length 15 m

4...20 mA/HART

ATEX Zone 1/21

Cable length 25 m

PROFIBUS DP-V1

ATEX Zone 0/21

Zone 2/22 24 V

GOST 110 V

FM/CSA 230 V

Comments:

1) Please specify the composition of mixed gases
(e.g., North Sea natural gas: 1) CH₄ 90%, 2) C₂H₆ 5%, 3) N₂ 3%, 4) C₃H₈, 1%, 5) CO₂ 1%).

2) Calibration is performed at the max. possible flow in the nominal size specified.

3) Please observe/determine the minimum inflow and outflow sections.

4) Output signal: 0...10 V as standard

Note: An order can only be confirmed and a delivery date specified once full technical clearance has been obtained.

Notes

Notes

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3KXF421001R1001



Sales



Service



Software

VA Master FAM540

Metal Cone Variable Area Flowmeter

Measurement made easy



For measuring liquids, gases and steam

Graphical 2-line LCD display

Magnet stick operation

- Configuration also possible with closed housing

Easily adjustable for new operating conditions

Approvals for explosion protection

- ATEX
- IECEx
- FM, CSA

VA Master FAM540

Metal Cone Variable Area Flowmeter

Overview

Model	FAM541	FAM544	FAM545	FAM546
	Standard design  G10448	Hygienic design  G10449	With PTFE liner  G10450	With heating jacket  G10451
Measured error in accordance with VDE / VDI 3513	1.6 % qg = 50 %	1.6 % qg = 50 %	2.5 % qg = 50 %	1.6 % qg = 50 %
Reproducibility	0.25 % of measured value	0.25 % of measured value	0.25 % of measured value	0.25 % of measured value
Process connection	Flange in accordance with DIN, ASME, JIS, female thread	Thread DIN 11851, SMS 1145	Flange in accordance with DIN, ASME, JIS	Flange in accordance with DIN, ASME, JIS
Nominal connection diameters	DN 15 (1/2") ... DN 100 (4")	DN 25 (1") ... DN 100 (4")	DN 25 (1") ... DN 100 (4")	DN 25 (1") ... DN 100 (4")
Maximum measuring medium temperature	400 °C (752 °F)	140 °C (284 °F)	120 °C (248 °F)	400 °C (752 °F)
Maximum pressure rating	PN 400 / class 2500	PN 40	PN 40 / class 300	PN 100 / class 600
Wetted material	Stainless steel 1.4404 (316L), 1.4571 (316Ti)	Stainless steel 1.4404 (316L), 1.4571 (316Ti)	PTFE	Stainless steel 1.4404 (316L), 1.4571 (316Ti)
Housing material	Stainless steel 1.4404 (316L), 1.4571 (316Ti)	Stainless steel 1.4404 (316L)	Stainless steel 1.4571 (316Ti)	Stainless steel 1.4404 (316L), 1.4571 (316Ti)
Gasket material	Viton A (DN 15 only)	Viton A (DN 25 only)	PTFE	Viton A (DN 25 only)

Indicator / transmitter	
IP degree of protection in accordance with EN 60529	IP 66, IP 67, NEMA 4X
Mechanical indicator	Analog indicator with or without alarm signaling unit
Electronic indicator	Analog indicator with transmitter 4 ... 20 mA, with or without LCD indicator
Communication	HART protocol (only for analog indicators with transmitters)
Power supply	Without alarm signaling unit: no power supply Analog indicator with alarm signaling unit: 8 V DC via switch amplifier Analog indicator with transmitter: 10 ... 46 V DC (Ex: 10 ... 30 V DC)
Indicator housing material	Al Si 12 material number 3.2582 (copper content 0.1 %), stainless steel 1.4408
Paint	Epoxy paint 80 ... 100 µm; Bottom color: RAL 7012, cover color: RAL 9002 (No housing paint for stainless steel indicator housing)

Approvals	
Ex-approvals	ATEX / IECEx: Zone 0 / 1 / 2 / 21 FM / cCSAus: XP, IS, DIP, NI, FM Zone 1 + 2
Sealing concept	Dual sealing in accordance with ANSI / ISA-12.27.01
SIL approval (not for FAM545)	Analog indicator with alarm signaling unit: SIL 2 Analog indicator with transmitter: FMEDA evaluation

Introduction and basics

Installation conditions

- The installation recommendations of VDI / VDE Directive 3513 must be observed.
- The flowmeter is installed vertically in the piping. The measuring media must flow from bottom to top.
- Keep the device as far as possible from pipe vibrations and powerful magnetic fields.
- The piping should be the same size as the connection size of the flowmeter.
- Inlet and outlet sections are generally not required. Care should be taken to avoid flow turbulence, pulsations, pressure shocks and other flow instabilities in order to prevent measuring inaccuracies, increased wear or damage.
- When selecting devices, pay close attention to the chemical resistance of the wetted parts of the device and the process connection gaskets in relation to the measuring medium.
- Avoid pulsating flow of the measuring medium. Use the optional float damping if necessary.
- For gaseous measuring media we recommend an undisturbed inlet length of five times the inside diameter of the piping in accordance with VDI / VDE Directive 3513 sheet 3. Additional measures such as flow straighteners or perforated plates may be necessary for highly unbalanced flow profiles.
- Avoid contamination of gaseous measuring media (refer to BGR 132-7.3.2.2.2).
- For liquid measuring media, the nominal size of the piping should be dimensioned as large as possible (if economically viable).
- Avoid gas inclusions in liquid measuring media.
- Use slow opening valves.
- If the flowmeter is installed in a pipeline where decommissioning is impossible or inexpedient, a bypass line should be provided.
- Shut-off and throttle valves should preferably be attached to the outlet of the flowmeter.

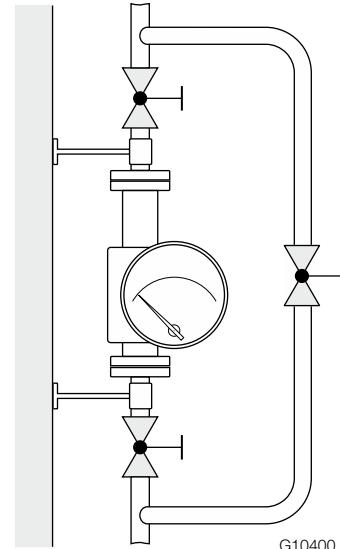


Fig. 1: Installation of the flowmeter (example)

Refer to VDI/VDE Directive 3513 sheet 3, Selection and Installation Recommendations for Variable Area Flowmeters.

Sensor insulation

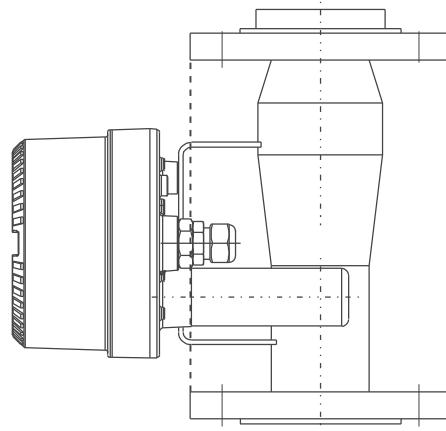


Fig. 2: Insulation of the flowmeter

As shown in Fig. 2, the flowmeter may only be insulated up to the flange diameter.

VA Master FAM540

Metal Cone Variable Area Flowmeter

Operating conditions

A variable area flowmeter is specified for a defined set of operating conditions of the measuring medium. For liquids and gases, these are pressure and temperature-related properties (density and viscosity) under operating conditions. For gases, in particular, this means operating at a specific operating pressure and operating temperature. The specified accuracy of the device always refers to the operating conditions underlying the specification.

Temperature data

The following diagram shows the maximum permissible measuring medium temperature depending on the ambient temperature.

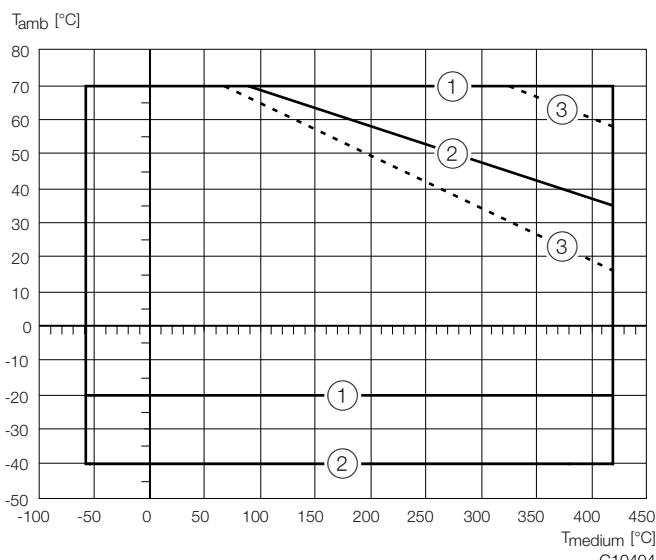


Fig. 3: Medium temperature (T_{medium}), ambient temperature (T_{amb})

(1) Devices with alarm output -20 ... 70 °C (-4 ... 158 °F)
(2) Devices with current output -40 ... 70 °C (-40 ... 158 °F)
(3) With insulation

NOTE

When using in potentially explosive atmospheres, observe the temperature information in the ATEX / IECEx limit values starting from „Safety specifications ATEX / IECEx“ on page 34 and the FM / cCSAus limit values tables starting from „Safety specifications FM, cCSAus“ on page 43!

Pressure loss

The available operating pressure at the measuring point must be higher than the pressure loss listed for the flowmeter in the specifications.

It is important to also consider the pressure loss downstream from the flowmeter due to losses in the piping and other fittings.

Prevention of compression oscillations when measuring gases

With low flow amounts and low operating pressure, so-called compression oscillations of the float can occur.

If the maximum upstream pressure listed in the specifications is not reached, the flowmeter can optionally be equipped with a gas damper.

To prevent self-generated compression oscillations, note the following information from VDI / VDE 3513 Sheet 3:

- Select a flowmeter with the lowest possible pressure loss.
- Minimize the piping length between the flowmeter and the closest up or downstream throttling location.
- Restrict the usual measuring range from the usual 10 ... 100 % to 25 ... 100 %.
- When setting the flow rate value, always start assuming larger values.
- Increase the operating pressure and consider its effect on the flow rate values due to the change in gas density at the new operating conditions.
- Minimize non-throttled, free volumes upstream and downstream of the device.

Pressure shocks

Especially when measuring gases, it is possible that pressure or shock waves can occur when fast opening solenoid valves are employed and the piping cross-sections are not throttled, or if there are gas bubbles in liquids.

As a result of the sudden expansion of the gas in the piping, the float is forcibly driven against the upper floatstop.

Under certain conditions, this can lead to destruction of the device.

Gas damping is not suited to compensating for pressure shocks!

Solids content in the measuring medium

Variable area flowmeters have only limited suitability for measuring media containing solids.

Depending on the concentration, particle size and type of solid, increased mechanical abrasion may occur, especially at the critical measuring edge of the float.

In addition, solidified deposits on the float can change its weight and shape.

These effects can lead to erroneous measurement results, depending on the float type.

In general, the use of appropriate filters is recommended in such applications.

For the flow measurement of measuring media containing magnetic particles, we recommend the installation of a magnetic separator upstream of the variable area flowmeter.

Float designs

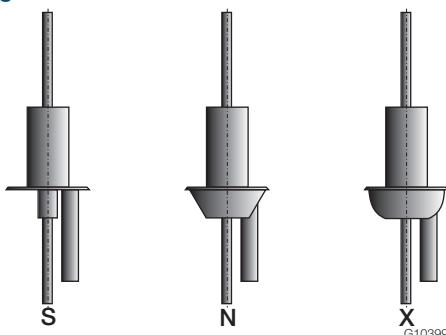


Fig. 4: Float designs

Float "S":

Basic shape of float.

Low flow rates, minimal pressure losses, essentially independent of viscosity; lower upstream pressure required for gas measurement.

Float "N":

Higher flow ranges, average pressure losses, well suited to liquids with minimum viscosity; higher minimum upstream pressure requirements for gas measurements.

Float "X":

Highest flow rates, maximum pressure losses, well suited to liquids with minimum viscosity; higher minimum upstream pressure requirements for gas measurements.

Measuring range limits

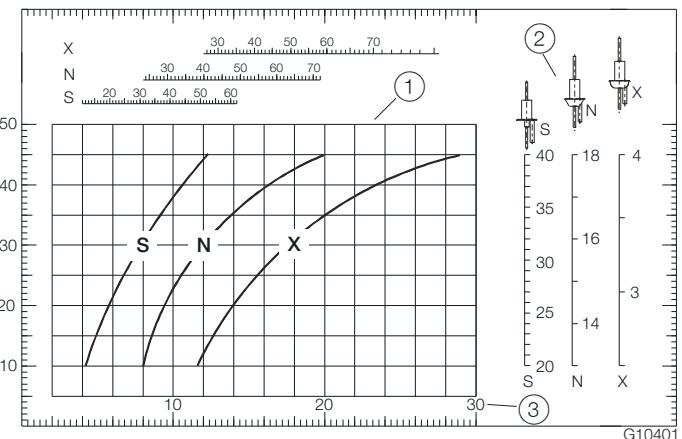


Fig. 5: Flow rate depending on float shape and weight (example)

- (1) Pressure loss (dP in mbar)
- (2) Diameter of the float weight (mm)
- (3) $\times 1000 \text{ l/h}$ water

For measuring range limits depending on nominal size and float type, refer to the measuring range tables.

Calculating the viscosity influence number (VIN)

The floats are designed geometrically so as to be independent of viscosity within broad limits. This means that the measuring medium viscosity can vary within these limits without resulting in a change of scale.

The viscosity influence number (VIN) is given in the device measuring range tables.

- If the calculated VIN is greater than the listed VIN, viscosity has no influence on the measurements.
- If the calculated VIN is greater than the listed viscosity, the flowmeters are equipped from the factory with a scale adjusted to the viscosity.

$$VUZ = \eta \cdot \sqrt{\frac{(\rho_{s-1}) \cdot 1}{(\rho_{s1} - \rho_1) \cdot \rho_1}}$$

Legend

η	Dynamic viscosity of the measuring medium [mPa s]
ρ_s	Density of the float in accordance with the selection in the measuring range table ($r = 8.02 \text{ g/cm}^3$)
ρ_{s1}	Density of the float being used
ρ_1	Density of the measuring medium

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Indicator and transmitter

A magnet in the float translates the height of the float as a measurement for the flow to the decouple-proof magnet follower system of the flowmeter, which is directly connected to the indicator pin.

For analog indicators, the flow value is shown by the indicator on the scale. For indicators with a two-wire transmitter, the indicator position is additionally measured directly at the axis. A standard eddy-current brake is used to dampen indicator vibrations and ensure outstanding readability.

The indicator/transmitter unit is attached to the flowmeter with 2 screws in a reproducible manner. To facilitate installation, the indicator can be removed. A name plate on the flowmeter bracket allows you to assign a unique identifier at a later date.

Analog indicator with or without alarm signaling unit

The analog indicators are available with or without an alarm signaling unit. The alarm signaling units are housed on an alarm module that can also be retrofitted. It is available as a single (min. or max. alarm) or dual (min. or max. alarm) alarm module.

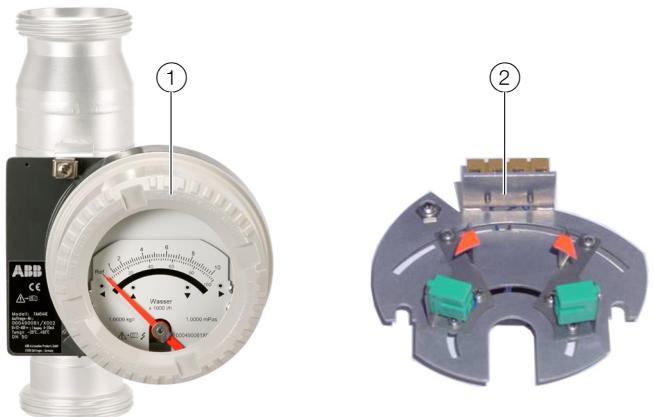


Fig. 6: Analog indicator

① Analog indicator ② Alarm module (option)

Product highlights

- Decouple-proof and hysteresis-free magnet follower system.
- The device conforms to NAMUR Recommendations NE43, NE53, NE107.
- Installing and uninstalling the analog indicator on the meter tube is possible without opening the indicator housing.
- Reading repeatability: $\pm 0.25\%$ of scale end value.
- The alarm signaling unit can be retrofitted as an alarm module.
- The switching points of the alarm signaling units are adjustable without removing the scale.
- The set switching points of the alarm signaling units are visible from the exterior.

Alarm signaling unit

Additional switching amplifiers are needed to operate the alarm signaling units.

See chapter „Ordering Information“ on page 50 for further information.

Alarm signaling unit specifications

Operating mode	bistable
Reproducibility	$\pm 0.5\%$ of scale end value
Nominal voltage	8 V DC (R _i approx. 1 k Ω)
Operating voltage	5 ... 25 V DC
Switching frequency, max.	3 kHz

Switching amplifier

For analog indicators with alarm signaling units
(model FAM54xB/C/Dx)

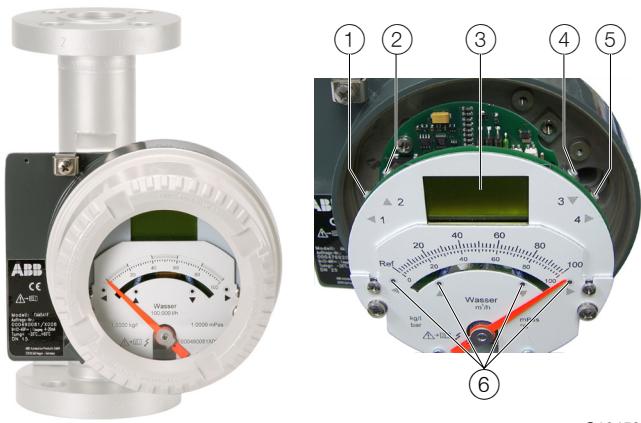
Specifications

Power supply	230 V AC, +10 % / -15 %, 45 ... 60 Hz 115 V AC, +10 % / -15 %, 45 ... 60 Hz 24 V DC, +10 % / -15 %
Output	1 or 2 switching relays with potential-free changeover contacts
Switching capacity	Maximum 250 V, maximum 4 A, maximum 500 VA
Maximum permissible cable length	Between switch amplifier and alarm signaling unit: 300 m (984 ft)
Permissible ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Electrical connection	Screw terminals, maximum 2.5 mm ² (14 AWG)
Type of assembly	35 mm top-hat rail in accordance with EN 60715:2001
IP rating	IP20 in accordance with EN 60529
Weight	Approx. 150 g (0.3 lb)

Analog indicator with transmitter

The electronic transmitter uses two-wire technology. An optional LCD indicator offers the possibility of adjusting on-site to changed measuring medium parameters.

For models with an LCD indicator, ABB recommends that you use a bar graph scale to avoid differences between a product scale and the flow rate shown on the LCD indicator.



G10453
Fig. 7: LCD indicator with operating buttons and magnet stick markings

- (1) ◀ button
- (2) ▲ button
- (3) LCD indicator
- (4) ▼ button
- (5) ▶ button
- (6) Dots for magnet stick operation

Product highlights

- 4 ... 20 mA current output.
- Current output for an alarm can be configured to 21 ... 23 mA (NAMUR NE43).
- Programmable binary output (min. / max. device alarm, general alarm or pulse output).
- Parameterization using HART communication via handheld terminal or DSV401 (SMART VISION).
- Damping: 1 ... 100 s configurable (5τ).
- Low flow cut-off: 0 ... 5 % for current and pulse output.
- Measuring medium parameters can be changed at any time (pressure and temperature influence, density, units, etc.).
- Simulation of current and binary output (manual process execution).
- EEPROM storage of counter readings and parameters specific to the measuring point (over 10 years).
- LCD indicator can be retrofitted.

LCD indicators

- High-contrast LCD indicator.
- Flow rate and flow totalizer value display.
- Plain text fault diagnostics
- Menu-guided parameterization with four buttons.
- Parameterization of the device using a magnet stick without opening the housing.

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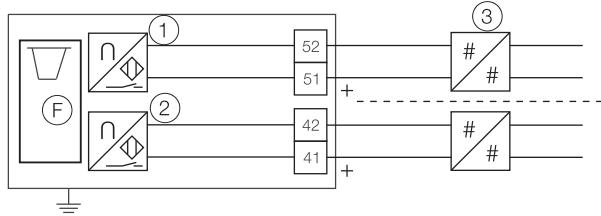
Electrical connections

NOTE

When using in potentially explosive atmospheres, observe the electrical data in the ATEX / IECEx limit value tables starting from „Safety specifications ATEX / IECEx“ on page 34 and the FM / cCSAus limit value tables starting from „Safety specifications FM, cCSAus“ on page 43!

Analog indicator with alarm signaling unit

Model FAM54xB/C/Dx



G10431

Fig. 8: Alarm signaling unit

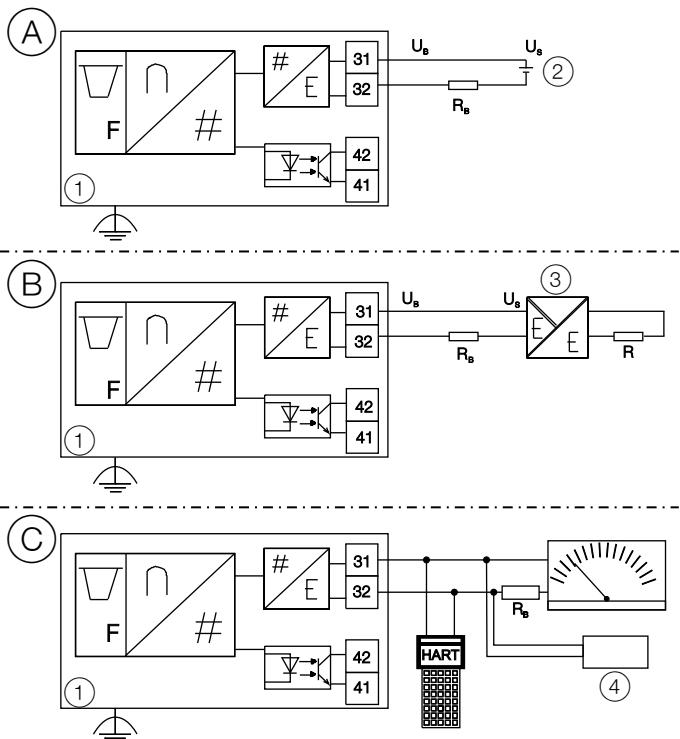
- (1) Maximum alarm signaling unit
- (2) Minimum alarm signaling unit
- (3) Switch amplifier
- (F) Flowmeter

Alarm signaling unit specifications

Operating mode	bistable
Reproducibility	$\pm 0.5\%$ of scale end value
Nominal voltage	8 V DC (R _i approx. 1 kΩ)
Operating voltage	5 ... 25 V DC
Switching frequency, max.	3 kHz

Analog indicator with transmitter

Model FAM54xE/Fx



G10418

Fig. 9: Analog indicator with transmitter

- (A) Central power supply
- (B) Power supply via power supply unit
- (C) HART output
- (1) Flowmeter
- (2) Power supply
- (3) Power supply unit
- (4) HART modem

Legend

U _B	Operating voltage
U _S	Input terminal voltage
R _B	Maximum permissible load for power supply unit (e.g. indicator)
R	Maximum permissible load for output circuit; is determined by power supply unit
	Functional earth

Cables

Maximum cable length 1500 m, AWG 24 twisted and shielded.

Power supply / current output

Terminals 31 / 32 serve both as a connection for the power supply and as a 4 ... 20 mA current output for the transmitter. The current output is also used for HART communication.

Power supply

Terminals	31 / 32
Voltage	Standard: 10 ... 46 V DC
	Explosion-proof design: 10 ... 30 V DC.
Residual ripple	Maximum 5 % or $\pm 1.5 V_{ss}$
Power consumption	< 1 W

Current output

Terminals	31 / 32
Output	4 ... 20 mA, can be configured to 21 ... 23 mA for an alarm (in accordance with NAMUR NE43)
Load	Minimum > 250 Ω , maximum 1500 Ω (for I at alarm = 23.0 mA)
Temperature effect	$\leq 8 \mu A/K$
Power consumption	< 1 W

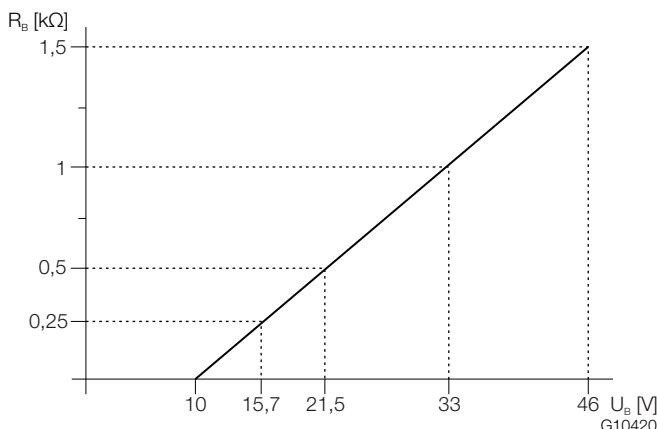


Fig. 10: Load diagram of the current output

HART output

Model FAM54xE/Fx

Specifications

Terminals	31 / 32
Configuration	<ul style="list-style-type: none"> — Directly on the device — Using DAT200 Asset Vision Basic software and HART-DTM
Transmission	FSK modulation on current output 4 ... 20 mA in accordance with Bell 202 standard
Baud rate	1200 baud
Display	Logic 1: 1200 Hz Logic 0: 2200 Hz
Maximum signal amplitude	1.2 mA _{ss}
Load (R_B) at current output	250 ... 1500 Ω

See the separate interface description for detailed information.

System integration

In conjunction with the DTM (Device Type Manager) available for the device, the corresponding framework applications in accordance with FDT 0.98 or 1.2 (DAT200 Asset Vision Basic) can be used for communication (configuration, parameterization). Other tool/system integrations (e.g., Emerson AMS/Siemens PCS7) are available on request. The necessary DTMs and additional files can also be downloaded from www.abb.com/flow.

Programmable binary output

Terminals 41 / 42 are used as a primary programmable binary output. The pulse output, general alarm, min./max. alarm and general alarm functions, as well as "no function" can be configured using the software.

Binary output

Terminals	41 / 42
Output	<ul style="list-style-type: none"> — NAMUR contact (DIN 19234) or — Standard optoelectronic coupler ($U_H = 16 \dots 30 V$ DC)
Switching behavior	Configurable as normally closed or normally open contacts
Internal resistance	With contact open > 10 k Ω
Switching current	Maximum 15 mA
Output voltage	Minimum U_s 2 V DC

Pulse output

Terminals	41 / 42
Pulse width	5 ... 256 ms, maximum 50 % of the period
Frequency f_{max}	Maximum 50 Hz

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Model FAM541 - Standard design



G10448

Fig. 11: Model FAM541

Scale

Design optionally with percentage scale or product scale.

Gas damping

Option, for preventing compression oscillations in case of gas measurements with low operating pressure.

SIL approval

- SIL2 declaration of conformity for devices with alarm function.
- Manufacturer's declaration (SIL1) in accordance with IEC 61508 / IEC61511 for devices with a current output of 4 ... 20 mA.

Measuring accuracy

1.6 % qg = 50 % in accordance with VDE / VDI 3513, sheet 2, optional 1 % of upper range value.

Measuring range limits and span limits

Measuring span: 10:1

For detailed information about measuring ranges, see chapter „Measuring range table“ on page 12.

Temperature limits °C (°F)

Medium temperature range

- -55 ... 400 °C (-67 ... 752 °F)

Ambient temperature range

- -40 ... 85 °C (-40 ... 185 °F)

NOTE

- When using in potentially explosive atmospheres, observe the temperature information in the ATEX / IECEx limit values starting from 34 and the FM / cCSAus limit values tables starting from „Safety specifications FM, cCSAus“ on page 43!
- Also observe the information in chapter „Temperature data“ on page 4!

Process connections

- Flange in accordance with EN 1092-1 (PN 16, PN 40)
- Flange in accordance with DIN 2501 (PN 63, PN 100)
- Flange with groove in accordance with DIN 2501
- Flange in accordance with ASME B16.5
- G 1" female thread (1/2" meter tube)
- G 1 1/2 "female thread (1" meter tube)

Pressure ratings

- Standard pressure rating: PN 40 (PN 16 for DN 100 [4"'])
- Flange in accordance with DIN / EN: PN 16, PN 40, PN 63, PN 100
- Flange in accordance with ASME: CL 150, CL 300, CL 600

Other designs and pressure ratings are available upon request.

See chapter „Material load“ on page 11.

Maximum permissible operating pressure

64 bar, 100 bar, 160 bar, 250 bar
(CL 600 /CL 900 /CL 1500 / CL 2500)

Materials

Materials for the indicator housing

Component	Material
Indicator housing	Standard: aluminum, powder-coated Option: stainless steel 1.4408
Powder coating	Epoxy paint 80 ... 100 µm Bottom color: RAL 7012 Cover color: RAL 9002
Housing gasket (O-ring)	Buna N®
Sight glass	Shatterproof glass

Materials for wetted parts

Component	Material
Meter tube	Stainless steel 1.4404 (316 L)
Conical meter pipe	Stainless steel 1.4571 (316 Ti), only DN 15 (1/2")
Flange	Stainless steel 1.4404 (316 L)
Variable area	Standard: stainless steel 1.4571 (316 Ti), Option: stainless steel 1.4571 (316 Ti)
Gas damping (option)	Stainless steel 1.4571 (316 Ti)

Material load

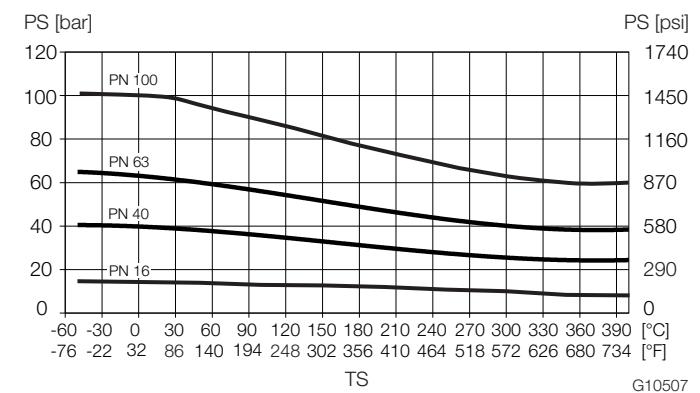


Fig. 12: DIN flange made from stainless steel

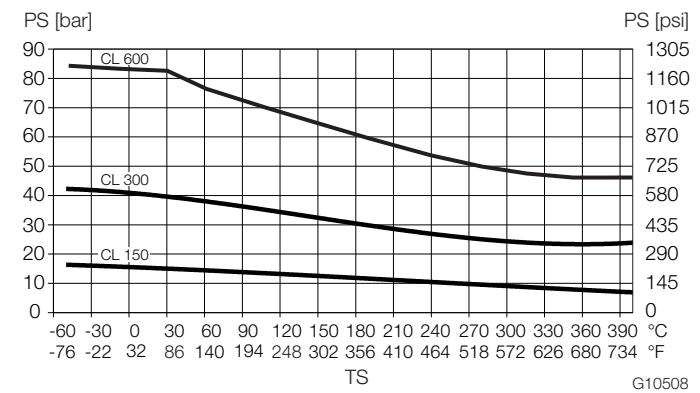


Fig. 13: ASME flange made from stainless steel

VA Master FAM540

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Measuring range table

NOTE

The "FlowCalc" program, which is available as a free download from www.abb.com/flow, can be used to calculate flow rates, pressure losses, and upstream pressure requirements.

The data listed applies to water at 20 °C (68 °F), 1 kg/dm³ (62.43 lb/ft³), 1 mPas (1 cP) and to air at 0 °C (70 °F), 1013 mbar (14.7 psia).

DN ¹⁾	Upper range value ²⁾ for		Meter tube / nominal flow rate H ₂ O [l/h] / Order code ³⁾	VIN ⁴⁾	Pressure loss ⁵⁾ [mbar (psi)]	Minimum upstream pressure for gas measurement ⁶⁾	
	Water [l/h (USgal/h)]	Air [m ³ /h (scfh)]				Without gas damping [bar abs (psia)]	With gas damping ⁷⁾ [bar abs (psia)]
DN 15 (1/2")	28 ... 32 (7.4 ... 8.5)	0.83 ... 0.95 (37 ... 45)	1/2" / 30 / A7 ⁸⁾	6	80 (1.16)	4.0 (58.02)	1.0 (14.5)
DN 25 (1")	37 ... 43 (10 ... 11.4)	1.10 ... 1.28 (52 ... 59)	1/2" / 40 / B7 ⁸⁾	6	80 (1.16)	4.0 (58.02)	1.0 (14.5)
G1"	44 ... 55 (11.6 ... 14.5)	1.30 ... 1.63 (54 ... 66)	1/2" / 50 / C7 ⁸⁾	6	80 (1.16)	4.0 (58.02)	1.0 (14.5)
	56 ... 64 (14.5 ... 17)	1.66 ... 1.90 (68 ... 80)	1/2" / 60 / D7 ⁸⁾	6	80 (1.16)	4.0 (58.02)	1.0 (14.5)
	77 ... 83 (20.5 ... 21.5)	2.29 ... 2.47 (84 ... 90)	1/2" / 80 / E7	16	40 (0.58)	3.0 (43.51)	1.0 (14.5)
	96 ... 104 (25.5 ... 27)	2.85 ... 3.09 (104 ... 112)	1/2" / 100 / F7	16	45 (0.65)	3.2 (46.41)	1.0 (14.5)
	115 ... 125 (30 ... 33)	3.42 ... 3.72 (125 ... 135)	1/2" / 120 / G7	16	50 (0.73)	3.5 (50.76)	1.0 (14.5)
	144 ... 156 (38 ... 41)	4.28 ... 4.64 (155 ... 165)	1/2" / 150 / H7	16	60 (0.87)	3.8 (55.11)	1.0 (14.5)
	188 ... 212 (50 ... 56)	5.59 ... 6.30 (205 ... 230)	1/2" / 200 / J7	16	60 (0.87)	4.0 (58.02)	1.0 (14.5)
	235 ... 265 (62 ... 70)	6.98 ... 7.88 (255 ... 285)	1/2" / 250 / K7	16	65 (0.94)	4.2 (60.92)	1.0 (14.5)
	282 ... 318 (74 ... 84)	8.38 ... 9.45 (310 ... 340)	1/2" / 300 / L7	16	70 (1.02)	4.4 (63.82)	1.0 (14.5)
	376 ... 424 (100 ... 112)	11.17 ... 12.60 (410 ... 460)	1/2" / 400 / M7	16	75 (1.09)	4.6 (66.72)	1.0 (14.5)
	470 ... 530 (125 ... 140)	13.97 ... 15.75 (510 ... 570)	1/2" / 500 / N7	16	75 (1.09)	4.8 (69.62)	1.0 (14.5)
	565 ... 635 (150 ... 165)	16.79 ... 18.87 (620 ... 680)	1/2" / 600 / P7	16	80 (1.16)	5.0 (72.52)	1.0 (14.5)
	750 ... 850 (200 ... 220)	22.29 ... 25.26 (820 ... 920)	1/2" / 800 / R7	16	85 (1.23)	5.4 (78.32)	1.0 (14.5)

DN ¹⁾	Upper range value ²⁾ for		Meter tube / nominal flow rate H ₂ O [l/h] / Order code ³⁾	VIN ⁴⁾	Pressure loss ⁵⁾ [mbar (psi)]	Minimum upstream pressure for gas measurement ⁶⁾	
	Water [l/h (USgal/h)]	Air [m ³ /h (scfh)]				Without gas damping [bar abs (psia)]	With gas damping ⁷⁾ [bar abs (psia)]
DN 25 (1") G1 1/2"	280 ... 656 (74 ... 170)	8.32 ... 19.50 (310 ... 700)	1" / 400 / A1	13 ... 21	20 ... 76 (0.3 ... 1.1)	2.9 ... 3.1 (42.1 ... 45.0)	1.1 ... 1.4 (16.0 ... 20.3)
	393 ... 870 (104 ... 220)	11.70 ... 25.85 (430 ... 940)	1" / 600 / B1	7 ... 10	27 ... 76 (0.4 ... 1.1)	3.0 ... 3.4 (43.5 ... 49.3)	1.2 ... 1.4 (17.4 ... 20.3)
	660 ... 1600 (170 ... 450)	19.38 ... 50.80 (720 ... 1850)	1" / 1000 / C1	16 ... 22	20 ... 76 (0.3 ... 1.1)	3.3 ... 4.3 (48.0 ... 62.4)	1.1 ... 1.4 (16.0 ... 20.3)
	975 ... 2370 (260 ... 620)	28.98 ... 70.44 (1060 ... 2550)	1" / 1600 / D1	8 ... 10	27 ... 82 (0.4 ... 1.2)	3.3 ... 5.3 (48.0 ... 77.0)	1.2 ... 1.5 (17.4 ... 21.8)
	1650 ... 4020 (440 ... 1060)	49.04 ... 119.50 (1800 ... 4300)	1" / 2500 / E1	17 ... 6	20 ... 76 (0.3 ... 1.1)	4.2 ... 6.4 (61.0 ... 92.8)	1.1 ... 1.4 (16.0 ... 20.3)
	2585 ... 6170 (680 ... 1600)	76.83 ... 183.50 (2800 ... 6600)	1" / 4000 / F1	8 ... 10	27 ... 82 (0.4 ... 1.2)	5.2 ... 8.0 (75.4 ... 116)	1.2 ... 1.5 (17.4 ... 21.8)
DN 40 (1 1/2")	4220 ... 12130 (1120 ... 3200)	125.40 ... 360.50 (4600 ... 13000)	2" / 8000 / A2	21 ... 38	11 ... 62 (0.2 ... 0.9)	3.1 ... 4.5 (45.0 ... 65.3)	1.1 ... 1.4 (16.0 ... 20.3)
DN 50 (2")	7940 ... 18460 (2100 ... 4800)	236.0 ... 584.6 (8600 ... 20000)	2" / 12000 / B2	13 ... 17	24 ... 74 (0.3 ... 1.1)	3.8 ... 6.2 (55.1 ... 90.0)	1.1 ... 1.4 (16.0 ... 20.3)
	11760 ... 24200 (3100 ... 6400)	349.50 ... 720.00 (13000 ... 27000)	2" / 18000 / C2	3 ... 4	28 ... 72 (0.4 ... 1.0)	4.4 ... 7.5 (63.8 ... 109)	1.1 ... 1.4 (16.0 ... 20.3)
DN 80 (3")	7000 ... 21010 (1850 ... 5500)	208.00 ... 624.40 (7600 ... 22000)	3" / 12000 / A3	22 ... 54	6 ... 48 (0.1 ... 0.7)	3.4 ... 5.4 (49.3 ... 78.3)	1.1 ... 1.3 (16.0 ... 18.9)
	18090 ... 35010 (4800 ... 9200)	537.70 ... 1040 (19500 ... 38000)	3" / 25000 / B3	18 ... 25	24 ... 65 (0.3 ... 1.0)	4.8 ... 7.4 (69.6 ... 107)	1.1 ... 1.4 (16.0 ... 20.3)
	29750 ... 53810 (7000 ... 14000)	795 ... 1600 (29000 ... 58000)	3" / 40000 / C3	4 ... 5	26 ... 68 (0.4 ... 1.0)	6.0 ... 9.2 (87.0 ... 133)	1.1 ... 1.4 (16.0 ... 20.3)
DN 100 (4")	25000 ... 50000 (5400 ... 13500)	—	4" / 40000 / A4	60 ... 81	28 ... 74 (0.4 ... 1.2)	—	—
	50000 ... 120000 (12500 ... 32000)	—	4" / 80000 / B4	24	42 ... 95 (0.6 ... 1.4)	—	—

1) Connection nominal size

2) The upper range value can be selected anywhere within these limits. The measuring span is 10:1.

Example: upper range value 12 m³/h (USgal/h) water, measuring span of device 1.2 to 12 m³/h (USgal/h) water.

3) Order code for meter tube / float combination (versions 18, 19), see chapter „Main ordering information FAM541“ on page 50.

4) Viscosity influence number (VIN), see chapter „Calculating the viscosity influence number (VIN)“ on page 5.

5) The listed pressure loss values are based on the listed upper range value.

6) The minimum required pressure (abs) to prevent compression oscillations (float bounce) in the meter tube. The specifications for the minimum required pressures with and without damping are based on average installation conditions. Some installations may have higher values (high free volume upstream / downstream of the device).

7) Cylinder / piston damping. For nominal diameters DN 15 ... DN 80 (1/2 ... 3").

8) These meter tube / float combinations always require gas piston damping for gas measurements.

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Dimensions

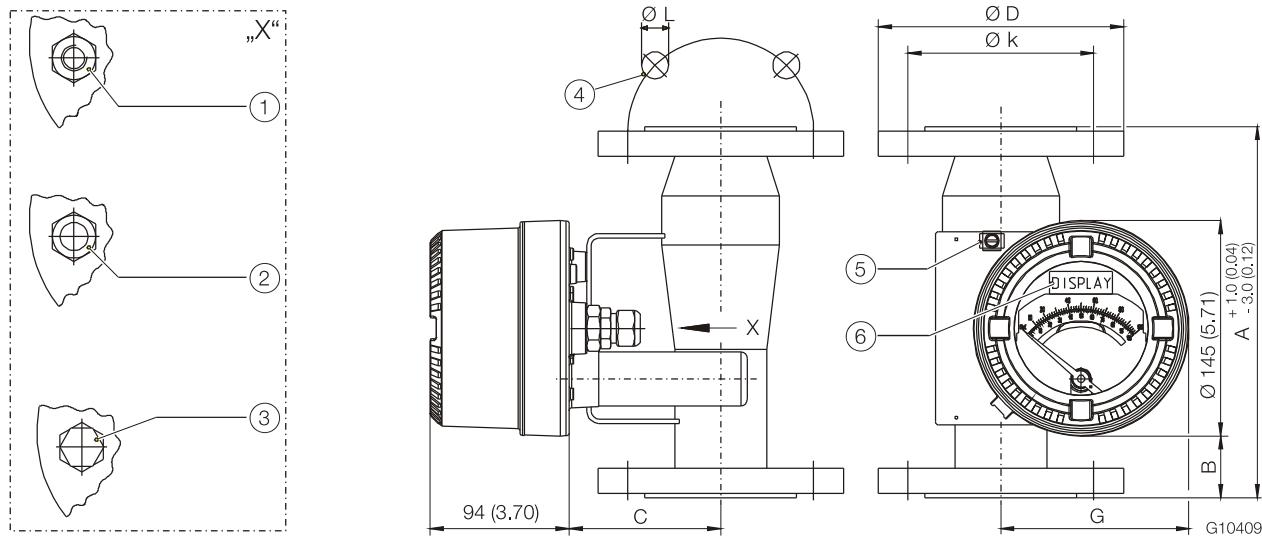


Fig. 14: Dimensions for flange devices in mm (inch), tolerances ± 2 mm

- (1) Threaded bushing 1/2" NPT
- (2) Cable gland M20x1.5
- (3) Plug M25x1.5 (only for model FAM541-A)
- (4) N Number of holes
- (5) Earthing terminal
- (6) LCD display, only for FAM541-F

Device size	Pressure rating	DN	\varnothing D [mm (inch)]	\varnothing k [mm (inch)]	\varnothing L [mm (inch)]	N	A [mm (inch)]	C [mm (inch)]	G [mm (inch)]
1/2"	PN 40	DN 15	95.0 (3.74)	65.0 (2.56)	14.0 (0.55)	4	250.0 (9.84)	87.0 (3.43)	118.0 (4.65)
	PN 63 / 100		105.0 (4.13)	75.0 (2.95)	14.0 (0.55)	4	258.0 (10.16)	87.0 (3.43)	118.0 (4.65)
	CL 150	1/2"	89.0 (3.50)	60.3 (2.37)	15.9 (0.63)	4	250.0 (9.84)	87.0 (3.43)	118.0 (4.65)
	CL 300		95.2 (3.75)	66.7 (2.63)	15.9 (0.63)	4	250.0 (9.84)	87.0 (3.43)	118.0 (4.65)
	CL 600		95.2 (3.75)	66.5 (2.62)	15.7 (0.62)	4	260.0 (10.24)	87.0 (3.43)	118.0 (4.65)
1"	PN 40	DN 25	115.0 (4.53)	85.0 (3.35)	14.0 (0.55)	4	250.0 (9.84)	87.0 (3.43)	118.0 (4.65)
	PN 63 / 100		140.0 (5.51)	100.0 (3.94)	18.0 (0.71)	4	262.0 (10.31)	87.0 (3.43)	118.0 (4.65)
	CL 150	1"	107.9 (4.25)	79.4 (3.13)	15.9 (0.63)	4	250.0 (9.84)	87.0 (3.43)	118.0 (4.65)
	CL 300		123.8 (4.87)	88.9 (3.50)	19.0 (0.75)	4	250.0 (9.84)	87.0 (3.43)	118.0 (4.65)
	CL 600		124.0 (4.88)	88.9 (3.50)	19.0 (0.75)	4	262.0 (10.31)	87.0 (3.43)	118.0 (4.65)
2"	PN 40	DN 40	150 (5.91)	110 (4.33)	18.0 (0.71)	4	250.0 (9.84)	102.0 (4.02)	130.0 (5.12)
	CL 150	1 1/2"	127 (5.0)	98.4 (3.87)	15.7 (0.62)	4	250.0 (9.84)	102.0 (4.02)	130.0 (5.12)
	CL 300	1 1/2"	155.3 (6.11)	114.3 (4.5)	22.2 (0.87)	4	250.0 (9.84)	102.0 (4.02)	130.0 (5.12)
	PN 40	DN 50	165.0 (6.50)	125.0 (4.92)	18.0 (0.71)	4	250.0 (9.84)	102.0 (4.02)	130.0 (5.12)
	PN 63		180.0 (7.09)	135.0 (5.31)	22.0 (0.87)	4	262.0 (10.31)	102.0 (4.02)	130.0 (5.12)
	PN 100		195.0 (7.68)	145.0 (5.71)	26.0 (1.02)	4	266.0 (10.47)	102.0 (4.02)	130.0 (5.12)
	CL 150	2"	152.4 (6.00)	120.6 (4.75)	19.0 (0.75)	4	250.0 (9.84)	102.0 (4.02)	130.0 (5.12)
	CL 300		165.1 (6.50)	127.0 (5.00)	19.0 (0.75)	8	250.0 (9.84)	102.0 (4.02)	130.0 (5.12)
	CL 600		165.1 (6.50)	127.0 (5.00)	19.0 (0.75)	8	274.0 (10.79)	102.0 (4.02)	130.0 (5.12)

Device size	Pressure rating	DN	Ø D [mm (inch)]	Ø k [mm (inch)]	Ø L [mm (inch)]	N	A [mm (inch)]	C [mm (inch)]	G [mm (inch)]
3"	PN 40	DN 80	200.0 (7.87)	160.0 (6.30)	18.0 (0.71)	8	250.0 (9.84)	132.0 (5.20)	144.0 (5.67)
	PN 63		215.0 (8.46)	170.0 (6.69)	22.0 (0.87)	8	258.0 (10.16)	132.0 (5.20)	144.0 (5.67)
	PN 100		230.0 (9.06)	180.0 (7.09)	26.0 (1.02)	8	272.0 (10.71)	132.0 (5.20)	144.0 (5.67)
	CL 150	3"	190.5 (7.50)	152.4 (6.00)	19.0 (0.75)	4	250.0 (9.84)	132.0 (5.20)	144.0 (5.67)
	CL 300		209.5 (8.25)	168.3 (6.63)	22.2 (0.87)	8	250.0 (9.84)	132.0 (5.20)	144.0 (5.67)
	CL 600		209.5 (8.25)	168.1 (6.62)	22.2 (0.87)	8	278.0 (10.94)	132.0 (5.20)	144.0 (5.67)
4"	PN 16	DN 100	220.0 (8.66)	180.0 (7.09)	18.0 (0.71)	8	250.0 (9.84)	147.0 (5.79)	158.0 (6.22)
	PN 40		235.0 (9.25)	190.0 (7.48)	22.0 (0.87)	8	250.0 (9.84)	147.0 (5.79)	158.0 (6.22)
	PN 63		250.0 (9.84)	200.0 (7.87)	26.0 (1.02)	8	262.0 (10.31)	147.0 (5.79)	158.0 (6.22)
	CL 150	4"	228.6 (9.00)	190.5 (7.50)	19.0 (0.75)	8	250.0 (9.84)	147.0 (5.79)	158.0 (6.22)
	CL 300		254.0 (10.00)	200.0 (7.87)	22.2 (0.87)	8	266.0 (10.47)	147.0 (5.79)	158.0 (6.22)

Overall length for devices with female thread connectors

Process connection	Overall length [mm (inch)]
Female thread 1"	296 (11.65)
Female thread 1 1/2"	304 (11.97)

Weight in kg (lb)

Indicator housing material	Device size (meter tube)				
	DN 15 (1/2")	DN 25 (1")	DN 50 (2")	DN 80 (3")	DN 100 (4")
Al Si 12	4.5 / (9.9)	5.8 / (12.8)	9.5 / (20.9)	15.7 / (34.6)	34.0 / (75)
Stainless steel 1.4408	7.0 / (15.4)	8.3 / (18.3)	12.0 / (26.4)	18.2 / (40.1)	36.5 / (80.4)

VA Master FAM540

Metal Cone Variable Area Flowmeter

Model FAM544 - hygienic design



Fig. 15: Model FAM544 in hygienic design

This model has been specially constructed with threaded connections in accordance with DIN 11851 to meet the more stringent hygienic requirements of the food and beverage industry in respect of biological cleaning.

All parts of the flowmeter that come into contact with the measuring medium are welded and polished. There are no gaps or other empty areas. The device is suitable for cleaning or sterilization with steam, acids and alkali. The device is also CIP-cleanable.

Scale

Design optionally with percentage scale or product scale.

Gas damping

Not available.

SIL approval

- SIL2 declaration of conformity for devices with alarm function.
- Manufacturer's declaration (SIL1) in accordance with IEC 61508 / IEC61511 for devices with a current output of 4 ... 20 mA.

Measuring accuracy

1.6 % qg = 50 % in accordance with VDE / VDI 3513, sheet 2, optional 1 % of upper range value.

Measuring range limits and span limits

Measuring span: 10:1

For detailed information about measuring ranges, see chapter „Measuring range table“ on page 18.

Temperature limits °C (°F)

Medium temperature range

- -55 ... 400 °C (-67 ... 752 °F)

Ambient temperature range

- -40 ... 85 °C (-40 ... 185 °F)

NOTE

- When using in potentially explosive atmospheres, observe the temperature information in the ATEX / IECEx limit values starting from 34 and the FM / cCSAus limit values tables starting from „Safety specifications FM, cCSAus“ on page 43!
- Also observe the information in chapter „Temperature data“ on page 4!

Process connections

- Threaded spud in accordance with DIN 11851 (SC 25 ... SC 80)
- Threaded spud in accordance with SMS 1145 (DN 38 ... DN 102)

Connection dimensions

Nominal Diameter	Meter tube size	SMS 1145	DIN 11851
DN 25	1/2"	SC 25	–
DN 40	1"	SC 40	DN 38
DN 50	2"	SC 50	DN 51
DN 80	3"	SC 80	DN 76
DN 100	4"	–	DN 102
DN 125	4"	SC 125	–

Pressure ratings

Threaded spuds in accordance with DIN 11851:

- PN 25 for DN 50 ... DN 80 (2 ... 3")
- PN 40 for DN 25 ... DN 40 (1 ... 1 1/2")
- PN 16 for DN 125 (5")

Threaded spud in accordance with DIN 1145:

- PN 6 for (DN 38 ... DN 102)

See chapter „Material load“ on page 17.

Maximum permissible operating pressure

See chapter „Material load“ on page 17.

Materials

Materials for the indicator housing

Component	Material
Indicator housing	Standard: aluminum, powder-coated Option: stainless steel 1.4408
Powder coating	Epoxy paint 80 ... 100 µm Bottom color: RAL 7012 Cover color: RAL 9002
Housing gasket (O-ring)	Buna N®
Sight glass	Shatterproof glass

Material load

Process connection	Nominal Diameter	PS _{max}	TS _{min}	TS _{max}
DIN 11851	DN 15 ... 40 (1/2 ... 1 1/2")	40 bar (580 psi)	-40 °C (-40 °F)	140 °C (284 °F)
	DN 50 ... 100 (2 ... 4")	25 bar (362 psi)	-40 °C (-40 °F)	140 °C (284 °F)
	DN 125 (5")	16 bar (232 psi)	-40 °C (-40 °F)	140 °C (284 °F)
SMS 1145	DN 38 ... 102 (1 1/2 ... 4")	6 bar (87 psi)	-40 °C (-40 °F)	140 °C (284 °F)

Materials for wetted parts

Component	Material
Meter tube	Stainless steel 1.4404 (316 L)
Conical meter pipe	Stainless steel 1.4571 (316 Ti), only DN 15 (1/2")
Variable area	Stainless steel 1.4571 (316 Ti)

VA Master FAM540

Metal Cone Variable Area Flowmeter

Measuring range table

NOTE

The "FlowCalc" program, which is available as a free download from www.abb.com/flow, can be used to calculate flow rates, pressure losses, and upstream pressure requirements.

The data listed applies to water at 20 °C (68 °F), 1 kg/dm³ (62.43 lb/ft³), 1 mPas (1 cP) and to air at 0 °C (70 °F), 1013 mbar (14.7 psia).

DN ¹⁾	Upper range value ²⁾ for Water [l/h (USgal/h)]	Air [m ³ /h (scfh)]	Meter tube / nominal flow rate H ₂ O [l/h] / Order code ³⁾	VIN ⁴⁾	Pressure loss ⁵⁾ [mbar (psi)]	Minimum upstream pressure for gas measurement ⁶⁾ [bar abs (psia)]
DN 25 (1 ["])	28 ... 32 (7.4 ... 8.5)	—	1/2" / 30 / A7	6	80 (1.16)	—
	37 ... 43 (10 ... 11.4)	—	1/2" / 40 / B7	6	80 (1.16)	—
	44 ... 55 (11.6 ... 14.5)	—	1/2" / 50 / C7	6	80 (1.16)	—
	56 ... 64 (14.5 ... 17)	—	1/2" / 60 / D7	6	80 (1.16)	—
	77 ... 83 (20.5 ... 21.5)	2.29 ... 2.47 (84 ... 90)	1/2" / 80 / E7	16	40 (0.58)	3.0 (43.51)
	96 ... 104 (25.5 ... 27)	2.85 ... 3.09 (104 ... 112)	1/2" / 100 / F7	16	45 (0.65)	3.2 (46.41)
	115 ... 125 (30 ... 33)	3.42 ... 3.72 (125 ... 135)	1/2" / 120 / G7	16	50 (0.73)	3.5 (50.76)
	144 ... 156 (38 ... 41)	4.28 ... 4.64 (155 ... 165)	1/2" / 150 / H7	16	60 (0.87)	3.8 (55.11)
	188 ... 212 (50 ... 56)	5.59 ... 6.30 (205 ... 230)	1/2" / 200 / J7	16	60 (0.87)	4.0 (58.02)
	235 ... 265 (62 ... 70)	6.98 ... 7.88 (255 ... 285)	1/2" / 250 / K7	16	65 (0.94)	4.2 (60.92)
	282 ... 318 (74 ... 84)	8.38 ... 9.45 (310 ... 340)	1/2" / 300 / L7	16	70 (1.02)	4.4 (63.82)
	376 ... 424 (100 ... 112)	11.17 ... 12.60 (410 ... 460)	1/2" / 400 / M7	16	75 (1.09)	4.6 (66.72)
	470 ... 530 (125 ... 140)	13.97 ... 15.75 (510 ... 570)	1/2" / 500 / N7	16	75 (1.09)	4.8 (69.62)
	565 ... 635 (150 ... 165)	16.79 ... 18.87 (620 ... 680)	1/2" / 600 / P7	16	80 (1.16)	5.0 (72.52)
	750 ... 850 (200 ... 220)	22.29 ... 25.26 (820 ... 920)	1/2" / 800 / R7	16	85 (1.23)	5.4 (78.32)

DN¹⁾	Upper range value²⁾ for Water [l/h (USgal/h)]	Air [m³/h (scfh)]	Meter tube / nominal flow rate H₂O [l/h] / Order code³⁾	VIN⁴⁾	Pressure loss⁵⁾ [mbar (psi)]	Minimum upstream pressure for gas measurement⁶⁾ [bar abs (psia)]
DN 40 (1 1/2")	280 ... 656 (74 ... 170)	8.32 ... 19.50 (310 ... 700)	1" / 400 / A1	13 ... 21	20 ... 76 (0.3 ... 1.1)	2.9 ... 3.1 (42.1 ... 45.0)
	393 ... 870 (104 ... 220)	11.70 ... 25.85 (430 ... 940)	1" / 600 / B1	7 ... 10	27 ... 76 (0.4 ... 1.1)	3.0 ... 3.4 (43.5 ... 49.3)
	660 ... 1600 (170 ... 450)	19.38 ... 50.80 (720 ... 1850)	1" / 1000 / C1	16 ... 22	20 ... 76 (0.3 ... 1.1)	3.3 ... 4.3 (48.0 ... 62.4)
	975 ... 2370 (260 ... 620)	28.98 ... 70.44 (1060 ... 2550)	1" / 1600 / D1	8 ... 10	27 ... 82 (0.4 ... 1.2)	3.3 ... 5.3 (48.0 ... 77.0)
	1650 ... 4020 (440 ... 1060)	49.04 ... 119.50 (1800 ... 4300)	1" / 2500 / E1	17 ... 6	20 ... 76 (0.3 ... 1.1)	4.2 ... 6.4 (61.0 ... 92.8)
	2585 ... 6170 (680 ... 1600)	76.83 ... 183.50 (2800 ... 6600)	1" / 4000 / F1	8 ... 10	27 ... 82 (0.4 ... 1.2)	5.2 ... 8.0 (75.4 ... 116)
DN 50 (2")	4220 ... 12130 (1120 ... 3200)	125.40 ... 360.50 (4600 ... 13000)	2" / 8000 / A2	21 ... 38	11 ... 62 (0.2 ... 0.9)	3.1 ... 4.5 (45.0 ... 65.3)
	7940 ... 18460 (2100 ... 4800)	236.0 ... 584.6 (8600 ... 20000)	2" / 12000 / B2	13 ... 17	24 ... 74 (0.3 ... 1.1)	3.8 ... 6.2 (55.1 ... 90.0)
	11760 ... 24200 (3100 ... 6400)	349.50 ... 720.00 (13000 ... 27000)	2" / 18000 / C2	3 ... 4	28 ... 72 (0.4 ... 1.0)	4.4 ... 7.5 (63.8 ... 109)
DN 50 (2" ⁷⁾)	3580 ... 7932 (944 ... 2080)	106.0 ... 236.0 (3830 ... 8520)	2" / 6000 Hygiene / H2	18 ... 28	18 ... 63 (0.3 ... 0.9)	3.1 ... 4.5 (45.0 ... 65.3)
	7670 ... 16700 (2025 ... 4400)	228.3 ... 496.0 (8520 ... 17900)	2" / 12000 Hygiene / J2	8 ... 9	33 ... 77 (0.5 ... 1.1)	3.8 ... 6.2 (55.1 ... 90.0)
DN 80 (3")	7000 ... 21010 (1850 ... 5500)	208.00 ... 620 (7600 ... 22000)	3" / 12000 / A3	22 ... 54	6 ... 48 (0.1 ... 0.7)	3.4 ... 5.4 (49.3 ... 78.3)
	18090 ... 35010 (4800 ... 9200)	537.70 ... 1040 (19500 ... 38000)	3" / 25000 / B3	18 ... 25	24 ... 65 (0.3 ... 1.0)	4.8 ... 7.4 (69.6 ... 107)
	29750 ... 53810 (7000 ... 14000)	795 ... 1550 (29000 ... 58000)	3" / 40000 / C3	4 ... 5	26 ... 68 (0.4 ... 1.0)	6.0 ... 9.2 (87.0 ... 133)
DN 80 (3" ⁷⁾)	9864 ... 21420 (2550 ... 5650)	293.0 ... 637.0 (10600 ... 23000)	3" / 16000 Hygiene / H3	25 ... 43	13 ... 49 (0.2 ... 0.7)	3.4 ... 5.4 (49.3 ... 78.3)
	22800 ... 41640 (6015 ... 10950)	677.0 ... 1237.0 (24500 ... 44600)	3" / 30000 Hygiene / H3	15 ... 18	30 ... 66 (0.4 ... 1.0)	4.8 ... 7.4 (69.6 ... 107)
DN 100 / DN 125 (4" ⁸⁾ / 5" ⁸⁾)	25000 ... 50000 (5400 ... 13500)	—	4" / 40000 / A4	60 ... 81	28 ... 74 (0.4 ... 1.2)	—
	50000 ... 120000 (12500 ... 32000)	—	4" / 80000 / B4	24	42 ... 95 (0.6 ... 1.4)	—

1) Connection nominal size

2) The upper range value can be selected anywhere within these limits. The measuring span is 10:1.

Example: upper range value 12 m³/h (USgal/h) water, measuring span of device 1.2 to 12 m³/h (USgal/h) water.

3) Order code for meter tube /float combination (versions 18, 19), see chapter „Main ordering information FAM544“ on page 54.

4) Viscosity influence number (VIN), see chapter „Calculating the viscosity influence number (VIN)“ on page 5.

5) The listed pressure loss values are based on the listed flow rate end value.

6) The minimum required pressure (abs) to prevent compression oscillations (float bounce) in the meter tube. The specifications for the minimum required pressures are based on average installation conditions. Some installations may have higher values (high free volume upstream / downstream of the device).

7) Only for threaded spuds in accordance with DIN 11851

8) Only for threaded spuds in accordance with SMS 1145

VA Master FAM540

Metal Cone Variable Area Flowmeter

Dimensions

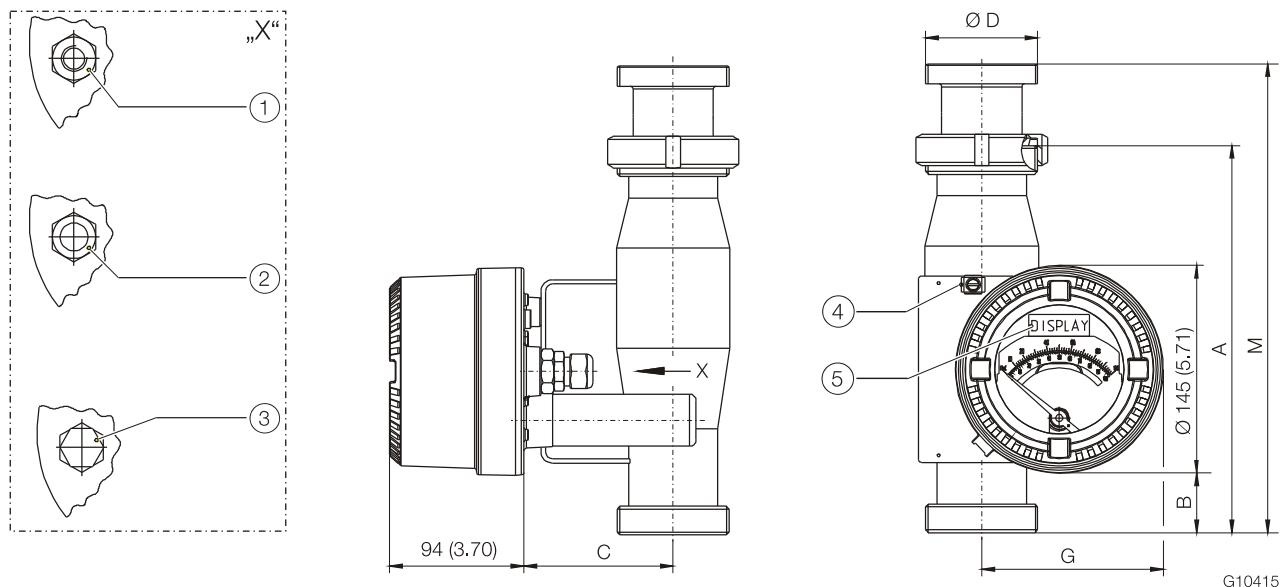


Fig. 16: Dimensions in mm (inch), tolerances ± 2 mm

- ① Threaded bushing 1/2" NPT
- ② Cable gland M20x1.5
- ③ Plug M25x1.5 (only for model FAM541-A)
- ④ Earthing terminal
- ⑤ LCD display only for FAM541-F

Dimensions for devices with threaded spuds in accordance with DIN 11851

Device size	DN [mm (inch)]	Pressure rating	\varnothing D	A ¹⁾ [mm (inch)]	B [mm (inch)]	C [mm (inch)]	G [mm (inch)]	M ¹⁾ [mm (inch)]
1/2"	25 (1")	PN 40	Rd 52 x 1/6"	270.0 (10.63)	51.5 (2.03)	87.0 (3.43)	118.0 (4.65)	—
1"	40 (1 1/2")	PN 40	Rd 65 x 1/6"	270.0 (10.63)	51.5 (2.03)	87.0 (3.43)	118.0 (4.65)	—
2"	50 (2")	PN 25	Rd 78 x 1/6"	270.0 (10.63)	51.5 (2.03)	102.0 (4.02)	130.0 (5.12)	315.0 (12.40)
3"	80 (3")	PN 25	Rd 110 x 1/6"	272.0 (10.71)	52.5 (2.07)	132.0 (5.20)	144.0 (5.67)	326.0 (12.83)
4"	125 (5")	PN 16	Rd 160 x 1/4"	320.0 (12.6)	76.5 (3.01)	147.0 (5.79)	158.0 (6.22)	—

1) Dimension A: design with threaded spud DIN 11851

Dimension M: hygienic design with threaded spud in accordance with DIN 11851 (available upon request)

Dimensions for devices with threaded spuds in accordance with SMS 1145

Device size	DN [mm]	Pressure rating	Ø D	A [mm (inch)]	B [mm (inch)]	C [mm (inch)]	G [mm (inch)]
1"	38	PN 6	Rd 60 x 1/6"	300.0 (11.81)	66.5 (2.62)	87.0 (3.43)	118.0 (4.65)
2"	51		Rd 70 x 1/6"			102.0 (4.02)	130.0 (5.12)
3"	76		Rd 98 x 1/6"			132.0 (5.20)	144.0 (5.67)
4"	102		Rd 132 x 1/6"			147.0 (5.79)	158.0 (6.22)

Weight in kg (lb)

Indicator housing material	Device size (meter tube)					
	DN 15 (1/2")	DN 25 (1")	DN 50 (2")	DN 80 (3")	DN 100 (4")	DN 125 (5")
Al Si 12	4.5 (9.9)	5.8 (12.8)	9.0 (19.8)	15.7 (34.6)	24.0 (53.0)	34.0 (75.0)
Stainless steel 1.4408	7.0 (15.4)	8.3 (18.3)	11.5 (25.3)	18.2 (40.1)	26.5 (58.0)	36.5 (80.4)

VA Master FAM540

Metal Cone Variable Area Flowmeter

Model FAM545 - with PTFE liner



Fig. 17: Model FAM545 with PTFE liner

NOTE

If the device is used in potentially explosive atmospheres, a minimum measuring medium conductivity of $> 10^{-8}$ S/m must be guaranteed.

See also chapters „Use in potentially explosive atmospheres according to ATEX and IECEx“ on page 32 and „Dimensions“ on page 25.

Scale

Design optionally with percentage scale or product scale.

Gas damping

Not available.

SIL approval

Not available.

Measuring accuracy

2.5 % qg = 50 % in accordance with VDE / VDI 3513, sheet 2.

Measuring range limits and span limits

Measuring span: 10:1

For detailed information about measuring ranges, see chapter „Measuring range table“ on page 24.

Temperature limits °C (°F)

Medium temperature range

- -20 ... 125 °C (-4 ... 257 °F)

Ambient temperature range

- -40 ... 85 °C (-40 ... 185 °F)

NOTE

For use in potentially explosive atmospheres, observe the temperature information in the ATEX / IECEx limit values starting from 34 and the FM / cCSAus limit values tables starting from „Safety specifications FM, cCSAus“ on page 43!

- Also observe the information in chapter „Temperature data“ on page 4!

Process connections

- Flange in accordance with DIN 2501 (DN 25 ... DN 80)
- Flange in accordance with ASME B16.5

Pressure ratings

- Standard pressure rating PN 40
- Flange in accordance with DIN 2501 (DN 40 ... DN 63)
- Flange in accordance with ASME CL 150, CL 300

See chapter „Material load“ on page 23.

Maximum permissible operating pressure

50 bar (CL 300), (higher pressures available upon request).

Materials

Materials for the indicator housing

Component	Material
Indicator housing	Standard: aluminum, powder-coated Option: stainless steel 1.4408
Powder coating	Epoxy paint 80 ... 100 µm Bottom color: RAL 7012 Cover color: RAL 9002
Housing gasket (O-ring)	Buna N®
Sight glass	Shatterproof glass

Materials for wetted parts

Component	Material
Meter tube	Stainless steel 1.4571 (316 Ti)
Conical meter pipe	PTFE
Flange	Stainless steel 1.4571 (316 Ti)
Variable area	PTFE

Material load

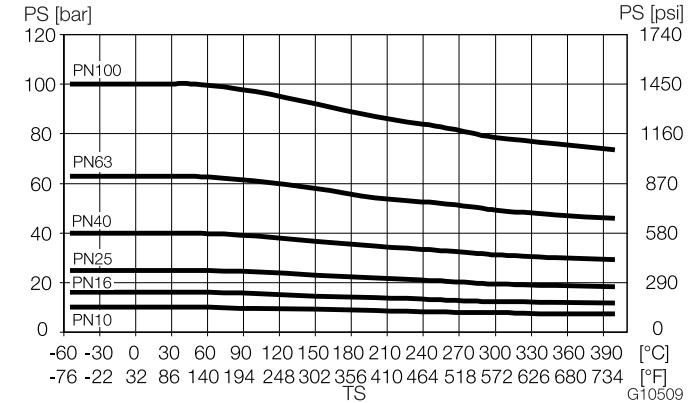


Fig. 18: DIN flange made from stainless steel

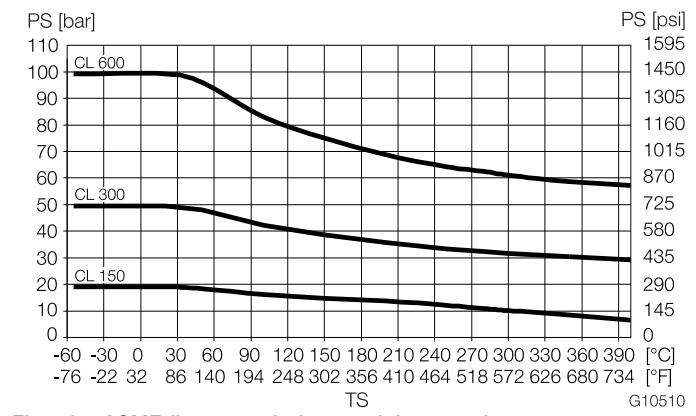


Fig. 19: ASME flange made from stainless steel

VA Master FAM540

Metal Cone Variable Area Flowmeter

Measuring range table

NOTE

The "FlowCalc" program, which is available as a free download from www.abb.com/flow, can be used to calculate flow rates, pressure losses, and upstream pressure requirements.

The data listed applies to water at 20 °C (68 °F), 1 kg/dm³ (62.43 lb/ft³), 1 mPas (1 cP) and to air at 0 °C (70 °F), 1013 mbar (14.7 psia).

DN ¹⁾	Upper range value ²⁾ for Water [l/h (USgal/h)]	Air [m ³ /h (scfh)]	Meter tube / nominal flow rate H ₂ O [l/h] / Order code ³⁾	VIN ⁴⁾	Pressure loss ⁵⁾ [mbar (psi)]
DN 25 (1")	270 ... 370 (72 ... 96)	8.02 ... 11.0 (340 ... 470)	1" / 300 / K1	18	30 ... 55 (0.4 ... 0.8)
	370 ... 530 (98 ... 140)	11.0 ... 15.75 (440 ... 620)	1" / 500 / L1	18	35 ... 60 (0.5 ... 0.9)
	530 ... 750 (140 ... 195)	15.75 ... 22.29 (680 ... 940)	1/2" / 600 / M1	18	40 ... 65 (0.6 ... 0.9)
	750 ... 1050 (200 ... 275)	22.29 ... 31.21 (920 ... 1250)	1" / 900 / N1	18	45 ... 70 (0.7 ... 1.0)
	1050 ... 1500 (275 ... 390)	31.21 ... 44.58 (1300 ... 1800)	1" / 1300 / P1	18	55 ... 80 (0.8 ... 1.2)
	1500 ... 2100 (400 ... 550)	44.58 ... 62.41 (1850 ... 2600)	1" / 1800 / R1	18	65 ... 90 (0.9 ... 1.3)
	2100 ... 3000 (550 ... 780)	62.41 ... 89.16 (2600 ... 3600)	1" / 2500 / S1	18	75 ... 100 (1.1 ... 1.5)
DN 50 (2")	2850 ... 3350 (760 ... 920)	84.70 ... 105.50 (3300 ... 4000)	2" / 3200 / K2	26	40 ... 80 (0.6 ... 1.2)
	3350 ... 4450 (940 ... 1160)	105.50 ... 132.20 (4100 ... 5000)	2" / 4000 / L2	26	45 ... 85 (0.7 ... 1.2)
	4450 ... 5450 (1180 ... 1400)	132.20 ... 162.00 (5100 ... 6200)	2" / 5000 / M2	26	50 ... 90 (0.7 ... 1.3)
	5450 ... 6750 (1450 ... 1750)	162.00 ... 200.60 (6200 ... 7600)	2" / 6000 / N2	26	60 ... 100 (0.9 ... 1.5)
	6750 ... 8250 (1800 2150)	200.60 ... 245.20 (7800 ... 9400)	2" / 7500 / P2	26	70 ... 110 (1.0 ... 1.6)
	8250 ... 10000 (2200 ... 2600)	245.20 ... 297.20 (9400 ... 11400)	2" / 9100 / R2	26	90 ... 130 (1.3 ... 1.9)
DN 80 (3")	10000 ... 14000 (2650 3600)	294.20 ... 416.10 (12000 ... 16500)	3" / 12000 / K3	36	40 ... 70 (0.6 ... 1.0)
	14000 ... 19000 (3700 ... 5000)	416.20 ... 564.70 (17000 ... 23000)	3" / 16500 / L3	36	60 ... 90 (0.3 ... 1.3)
	19000 ... 27000 (5000 ... 7000)	564.70 ... 802.40 (23000 ... 32000)	3" / 23000 / M3	20	80 ... 110 (1.2 ... 1.6)

1) Connection nominal size

2) The upper range value can be selected anywhere within these limits. The measuring span is 10:1.

Example: upper range value 12 m³/h (USgal/h) water, measuring span of device 1.2 to 12 m³/h (USgal/h) water.

3) Order code for meter tube /float combination (versions 18, 19), see chapter „Main ordering information FAM545“ on page 57.

4) Viscosity influence number (VIN), see chapter „Calculating the viscosity influence number (VIN)“ on page 5.

5) The listed pressure loss values are based on the listed flow rate end value.

Dimensions

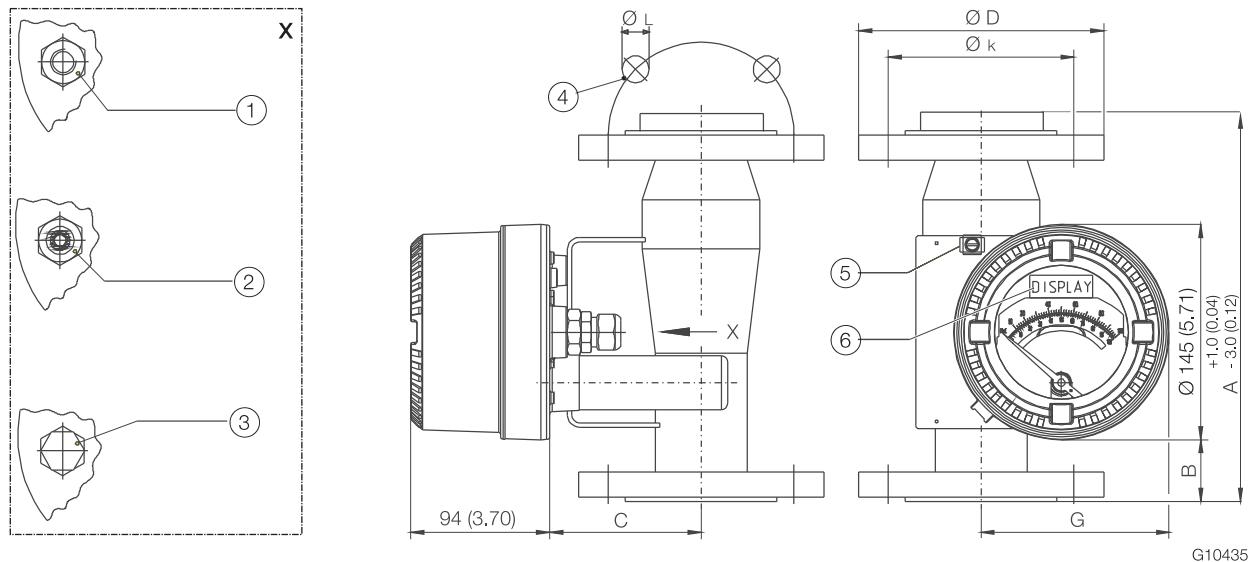


Fig. 20: Dimensions in mm (inch), tolerances ± 2 mm

- (1) Threaded bushing 1/2" NPT
- (2) Cable gland M20x1.5
- (3) Plug M25x1.5 (only for model FAM545-A)
- (4) N Number of holes
- (5) Earthing terminal
- (6) LCD display only for FAM545-F

Device size	Pressure rating	DN	\varnothing D [mm (inch)]	\varnothing k [mm (inch)]	\varnothing L [mm (inch)]	N	A [mm (inch)]	C [mm (inch)]	G [mm (inch)]
1"	PN 40	DN 25	115.0 (4.53)	85.0 (3.35)	14.0 (0.55)	4	260.0 (10.24)	87.0 (3.43)	118.0 (4.65)
	CL 150	1"	107.9 (4.25)	79.4 (3.13)	15.9 (0.63)	4	260.0 (10.24)	87.0 (3.43)	118.0 (4.65)
	CL 300	1"	123.8 (4.87)	88.9 (3.50)	19.0 (0.75)	4	260.0 (10.24)	87.0 (3.43)	118.0 (4.65)
2"	PN 40	DN 50	165.0 (6.50)	125.0 (4.92)	18.0 (0.71)	4	375.0 (14.76)	102.0 (4.02)	130.0 (5.12)
	CL 150	2"	152.4 (6.00)	120.6 (4.75)	19.0 (0.75)	4	375.0 (14.76)	102.0 (4.02)	130.0 (5.12)
	CL 300	2"	165.1 (6.50)	127.0 (5.00)	19.0 (0.75)	8	375.0 (14.76)	102.0 (4.02)	130.0 (5.12)
3"	PN 40	DN 80	200 (7.87)	160.0 (6.30)	18.0 (0.71)	8	375.0 (14.76)	132.0 (5.20)	144.0 (5.67)
	CL 150	3"	190.5 (7.50)	152.4 (6.00)	19.0 (0.75)	4	375.0 (14.76)	132.0 (5.20)	144.0 (5.67)
	CL 300	3"	209.5 (8.25)	168.3 (6.63)	22.2 (0.87)	8	375.0 (14.76)	132.0 (5.20)	144.0 (5.67)

Weight in kg (lb)

Indicator housing material	Device size (meter tube)		
	DN 25 (1")	DN 50 (2")	DN 80 (3")
Al Si 12	5.8 (12.8)	10.7 (23.6)	16.7 (36.8)
Stainless steel 1.4408	8.3 (18.3)	13.2 (29.1)	19.2 (42.3)

VA Master FAM540

Metal Cone Variable Area Flowmeter

Model FAM546 - with heating jacket



Fig. 21: Model FAM541

Scale

Design optionally with percentage scale or product scale.

Gas damping

Option, for preventing compression oscillations in case of gas measurements with low operating pressure.

SIL approval

- SIL2 declaration of conformity for devices with alarm function.
- Manufacturer's declaration (SIL1) in accordance with IEC 61508 / IEC61511 for devices with a current output of 4 ... 20 mA.

Measuring accuracy

1.6 % qg = 50 % in accordance with VDE / VDI 3513, sheet 2, optional 1 % of upper range value.

Measuring range limits and span limits

Measuring span: 10:1

For detailed information about measuring ranges, see chapter „Measuring range table“ on page 28.

Temperature limits °C (°F)

Medium temperature range

- -55 ... 400 °C (-67 ... 752 °F)

Ambient temperature range

- -40 ... 85 °C (-40 ... 185 °F)

NOTE

- When using in potentially explosive atmospheres, observe the temperature information in the ATEX / IECEx limit values starting from 34 and the FM / cCSAus limit values tables starting from „Safety specifications FM, cCSAus“ on page 43!
- Also observe the information in chapter „Temperature data“ on page 4!

Process connections

- Flange in accordance with DIN 2501 (DN 50 (2") ... DN 100 (4"))
- Flange in accordance with EN 1092-1 (DN 25 (1"))
- Flange in accordance with ASME B16.5

Heating jacket connection

Female thread G 1/4, at the back of the meter tube.

Pressure ratings

- Standard pressure rating: PN 40 (PN 16 for DN 100 (4"))
- Flange in accordance with DIN / EN: PN 16, PN 40, PN 63, PN 100
- Flange in accordance with ASME: CL 150, CL 300, CL 600
- Heating jacket: PN 16

See chapter „Material load“ on page 27.

Maximum permissible operating pressure

- Meter tube: 100 bar (CL 600).
- Heating jacket: 16 Bar (232 psi)

Higher pressures on request.

Materials

Materials for the indicator housing

Component	Material
Indicator housing	Standard: aluminum, powder-coated Option: stainless steel 1.4408
Powder coating	Epoxy paint 80 ... 100 µm Bottom color: RAL 7012 Cover color: RAL 9002
Housing gasket (O-ring)	Buna N®
Sight glass	Shatterproof glass

Materials for wetted parts

Component	Material
Meter tube	Stainless steel 1.4571 (316 Ti)
Conical meter pipe	Stainless steel 1.4571 (316 Ti), only DN 15 (1/2")
Flange	Stainless steel 1.4571 (316 Ti)
Variable area	– Stainless steel 1.4571 (316 Ti), standard – Stainless steel 1.4571 (316 Ti) / float head: Hastelloy™ C 2.4610, optional
Gas damping (option)	Stainless steel 1.4571 (316 Ti)

Material load

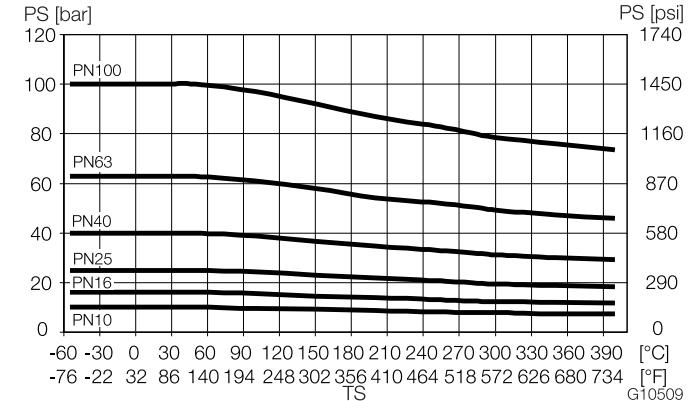


Fig. 22: DIN flange made from stainless steel

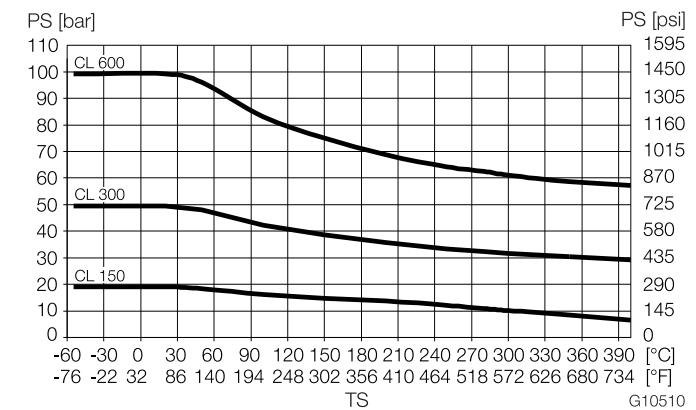


Fig. 23: ASME flange made from stainless steel

VA Master FAM540

Metal Cone Variable Area Flowmeter

Measuring range table

NOTE

The "FlowCalc" program, which is available as a free download from www.abb.com/flow, can be used to calculate flow rates, pressure losses, and upstream pressure requirements.

The specified data applies to water at 20 °C (68 °F) 1 kg/dm³ (62.43 lb/ft³), 1 mPas (1 cP) and to air at 0 °C (32 °F), 1013 mbar (14.7 psia).

DN ¹⁾	Upper range value ²⁾ for		Meter tube / nominal flow rate H ₂ O [l/h] / Order code ³⁾	VIN ⁴⁾	Pressure loss ⁵⁾ [mbar (psi)]	Minimum upstream pressure for gas measurement ⁶⁾	
	Water [l/h (USgal/h)]	Air [m ³ /h (scfh)]				Without gas damping [bar abs (psia)]	With gas damping ⁷⁾ [bar abs (psia)]
DN 25 (1")	28 ... 32 (7.4 ... 8.5)	0.83 ... 0.95 (37 ... 45)	1/2" / 30 / A7 ⁸⁾	6	80 (1.16)	4.0 (58.02)	1.0 (14.5)
	37 ... 43 (10 ... 11.4)	1.10 ... 1.28 (52 ... 59)	1/2" / 40 / B7 ⁸⁾	6	80 (1.16)	4.0 (58.02)	1.0 (14.5)
	44 ... 55 (11.6 ... 14.5)	1.30 ... 1.63 (54 ... 66)	1/2" / 50 / C7 ⁸⁾	6	80 (1.16)	4.0 (58.02)	1.0 (14.5)
	56 ... 64 (14.5 ... 17)	1.66 ... 1.90 (68 ... 80)	1/2" / 60 / D7 ⁸⁾	6	80 (1.16)	4.0 (58.02)	1.0 (14.5)
	77 ... 83 (20.5 ... 21.5)	2.29 ... 2.47 (84 ... 90)	1/2" / 80 / E7	16	40 (0.58)	3.0 (43.51)	1.0 (14.5)
	96 ... 104 (25.5 ... 27)	2.85 ... 3.09 (104 ... 112)	1/2" / 100 / F7	16	45 (0.65)	3.2 (46.41)	1.0 (14.5)
	115 ... 125 (30 ... 33)	3.42 ... 3.72 (125 ... 135)	1/2" / 120 / G7	16	50 (0.73)	3.5 (50.76)	1.0 (14.5)
	144 ... 156 (38 ... 41)	4.28 ... 4.64 (155 ... 165)	1/2" / 150 / H7	16	60 (0.87)	3.8 (55.11)	1.0 (14.5)
	188 ... 212 (50 ... 56)	5.59 ... 6.30 (205 ... 230)	1/2" / 200 / J7	16	60 (0.87)	4.0 (58.02)	1.0 (14.5)
	235 ... 265 (62 ... 70)	6.98 ... 7.88 (255 ... 285)	1/2" / 250 / K7	16	65 (0.94)	4.2 (60.92)	1.0 (14.5)
	282 ... 318 (74 ... 84)	8.38 ... 9.45 (310 ... 340)	1/2" / 300 / L7	16	70 (1.02)	4.4 (63.82)	1.0 (14.5)
	376 ... 424 (100 ... 112)	11.17 ... 12.60 (410 ... 460)	1/2" / 400 / M7	16	75 (1.09)	4.6 (66.72)	1.0 (14.5)
	470 ... 530 (125 ... 140)	13.97 ... 15.75 (510 ... 570)	1/2" / 500 / N7	16	75 (1.09)	4.8 (69.62)	1.0 (14.5)
	565 ... 635 (150 ... 165)	16.79 ... 18.87 (620 ... 680)	1/2" / 600 / P7	16	80 (1.16)	5.0 (72.52)	1.0 (14.5)
	750 ... 850 (200 ... 220)	22.29 ... 25.26 (820 ... 920)	1/2" / 800 / R7	16	85 (1.23)	5.4 (78.32)	1.0 (14.5)

DN ¹⁾	Upper range value ²⁾ for		Meter tube / nominal flow rate H ₂ O [l/h] / Order code ³⁾	VIN ⁴⁾	Pressure loss ⁵⁾ [mbar (psi)]	Minimum upstream pressure for gas metering ⁶⁾	
	Water [l/h (USgal/h)]	Air [m ³ /h (scfh)]				Without gas damping [bar abs (psia)]	With gas damping ⁷⁾ [bar abs (psia)]
DN 50 (2")	280 ... 656 (74 ... 170)	8.32 ... 19.50 (310 ... 700)	1" / 400 / A1	13 ... 21	20 ... 76 (0.3 ... 1.1)	2.9 ... 3.1 (42.1 ... 45.0)	1.1 ... 1.4 (16.0 ... 20.3)
	393 ... 870 (104 ... 220)	11.70 ... 25.85 (430 ... 940)	1" / 600 / B1	7 ... 10	27 ... 76 (0.4 ... 1.1)	3.0 ... 3.4 (43.5 ... 49.3)	1.2 ... 1.4 (17.4 ... 20.3)
	660 ... 1600 (170 ... 450)	19.38 ... 50.80 (720 ... 1850)	1" / 1000 / C1	16 ... 22	20 ... 76 (0.3 ... 1.1)	3.3 ... 4.3 (48.0 ... 62.4)	1.1 ... 1.4 (16.0 ... 20.3)
	975 ... 2370 (260 ... 620)	28.98 ... 70.44 (1060 ... 2550)	1" / 1600 / D1	8 ... 10	27 ... 82 (0.4 ... 1.2)	3.3 ... 5.3 (48.0 ... 77.0)	1.2 ... 1.5 (17.4 ... 21.8)
	150 ... 4020 (440 ... 1060)	49.04 ... 119.50 (1800 ... 4300)	1" / 2500 / E1	17 ... 6	20 ... 76 (0.3 ... 1.1)	4.2 ... 6.4 (61.0 ... 92.8)	1.1 ... 1.4 (16.0 ... 20.3)
	285 ... 6170 (680 ... 1600)	76.83 ... 183.50 (2800 ... 6600)	1" / 4000 / F1	8 ... 10	27 ... 82 (0.4 ... 1.2)	5.2 ... 8.0 (75.4 ... 116)	1.2 ... 1.5 (17.4 ... 21.8)
DN 80 (3")	420 ... 12130 (1120 ... 3200)	125.40 ... 360.50 (4600 ... 13000)	2" / 8000 / A2	21 ... 38	11 ... 62 (0.2 ... 0.9)	3.1 ... 4.5 (45.0 ... 65.3)	1.1 ... 1.4 (16.0 ... 20.3)
	7940 ... 1860 (2100 ... 4800)	236.0 ... 584.6 (8600 ... 20000)	2" / 12000 / B2	13 ... 17	24 ... 74 (0.3 ... 1.1)	3.8 ... 6.2 (55.1 ... 90.0)	1.1 ... 1.4 (16.0 ... 20.3)
	11760 ... 24200 (3100 ... 6400)	349.50 ... 720.00 (13000 ... 27000)	2" / 18000 / C2	3 ... 4	28 ... 72 (0.4 ... 1.0)	4.4 ... 7.5 (63.8 ... 109)	1.1 ... 1.4 (16.0 ... 20.3)
DN 100 (4")	7000 ... 21010 (1850 ... 5500)	208.00 ... 624.40 (7600 ... 22000)	3" / 12000 / A3	22 ... 54	6 ... 48 (0.1 ... 0.7)	3.4 ... 5.4 (49.3 ... 78.3)	1.1 ... 1.3 (16.0 ... 18.9)
	18090 ... 35010 (4800 ... 9200)	537.70 ... 1040 (19500 ... 38000)	3" / 25000 / B3	18 ... 25	24 ... 65 (0.3 ... 1.0)	4.8 ... 7.4 (69.6 ... 107)	1.1 ... 1.4 (16.0 ... 20.3)
	29750 ... 53810 (7000 ... 14000)	795 ... 1600 (29000 ... 58000)	3" / 40000 / C3	4 ... 5	26 ... 68 (0.4 ... 1.0)	6.0 ... 9.2 (87.0 ... 133)	1.1 ... 1.4 (16.0 ... 20.3)

1) Connection nominal size

2) The upper range value can be selected anywhere within these limits. The measuring span is 10:1.

Example: upper range value 12 m³/h (USgal/h) water, measuring span of device 1.2 to 12 m³/h (USgal/h) water.

3) Order code for meter tube /float combination (versions 18, 19), see chapter „Main ordering information FAM546“ on page 60.

4) Viscosity influence number (VIN), see chapter „Calculating the viscosity influence number (VIN)“ on page 5.

5) The listed pressure loss values are based on the listed flow rate end value.

6) The minimum required pressure (abs) to prevent compression oscillations (float bounce) in the meter tube. The specifications for the minimum required pressures with and without damping are based on average installation conditions. Some installations may have higher values (high free volume upstream / downstream of the device).

7) Cylinder / piston damping. For nominal diameters DN 15 ... DN 80 (1/2 ... 3").

8) These meter tube/float combinations always require gas piston damping for gas measurements.

VA Master FAM540

Metal Cone Variable Area Flowmeter

Dimensions

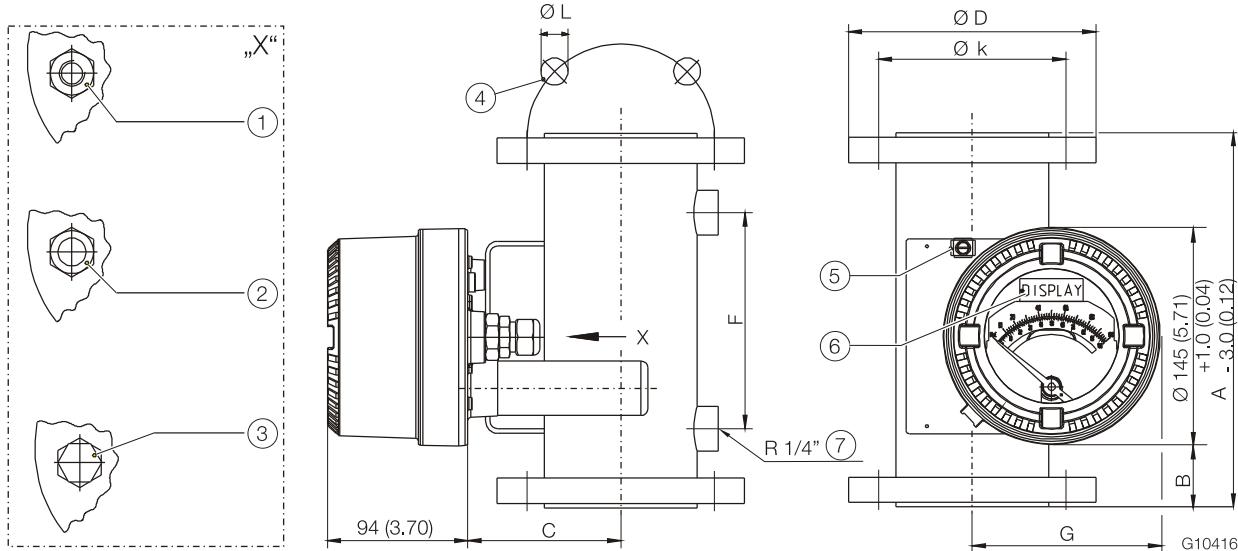


Fig. 24: Dimensions in mm (inch), tolerances ± 2 mm

- (1) Threaded bushing 1/2" NPT (2) Cable gland M20x1.5 (3) Plug M25x1.5 (only for model FAM546-A) (4) N Number of holes
- (5) Earthing terminal (6) LCD display only for FAM546-F (7) Heating jacket connectors 1/2" NPT on request

Device size	Pressure rating	\varnothing D [mm (inch)]	\varnothing k [mm (inch)]	\varnothing L [mm (inch)]	N	A [mm (inch)]	B [mm (inch)]	C [mm (inch)]	F [mm (inch)]	G [mm (inch)]
DN 25	PN 40	115.0 (4.53)	85.0 (3.35)	14.0 (0.55)	4	258.0 (10.16)	45.5 (1.79)	87.0 (3.43)	170.0 (6.69)	118.0 (4.65)
	PN 63 / 100	140.0 (5.51)	100.0 (3.94)	18.0 (0.71)	4	270.0 (10.63)	51.5 (2.03)	87.0 (3.43)	170.0 (6.69)	118.0 (4.65)
1"	CL 150	107.9 (4.25)	79.4 (3.13)	15.9 (0.63)	4	258.0 (10.16)	45.5 (1.79)	87.0 (3.43)	170.0 (6.69)	118.0 (4.65)
	CL 300	123.8 (4.87)	88.9 (3.50)	19.0 (0.75)	4	258.0 (10.16)	45.5 (1.79)	87.0 (3.43)	170.0 (6.69)	118.0 (4.65)
	CL 600	124.0 (4.88)	88.9 (3.50)	19.0 (0.75)	4	270.0 (10.63)	51.5 (2.03)	87.0 (3.43)	170.0 (6.69)	118.0 (4.65)
DN 50	PN 40	165.0 (6.50)	125.0 (4.92)	18.0 (0.71)	4	258.0 (10.16)	45.5 (1.79)	102.0 (4.02)	170.0 (6.69)	118.0 (4.65)
	PN 63	180.8 (7.12)	135.0 (5.31)	22.0 (0.87)	4	270.0 (10.63)	51.5 (2.03)	102.0 (4.02)	170.0 (6.69)	118.0 (4.65)
	PN 100	195.0 (7.68)	145.0 (5.71)	26.0 (1.02)	4	274.0 (10.79)	53.5 (2.11)	102.0 (4.02)	170.0 (6.69)	118.0 (4.65)
2"	CL 150	152.4 (6.00)	120.7 (4.75)	19.0 (0.75)	4	258.0 (10.16)	45.5 (1.79)	102.0 (4.02)	170.0 (6.69)	118.0 (4.65)
	CL 300	165.1 (6.50)	127.0 (5.00)	19.0 (0.75)	8	263.0 (10.35)	48.0 (1.89)	102.0 (4.02)	170.0 (6.69)	118.0 (4.65)
	CL 600	165.1 (6.50)	127.0 (5.00)	19.0 (0.75)	8	284.0 (11.18)	58.5 (2.30)	102.0 (4.02)	170.0 (6.69)	118.0 (4.65)
DN 80	PN 40	200.0 (7.87)	160.0 (6.30)	18.0 (0.71)	8	262.0 (10.31)	47.5 (1.87)	117.0 (4.61)	166.0 (6.54)	130.0 (5.12)
	PN 63	215.0 (8.46)	170.0 (6.69)	22.0 (0.87)	8	270.0 (10.63)	51.5 (2.03)	117.0 (4.61)	166.0 (6.54)	130.0 (5.12)
	PN 100	230.0 (9.06)	180.0 (7.09)	26.0 (1.02)	8	282.0 (11.10)	57.5 (2.26)	117.0 (4.61)	166.0 (6.54)	130.0 (5.12)
3"	CL 150	190.5 (7.50)	152.4 (6.00)	19.0 (0.75)	4	262.0 (10.31)	47.5 (1.87)	117.0 (4.61)	166.0 (6.54)	130.0 (5.12)
	CL 300	209.5 (8.25)	168.1 (6.62)	22.3 (0.88)	8	271.0 (10.67)	52.0 (2.05)	117.0 (4.61)	166.0 (6.54)	130.0 (5.12)
	CL 600	209.5 (8.25)	168.1 (6.62)	22.2 (0.87)	8	292.0 (11.50)	58.5 (2.30)	117.0 (4.61)	166.0 (6.54)	130.0 (5.12)

Device size	Pressure rating	Ø D [mm (inch)]	Ø k [mm (inch)]	Ø L [mm (inch)]	N	A [mm (inch)]	B [mm (inch)]	C [mm (inch)]	F [mm (inch)]	G [mm (inch)]
DN 100	PN 40	235.0 (9.25)	190.0 (7.48)	22.0 (0.87)	8	254.0 (10.00)	43.5 (1.71)	132.0 (5.20)	168.0 (6.61)	144.0 (5.67)
	PN 63	250.0 (9.84)	200.0 (7.87)	26.0 (1.02)	8	266.0 (10.47)	49.5 (1.95)	132.0 (5.20)	168.0 (6.61)	144.0 (5.67)
	PN 100	265.0 (10.43)	210.0 (8.27)	30.0 (1.18)	8	278.0 (10.94)	55.5 (2.19)	132.0 (5.20)	168.0 (6.61)	144.0 (5.67)
4"	CL 150	228.6 (9.00)	190.5 (7.50)	19.0 (0.75)	8	254.0 (10.00)	43.5 (1.71)	132.0 (5.20)	168.0 (6.61)	144.0 (5.67)
	CL 300	254.0 (10.00)	200.1 (7.88)	22.2 (0.87)	8	270.0 (10.63)	51.5 (2.03)	132.0 (5.20)	168.0 (6.61)	144.0 (5.67)
	CL 600	273.0 (10.75)	215.9 (8.50)	25.4 (1.00)	8	290.0 (11.42)	61.5 (2.42)	132.0 (5.20)	168.0 (6.61)	144.0 (5.67)

Weight in kg (lb)

Indicator housing material	Device size (meter tube)			
	DN 25 (1")	DN 50 (2")	DN 80 (3")	DN 100 (4")
Al Si 12	6.8 / (15)	10.7 / (23.6)	15.7 / (34.6)	34 / (75)
Stainless steel 1.4408	9.3 / (20.5)	13.2 / (29.1)	18.2 / (40.1)	36.5 / (80.4)

VA Master FAM540

Metal Cone Variable Area Flowmeter

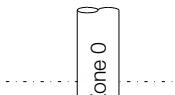
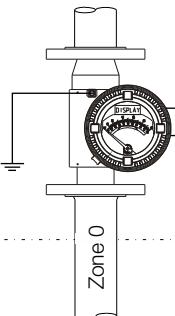
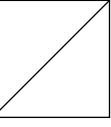
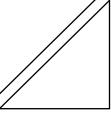
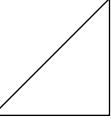
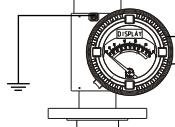
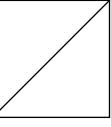
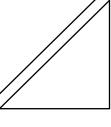
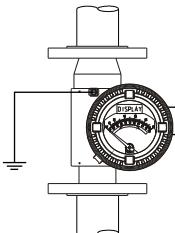
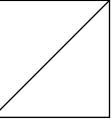
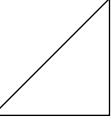
Use in potentially explosive atmospheres according to ATEX and IECEx

NOTE

Further information on the approval of devices for use in potentially explosive atmospheres can be found in the type examination certificates or the relevant certificates at www.abb.com/flow.

Device overview

The devices are designed for maximum versatility. This is achieved through a combination of several types of protection within each device. All devices are suitable for use in potentially explosive atmospheres with combustible dust. For detailed installation instructions and terminal assignments, refer to chapter „Electrical connections“ on page 8.

Zone 1	Zone 2	Standard / No explosion protection	Order code ¹⁾
		  	B1 (Ex nA) A4 (Ex nA, Ex ia) A9 (Ex nA, Ex ia, Ex d)
		 	
		 	G10467

 Potential equalization

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

Ex-marking

NOTE

- Depending on the design, a specific marking in accordance with ATEX or IECEx applies.
- ABB reserves the right to modify the Ex-marking. Refer to the name plate for the exact marking.

Model FAM54xAx (analog indicator without alarm signaling unit)

Labeling	Type of protection	Order code ¹⁾	Limit value table
ATEX	II 1/2 G c II T6...T1	A4, A9, B1	„Table 5“ on page 39
	II 2D c T85 °C to T _{medium} Db		
	II 2D Ex tb IIIC T85 °C... T _{medium} Db		

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

Model FAM54xB/C/Dx (analog indicator with alarm signaling unit)

Labeling	Type of protection	Order code ¹⁾	Limit value table
ATEX	II 1/2G Ex c ia IIC T6 ... T1 Ga/Gb	A4	„Table 2“ on page 36 „Table 4“ on page 38 „Table 2“ on page 36, „Table 4“ on page 38
	II 1/3G Ex c nA IIC T6 ... T1 Ga/Gc		
	II 2D Ex tb IIIC T85 °C... T _{medium} Db		
IECEx	Ex ia IIC T6 ... T1 Ga/Gb	A9	„Table 2“ on page 36 „Table 4“ on page 38 „Table 2“ on page 36, „Table 4“ on page 38
	Ex nA II T6 ... T1		
	Ex tb IIIC T85 °C ... T _{medium} Db		
ATEX	II 1/2G Ex c d IIC T6 ... T1 Ga/Gb	A9	„Table 3“ on page 37 „Table 2“ on page 36 „Table 4“ on page 38 „Table 2“ on page 36, „Table 3“ on page 37, „Table 4“ on page 38
	II 1/2G Ex c ia IIC T6 ... T1 Ga/Gb		
	II 1/3G Ex c nA IIC T6 ... T1 Ga/Gc		
	II 2D Ex tb IIIC T85 °C... T _{medium} Db		
IECEx	Ex d IIC T6 ... T1 Ga /Gb	B1	„Table 3“ on page 37 „Table 2“ on page 36 „Table 4“ on page 38 „Table 2“ on page 36, „Table 3“ on page 37, „Table 4“ on page 38
	Ex ia IIC T6 ... T1 Ga /Gb		
	Ex nA IIC T6 ... T1 Ga /Gb		
	Ex tb IIIC T85 °C ... T _{medium} Db		
ATEX	II 1/3G Ex c nA IIC T6 ... T1 Ga/Gc	B1	„Table 4“ on page 38 „Table 4“ on page 38
	II 2D Ex tb IIIC T85 °C... T _{medium} Db		
IECEx	Ex nA IIC T6 ... T1 Ga / Gc	B1	„Table 4“ on page 38 „Table 4“ on page 38
	Ex tb IIIC T85 °C ... T _{medium} Db		

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

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Metal Cone Variable Area Flowmeter

Model FAM54xE/Fx (analog indicator with transmitter and with or without LCD indicator)				
Labeling	Type of protection	Order code ¹⁾	Limit value table	
ATEX	II 1/2 G Ex c ia IIC T4 ... T1 Ga/Gb	Intrinsic Safety	A4	„Table 1“ on page 35
	II 1/3G Ex c nA ic IIC T6 ... T1 Ga/Gc	Non-sparking materials		
	II 2 D Ex tb IIIC T85 °C ... T _{medium} Db	Dust explosion protection		
IECEx	Ex ia IIC T4 ... T1 Ga / Gb	Intrinsic Safety	A9	„Table 1“ on page 35
	Ex na ic IIC T6 ... T1 Ga / Gc	Non-sparking materials		
	Ex tb IIIC T85 °C ... T _{medium} Db	Dust explosion protection		
ATEX	II 1/2G Ex c d IIC T6 ... T1 Ga/Gb	Flameproof (enclosure)	A9	„Table 1“ on page 35
	II 1/2 G Ex c ia IIC T4 ... T1 Ga/Gb	Intrinsic Safety		
	II 1/3G Ex c nA ic IIC T6 ... T1 Ga/Gc	Non-sparking materials		
	II 2 D Ex tb IIIC T85 °C ... T _{medium} Db	Dust explosion protection		
IECEx	Ex d IIC T6 ... T1 Ga / Gb	Flameproof (enclosure)	B1	„Table 4“ on page 38
	Ex ia IIC T4 ... T1 Ga / Gb	Intrinsic Safety		
	Ex na ic IIC T6 ... T1 Ga / Gc	Non-sparking materials		
	Ex tb IIIC T85 °C ... T _{medium} Db	Dust explosion protection		
ATEX	II 1/3G Ex c nA ic IIC T6 ... T1 Ga/Gc	Non-sparking materials	B1	„Table 4“ on page 38
	II 2 D Ex tb IIIC T85 °C ... T _{medium} Db	Dust explosion protection		
IECEx	Ex na ic IIC T6 ... T1 Ga / Gc	Non-sparking materials		
	Ex tb IIIC T85 °C ... T _{medium} Db	Dust explosion protection		

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

Safety specifications ATEX / IECEx

Special conditions for type of protection "Ex td" (dust explosion protection)

Model FAM54xB/C/D/E/Fx

The following differing temperature data applies to usage in areas with combustible dust.

Order code	Ambient temperature T _{amb}	Maximum permissible measuring medium temperature T _{medium}
A4, A9, B1	-50°C... +60°C	250 °C
	-50°C... +40°C	340 °C
	-50°C... +20°C	430 °C

Table 1: Analog indicator with transmitter, with or without LCD indicator

Model FAM54xE/Fx

Type of protection: flameproof enclosure, intrinsic safety, non-sparking equipment, dust explosion protection.

Order code ¹⁾	Labeling	Terminals	Electrical values	T _{amb} -20 °C ... (-50 °C ...)	Temp. class	T _{medium Maximum}	Insula-tion	Heating jacket
A4, A9	ATEX: II 1/2 G Ex c ia IIC T4 ... T1 Ga/Gb II 2 D Ex tb IIIC T85 °C... T _{medium} Db	31 / 32 ²⁾	U _i = 30 V I _i = 110 mA P _i = 770 mW C _i = 5.3 nF L _i = 266 µH	40 °C	T1	440 °C	No	No
				40 °C	T1	375 °C	yes	No
				40 °C	T1	260 °C	yes	yes
				50 °C	T1	300 °C	yes	No
				50 °C	T2	290 °C	yes	No
				50 °C	T2	220°C	yes	yes
				60 °C	T2	320 °C	No	No
	IECEx: Ex ia IIC T4 ... T1 Ga / Gb Ex tb IIIC T85 °C ... T _{medium} Db	41 / 42 ²⁾	U _i = 30 V I _i = 30 mA P _i = 115 mW C _i = 4.8 nF L _i = 133 µH	60 °C	T2	230 °C	yes	No
				60 °C	T3	170 °C	yes	yes
				70 °C	T3	195 °C	No	No
				70 °C	T3	150 °C	yes	No
				70 °C	T4	125 °C	yes	yes
				40 °C	T1	440 °C	No	No
				40 °C	T1	375 °C	yes	No
A9	ATEX: II 1/2G Ex c d IIC T6 ... T1 Ga/Gb II 2 D Ex tb IIIC T85 °C... T _{medium} Db	31 / 32 ³⁾	U _{max} = 46 V	40 °C	T1	260 °C	yes	yes
				50 °C	T1	300 °C	yes	No
				50 °C	T2	290 °C	yes	No
				50 °C	T2	220°C	yes	yes
				60 °C	T2	320 °C	No	No
				60 °C	T2	230 °C	yes	No
				60 °C	T3	170 °C	yes	yes
	IECEx: Ex d IIC T6 ... T1 Ga / Gb Ex tb IIIC T85 °C ... T _{medium} Db	41 / 42 ³⁾	U _{max} = 30 V I _{max} = 30 mA P _{max} = 115 mW	60 °C	T4	130 °C	yes	yes
				60 °C	T5	95 °C	yes	yes
				60 °C	T6	80 °C	yes	yes
				40 °C	T1	440 °C	No	No
				40 °C	T1	375 °C	yes	No
				40 °C	T1	260 °C	yes	yes
				50 °C	T1	300 °C	yes	No
A4, A9, B1	ATEX: II 1/3G Ex c nA ic IIC T6 ... T1 Ga/Gc II 2 D Ex tb IIIC T85 °C... T _{medium} Db	31 / 32 ³⁾	U _{max} = 46 V	50 °C	T2	290 °C	yes	No
				50 °C	T2	220°C	yes	yes
				60 °C	T2	320 °C	No	No
				60 °C	T2	230 °C	yes	No
				60 °C	T3	170 °C	yes	yes
				70 °C	T3	195 °C	No	No
				70 °C	T3	150 °C	yes	No
	IECEx: Ex nA ic IIC T6 ... T1 Ga / Gc Ex tb IIIC T85 °C ... T _{medium} Db	41 / 42 ³⁾	U _{max} = 30 V I _{max} = 30 mA P _{max} = 115 mW	70 °C	T4	130 °C	yes	yes

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

2) For connection to an intrinsically safe circuit.

3) For connection to a non-intrinsically safe circuit. If the device is to be operated subsequently with type of protection "intrinsically safe", then U_{max} = 60 V may not be exceeded.

VA Master FAM540

Metal Cone Variable Area Flowmeter

Table 2: Analog indicator with alarm signaling unit

Model FAM54xB/C/Dx

Type of protection: intrinsic safety, dust explosion protection.

Order code ¹⁾	Labeling	Terminals	Electrical values	T _{amb} -20 °C ... (-50 °C ...)	Temp. class	T _{medium Maximum}	Insula-tion	Heating jacket
A4, A9	ATEX: II 1/2G Ex c ia IIC T6 ... T1 Ga/Gb II 2D Ex tb IIIC T85 °C... T _{medium} Db	41 / 42 ²⁾ 51 / 52 ²⁾	U _i = 16 V I _i = 25 mA P _i = 64 mW C _i = 50 nF L _i = 250 µH	40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 70 °C 60 °C	T1 T1 T1 T1 T2 T2 T2 T2 T3 T3 T3 T3 T4 T5 T6	440 °C 375 °C 260 °C 300 °C 290 °C 220°C 320 °C 230 °C 170 °C 195 °C 150 °C 130 °C 95 °C 80 °C	No yes yes yes yes yes No yes yes No yes yes yes yes	No No yes yes No No No No yes No No No yes yes yes
	IECEx: Ex ia IIC T6 ... T1 Ga / Gb Ex tb IIIC T85 °C ... T _{medium} Db	41 / 42 ²⁾ 51 / 52 ²⁾	U _i = 16 V I _i = 52 mA P _i = 169 mW C _i = 50 nF L _i = 250 µH	40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 70 °C 60 °C	T1 T1 T1 T1 T2 T2 T2 T2 T3 T3 T3 T3 T4 T5 T6	440 °C 375 °C 260 °C 300 °C 290 °C 220°C 320 °C 230 °C 170 °C 195 °C 150 °C 130 °C 60 °C 60 °C	No yes yes yes yes yes No yes yes No yes yes yes yes	No No yes No No yes No No yes No No yes yes yes
		41 / 42 ²⁾ 51 / 52 ²⁾	U _i = 16 V I _i = 76 mA P _i = 242 mW C _i = 50 nF L _i = 250 µH	40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 40 °C 30 °C	T1 T1 T2 T2 T2 T2 T2 T3 T4 T4 T4 T5 T6	440 °C 310 °C 190 °C 340 °C 230 °C 230°C 160 °C 120 °C 100 °C 60 °C 60 °C 30 °C	No yes yes No yes No yes No yes No yes yes yes	No No yes No No No yes No No yes yes yes

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

2) For connection to an intrinsically safe circuit.

Table 3: Analog indicator with alarm signaling unit

Model FAM54xB/C/Dx

Type of protection: flameproof enclosure, dust explosion protection.

Order code ¹⁾	Labeling	Terminals	Electrical values	T _{amb} -20 °C ... (-50 °C ...)	Temp. class	T _{medium Maximum}	Insula-tion	Heating jacket
A9	ATEX: II 1/2G Ex c d IIC T6 ... T1 Ga/Gb II 2D Ex tb IIIC T85 °C... T _{medium} Db IECEx: Ex d IIC T6 ... T1 Ga / Gb Ex tb IIIC T85 °C ... T _{medium} Db	41 / 42 ²⁾ 51 / 52 ²⁾	U _{max} = 16 V I _{max} = 25 mA P _{max} = 64 mW	40 °C	T1	440 °C	No	No
				40 °C	T1	375 °C	yes	No
				40 °C	T1	260 °C	yes	yes
				50 °C	T1	300 °C	yes	No
				50 °C	T2	290 °C	yes	No
				50 °C	T2	220°C	yes	yes
				60 °C	T2	320 °C	No	No
				60 °C	T2	230 °C	yes	No
				60 °C	T3	170 °C	yes	yes
				70 °C	T3	195 °C	No	No
				70 °C	T3	150 °C	yes	No
				70 °C	T4	130 °C	yes	yes
				70 °C	T5	95 °C	yes	yes
				60 °C	T6	80 °C	yes	yes
		41 / 42 ²⁾ 51 / 52 ²⁾	U _{max} = 16 V I _{max} = 52 mA P _{max} = 169 mW	40 °C	T1	440 °C	No	No
				40 °C	T1	375 °C	yes	No
				40 °C	T1	260 °C	yes	yes
				50 °C	T1	300 °C	yes	No
				50 °C	T2	290 °C	yes	No
				50 °C	T2	220°C	yes	yes
				60 °C	T2	320 °C	No	No
				60 °C	T2	230 °C	yes	No
				60 °C	T3	170 °C	yes	yes
				70 °C	T3	195 °C	No	No
				70 °C	T3	150 °C	yes	No
				70 °C	T4	130 °C	yes	yes
				60 °C	T5	60 °C	yes	yes
				50 °C	T5	90 °C	No	yes
				40 °C	T6	60 °C	yes	yes
		41 / 42 ²⁾ 51 / 52 ²⁾	U _{max} = 16 V I _{max} = 76 mA P _{max} = 242 mW	40 °C	T1	440 °C	No	No
				40 °C	T1	310 °C	yes	No
				40 °C	T2	190 °C	yes	yes
				50 °C	T2	340 °C	No	No
				50 °C	T2	230 °C	yes	yes
				60 °C	T2	230°C	No	No
				60 °C	T3	160 °C	yes	yes
				70 °C	T4	120 °C	No	No
				70 °C	T4	100 °C	yes	yes
				40 °C	T5	60 °C	yes	yes
				30 °C	T6	30 °C	yes	yes

- 1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.
- 2) For connection to a non-intrinsically safe circuit. If the device is to be operated subsequently with type of protection "intrinsically safe", then U_{max} = 60 V may not be exceeded.

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Metal Cone Variable Area Flowmeter

Table 4: Analog indicator with alarm signaling unit

Model FAM54xB/C/Dx

Type of protection: non-sparking materials, dust explosion protection.

Order code ¹⁾	Labeling	Terminals	Electrical values	T _{amb} -20 °C ... (-50 °C ...)	Temp. class	T _{medium Maximum}	Insula-tion	Heating jacket
A4, A9, B1	ATEX: II 1/3G Ex c nA IIC T6 ... T1 Ga/Gc II 2D Ex tb IIIC T85 °C... T _{medium} Db IECEx: Ex na IIC T6 ... T1 Ga / Gc Ex tb IIIC T85 °C ... T _{medium} Db	41 / 42 ²⁾ 51 / 52 ²⁾	U _{max} = 16 V I _{max} = 25 mA P _{max} = 64 mW	40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 70 °C 60 °C	T1 T1 T1 T1 T2 T2 T2 T2 T3 T3 T3 T4 T5 T6	440 °C 375 °C 260 °C 300 °C 290 °C 220°C 320 °C 230 °C 170 °C 195 °C 150 °C 130 °C 95 °C 80 °C	No yes yes yes yes yes No yes yes No yes yes yes yes	No No yes yes No No No No yes No No yes yes yes
		41 / 42 ²⁾ 51 / 52 ²⁾	U _{max} = 16 V I _{max} = 52 mA P _{max} = 169 mW	40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 70 °C 60 °C	T1 T1 T1 T1 T2 T2 T2 T2 T3 T3 T3 T4 T5 T6	440 °C 375 °C 260 °C 300 °C 290 °C 220°C 320 °C 230 °C 170 °C 195 °C 150 °C 130 °C 60 °C 60 °C	No yes yes yes yes yes No yes yes No yes yes yes yes	No No yes No No yes No No yes No No yes yes yes
A4, A9, B1	ATEX: II 1/3G Ex c nA IIC T6 ... T1 Ga/Gc II 2D Ex tb IIIC T85 °C... T _{medium} Db IECEx: Ex na IIC T6 ... T1 Ga / Gc Ex tb IIIC T85 °C ... T _{medium} Db	41 / 42 ²⁾ 51 / 52 ²⁾	Umax= 16 V Imax = 76 mA Pmax = 242 mW	40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 40 °C 30 °C	T1 T1 T2 T2 T2 T2 T3 T3 T3 T4 T4 T4 T5 T6	440 °C 310 °C 190 °C 340 °C 230 °C 230°C 160 °C 120 °C 100 °C 60 °C 60 °C 60 °C 30 °C	No yes yes No yes No yes No yes yes No yes yes yes	No No yes No yes No yes No yes yes No yes yes yes

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

2) For connection to a non-intrinsically safe circuit. If the device is to be operated subsequently with type of protection "intrinsically safe", then U_{max} = 60 V may not be exceeded.

Table 5: Analog indicator without alarm signaling unit

Model FAM54xAx

Type of protection: constructional safety, dust explosion protection

Order code ¹⁾	Labeling	Terminals	Electrical values	T _{amb} -20 °C ... (-50 °C ...)	Temp. class	T _{medium} Maximum	Insula-tion	Heating jacket
A4, A9, B1	ATEX: II 1/2 G c II T6...T1 II 2D c T85 °C to T _{medium} II 2D Ex tb IIIC T85 °C... T _{medium} Db IECEx: Ex tb IIIC T85 °C ... T _{medium} Db	n.a.	n.a	70 °C 70 °C 70 °C 70 °C 70 °C 70 °C	T1 T2 T3 T4 T5 T6	440 °C 290 °C 190 °C 130 °C 95 °C 80°C	yes yes yes yes yes yes	yes yes yes yes yes yes

Electrical connections

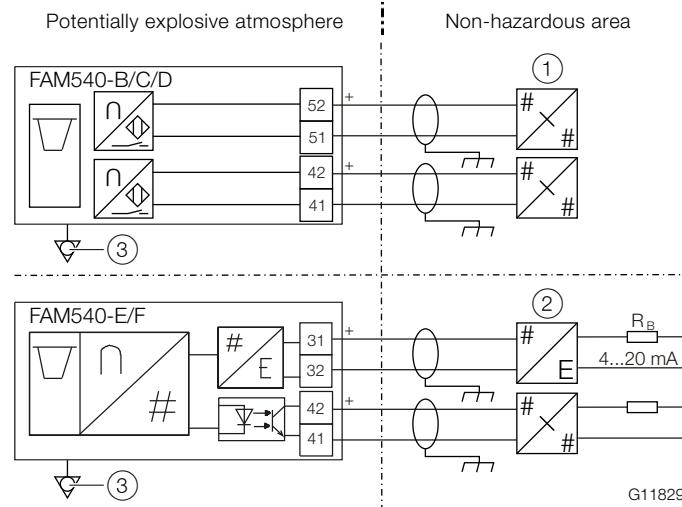


Fig. 25: ATEX / IECEx electrical connection

- (1) NAMUR switching amplifier (2) Safety barrier
- (3) Potential equalization

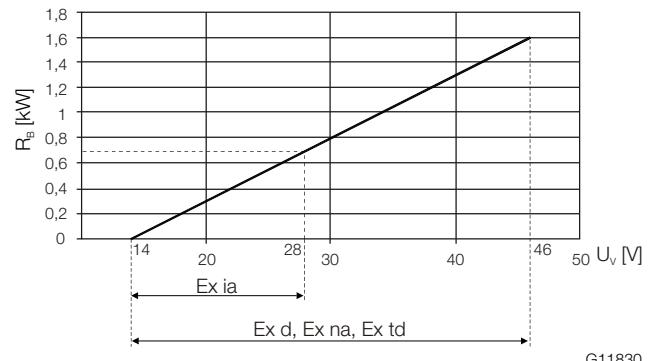


Fig. 26: Terminals 31 / 32, power supply / load

U_V Power supply

R_B Maximum permissible load in the power supply (e.g. indicator)

The minimum voltage U_V = 0 V is based on a load of 0 Ω.

Terminal	Function
31 / 32	Power supply / current output / HART output
41 / 42	Programmable binary output
	Alarm signaling unit (min.)
51 / 52	Alarm signaling unit (max.)

VA Master FAM540

Metal Cone Variable Area Flowmeter

Signal cable

The Ex calculations are based on temperatures of 80 °C (176 °F) at the cable input. For this reason, cables with a specification of 80 °C (176 °F) must be used.

For cables limited to 70 °C (158 °F), a maximum ambient temperature of $T_{amb} = 60 °C$ (140 °F) applies.

The resulting new maximum measuring medium temperatures are determined as follows:

- Calculate a new ambient temperature:
 $T_{amb\ new} = T_{amb} + 10 °C$ (18 °F).
- Use the calculated ambient temperature $T_{amb\ new}$ to determine the new associated permissible measuring medium temperatures in the tables.
- Please use the limit value tables with the original ambient temperature T_{amb} to determine the relevant temperature class. See chapter „Safety specifications ATEX / IECEx“ on page 34, Tables 1 through 5.

Example:

- $T_{amb} = 50 °C$ (122 °F) becomes
 $T_{amb\ new} = 60 °C$ (140 °F).
- Determine the measuring medium temperature
 $T_{amb} = 60 °C$ (140 °F).
- Determine the temperature class for
 $T_{amb} = 50 °C$ (122 °F).

Earthing

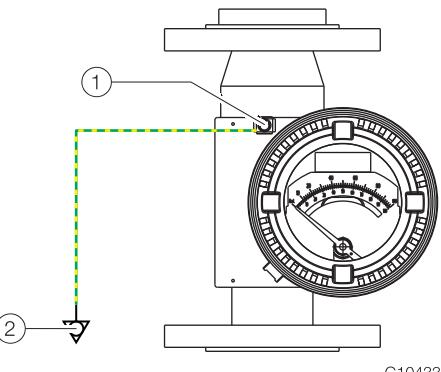


Fig. 27: Earthing
① Earthing terminal
② Potential equalization in accordance with EN 60079-0

The FAM540 housing must be correctly earthed in order to ensure proper function and safe operation.

Copper wires with a minimum cross-section of 6 mm² (AWG 10) must be used to connect to the potential equalization.

i NOTE

The operator must ensure that when connecting the protective earth (PE), there are no potential differences between protective earth (PE) and potential equalization, even in the event of a fault.

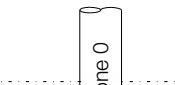
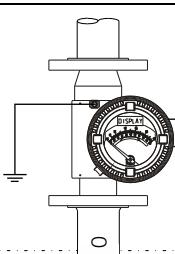
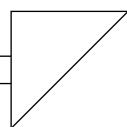
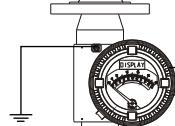
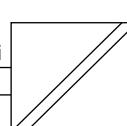
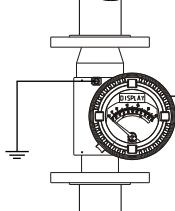
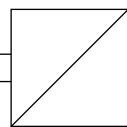
Use in potentially explosive atmospheres in accordance with FM and cCSAus

NOTE

Further information on the approval of devices for use in potentially explosive atmospheres can be found in the type examination certificates or the relevant certificates at www.abb.com/flow.

Device overview

The devices are designed for maximum versatility. This is achieved through a combination of several types of protection within each device. All devices are suitable for use in potentially explosive atmospheres with combustible dust. For detailed installation instructions and terminal assignments, refer to chapter „Electrical connections“ on page 8.

Class 1 Division 1 / Zone 1	Class 1 Division 2 / Zone 2	Standard / No explosion protection	Order code ¹⁾
			F4 (NI, IS)
			F3 (NI, IS, XP)
			G11831

 **Potential equalization**

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

VA Master FAM540

Metal Cone Variable Area Flowmeter

Ex-marking

NOTE

- Depending on the design, a specific marking in accordance with FM applies.
- ABB reserves the right to modify the Ex-marking. Refer to the name plate for the exact marking.

Model FAM54xAx (analog indicator without alarm signaling unit and model FAM54xB/C/Dx (analog indicator with alarm signaling unit)

Labeling		Type of protection	Order code¹⁾	Limit value table
FM	XP / CL I / DIV 1 / GP ABCD / T6...T1 CL I, ZN 1 AEx d IIC T6...T1	Explosionproof	F3	„Table 2“ on page 44
	IS / CL I,II,III / DIV 1 / GP ABCDEFG / T6..T1 CL I, ZN 1 AEx ia IIC T6...T1	Intrinsic Safety	F3, F4	„Table 1“ on page 43, „Table 2“ on page 44
	DIP / CL II, III / DIV 1 / GP EFG / T6...T1	Dust-Ignitionproof		
	NI /CL I,II / DIV 2 / GP ABCDFG / T5...T1 NI / CL III T5...T1 CL II, ZN 2 AEx nA II T5...T1	Non-Incendive	F3, F4	„Table 1“ on page 43, „Table 2“ on page 44, „Table 3“ on page 45
cCSAus	XP / CL I / DIV 1 / GP BCD / T6...T1 Ex d IIC T6...T1	Explosionproof	F3	„Table 2“ on page 44
	IS / CL I,II,III / DIV 1 / GP ABCDEFG / T6..T1 Ex ia IIC T6...T1	Intrinsic Safety	F3, F4	„Table 1“ on page 43,
	DIP / CL II, III / DIV 1 / GP EFG / T6...T1 DIP A21 TA 85°C to T _{medium}	Dust-Ignitionproof	F3, F4	„Table 1“ on page 43, „Table 2“ on page 44, „Table 3“ on page 45
	NI /CL I,II / DIV 2 / GP ABCDFG / T5...T1 NI / CL III T5...T1 Ex nA II T5...T1	Non-Incendive	F3, F4	„Table 3“ on page 45

1) Order code "Explosion protection and approvals" (version digit No. 9, 10); refer to chapter „Ordering Information“ on page 50.

Model FAM54xE/Fx (analog indicator with transmitter / with or without LCD display)

Labeling		Type of protection	Order code¹⁾	Limit value table	
FM	XP / CL I / DIV 1 / GP ABCD / T6...T1 CL I, ZN 1 AEx d IIC T6...T1	Explosionproof	F3	„Table 4“ on page 46	
	IS / CL I,II,III / DIV 1 / GP ABCDEFG / T4..T1 CL I, ZN 1 AEx ia IIC T4...T1	Intrinsic Safety	F3, F4		
	DIP / CL II, III / DIV 1 / GP EFG / T6...T1	Dust-Ignitionproof			
	NI /CL I,II / DIV 2 / GP ABCDFG / T4...T1 NI / CL III T4...T1 CL II, ZN 2 AEx nA [nL] IIC T6...T1	Non-Incendive			
	XP / CL I / DIV 1 / GP BCD / T6...T1 Ex d IIC T6...T1	Explosionproof	F3		
	IS / CL I,II,III / DIV 1 / GP ABCDEFG / T4..T1 Ex ia IIC T4...T1	Intrinsic Safety	F3, F4		
cCSAus	DIP / CL II, III / DIV 1 / GP EFG / T6...T1 DIP A21 TA 85°C to T _{medium}	Dust-Ignitionproof			
	NI /CL I,II / DIV 2 / GP ABCDFG / T4...T1 NI / CL III T4...T1 Ex nA [nL] IIC T6...T1	Non-Incendive			

1) Order code "Explosion protection and approvals" (version digit No. 9, 10); refer to chapter „Ordering Information“ on page 50.

Safety specifications FM, cCSAus

Table 1: Analog indicator with alarm signaling unit (temperature data for FM in °F, for cCSAus in °C)

Order code ¹⁾	Labeling	Terminal s	Electrical values	T _{amb} -58 °F ...	T _{amb} -50 °C ...	Temp. class	T _{medium Maximum}	Insula-tion	Heating jacket
F3, F4	FM IS / CL I,II,III / DIV 1 / GP ABCDEFG / T6...T1 ²⁾ DIP / CL II, III / DIV 1 / GP EFG / T6...T1 CL I, ZN 1 AEx ia IIC T6...T1 cCSAus IS / CL I,II,III / DIV 1 / GP ABCDEFG / T6...T1 ²⁾ DIP / CL II, III / DIV 1 / GP EFG / T6...T1	41 / 42 ³⁾ 51 / 52 ³⁾	U _i = 16 V I _i = 25 mA P _i = 64 mW C _i = 50 nF L _i = 250 µH	104 °F	40 °C	T1	824 °F 440 °C	No	No
				104 °F	40 °C	T1	707 °F 375 °C	yes	No
				104 °F	40 °C	T1	500 °F 260 °C	yes	yes
				122 °F	50 °C	T1	572 °F 300 °C	yes	No
				122 °F	50 °C	T2	554 °F 290 °C	yes	No
				122 °F	50 °C	T2	428 °F 220 °C	yes	yes
				140 °F	60 °C	T2	608 °F 320 °C	No	No
				140 °F	60 °C	T2	446 °F 230 °C	yes	No
				140 °F	60 °C	T3	338 °F 170 °C	yes	yes
				158 °F	70 °C	T3	383 °F 195 °C	No	No
				158 °F	70 °C	T3	302 °F 150 °C	yes	No
				158 °F	70 °C	T4	266 °F 130 °C	yes	yes
				158 °F	70 °C	T5	203 °F 95 °C	yes	yes
				140 °F	60 °C	T6	176 °F 80 °C	yes	yes
		41 / 42 ³⁾ 51 / 52 ³⁾	U _i = 16 V I _i = 52 mA P _i = 169 mW C _i = 50 nF L _i = 250 µH	104 °F	40 °C	T1	824 °F 440 °C	No	No
				104 °F	40 °C	T1	707 °F 375 °C	yes	No
				104 °F	40 °C	T1	500 °F 260 °C	yes	yes
				122 °F	50 °C	T1	572 °F 300 °C	yes	No
				122 °F	50 °C	T2	554 °F 290 °C	yes	No
				122 °F	50 °C	T2	428 °F 220 °C	yes	yes
				140 °F	60 °C	T2	608 °F 320 °C	No	No
				140 °F	60 °C	T2	446 °F 230 °C	yes	No
				140 °F	60 °C	T3	338 °F 170 °C	yes	yes
				158 °F	70 °C	T3	383 °F 195 °C	No	No
				158 °F	70 °C	T3	302 °F 150 °C	yes	No
				158 °F	70 °C	T4	266 °F 130 °C	yes	yes
				140 °F	60 °C	T5	140 °F 60 °C	yes	yes
				122 °F	50 °C	T5	194 °F 90 °C	No	yes
				104 °F	40 °C	T6	140 °F 60 °C	yes	yes
	Ex ia IIC T6...T1 DIP A21 TA 85°C to T _{medium}	41 / 42 ³⁾ 51 / 52 ³⁾	U _i = 16 V I _i = 76 mA P _i = 242 mW C _i = 50 nF L _i = 250 µH	104 °F	40 °C	T1	824 °F 440 °C	No	No
				104 °F	40 °C	T1	590 °F 310 °C	yes	No
				104 °F	40 °C	T2	374 °F 190 °C	yes	yes
				122 °F	50 °C	T2	644 °F 340 °C	No	No
				122 °F	50 °C	T2	446 °F 230 °C	yes	yes
				140 °F	60 °C	T2	446 °F 230 °C	No	No
				140 °F	60 °C	T3	320 °F 160 °C	yes	yes
				158 °F	70 °C	T4	248 °F 120 °C	No	No
				158 °F	70 °C	T4	212 °F 100 °C	yes	yes
				104 °F	40 °C	T5	140 °F 60 °C	yes	yes
				86 °F	30 °C	T6	86 °F 30 °C	yes	yes

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

2) "IS" installation in accordance with Installation Drawing SDM-10-A0253.

3) For connection to an intrinsically safe circuit.

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Table 2: Analog indicator with alarm signaling unit (temperature data for FM in °F, for cCSAus in °C)

Order code ¹⁾	Labeling	Terminals	Electrical values	T _{amb} -58 °F ...	T _{amb} -50 °C ...	Temp. class	T _{medium} Maximum	Insula-tion	Heating jacket
F3	FM XP / CL I / DIV 1 / GP ABCD / T6...T1 DIP / CL II, III / DIV 1 / GP EFG / T6...T1 CL I, ZN 1 AEx d IIC T6...T1 cCSAus XP / CL I / DIV 1 / GP BCD / T6...T1 DIP / CL II, III / DIV 1 / GP EFG / T6...T1 Ex d IIC T6...T1 DIP A21 TA 85°C to T _{medium}	41 / 42 ²⁾ 51 / 52 ²⁾	U _{max} = 16 V I _{max} = 25 mA P _{max} = 64 mW	104 °F	40 °C	T1	824 °F	440 °C	No
				104 °F	40 °C	T1	707 °F	375 °C	yes
				104 °F	40 °C	T1	500 °F	260 °C	yes
				122 °F	50 °C	T1	572 °F	300 °C	yes
				122 °F	50 °C	T2	554 °F	290 °C	yes
				122 °F	50 °C	T2	428 °F	220°C	yes
				140 °F	60 °C	T2	608 °F	320 °C	No
				140 °F	60 °C	T2	446 °F	230 °C	yes
				140 °F	60 °C	T3	338 °F	170 °C	yes
				158 °F	70 °C	T3	383 °F	195 °C	No
				158 °F	70 °C	T3	302 °F	150 °C	yes
				158 °F	70 °C	T4	266 °F	130 °C	yes
				158 °F	70 °C	T5	203 °F	95 °C	yes
				140 °F	60 °C	T6	176 °F	80 °C	yes
				104 °F	40 °C	T1	824 °F	440 °C	No
				104 °F	40 °C	T1	707 °F	375 °C	yes
				104 °F	40 °C	T1	500 °F	260 °C	yes
				122 °F	50 °C	T1	572 °F	300 °C	yes
				122 °F	50 °C	T2	554 °F	290 °C	yes
				122 °F	50 °C	T2	428°F	220°C	yes
				140 °F	60 °C	T2	608 °F	320 °C	No
				140 °F	60 °C	T2	446 °F	230 °C	yes
				140 °F	60 °C	T3	338 °F	170 °C	yes
				158 °F	70 °C	T3	383 °F	195 °C	No
				158 °F	70 °C	T3	302 °F	150 °C	yes
				158 °F	70 °C	T4	266 °F	130 °C	yes
				140 °F	60 °C	T5	140 °F	60 °C	yes
				122 °F	50 °C	T5	194 °F	90 °C	No
				104 °F	40 °C	T6	140 °F	60 °C	yes
				104 °F	40 °C	T1	824 °F	440°C	No
				104 °F	40 °C	T1	590 °F	310 °C	yes
				104 °F	40 °C	T2	374 °F	190 °C	yes
				122 °F	50 °C	T2	644 °F	340 °C	No
				122 °F	50 °C	T2	446 °F	230 °C	yes
				140 °F	60 °C	T2	446°F	230 °C	No
				140 °F	60 °C	T3	320 °F	160 °C	yes
				158 °F	70 °C	T4	248 °F	120 °C	No
				158 °F	70 °C	T4	212 °F	100 °C	yes
				104 °F	40 °C	T5	140 °F	60 °C	yes
				86 °F	30 °C	T6	86 °F	30 °C	yes

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

2) For connection to a non-intrinsically safe circuit.

Table 3: Analog indicator with / without alarm signaling unit (temperature data for FM in °F, for cCSAus in °C)

Order code ¹⁾	Labeling	Terminals	Electrical values	T _{amb} -58 °F ...	T _{amb} -50 °C ...	Temp. class	T _{medium} Maximum	Insula-tion	Heating jacket	
F3 ²⁾ , F4 ²⁾	FM NI / CL I,II / DIV 2 / GP ABCDFG / T5...T1 NI / CL III / T5...T1 CL II, ZN 2 AEx nA II T5...T1 cCSAus NI / CL I,II / DIV 2 / GP ABCDFG / T5...T1 NI / CL III / T5...T1 Ex nA II T6...T1 DIP A21 TA 85°C to T _{medium}	41 / 42 ³⁾ 51 / 52 ³⁾	U _{max} = 16 V I _{max} = 25 mA P _{max} = 64 mW	104 °F 104 °F 104 °F 122 °F 122 °F 122 °F 140 °F 140 °F 140 °F 158 °F 158 °F 158 °F 104 °F 104 °F 104 °F 122 °F 122 °F 122 °F 140 °F 140 °F 140 °F 158 °F 158 °F 158 °F 140 °F 122 °F	40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 60 °C 50 °C	T1 T1 T1 T1 T2 T2 T2 T2 T2 T3 T3 T3 T1 T1 T1 T1 T1 T2 T2 T2 T3 T3 T3 T4 T4 T4 T5 T5	824 °F 707 °F 500 °F 572 °F 554 °F 428°F 608 °F 446 °F 338 °F 383 °F 302 °F 266 °F 203 °F 824 °F 707 °F 500 °F 572 °F 554 °F 428°F 608 °F 446 °F 338 °F 383 °F 302 °F 266 °F 140 °F 194 °F	440 °C 375 °C 260 °C 300 °C 290 °C 220°C 320 °C 230 °C 170 °C 195 °C 150 °C 130 °C 95 °C 440 °C 375 °C 260 °C 300 °C 290 °C 220°C 320 °C 230 °C 170 °C 195 °C 150 °C 130 °C 60 °C 90 °C	No yes yes yes yes yes No No yes No No yes yes No No yes yes yes yes yes yes yes yes yes yes yes yes yes yes yes yes no yes	No No yes yes No yes No No yes No No yes yes No No yes No No yes No No yes No No yes yes yes yes yes yes yes yes
		41 / 42 ³⁾ 51 / 52 ³⁾	U _{max} = 16 V I _{max} = 52 mA P _{max} = 169 mW	104 °F 104 °F 104 °F 122 °F 122 °F 122 °F 140 °F 140 °F 140 °F 158 °F 158 °F 158 °F 104 °F 104 °F 104 °F 122 °F 122 °F 122 °F 140 °F 140 °F 140 °F 158 °F 158 °F 158 °F 140 °F 122 °F	40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 60 °C 50 °C	T1 T1 T1 T1 T2 T2 T2 T2 T2 T3 T3 T3 T1 T1 T1 T1 T1 T2 T2 T2 T3 T3 T3 T4 T4 T4 T5 T5	824 °F 707 °F 500 °F 572 °F 554 °F 428°F 608 °F 446 °F 338 °F 383 °F 302 °F 266 °F 203 °F 824 °F 707 °F 500 °F 572 °F 554 °F 428°F 608 °F 446 °F 338 °F 383 °F 302 °F 266 °F 140 °F 194 °F	440 °C 375 °C 260 °C 300 °C 290 °C 220°C 320 °C 230 °C 170 °C 195 °C 150 °C 130 °C 95 °C 440 °C 375 °C 260 °C 300 °C 290 °C 220°C 320 °C 230 °C 170 °C 195 °C 150 °C 130 °C 60 °C 90 °C	No yes yes yes yes yes No No yes No No yes yes No No yes No No yes No No yes No No yes yes yes yes yes yes yes yes	No No yes yes No yes No No yes No No yes yes No No yes No No yes No No yes No No yes yes yes yes yes yes yes yes
		41 / 42 ³⁾ 51 / 52 ³⁾	U _{max} = 16 V I _{max} = 76 mA P _{max} = 242 mW	104 °F 104 °F 104 °F 122 °F 122 °F 122 °F 140 °F 140 °F 140 °F 158 °F 158 °F 158 °F 104 °F	40 °C 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C 60 °C 60 °C 70 °C 70 °C 70 °C 40 °C	T1 T1 T2 T2 T2 T2 T3 T3 T3 T4 T4 T4 T5	824 °F 590 °F 374 °F 644 °F 446°F 320 °F 248 °F 212 °F 140 °F	440 °C 310 °C 190 °C 340 °C 230 °C 160 °C 120 °C 100 °C 60 °C	No yes yes no yes yes no yes yes yes yes yes yes	No No yes yes no yes no yes yes yes yes yes yes

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

2) For connection in Division 2 or Zone 2.

3) For connection to a non-intrinsically safe circuit.

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Table 4: Analog indicator with transmitter, with or without LCD indicator (temperature data for FM in °F, for cCSAus in °C)

Order code ¹⁾	Labeling	Terminals	Electrical values	T _{amb} -58 °F ...	T _{amb} -50 °C ...	Temp. class	T _{medium} Maximum	Insula- tion	Heating jacket	
F3, F4	FM IS / CL I,II,III / DIV 1 / GP ABCDEFG / T4...T1 DIP / CL II, III / DIV 1 / GP EFG / T6...T1 CL I, ZN 1 AEx ia IIC T4...T1	31 / 32 ²⁾ ³⁾	$U_i = 30 \text{ V}$ $I_i = 110 \text{ mA}$ $P_i = 770 \text{ mW}$ $C_i = 5.3 \text{ nF}$ $L_i = 266 \mu\text{H}$	104 °F	40 °C	T1	824 °F	440 °C	No	No
				104 °F	40 °C	T1	707 °F	375 °C	yes	No
				104 °F	40 °C	T1	500 °F	260 °C	yes	yes
				122 °F	50 °C	T1	572 °F	300 °C	yes	No
				122 °F	50 °C	T2	554 °F	290 °C	yes	No
				122 °F	50 °C	T2	428°F	220°C	yes	yes
				140 °F	60 °C	T2	608 °F	320 °C	No	No
F3	cCSAus IS / CL I,II,III / DIV 1 / GP ABCDEFG / T4...T1 ²⁾ DIP / CL II, III / DIV 1 / GP EFG / T6...T1 Ex ia IIC T6...T1 DIP A21 TA 85°C to T _{medium}	41 / 42 ²⁾	$U_i = 30 \text{ V}$ $I_i = 30 \text{ mA}$ $P_i = 115 \text{ mW}$ $C_i = 4.8 \text{ nF}$ $L_i = 133 \mu\text{H}$	140 °F	60 °C	T2	446 °F	230 °C	yes	No
				140 °F	60 °C	T3	338 °F	170 °C	yes	yes
				158 °F	70 °C	T3	383 °F	195 °C	No	No
				158 °F	70 °C	T3	302 °F	150 °C	yes	No
				158 °F	70 °C	T4	257 °F	125 °C	yes	yes
				104 °F	40 °C	T1	824 °F	440 °C	No	No
				104 °F	40 °C	T1	707 °F	375 °C	yes	No
	FM XP / CL I / DIV 1 / GP ABCD / T6...T1 DIP / CL II, III / DIV 1 / GP EFG / T6...T1 CL I, ZN 1 AEx d IIC T6...T1	31 / 32 ⁴⁾	$U_{max} = 46 \text{ V}$	104 °F	40 °C	T1	500 °F	260 °C	yes	yes
				122 °F	50 °C	T1	572 °F	300 °C	yes	No
				122 °F	50 °C	T2	554 °F	290 °C	yes	No
				122 °F	50 °C	T2	428°F	220 °C	yes	yes
				140 °F	60 °C	T2	608 °F	320 °C	No	No
				140 °F	60 °C	T2	446 °F	230 °C	yes	No
				140 °F	60 °C	T3	338 °F	170 °C	yes	yes
	cCSAus XP / CL I / DIV 1 / GP BCD / T6...T1 DIP / CL II, III / DIV 1 / GP EFG / T6...T1 Ex d IIC T6...T1 DIP A21 TA 85°C to T _{medium}	41 / 42 ⁴⁾	$U_{max} = 30 \text{ V}$ $I_{max} = 30 \text{ mA}$ $P_{max} = 115 \text{ mW}$	140 °F	60 °C	T4	266 °F	130 °C	yes	yes
				140 °F	60 °C	T5	203 °F	95 °C	yes	yes
				140 °F	60 °C	T6	176 °F	80 °C	yes	yes

1) Order code "Explosion protection and approvals" (versions 9, 10); refer to chapter „Ordering Information“ on page 50.

2) For connection to an intrinsically safe circuit.

3) Installation in accordance with Installation Drawing SDM-10-A0253.

4) For connection to a non-intrinsically safe circuit.

Continuation of Table 4: Analog indicator with transmitter, with or without LCD indicator (temperature data for FM in °F, for cCSAus in °C)

Order code ¹⁾	Labeling	Terminals	Electrical values	T _{amb} -58 °F ...	T _{amb} -50 °C ...	Temp. class	T _{medium} Maximum	Insula-tion	Heating jacket	
F3 ⁵⁾ , F4 ⁵⁾	FM NI / CL I,II / DIV 2 / GP ABCDFG / T4...T1 NI / CL III / T4...T1 CL II, ZN 2 AEx nA [nL] IIC T4...T1	31 / 32 ⁴⁾	U _{max} = 46 V	104 °F	104 °F	T1	824 °F	440 °C	No	No
				104 °F	104 °F	T1	707 °F	375 °C	yes	No
				104 °F	104 °F	T1	500 °F	260 °C	yes	yes
				122 °F	122 °F	T1	572 °F	300 °C	yes	No
				122 °F	122 °F	T2	554 °F	290 °C	yes	No
				122 °F	122 °F	T2	428°F	220 °C	yes	yes
				140 °F	140 °F	T2	608 °F	320 °C	No	No
	cCSAus NI / CL I,II / DIV 2 / GP ABCDFG / T4...T1 NI / CL III / T4...T1 Ex nA [nL] IIC T4...T1 DIP A21 TA 85°C to T _{medium}	41 / 42 ⁴⁾	U _{max} = 30 V I _{max} = 30 mA P _{max} = 115 mW	140 °F	60 °C	T2	446 °F	230 °C	yes	No
				140 °F	60 °C	T3	338 °F	170 °C	yes	yes
				158 °F	70 °C	T3	383 °F	195 °C	No	No
				158 °F	70 °C	T3	302 °F	150 °C	yes	No
				158 °F	70 °C	T4	266 °F	130 °C	yes	yes
				158 °F	70 °C	T5	203 °F	95 °C	yes	yes
				86 °F	30 °C	T6	77 °F	25 °C	yes	yes

1) Order code "Explosion protection and approvals" (version digit No. 9, 10); refer to chapter „Ordering Information“ on page 50.

2) For connection to an intrinsically safe circuit.

3) Installation in accordance with Installation Drawing SDM-10-A0253.

4) For connection to a non-intrinsically safe circuit.

5) For connection in Division 2 or Zone 2.

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Electrical connections

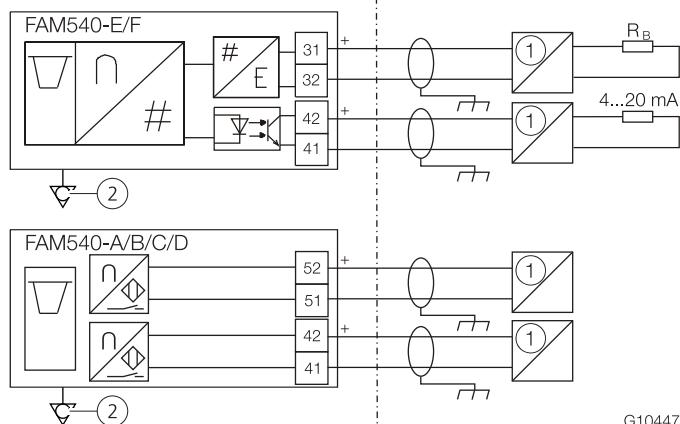


Fig. 28: FM / cCSAus electrical connection

① FM Approved IS Barrier ② Potential equalization

G10447

Terminal	Function
31 / 32	Power supply / current output / HART output
41 / 42	Binary output
51 / 52	Alarm signaling unit (min.)
	Alarm signaling unit (max.)

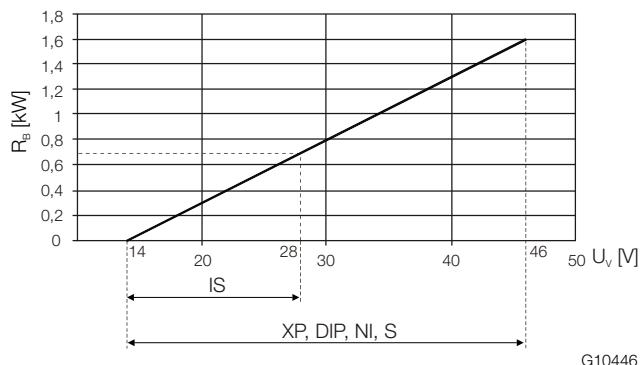


Fig. 29: Terminals 31 / 32, power supply / load

U_V Power supply

R_B Maximum permissible load in the power supply (z. B. indicator)

The minimum voltage $U_V = 0$ V is based on a load of 0Ω .

Installation instructions

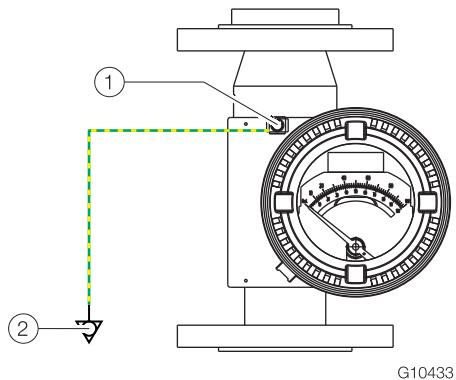
The concept of intrinsic safety enables multiple intrinsic safety devices with FM or CSA approval to be interconnected, without entity parameters being examined specifically, subject to observation of the following conditions:

- U_o or V_{oc} or $V_t \leq 0$ V max., I_o or I_{sc} or $I_t \leq I_{max}$, C_a or $C_o \geq C_i + C_{cable}$, L_a or $L_o \geq L_i + L_{cable}$, $P_o \leq P_i$.
- For installation in Class II and III environments, dust-proof ignition blocks must be used.
- Devices connected to such apparatus must not use or generate rms or direct voltages in excess of 250 V.
- Installation must meet the requirements of ANSI / ISA RP 12.6 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI / NFPA 70) sections 504, 505 and CEC.
- The configuration of the associated apparatus must have Factory Mutual Research and CSA approval in accordance with the entity concept.
- Devices must be installed in compliance with the manufacturer-supplied installation drawing of the associated apparatus.
- Changes to drawings are only permitted subject to prior approval from Factory Mutual Research and CSA.
- Only shielded twisted pair cables may be used (see above).

NOTE

For intrinsically safe installations, the FAM540 must be installed as illustrated in the "Intrinsic Safety Control Drawing SDM-10-A0253".

Earthing



G10433

Fig. 30: Earthing

(1) Earthing terminal

(2) Potential equalization in accordance with EN 60079-0

The FAM540 housing must be correctly earthed in order to ensure proper function and safe operation.

Copper wires with a minimum cross-section of 6 mm² (AWG 10) must be used to connect to the potential equalization.

i NOTE

The operator must ensure that when connecting the protective earth (PE), there are no potential differences between protective earth (PE) and potential equalization, even in the event of a fault.

Signal cable

For ambient temperatures below 5 °C (41 °F) or above 40 °C (104 °F), signal cables that are suited for the minimum/maximum ambient temperatures in question must be used.

Only use signal cables made from copper, copper-coated aluminum, or aluminum.

The recommended tightening torque for the terminals is 0.8 Nm (7 in. lb) or higher, in accordance with the specification.

Power supply

Installation must comply with the requirements of the National Electric Code® (ANSI / NFPA70).

Unless specified otherwise in regional or national standards, power supply lines must be dimensioned to AWG 20.

Installation must be carried out as outlined in the latest edition of the manufacturer's instruction manual.

A power supply with the following requirements must be used to provide power:

- SELV (safety extra-low voltage) with LPS (current-limited source) and double or reinforced insulation.
- Maximum output current of 8 A (current-limited output).
- In accordance with National Electric Code® (ANSI / NFPA70) connected to NEC class 2.

VA Master FAM540

Metal Cone Variable Area Flowmeter

Ordering Information

Main ordering information FAM541

Base model

VA Master FAM541 Metal Cone Variable Area Flowmeter, standard, for general purposes	FAM541	X	X	XX	XX	X	X	XX	X	XX
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Display Type / Output Signal

Analog indicator / Without	A	Continued see next page
Analog indicator / Min-Alarm (Amplifier D163A011U01 ... U03 as a separate item)	B	
Analog indicator / Max-Alarm (Amplifier D163A011U01 ... U03 as a separate item)	C	
Analog indicator / Min- and Max-Alarm (Amplifier D163A011U04 ... U06 as a separate item)	D	
Analog indicator / 4 ... 20 mA with HART protocol	E	
Analog indicator with LCD display / 4 ... 20 mA with HART protocol	F	

Housing Material / Cable Gland

Aluminium / Cable gland M20 x 1.5 (Indicator type A with blind plug M25 x 1.5)	1	
Aluminium / Thread 1/2 in. NPT (Indicator type A with blind plug M25 x 1.5)	2	
Stainless steel / Cable gland M20 x 1.5 (Indicator type A with blind plug M25 x 1.5)	1)	3
Stainless steel / Thread 1/2 in. NPT (Indicator type A with blind plug M25 x 1.5)	1)	4

Explosion Protection Certification and Approvals

Without	Y0	
ATEX / IECEx, (Zone 2 / 21), Ex nA, c, Ex tD	2)	B1
ATEX / IECEx, (Zone 1 / 21), Ex ia, Ex nA, c, Ex tD	2)	A4
ATEX / IECEx, (Zone 1 / 21), Ex d, Ex ia, Ex nA, c, Ex tD	3)	A9
FM / CSA, Class I, Div 1, 2 (Zone 1, 2), XP + IS, NI	4)	F3
FM / CSA, Class I, Div 1, 2 (Zone 1, 2), IS, NI	4)	F4

Process Connection

Flange	F1	
Flange with groove (DIN 2512)	F2	
Female thread metric (DN 25 [1 in.] = PN 100, DN 40 [1-1/2 in.] = PN 40)	5)	T1

Connection Size

DN 15 (1/2 in.)	A	
DN 25 (1 in.)	B	
DN 40 (1-1/2 in.)	N	
DN 50 (2 in.)	C	
DN 80 (3 in.)	D	
DN 100 (4 in.)	6)	E

Float Design

Standard	1	
With gas damping	7)	3

Main ordering information

VA Master FAM541 Metal Cone Variable Area Flowmeter, standard, for general purposes	XX	X	XX
Pressure Rating			
PN 16	D2		
PN 40	D4		
PN 63	9) D5		
PN 100	8) D6		
ASME CL 150	A1		
ASME CL 300	A3		
ASME CL 600	8) A6		
JIS 10K	8) J1		
Design Level			
(Specified by ABB)		X	
Tube / Float Combination			
(Specified by ABB) See flow range tables.		XX	

Additional ordering information

VA Master FAM541 Metal Cone Variable Area Flowmeter, standard, for general purposes	XX	XX	XX	XX	XX	XX
Primary						
Without, secondary only	10) Y0					
Standard	11) Y1					
Measuring Deviation						
Class 1.6 acc. VDE / VDI 3513	11) A1					
1 % of full scale	AA					
4 % of full scale (high viscosity, without calculation)	AK					
4 % of full scale (high viscosity, with calculation)	AL					
Material: 3.1, 3.2 Inspection / NACE						
Material monitoring with inspection certificate 3.1 acc. EN 10204	C2					
Material monitoring with inspection certificate 3.2 acc. EN 10204	C3					
Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204	CN					
Material: 2.1 Compliance						
Declaration of compliance with the order 2.1 acc. EN 10204		C4				
Certificates: 3.1 Visual, Dimensional and Functional Test						
Inspection certificate 3.1 acc. EN 10204 of visual, dimensional and functional test			C6			
Certificates: 3.1 PMI Test						
Inspection certificate 3.1 acc. EN 10204 of positive material identification PMI				CA		

VA Master FAM540

Metal Cone Variable Area Flowmeter

Additional ordering information

VA Master FAM541 Metal Cone Variable Area Flowmeter, standard, for general purposes	XX	XX	XXX	XXX	XX	XX
Certificates: 3.1 Pressure Test						
Pressure test acc. AD2000	CB					
Test package (pressure test, non-destructive test, welder and welding procedure certificate) (Non-destructive test = X-ray for welding neck flanges, dye penetration test for slip-on flanges)	CP					
Certificates: Calibration, Test Report						
Certificate of compliance for calibration 2.1 acc. EN 10204	CM					
Inspection certificate 3.1 acc. EN 10204 of calibration, with test report	CE					
Other Usage Certifications						
Russia - metrological and GOST-R certificate	CG1					
Kazakhstan - metrological and GOST-K certificate (In preparation)	CG2					
Ukraine - metrological certificate	CG3					
Belarus - Metrological Certificate	CG6					
Other Explosion Protection Certifications and Approvals						
Russia - GOST-Ex and RTN certificate	EG7					
Kazakhstan - Ex Permission certificate (In preparation)	EG3					
Ukraine - GOST-Ex and Ex permission certificate (In preparation)	EG5					
Belarus - GGTN Certificate	EG9					
INMETRO (Brazil)	EB1					
Documentation Language						
German		M1				
English	11)	M5				
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)		MW				
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)		ME				
Applications						
Degreased for oxygen applications		P1				

Additional ordering information

VA Master FAM541 Metal Cone Variable Area Flowmeter, standard, for general purposes	XX	XX	XX	XX	XXX
Device Identification Plate					
Stainless steel plate with TAG no.	T0				
Adhesive label with TAG no.	11) TC				
Float Material					
AISI 316Ti SST (1.4571)	11) F1				
Scale Design					
Direct reading scale	11) SD				
Percentage scale	SP				
Bargraph	12) SB				
Ambient Temperature Range					
Extended -40 ... 70 °C (-40 ... 158 °F) / -40 ... 60 °C (-40 ... 140 °F) with Ex protection Exd + Ex tD	13) R5				
Standard -20 ... 70 °C (-4 ... 158 °F) / -20 ... 60 °C (-4 ... 140 °F) with Ex protection Exd + Ex tD	11) R6				
Alarm Relay					
Amplifier Model KFA5-SR2-Ex1.W, Single Alarm, 115 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C					W11
Amplifier Model KFA6-SR2-Ex1.W, Single Alarm, 230 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C					W12
Amplifier Model KFD2-SR2-Ex1.W, Single Alarm, 24 V DC, Ambient Temperature Range -20 ... 60 °C					W13
Amplifier Model KFA5-SR2-Ex2.W, Double Alarm, 115 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C					W14
Amplifier Model KFA6-SR2-Ex2.W, Double Alarm, 230 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C					W15
Amplifier Model KFD2-SR2-Ex2.W, Double Alarm, 24 V DC, Ambient Temperature Range -20 ... 60 °C					W16

- 1) Not available with Ex d or XP applications
- 2) Version with analog indicator without output signal: Type of protection "c" only available with ATEX approval
- 3) With Ex d approved cable gland. Not available for analog indicator without output signal
- 4) Only with cable entry 1/2 in. NPT
- 5) Not available with FM / CSA approval, only available in 1 in. and 1-1/2 in. size
- 6) For liquid applications only
- 7) DN 15 ... DN 80 only (1/2 ... 3 in.)
- 8) Not available with DN 40 (1-1/2 in.) and DN 100 (4 in.)
- 9) Not available with DN 40 (1-1/2 in.)
- 10) For Ex devices upon request
- 11) Standard, automatically specified by ABB if not specified by customer
- 12) Recommended for indicator with transmitter 4 ... 20 mA with LCD display
- 13) Not available with analog indicator with alarm

VA Master FAM540

Metal Cone Variable Area Flowmeter

Main ordering information FAM544

Base model

VA Master FAM544 Metal Cone Variable Area Flowmeter, hygienic design, for specific food and pharmacy applications	FAM544	X	X	XX	XX	X	X	XX	X	XX	X	XX
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Display Type / Output Signal

Analog indicator / Without	A
Analog indicator / Min-Alarm (Amplifier D163A011U01 ... U03 as a separate item)	B
Analog indicator / Max-Alarm (Amplifier D163A011U01 ... U03 as a separate item)	C
Analog indicator / Min- and Max-Alarm (Amplifier D163A011U04 ... U06 as a separate item)	D
Analog indicator / 4 ... 20 mA with HART protocol	E
Analog indicator with LCD display / 4 ... 20 mA with HART protocol	F

Housing Material / Cable Gland

Aluminium / Cable gland M20 x 1.5 (Indicator type A with blind plug M25x1.5)	1
Aluminium / Thread 1/2 in. NPT (Indicator type A with blind plug M25x1.5)	2
Stainless steel / Cable gland M20 x 1.5 (Indicator type A with blind plug M25x1.5)	1) 3
Stainless steel / Thread 1/2 in. NPT (Indicator type A with blind plug M25x1.5)	1) 4

Explosion Protection Certification and Approvals

Without	Y0
ATEX / IECEx, (Zone 2 / 21), Ex nA, c, Ex tD	2) B1
ATEX / IECEx, (Zone 1 / 21), Ex ia, Ex nA, c, Ex tD	2) A4
ATEX / IECEx, (Zone 1 / 21), Ex d, Ex ia, Ex nA, c, Ex tD	3) A9
FM / CSA, Class I, Div 1, 2 (Zone 1, 2), XP + IS, NI	4) F3
FM / CSA, Class I, Div 1, 2 (Zone 1, 2), IS, NI	4) F4

Process Connection

Thread DIN 11851	S1
SMS 1145	S2

Connection Size

DN 25 (1 in.)	B
DN 40 (1-1/2 in.)	N
DN 50 (2 in.)	C
DN 80 (3 in.)	D
DN 100 (4 in.)	E

Float Design

Standard	1
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Pressure Rating

PN 6	D0
PN 25	5) D3
PN 40	6) D4

Design Level

(Specified by ABB)	X
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Tube / Float Combination	XX
(Specified by ABB.) See flow range tables.	XX

Additional ordering information

VA Master FAM544 Metal Cone Variable Area Flowmeter, hygienic design, for specific food and pharmacy applications	XX	XXX							
Primary									
Without, secondary only	7)	Y0							
Standard	8)	Y1							
Measuring Deviation									
Class 1.6 acc. VDE / VDI 3513	8)	A1							
1 % of full scale		AA							
4 % of full scale (high viscosity, without calculation)		AK							
4 % of full scale (high viscosity, with calculation)		AL							
Material: 3.1, 3.2 Inspection / NACE									
Material monitoring with inspection certificate 3.1 acc. EN 10204		C2							
Material monitoring with inspection certificate 3.2 acc. EN 10204		C3							
Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204		CN							
Material: 2.1 Compliance									
Declaration of compliance with the order 2.1 acc. EN 10204		C4							
Certificates: 3.1 Visual, Dimensional and Functional Test									
Inspection certificate 3.1 acc. EN 10204 of visual, dimensional and functional test		C6							
Certificates: 3.1 PMI Test									
Inspection certificate 3.1 acc. EN 10204 of positive material identification PMI		CA							
Certificates: 3.1 Pressure Test									
Pressure test acc. AD2000		CB							
Test package (pressure test, non-destructive test, welder and welding procedure certificate) (Non-destructive test = X-ray for welding neck flanges, dye penetration test for slip-on flanges)		CP							
Certificates: Calibration, Test Report									
Certificate of compliance for calibration 2.1 acc. EN 10204		CM							
Inspection certificate 3.1 acc. EN 10204 of calibration, with test report		CE							
Other Usage Certifications									
Russia - metrological and GOST-R certificate		CG1							
Kazakhstan - metrological and GOST-K certificate (In preparation)		CG2							
Ukraine - metrological certificate		CG3							
Belarus - Metrological Certificate		CG6							

VA Master FAM540

Metal Cone Variable Area Flowmeter

Additional ordering information

VA Master FAM544 Metal Cone Variable Area Flowmeter, hygienic design, for specific food and pharmacy applications	XXX	XX	XX	XX	XX	XX	XX	XXX
Other Explosion Protection Certifications and Approvals								
Russia - GOST-Ex and RTN certificate		EG7						
Kazakhstan - Ex Permission certificate (In preparation)		EG3						
Ukraine - GOST-Ex and Ex permission certificate (In preparation)		EG5						
Belarus - GGTN Certificate		EG9						
INMETRO (Brazil)		EB1						
Documentation Language								
German		M1						
English	8)	M5						
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)		MW						
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)		ME						
Applications								
Degreased for oxygen applications		P1						
Device Identification Plate								
Stainless steel plate with TAG no.		T0						
Adhesive label with TAG no.	8)	TC						
Float Material								
AISI 316Ti SST (1.4571)	8)	F1						
Scale Design								
Direct reading scale	8)	SD						
Percentage scale		SP						
Bargraph	9)	SB						
Ambient Temperature Range								
Extended -40 ... 70 °C (-40 ... 158 °F) / -40 ... 60 °C (-40 ... 140 °F) with Ex protection Exd + Ex tD	10)	R5						
Standard -20 ... 70 °C (-4 ... 158 °F) / -20 ... 60 °C (-4 ... 140 °F) with Ex protection Exd + Ex tD	8)	R6						
Alarm relay								
Amplifier Model KFA5-SR2-Ex1.W, Single Alarm, 115 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C								W11
Amplifier Model KFA6-SR2-Ex1.W, Single Alarm, 230 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C								W12
Amplifier Model KFD2-SR2-Ex1.W, Single Alarm, 24 V DC, Ambient Temperature Range -20 ... 60 °C								W13
Amplifier Model KFA5-SR2-Ex2.W, Double Alarm, 115 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C								W14
Amplifier Model KFA6-SR2-Ex2.W, Double Alarm, 230 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C								W15
Amplifier Model KFD2-SR2-Ex2.W, Double Alarm, 24 V DC, Ambient Temperature Range -20 ... 60 °C								W16

- 1) Not available with Ex d or XP applications
- 2) Version with analog indicator without output signal: Type of protection "c" only available with ATEX approval
- 3) With Ex d approved cable gland. Not available for analog indicator without output signal
- 4) Only with cable entry 1/2 in. NPT
- 5) For DN 50 and DN 80 (2 in. and 3 in.)
- 6) For DN 25 and DN 40 (1 in. and 1-1/2 in.)
- 7) For Ex devices upon request
- 8) Standard, automatically specified by ABB if not specified by customer
- 9) Recommended for indicator with transmitter 4 ... 20 mA with LCD display
- 10) Not available with analog indicator with alarm

Main ordering information FAM545

Base model

VA Master FAM545 Metal Cone Variable Area Flowmeter, PTFE liner, for aggressive measuring media	FAM545	X	X	XX	XX	X	X	XX	X	XX
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Display Type / Output Signal

Analog indicator / Without	A
Analog indicator / Min-Alarm (Amplifier D163A011U01 ... U03 as a separate item)	B
Analog indicator / Max-Alarm (Amplifier D163A011U01 ... U03 as a separate item)	C
Analog indicator / Min- and Max-Alarm (Amplifier D163A011U04 ... U06 as a separate item)	D
Analog indicator / 4 ... 20 mA with HART protocol	E
Analog indicator with LCD display / 4 ... 20 mA with HART protocol	F

Housing Material / Cable Gland

Aluminium / Cable gland M20 x 1.5 (Indicator type A with blind plug M25x1.5)	1
Aluminium / Thread 1/2 in. NPT (Indicator type A with blind plug M25x1.5)	2
Stainless steel / Cable gland M20 x 1.5 (Indicator type A with blind plug M25x1.5)	1) 3
Stainless steel / Thread 1/2 in. NPT (Indicator type A with blind plug M25x1.5)	1) 4

Explosion Protection Certification and Approvals

Without	Y0
ATEX / IECEx, (Zone 2 / 21), Ex nA, c, Ex tD	2) B1
ATEX / IECEx, (Zone 1 / 21), Ex ia, Ex nA, c, Ex tD	2) A4
ATEX / IECEx, (Zone 1 / 21), Ex d, Ex ia, Ex nA, c, Ex tD	3) A9
FM / CSA, Class I, Div 1, 2 (Zone 1, 2), XP + IS, NI	4) F3
FM / CSA, Class I, Div 1, 2 (Zone 1, 2), IS, NI	4) F4

Process Connection

Flange	F1
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Connection Size

DN 25 (1 in.)	B
DN 50 (2 in.)	C
DN 80 (3 in.)	D

Float Design

Standard	1
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Pressure Rating

PN 40	D4
ASME CL 150	A1
ASME CL 300	A3

Design Level

(Specified by ABB)	X
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Tube / Float Combination

(Specified by ABB.) See flow range tables.	XX
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VA Master FAM540

Metal Cone Variable Area Flowmeter

Additional ordering information

VA Master FAM545 Metal Cone Variable Area Flowmeter, PTFE liner, for aggressive measuring media	XX	XXX	XXX							
Primary										
Without, secondary only	5) Y0									
Standard	6) Y1									
Measuring Deviation										
Class 2.5 acc. VDE / VDI 3513	6) A2									
4 % of full scale (high viscosity, without calculation)	AK									
Material: 3.1, 3.2 Inspection / NACE										
Material monitoring with inspection certificate 3.1 acc. EN 10204	C2									
Material monitoring with inspection certificate 3.2 acc. EN 10204	C3									
Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204	CN									
Material: 2.1 Compliance										
Declaration of compliance with the order 2.1 acc. EN 10204	C4									
Certificates: 3.1 Visual, Dimensional and Functional Test										
Inspection certificate 3.1 acc. EN 10204 of visual, dimensional and functional test	C6									
Certificates: 3.1 PMI Test										
Inspection certificate 3.1 acc. EN 10204 of positive material identification PMI	CA									
Certificates: 3.1 Pressure Test										
Pressure test acc. AD2000	CB									
Test package (pressure test, non-destructive test, welder and welding procedure certificate) (Non-destructive test = X-ray for welding neck flanges, dye penetration test for slip-on flanges)	CP									
Certificates: Calibration, Test Report										
Certificate of compliance for calibration 2.1 acc. EN 10204	CM									
Inspection certificate 3.1 acc. EN 10204 of calibration, with test report	CE									
Other Usage Certifications										
Russia - metrological and GOST-R certificate	CG1									
Kazakhstan - metrological and GOST-K certificate (In preparation)	CG2									
Ukraine - metrological certificate	CG3									
Belarus - Metrological Certificate	CG6									
Other Explosion Protection Certifications and Approvals										
Russia - GOST-Ex and RTN certificate	EG7									
Kazakhstan - Ex Permission certificate (In preparation)	EG3									
Ukraine - GOST-Ex and Ex permission certificate (In preparation)	EG5									
Belarus - GGTN Certificate	EG9									
INMETRO (Brazil)	EB1									

Additional ordering information

VA Master FAM545 Metal Cone Variable Area Flowmeter, PTFE liner, for aggressive measuring media	XX						
Documentation Language							
German	M1						
English	6) M5						
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)	MW						
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)	ME						
Applications							
Degreased for oxygen applications	P1						
Device Identification Plate							
Stainless steel plate with TAG no.	T0						
Adhesive label with TAG no.	6) TC						
Float Material							
PTFE	6) F2						
Scale Design							
Direct reading scale	6) SD						
Percentage scale	SP						
Bargraph	7) SB						
Ambient Temperature Range							
Extended -40 ... 70 °C (-40 ... 158 °F) / -40 ... 60 °C (-40 ... 140 °F) with Ex protection Exd + Ex tD	8) R5						
Standard -20 ... 70 °C (-4 ... 158 °F) / -20 ... 60 °C (-4 ... 140 °F) with Ex protection Exd + Ex tD	6) R6						
Alarm relay							
Amplifier Model KFA5-SR2-Ex1.W, Single Alarm, 115 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C	W11						
Amplifier Model KFA6-SR2-Ex1.W, Single Alarm, 230 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C	W12						
Amplifier Model KFD2-SR2-Ex1.W, Single Alarm, 24 V DC, Ambient Temperature Range -20 ... 60 °C	W13						
Amplifier Model KFA5-SR2-Ex2.W, Double Alarm, 115 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C	W14						
Amplifier Model KFA6-SR2-Ex2.W, Double Alarm, 230 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C	W15						
Amplifier Model KFD2-SR2-Ex2.W, Double Alarm, 24 V DC, Ambient Temperature Range -20 ... 60 °C	W16						

- 1) Not available with Ex d or XP applications
- 2) Version with analog indicator without output signal: Type of protection "c" only available with ATEX approval
- 3) With Ex d approved cable gland. Not available for analog indicator without output signal
- 4) Only with cable entry 1/2 in. NPT
- 5) For Ex devices upon request
- 6) Standard, automatically specified by ABB if not specified by customer
- 7) Recommended for indicator with transmitter 4 ... 20 mA with LCD display
- 8) Not available with analog indicator with alarm

VA Master FAM540

Metal Cone Variable Area Flowmeter

Main ordering information FAM546

Base model

VA Master FAM546 Metal Cone Variable Area Flowmeter, with steam jacket, for temperature-sensitive applications	FAM546	X	X	XX	XX	X	X	XX	X	XX
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Display Type / Output Signal

Analog indicator / Without	A	Continued see next page
Analog indicator / Min-Alarm (Amplifier D163A011U01 ... U03 as a separate item)	B	
Analog indicator / Max-Alarm (Amplifier D163A011U01 ... U03 as a separate item)	C	
Analog indicator / Min- and Max-Alarm (Amplifier D163A011U04 ... U06 as a separate item)	D	
Analog indicator / 4 ... 20 mA with HART protocol	E	
Analog indicator with LCD display / 4 ... 20 mA with HART protocol	F	

Housing Material / Cable Gland

Aluminium / Cable gland M20 x 1.5 (Indicator type A with blind plug M25x1.5)	1
Aluminium / Thread 1/2 in. NPT (Indicator type A with blind plug M25x1.5)	2
Stainless steel / Cable gland M20 x 1.5 (Indicator type A with blind plug M25x1.5)	1) 3
Stainless steel / Thread 1/2 in. NPT (Indicator type A with blind plug M25x1.5)	1) 4

Explosion Protection Certification and Approvals

Without	Y0
ATEX / IECEx, (Zone 2 / 21), Ex nA, c, Ex tD	2) B1
ATEX / IECEx, (Zone 1 / 21), Ex ia, Ex nA, c, Ex tD	2) A4
ATEX / IECEx, (Zone 1 / 21), Ex d, Ex ia, Ex nA, c, Ex tD	3) A9
FM / CSA, Class I, Div 1, 2 (Zone 1, 2), XP + IS, NI	4) F3
FM / CSA, Class I, Div 1, 2 (Zone 1, 2), IS, NI	4) F4

Process Connection

Flange	F1
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Connection Size

DN 25 (1 in.)	B
DN 50 (2 in.)	C
DN 80 (3 in.)	D
DN 100 (4 in.)	E

Float Design

Standard	1
With gas damping	3

Pressure Rating

PN 16	D2
PN 40	D4
PN 63	D5
PN 100	D6
ASME CL 150	A1
ASME CL 300	A3
ASME CL 600	A6

Main ordering information

VA Master FAM546 Metal Cone Variable Area Flowmeter, with steam jacket, for temperature-sensitive applications	X	XX
Design Level (Specified by ABB)	X	
Tube / Float Combination (Specified by ABB.) See flow range tables.		XX

Additional ordering information

VA Master FAM546 Metal Cone Variable Area Flowmeter, with steam jacket, for temperature-sensitive applications	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX
Primary										
Without, secondary only	5) Y0									
Standard	6) Y1									
Measuring Deviation										
Class 1.6 acc. VDE / VDI 3513	6) A1									
1 % of full scale	AA									
4 % of full scale (high viscosity, without calculation)	AK									
4 % of full scale (high viscosity, with calculation)	AL									
Material: 3.1, 3.2 Inspection / NACE										
Material monitoring with inspection certificate 3.1 acc. EN 10204	C2									
Material monitoring with inspection certificate 3.2 acc. EN 10204	C3									
Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204	CN									
Material: 2.1 Compliance										
Declaration of compliance with the order 2.1 acc. EN 10204	C4									
Certificates: 3.1 Visual, Dimensional and Functional Test										
Inspection certificate 3.1 acc. EN 10204 of visual, dimensional and functional test	C6									
Certificates: 3.1 PMI Test										
Inspection certificate 3.1 acc. EN 10204 of positive material identification PMI	CA									
Certificates: 3.1 Pressure Test										
Pressure test acc. AD2000	CB									
Test package (pressure test, non-destructive test, welder and welding procedure certificate) (Non-destructive test = X-ray for welding neck flanges, dye penetration test for slip-on flanges)	CP									
Certificates: Calibration, Test Report										
Certificate of compliance for calibration 2.1 acc. EN 10204	CM									
Inspection certificate 3.1 acc. EN 10204 of calibration, with test report	CE									
Other Usage Certifications										
Russia - metrological and GOST-R certificate	CG1									
Kazakhstan - metrological and GOST-K certificate (In preparation)	CG2									
Ukraine - metrological certificate	CG3									
Belarus - Metrological Certificate	CG6									

VA Master FAM540

Metal Cone Variable Area Flowmeter

Additional ordering information

VA Master FAM546 Metal Cone Variable Area Flowmeter, with steam jacket, for temperature-sensitive applications	XXX	XX	XX	XX	XX	XX	XX	XXX
Other Explosion Protection Certifications and Approvals								
Russia - GOST-Ex and RTN certificate	EG7							
Kazakhstan - Ex Permission certificate (In preparation)	EG3							
Ukraine - GOST-Ex and Ex permission certificate (In preparation)	EG5							
Belarus - GGTN Certificate	EG9							
INMETRO (Brazil)	EB1							
Documentation Language								
German		M1						
English	6)	M5						
Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)		MW						
Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)		ME						
Applications								
Degreased for oxygen applications		P1						
Device Identification Plate								
Stainless steel plate with TAG no.		T0						
Adhesive label with TAG no.	6)	TC						
Float Material								
AISI 316Ti SST (1.4571)	6)	F1						
Scale Design								
Direct reading scale	6)	SD						
Percentage scale		SP						
Bargraph	7)	SB						
Ambient Temperature Range								
Extended -40 ... 70 °C (-40 ... 158 °F) / -40 ... 60 °C (-40 ... 140 °F) with Ex protection Exd + Ex tD	8)	R5						
Standard -20 ... 70 °C (-4 ... 158 °F) / -20 ... 60 °C (-4 ... 140 °F) with Ex protection Exd + Ex tD	6)	R6						
Alarm relay								
Amplifier Model KFA5-SR2-Ex1.W, Single Alarm, 115 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C								W11
Amplifier Model KFA6-SR2-Ex1.W, Single Alarm, 230 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C								W12
Amplifier Model KFD2-SR2-Ex1.W, Single Alarm, 24 V DC, Ambient Temperature Range -20 ... 60 °C								W13
Amplifier Model KFA5-SR2-Ex2.W, Double Alarm, 115 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C								W14
Amplifier Model KFA6-SR2-Ex2.W, Double Alarm, 230 V AC 50 / 60 Hz, Ambient Temperature Range -20 ... 60 °C								W15
Amplifier Model KFD2-SR2-Ex2.W, Double Alarm, 24 V DC, Ambient Temperature Range -20 ... 60 °C								W16

- 1) Not available with Ex d or XP applications
- 2) Version with analog indicator without output signal: Type of protection "c" only available with ATEX approval
- 3) With Ex d approved cable gland. Not available for analog indicator without output signal
- 4) Only with cable entry 1/2 in. NPT
- 5) For Ex devices upon request
- 6) Standard, automatically specified by ABB if not specified by customer
- 7) Recommended for indicator with transmitter 4 ... 20 mA with LCD display
- 8) Not available with analog indicator with alarm

Trademarks

® HART is a registered trademark of FieldComm Group, Austin, Texas, USA
 ® Buna-N is a registered trademark of DuPont Dow Elastomers.
 ™ Hastelloy C-2 is a Haynes International trademark

Questionnaire

Customer:	Date:
Ms./Mr.:	Department:
Telephone:	Fax:

Measuring medium:	<input type="checkbox"/> _____	contaminated	<input type="checkbox"/> Yes			
	<input type="checkbox"/> liquid		<input type="checkbox"/> No			
	<input type="checkbox"/> gaseous		<input type="checkbox"/> Yes			
	<input type="checkbox"/> transparent	Solids content	<input type="checkbox"/> No			
	<input type="checkbox"/> non-transparent					
	<input type="checkbox"/> translucent	Size _____				
Flow rate:	min. _____	norm. _____	max. _____			
	<input type="checkbox"/> l/min	<input type="checkbox"/> l/h	<input type="checkbox"/> m ³ /min			
	<input type="checkbox"/> cm ³ /min	<input type="checkbox"/> kg/min	<input type="checkbox"/> g/min			
	<input type="checkbox"/> other _____		<input type="checkbox"/> kg/h			
If a vol. gas measurement refers to standard state, (Qv)n should be added to the flow rate unit.						
Operating temperature:	standard _____	max. _____				
Operating pressure:	Upstream pressure (P1) _____	Downstream pressure(P1) _____	max. _____			
Gases:	Standard density (ρ_n) _____ kg/m ³	Viscosity _____ mPa s				
Fluid:	Concentration _____ vol. %	Weight %				
	Density at operating temperature	_____ kg/dm ³				
	Viscosity at operating temperature	_____ mPa s				
Materials:	Meter tube _____					
	Variable area _____					
	Gaskets _____					
	Other wetted parts _____					
Connectors:	inlet	<input type="checkbox"/> left	<input type="checkbox"/> right	<input type="checkbox"/> front	<input type="checkbox"/> rear	<input type="checkbox"/> from below
	Outlet	<input type="checkbox"/> left	<input type="checkbox"/> right	<input type="checkbox"/> front	<input type="checkbox"/> rear	<input type="checkbox"/> upward
		<input type="checkbox"/> Thread		<input type="checkbox"/> Flange		<input type="checkbox"/> Hose nozzle
		<input type="checkbox"/> Threaded spuds in accordance with DIN 11851				<input type="checkbox"/> other _____
Installation type:		<input type="checkbox"/> Cable assembly		<input type="checkbox"/> Wall mounting		
		<input type="checkbox"/> Panel mounting		<input type="checkbox"/> Flush mounting		
Display on device:	<input type="checkbox"/> % scale		<input type="checkbox"/> Dk/Ds up to 1/4" size with flow rate table			
			<input type="checkbox"/> Directly readable product scale			
Transmitter, electrical:	<input type="checkbox"/> 0 ... 20 mA	<input type="checkbox"/> 4 ... 20 mA	<input type="checkbox"/> Ex	<input type="checkbox"/> Non-Ex		
Limit switch	<input type="checkbox"/> Min. contact	<input type="checkbox"/> Max. contact	<input type="checkbox"/> Min. and max. contact			
Notes:						

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Sales



Service