



ABB Measurement Products

# ABB ControlMaster universal process controllers Making process control easy

# ABB ControlMaster universal process controllers

Whether you're a plant or process manager, electrical engineer, process operator or maintenance engineer, the future of process control instrumentation starts here.

ABB's new ControlMaster range elevates process monitoring and control to an altogether higher level.

ABB has used its experience in controllers and indicators to create a new generation of process control instruments that are more intuitive, easier to operate and significantly more powerful in use.



The concept at the very heart of ControlMaster is 'Control Made Easy'. Each instrument provides a comprehensive display of process status using crystal clear, full color, TFT technology. The simple to use user interface delivers clear text prompts that make installation, commissioning and operation quick and easy. And full scalability from the concise range makes ControlMaster suitable for the most basic applications through to complex, difficult to control processes.

Specify any new ControlMaster and you'll be choosing a tough, compact process partner. From IP66 and NEMA 4X environmental protection all the way through to powerful control functionality, with cascade, feed forward and ratio control, plus advanced predictive, adaptive and dual loop capabilities.

Then we put problem-solving diagnostics right at your fingertips, plus total communications flexibility - connect the way that suits you, with Ethernet and Modbus RTU protocols.

A line up of 4 new instruments with the functionality and capability you need to meet the challenges of an information hungry process control industry.



From ABB's legacy in controllers and indicators, the new ControlMaster range of distinctive, accomplished and innovative instruments not only focuses on each model being easier and more powerful in use, but with such a concise number of function-rich units, it's now so much easier to choose the right ControlMaster for your process application.

# ABB ControlMaster universal process controllers

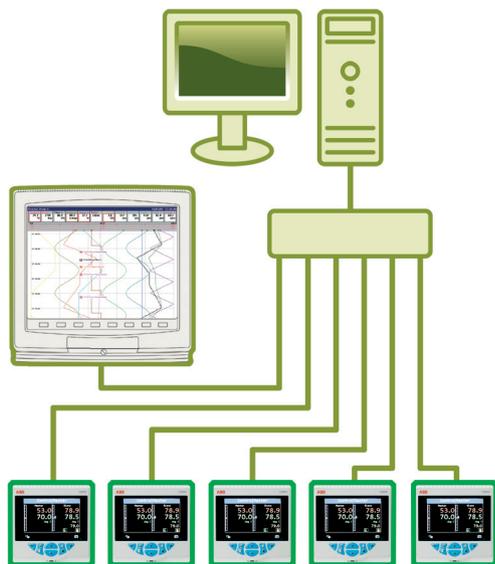
## Innovative, easy to use HMI

Each ControlMaster has an innovative HMI at the heart of its operation, providing a common link with other instrumentation products from ABB. So, if you know one, you know them all. Operation is so easy that you will be impressed by the efficiency of it all.

## Advanced controls and functionality

On each of the 4 new ControlMaster instruments, higher levels of functionality are right at your finger tips. Features packed in include math, totalization and a frequency input, logic, gain scheduling, split output, valve control and real time alarms.

pPI predictive control enables processes with long dead times to be easily controlled. Simple configuration needs only three parameters - proportional band, integral time and dead time. Adaptive control means automatic adjustment of control response to correct changing process dynamics. Valuable where processes have varying or uncontrolled types of load, it provides continuous tuning for optimum control efficiency 24/7. Dual loop control independently manages two separate processes. The loops operate entirely independently while ControlMaster's flexibility and functionality provides interlock and interaction between both if required. Processes can be displayed simultaneously on one screen without compromising data.



## Communications protocols

Ethernet communications provide high levels of connectivity. Remote process monitoring is made easy via the integrated web server. A ControlMaster can send emails upon alarm conditions or critical process status, providing instant notification to a plant supervisor. Modbus communications (TCP or RTU) enable rapid connection to PLCs and control systems. Modbus also provides simple, fast connection of multiple ControlMasters to a ScreenMaster recorder to create a multipoint control and data logging system.

### Customizable full color TFT display

Clear, comprehensive process status and history trending. Information messages and configuration menus are displayed in full text, unabbreviated or scrolled as on other commonly used process control display technologies. Custom set-up is fast and uses predefined display templates, as well as template customization with unique display values and colors.

### Scalable I/O and functionality

I/O, functionality and template availability is easily expanded with additional plug-and-play input models and function keys, making a single ControlMaster unit fully scalable from basic through to complex control applications. Users can now standardize on a single product so operators have the familiarity of a single user interface regardless of application requirements.

### Historical Trending

ControlMaster features short-term trending capability, providing invaluable information during commissioning or for the history of unattended processes.



### Diagnostics

To quickly alert an operator to important process information, ControlMaster's diagnostic functions clearly display messages detailing fault conditions, abnormal process status and maintenance requirements. At any time the operator can also switch to an alarm and diagnostic status display to gain an overview of any active messages.

### Template based configuration

ControlMaster configuration is vastly simplified by using application templates. Selecting the template best suited to your process requirements automatically configures I/O and control functionality while display templates are selected automatically.

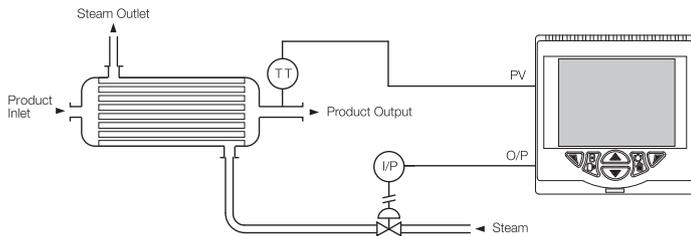


# ABB ControlMaster universal process controllers

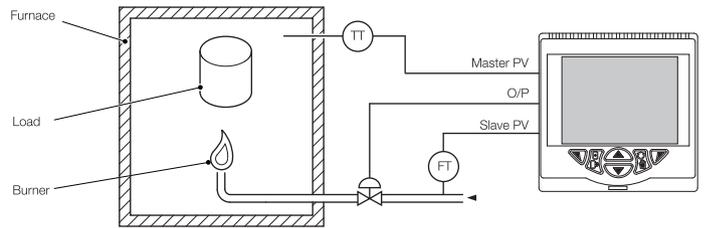
## Application Scenarios

Universal by design, a ControlMaster is suitable for use in a wide range of applications. Typical configurations include:

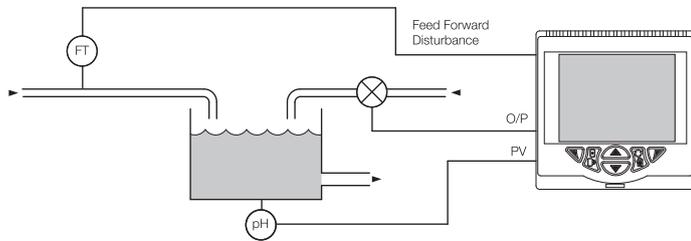
### Temperature control of a steam heated product



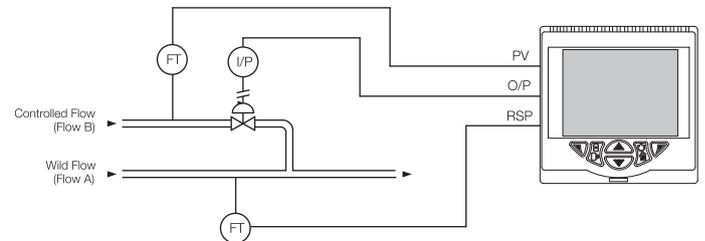
### Temperature control of electrically or gas heated furnaces



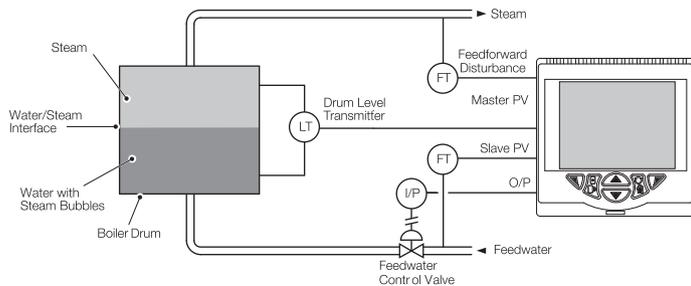
### pH control of effluent flow via acid or alkaline dosing



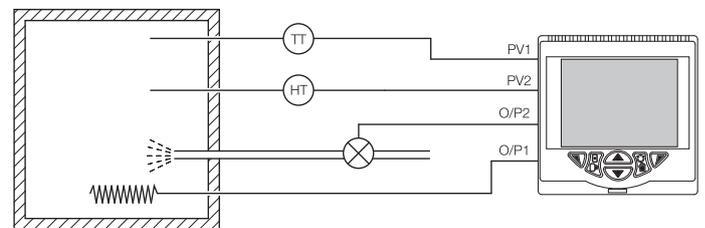
### Ratio control of product blending



### Boiler drum level control



### Independent dual loop control of temperature and humidity in a climatic chamber



# Product Selection Guide

Standard ✓    Optional ●	CM10	CM15	CM30	CM50
<b>General</b>				
Size	1/8 DIN (48 x 96mm)	1/8 DIN (Horizontal) (96 x 48mm)	¼ DIN (96 x 96mm)	3 x 6 DIN (76 x 144mm)
Display	5.6cm (2.2in) Color TFT	5.6cm (2.2in) Color TFT	8.9cm (3.5in) Color TFT	8.9cm (3.5in) Color TFT
Dust/Water Protection	IP66 & NEMA 4X			
Supply Voltage	85-265V a.c. std (24V d.c. opt.)			
<b>Control Capabilities</b>				
PID (analog/time proportioning)	✓		✓	✓
Motorized Valve	✓		✓	✓
Split Output (Heat Cool)	✓		✓	✓
Adaptive Control			●	●
pPI (predictive)			●	●
Gain Scheduling	●		●	●
Autotune	✓		✓	✓
<b>Templates</b>				
Single Loop	✓		✓	✓
Single Loop with Feed Forward			●	●
Auto/Manual Station	●		●	●
Analog Backup Station	●		●	●
Manual Loader	●		●	●
Cascade			●	●
Cascade with Feed Forward			●	●
Ratio Controller			●	●
Ratio Station			●	●
Dual Loop			●	●
Indicator	●	✓	●	●
Dual Indicator	●	●	●	●
<b>Inputs</b>				
Universal (TC, RTD, Resistance, mA, Volt, mV & Frequency)	1 std.	1 std.	1 std. (1 opt.)	1 std. (1 opt.)
Process (TC, mA, Volts, mV & Digital)	1 std.	1 std.	1 std. (1 opt.)	1 std. (1 opt.)
Digital	2 opt.	2 opt.	6 opt.	2 std. (4 opt.)
Transmitter Power Supply	2 std.	2 std.	2 std. (2 opt.)	2 std. (2 opt.)
<b>Outputs</b>				
Analog/Logic	1 std.	1 std.	1 std.	1 std.
Analog	1 opt.	1 opt.	1 opt.	1 opt.
Relay	1 std. (3 opt.)	1 std. (3 opt.)	1 std. (3 opt.)	2 std. (2 opt.)
Digital	2 opt.	2 opt.	6 opt.	2 std. (4 opt.)
<b>Advanced Features</b>				
Math	●	●	●	●
Logic	●	●	●	●
Custom Linearizers	●	●	●	●
Delay Timers	●	●	●	●
Real-time Alarms	●	●	●	●
Totalization		✓	●	●
Historical Trending			●	●
<b>Communications</b>				
Ethernet	●	●	●	●
RS485 MODBUS	●	●	●	●

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# ControlMaster CM30

## Universal process controller, 1/4 DIN

Measurement made easy

Making process control easy



### Comprehensive display of process status

- Crystal-clear, full-color TFT display
- User-customizable
- Historical trending

### Exceptionally easy to use

- Intuitive user interface and clear text prompts make installation, commissioning and operation quick and simple

### Scalable to match application requirements

- Comprehensive hardware and software options

### Powerful control functionality

- Cascade, feed-forward, ratio, predictive and adaptive control strategies
- Dual-loop capability

### Problem-solving capability

- Flexible functionality including math, logic and totalization providing power to solve complex application requirements

### Built to survive

- IP 66 and NEMA 4X environmental protection

### Flexible connectivity

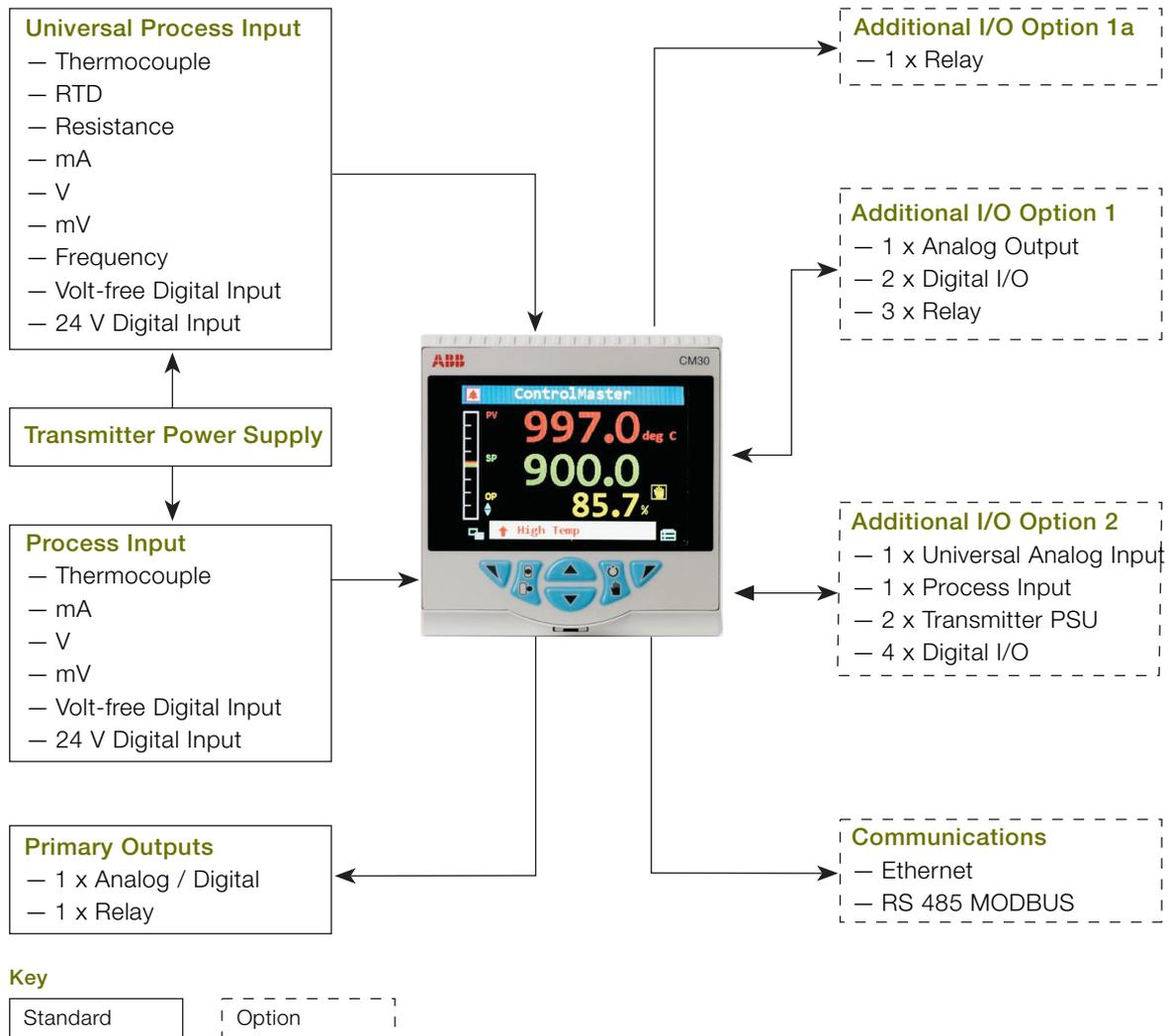
- Ethernet and MODBUS® communications

# ControlMaster CM30

## Universal process controller, 1/4 DIN

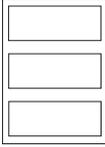
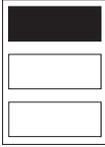
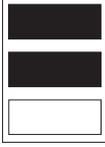
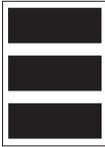
### Overview

The ControlMaster CM30 is a highly versatile, 1/4 DIN, universal PID process controller. Detailed process information is presented clearly on the CM30's full-color TFT display and an intuitive operator interface simplifies configuration and operation. Highly scalable in both hardware and software functionality, a CM30 can be specified easily to meet the needs of virtually any process control application – simple or advanced. Powerful control functions such as adaptive control, math, logic and totalization provide problem-solving flexibility and make the CM30 suitable for a wide range of process applications. Fully configurable via the easy-to-navigate front panel menus or PC configuration software, the CM30 can be commissioned rapidly and then tuned via the advanced autotune capability. MODBUS and Ethernet communication options ensure easy integration into a control system.



## Highly scalable

The CM30 is highly scalable in terms of both hardware and software, to fulfill the demands of the simplest to the most complex process. The basic CM30 meets the needs of a simple control loop. Templates and control functionality can be increased by adding function keys to the basic model. Each function key added provides additional templates and functionality as shown in Fig. 1, while retaining previous templates and functionality. For I/O builds, see also Ordering information on page 23.

Level	Function Keys	Template	Functionality
Base	0 	Single loop Single loop with remote setpoint	Process alarms Basic setpoint switching Basic control – Analog PID – On / Off or time proportioning – Auto tune – Split output control
Standard	1 	Auto / Manual station low signal selection Auto / Manual station digital signal selection * Analog backup station low signal selection Analog backup station digital signal selection * Single indicator / manual loader Dual indicator / manual loader	Standard setpoint switching * Standard control – Gain scheduling – Motorized valve control † Output tracking Logic Math Custom linearizers Delay timers Real time alarms Template customization
Extended	2 	Single loop with feedforward Single loop with feedforward and remote setpoint ‡ Cascade Cascade with remote setpoint ‡ Cascade with feedforward ‡ Ratio controller (internal ratio) Ratio controller (external ratio) ‡ Ratio station (internal ratio) Ratio station (external ratio) ‡	Totalization Advanced control – Feed forward – Predictive control – Adaptive control Historical trending Display customization
Dual Loop	3 	Dual loop – local / local ‡ Dual loop – remote / local ‡ Dual loop – remote / remote ‡	

Recommended I/O Build: \* Basic + option board 1, † Basic + option board 1a, ‡ Basic + option boards 1 and 2

**Fig. 1: Overview of template options**

# ControlMaster CM30

## Universal process controller, 1/4 DIN

### Powerful operator display

The CM30 features a full-color 9 cm (3.5 in.) display for displaying detailed process information to the user. Process details such as alarm messages and diagnostic information are displayed clearly in full text without the need for difficult-to-read scrolling displays.

#### Example of an operator page

Automatic selection of standard display templates immediately makes best use of the CM30's display. Extensive customization features then enable the displayed information to be tailored to suit the process requirements.



Fig. 2: Cascade template display

### Diagnostics and alarm status display

The diagnostics and alarm status display provides detailed information on any active alarm or diagnostic condition. The operator can see, at-a-glance, the status of any alarm condition present within the process. Additionally, diagnostic messages are presented clearly to the operator, enabling rapid notification and simple diagnosis of any critical instrument status condition.

Historical information of diagnostic messages can also be viewed in the controller's diagnostic log.



Fig. 3: Alarm status display

### Trend display

Any 2 analog values within the CM30 can be plotted on the trend display to give a short-term process history. This feature enables control efficiency to be monitored against setpoint and assists in tuning during commissioning.



Fig. 4: Trend display

### Exceptionally easy to use

The CM30's full text display and simple-to-navigate, pop-up menu makes operation exceptionally easy. A programmable soft key enables commonly used functions, such as alarm acknowledgement and display selection, to be accessed easily by the operator.



Fig. 5: Pop-up menu

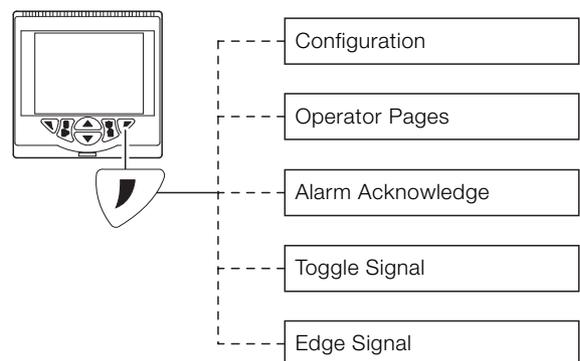


Fig. 6: Programmable soft key

# ControlMaster CM30

## Universal process controller, 1/4 DIN

### Advanced control functionality

The CM30 features many advanced control functions providing the power to bring even the most complex process under control.

#### Autotune

Once initial configuration is complete, a powerful autotune facility enables automatic calculation of the PID values required, enabling rapid commissioning of the CM30.

#### Gain scheduling

The CM30's gain scheduling functionality is used for efficient control of non-linear processes. Up to 3 different sets of PID parameters are selected automatically from a reference signal ensuring optimum control response, regardless of the process status.

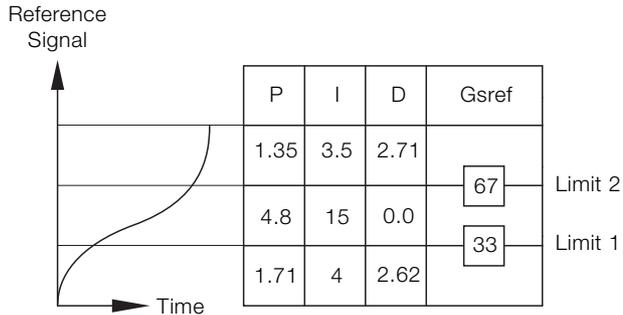


Fig. 7: Gain scheduling example

#### Predictive control (dead-time compensation)

Control of processes with long dead-times, such as pH dosing in a pipeline, is addressed easily using pPI control. Configured via only 3 parameters (gain, integral time and dead-time), pPI control can also be combined with gain scheduling for optimum control efficiency.

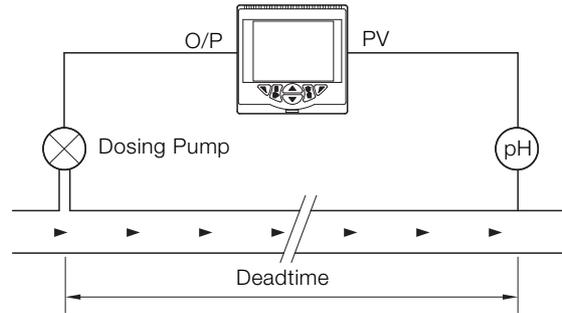


Fig. 8: Predictive control example

#### Adaptive control

Adaptive control enables the CM30 to adjust its control response automatically to suit changing process dynamics. This makes the CM30 particularly useful for processes with varying or uncontrolled types of load, by providing continuous tuning to maximize control efficiency. Fig. 9 shows a product used in a manufacturing process that is stored in an outside tank. The use of adaptive control within the manufacturing process compensates automatically for the change in product temperature caused by seasonal variation.

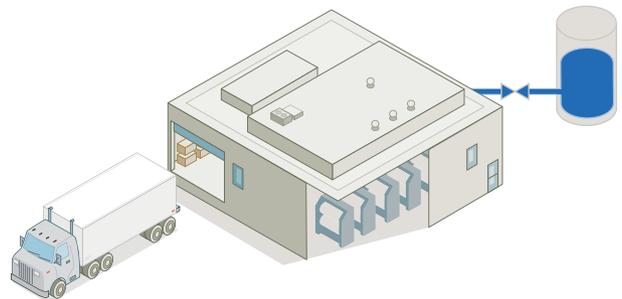


Fig. 9: Adaptive control example

### Split output control

The CM30 can also be configured to perform split output control, for example, when both heating and cooling of a single process is required.

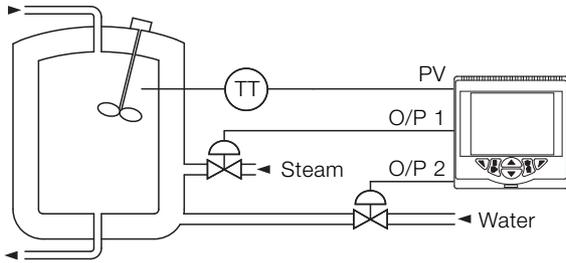


Fig. 10: Split output control example

### External setpoint selection

The CM30's control setpoint can be selected via external digital signals, for example, simplifying operation by selecting different setpoints using external push buttons.

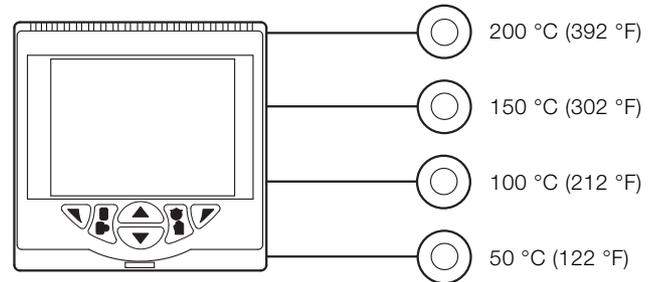


Fig. 12: External setpoint selection

### Remote auto / manual switching

In addition to switching via the front panel, the CM30 can be switched between automatic and manual control mode using an external signal. When switched to manual mode via a digital signal, the value of the control output can be preset, for example, to fully open a control valve automatically during a cleaning cycle.

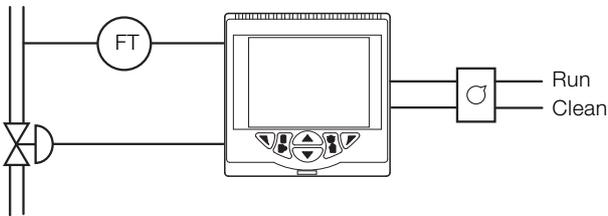


Fig. 11: Remote auto / manual switching

# ControlMaster CM30

## Universal process controller, 1/4 DIN

### Problem solving flexibility

Extensive functionality is available to provide flexible problem-solving capability; making the CM30 much more than just a process controller.

#### Process alarms

8 independent process alarms can monitor any analog signal within the CM30, enabling extensive process monitoring capability. Alarms can be used to drive physical outputs or soft-wired to other functions within the controller.

#### Real-time alarms

The 'alarm clock' functionality provided by the CM30's real-time alarms enables time-of-day decisions to be introduced into the controller's actions or specific functions to be triggered routinely at specified times.

#### Delay timers

Event sequencing is enabled through the use of the CM30's delay timers. A predetermined delay and output duration can be programmed into each delay timer and timers can be linked together.

#### Custom linearizers

The CM30 has 2 independent 20-point custom linearizers that can be applied to any analog signal within the controller. These linearizers can be used in applications such as level-to-volume conversion of a non-linear tank level or to accommodate special input signals or output devices.

#### Math

8 math blocks provide arithmetic, averaging, min. / max. hold, square root and signal switching functionality. Simple equations can be performed in a single math block or multiple math blocks can be nested together to construct complex equations.

Signal switching 'multiplexer' math blocks switch between 2 analog signals based on a trigger signal. For example, a backup sensor could be selected automatically on failure of a primary sensor.

#### Logic

8 comprehensive logic equations provide powerful interlock functionality. Inputs and outputs of the logic equations can be soft-wired to any digital signal within the controller to maximize flexibility.

#### Totalizer

2 totalizers are available on the CM30. The totalizers can be configured to perform multiple functions:

- integration against an analog signal to totalize flow
- counting digital pulses
- totalization of flow based on a frequency signal from an electromagnetic flow meter

## Communications

Extensive communication options enable the CM30 to be integrated into larger control systems easily or connected to other process instrumentation.

### Ethernet

Optional Ethernet communications enable the CM30 to be integrated in to an Ethernet network quickly. The following functionality is provided:

#### – Email

Notification of a critical process event or status can be made by email. Multiple events can trigger an email that can be sent to multiple recipients

#### – Webserver

ControlMaster's integrated webserver enables the current status of the process and controller to be viewed remotely using a standard web browser

#### – MODBUS TCP

Process values and status can be communicated to and from the CM30 in real-time using MODBUS TCP, enabling it to be integrated easily into larger control systems or connected to a data recorder

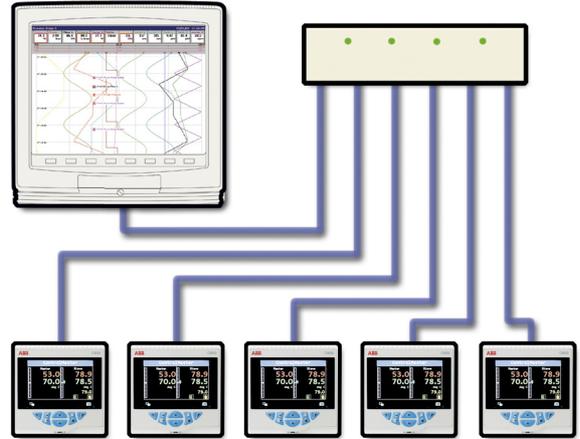


Fig. 14: ControlMasters connected to a ScreenMaster

### RS 485 MODBUS

Using RS 485 MODBUS, values and status can be communicated to and from the controller in real-time via an RS 485 connection.



Fig. 13: Webserver

# ControlMaster CM30

## Universal process controller, 1/4 DIN

### PC configuration

In addition to configuration via the front panel, the CM30 can be configured offline using ABB's Asset Vision Basic, a Device Type Manager (DTM)-based configuration package.

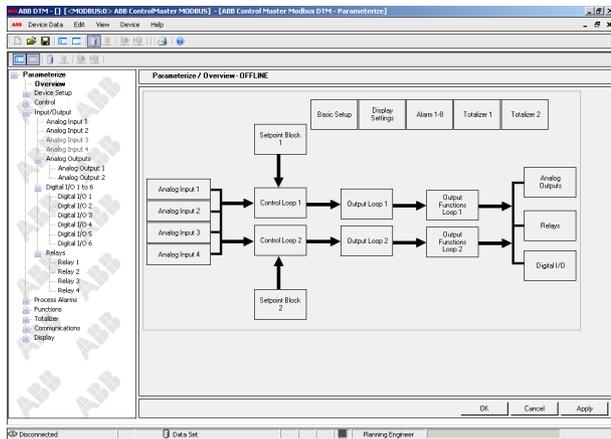


Fig. 15: PC configuration software

Configuration files can be stored locally on a PC and transferred to the controller via its front panel infrared port.

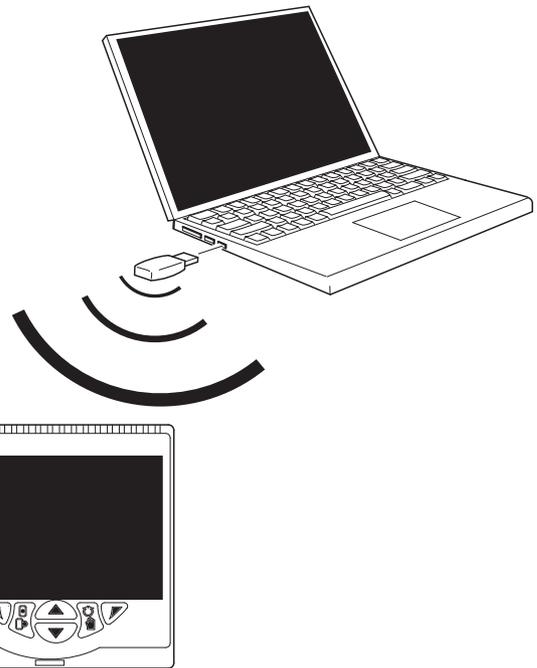


Fig. 16: Transferring a configuration file via the infrared port

PC configuration software for ControlMaster is available for download from [www.abb.com/instrumentation](http://www.abb.com/instrumentation).

## Application templates

To minimize commissioning time, the CM30 features up to 20 preconfigured control strategy templates. By selecting the required control strategy, the template configures the CM30's function blocks and display automatically. Customization of the preconfigured templates is also possible, providing the flexibility to create customized solutions.

### Single loop

This template provides standard, single-loop process control and is available with or without a remote setpoint. In this example, the temperature of a product heated by a heat exchanger is regulated via the control of the steam feed to the heat exchanger.

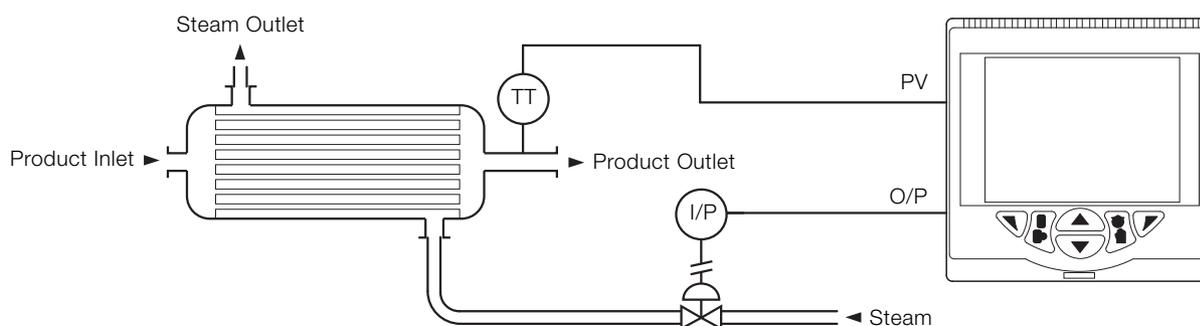


Fig. 17: Single loop

### Single loop with feed-forward

This template adds feed-forward functionality to the single-loop template and is available with or without a remote setpoint. Feed-forward control enables the CM30 to anticipate, and respond to, process occurrences not yet detected by the process variable signal.

In this example, the CM30 is regulating the speed of a dosing pump used to neutralize the pH of waste discharge. The flow rate of the waste discharge is monitored and fed forward to the CM30 so that, as the flow rate increases, the speed of the dosing pump increases automatically to neutralize the extra volume of waste discharge.

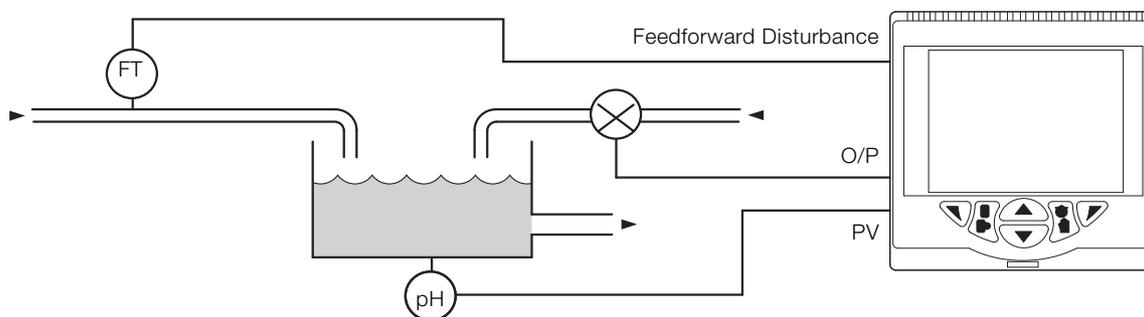


Fig. 18: Single loop with feed-forward

# ControlMaster CM30

## Universal process controller, 1/4 DIN

### Cascade

The cascade template connects two PID loops together to enhance the control of a master variable (master loop) by manipulation of a slave loop.

In this example, the temperature of a furnace is regulated (master loop) by monitoring and controlling the gas flow rate to the burner (slave loop). By performing slave loop control on the gas flow rate, variations in gas supply can be accounted for and better temperature control performance achieved. This template is available with or without a remote setpoint.

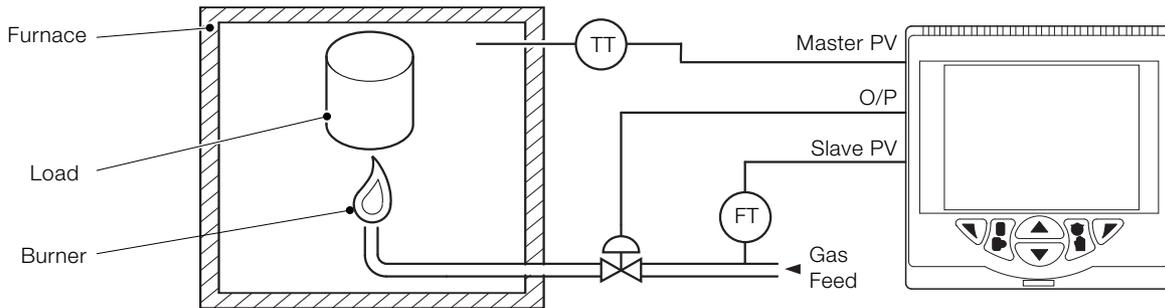


Fig. 19: Cascade

### Cascade with feed-forward

This template combines the benefits of the feed-forward and cascade templates.

In this example, the effect of steam demand change on the level within the boiler drum is predicted and accounted for via the feed-forward signal. Feed water supply is then controlled accurately using a 'slave' flow loop that accounts for any variations in water supply.

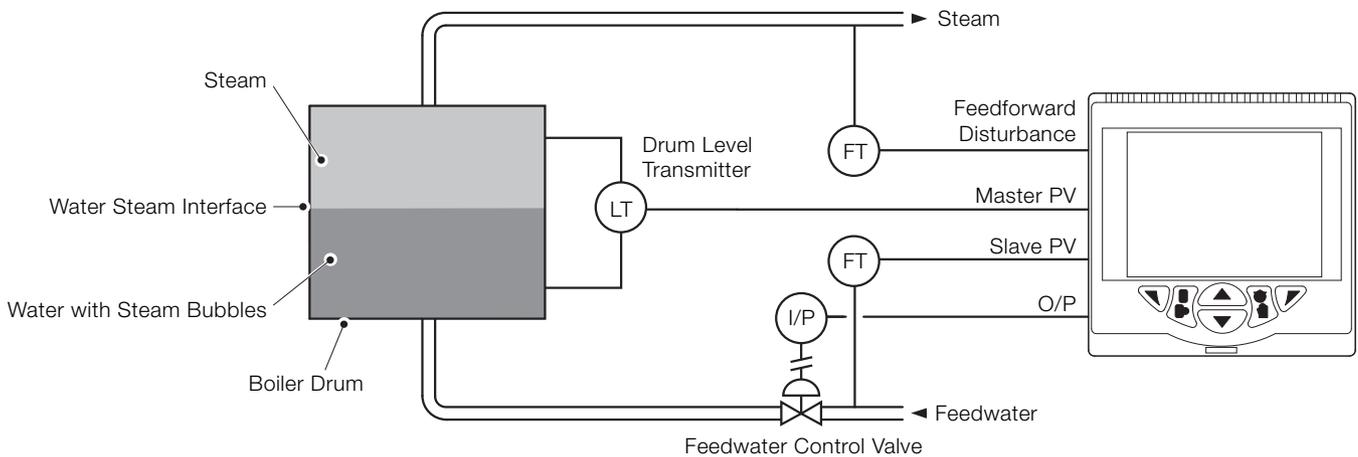


Fig. 20: Cascade with feed-forward

### Ratio controller

The ratio controller template configures the CM30 to regulate one process variable against another based on a specified ratio. When using the ratio control template, the CM30's display shows the required ratio (setpoint) and the actual ratio achieved (process variable).

In this example, a controlled amount of 'Flow B' is added to 'Flow A' at a ratio programmed into the CM30. This template is available with or without an external ratio.

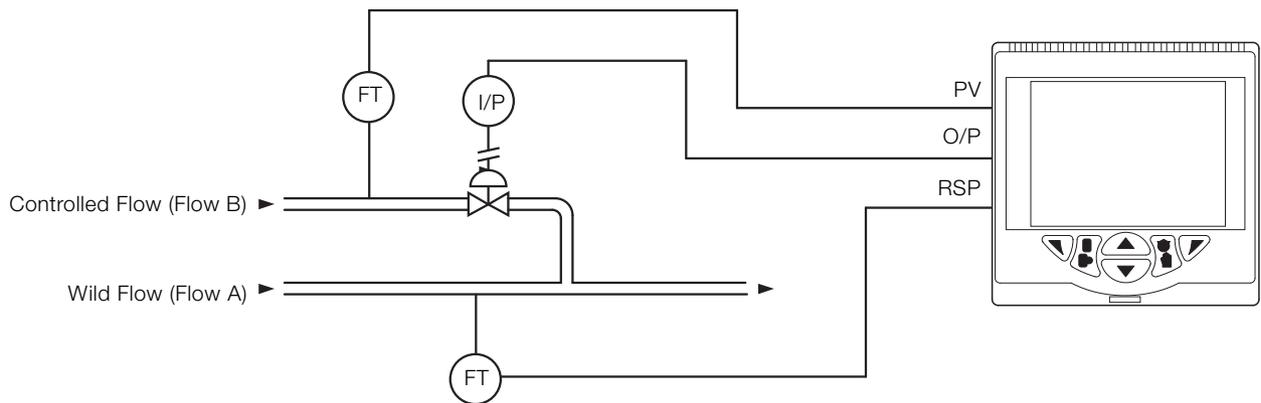


Fig. 21: Ratio controller

### Ratio station

The ratio station template configures the CM30 as an indicator and setpoint generator.

In this example, the CM30 is calculating and indicating the ratio of flow A and flow B. The operator is able to enter the desired ratio on the CM30; the CM30 then retransmits the setting to the slave controller. In many applications, the slave controller is a blind or remotely-located device.

This template is available with or without an external ratio.

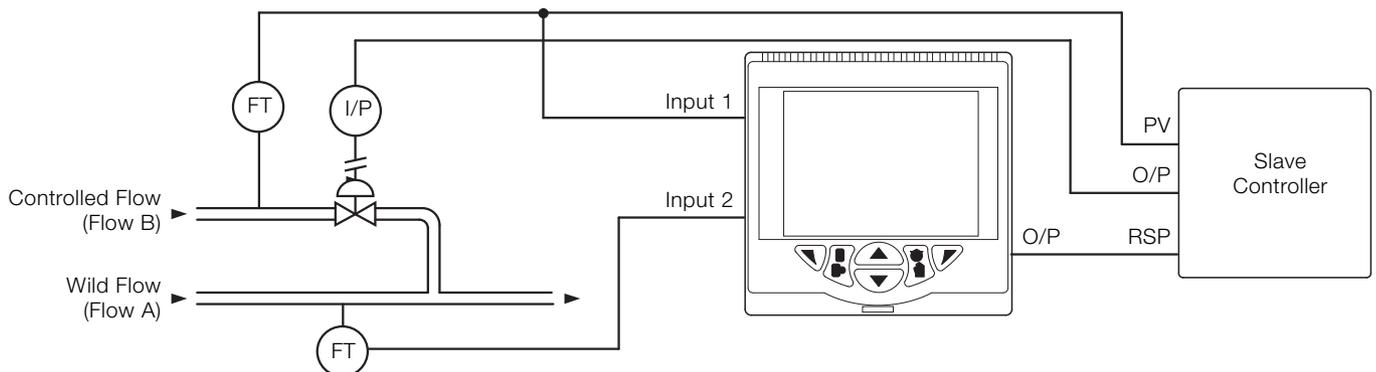


Fig. 22: Ratio station

# ControlMaster CM30

## Universal process controller, 1/4 DIN

### Auto / Manual station and analog backup station

These templates configure the CM30 to backup a master controller, typically a PLC or DCS. A fault condition is detected via a low output signal from the master controller or a digital signal. On detection of a fault signal, the CM30 can take control of the process (analog backup template), freeze its output or switch to a safe output (auto / manual station template). In this example, a critical control of flow is backed-up by the CM30.

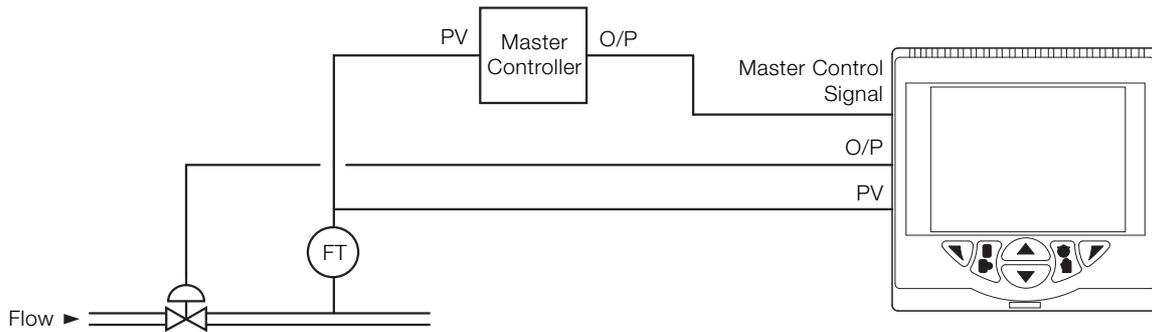


Fig. 23: Auto / Manual station and analog backup station

### Dual loop

The dual loop template enables a CM30 to act as 2 independent controllers and is available with a remote setpoint for either, or both, control loops. In this example, the temperature and humidity of a climatic chamber are controlled independently.

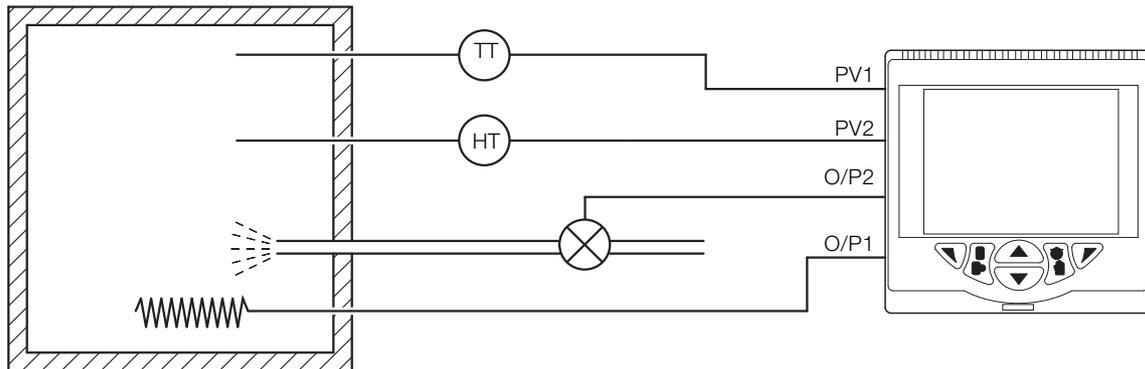


Fig. 24: Dual loop

## Technical specification

### Operation

#### Display

Color, 1/4 VGA TFT, liquid crystal display (LCD) with built-in backlight

#### Language

English, German, French, Italian and Spanish

#### Operator keypad

6 tactile membrane keys

#### Trend display

- Recording of 2 variables
- Configurable sample rate (1 second to 5 minutes)
- 272 samples displayed on screen

### Security

#### Password protection

Basic / Advanced – user-assigned password protection (not set at factory)

### Standard functions

#### Control strategies

Base templates:

- Single loop with local setpoint
- Single loop with remote setpoint

Standard templates:

- Auto / Manual station (low signal detection)
- Auto / Manual station (digital signal selection)
- Analog backup station (low signal detection)
- Analog backup station (digital signal detection)
- Single indicator / manual loader station
- Dual indicator / manual loader station

Extended templates:

- Single loop with feedforward
- Single loop with feedforward and remote setpoint
- Cascade
- Cascade with remote setpoint
- Cascade with feedforward
- Ratio controller with internal ratio
- Ratio controller with external ratio
- Ratio station with internal ratio
- Ratio station with external ratio

Dual loop templates:

- Dual loop with local setpoints
- Dual loop with remote setpoint on 1 and local setpoint on 2
- Dual loop with remote setpoint on both

### Control output types

Current proportioning

Time proportioning

On / Off

Motorized valve with feedback

Motorized valve without feedback

Split output – with combinations of relay, digital output and current outputs

### Control parameters

Proportional band: \*

- 0.0 to 999.9 %

Integral: \*

- 0 to 10000 s

Derivative: \*

- 0.0 to 999.9 s

Manual Reset:

- 0.0 to 100.0 %

\* 3 sets of PID parameters when used with Gain Scheduling facility

# ControlMaster CM30

## Universal process controller, 1/4 DIN

### Setpoints

Local:

- 4, selectable via digital input or front panel

Remote:

- selectable via digital input or front panel keys

### Auto tune

On-demand calculation of control settings

### Process alarms

Number:

- 8

Types:

- High / Low process
- High / Low latch

Source

- Fully configurable  
(for example – PV, Analog input, Math block inbuilt, OP control loop deviation)

Hysteresis:

- Level and time

Alarm enable:

- Enable / Disable individual alarms via a digital signal

### Acknowledgement

Via front panel keys or digital signals

### Real-time alarms

Number:

- 2

Programmable:

- Time
- Day
- Duration

### Math blocks

Number:

- 8

Operators:

- +, -, x, /
- Average, Maximum, Minimum
- High / Low / Median select
- Square root
- Multiplexer

### Delay timers

Number:

- 2

Programmable:

- Delay
- Duration

### Logic equations

Number:

- 8

Elements:

- 15 per equation

Operators:

- OR, AND, NOR, NAND, NOT, EXOR

### Custom linearizer

Number:

- 2

Elements:

- 20 breakpoints

## Analog inputs

### Universal process inputs

Number:

- 2 (1 standard, 1 optional)

Type:

- Voltage
- Current
- Resistance (ohms)
- 3-Wire RTD
- Thermocouple
- Digital volt-free
- Digital 24 V
- Frequency (Input 1)
- Pulse

### Non-universal process inputs

Number:

- 2 (1 standard, 1 optional)

Type:

- Voltage
- Current
- Thermocouple \*
- Digital volt-free
- Digital 24 V

### Thermocouple types

B, E, J, K, L, N, R, S, T

### Resistance thermometer

Pt100

### Other linearizations

$\sqrt{x}$ ,  $x^{3/2}$ ,  $x^{5/2}$ , custom linearization

### Digital filter

Programmable 0 to 60 s

### Display range

–9999 to 99999

### Update rate

125 ms

### Common mode noise rejection

> 120 dB at 50 / 60 Hz with 300  $\Omega$  imbalance resistance

### Normal (series) mode noise rejection

> 60 dB at 50 / 60 Hz

### CJC rejection ratio

0.05  $^{\circ}\text{C}/^{\circ}\text{C}$  change in ambient temperature

### Temperature stability

0.02  $\%/^{\circ}\text{C}$  or 2  $\mu\text{V}/^{\circ}\text{C}$  (1  $\mu\text{V}/^{\circ}\text{F}$ )

### Long term (input) drift

< 0.1 % of reading or 10  $\mu\text{V}$  annually

### Input impedance

> 10  $\text{M}\Omega$  (mV input)

10  $\Omega$  (mA input)

\* Only if universal process input is configured as 'Thermocouple'

# ControlMaster CM30

## Universal process controller, 1/4 DIN

### Inputs

Thermocouple	Maximum range °C (°F)	Accuracy (% of reading)
B	-18 to 1800 (0 to 3270)	0.1 % or ±2 °C (3.6 °F) (above 200 °C [392 °F]) *
E	-100 to 900 (-140 to 1650)	0.1 % or ±0.5 °C (0.9 °F)
J	-100 to 900 (-140 to 1650)	0.1 % or ±0.5 °C (0.9 °F)
K	-100 to 1300 (-140 to 2350)	0.1 % or ±0.5 °C (0.9 °F)
L	-100 to 900 (-140 to 1650)	0.1 % or ±1.5 °C (2.7 °F)
N	-200 to 1300 (-325 to 2350)	0.1 % or ±0.5 °C (0.9 °F)
R	-18 to 1700 (0 to 3000)	0.1 % or ±1 °C (1.8 °F) (above 300 °C [540 °F]) *
S	-18 to 1700 (0 to 3000)	0.1 % or ±1 °C (1.8 °F) (above 200 °C [392 °F]) *
T	-250 to 300 (-400 to 550)	0.1 % or ±0.5 °C (0.9 °F) (above -150 °C [-238 °F]) *

\* Accuracy is not guaranteed at temperatures below this value

RTD	Maximum range °C (°F)	Accuracy (% of reading)
Pt100	-200 to 600 (-325 to 1100)	0.1 % or ±0.5 °C (0.9 °F)

Linear inputs	Standard analog input	Accuracy (% of reading)
Millivolts	0 to 150 mV	0.1 % or ±20 µV
Milliamps	0 to 50 mA	0.2 % or ±4 µA
Volts	0 to 25 V	0.2 % or ±20 mV
Resistance (low)	0 to 550 Ω	0.2 % or ±0.1 Ω
Resistance (high)	0 to 10 kΩ	0.5 % or ±10 Ω
Sample Interval	125 ms per sample	

Digital inputs	
Type	Volt-free or 24 V
Minimum pulse duration	Analog inputs 1 and 2: – Single inputs configured – 250 mS – Both inputs configured as analog or digital – 500 mS Analog inputs 3 and 4: – Single inputs configured – 250 mS – Both inputs configured as analog or digital – 500 mS Consider analog inputs 1/2 and 3/4 independently

Frequency input*	
Frequency range	0 to 6000 Hz
1-signal	15 to 30 V
0-signal	-3 to 5 V

\*For use with devices with open collector outputs

### Outputs

#### Controls / Retransmission outputs

Number:

- 2 (1 standard, 1 optional)

Type:

- Configurable as analog or digital pulse

Isolation:

- Galvanically isolated from the rest of the circuitry, 500 V for 1 minute

Analog range:

- 0 to 20 mA programmable

Load:

- 750 Ω max.

Accuracy:

- 0.25 % of output or ±10 µA

## Relays

Number:

- 4 (1 standard, 3 optional)

Type:

- Standard with changeover contacts
- Optional contacts selectable as NO or NC (by jumper)

Contact ratings:

- 5 A, 240 V

Update rate:

- 125 ms

## Digital I/O

Number:

- 6 (2 standard, 4 optional)

Type:

- User-programmable as input or output
- Minimum input pulse duration – 125 ms

Input:

- Volt-free or 24 V DC
- 1-signal 15 to 30 V
- 0-signal –3 to 5 V
- Conforms to IEC 61131-2

Output:

- Open collector output
- 30 V, 100 mA max. switched
- Conforms to IEC 61131-2

Update rate:

- 125 ms

## 2-Wire transmitter power supply

Number:

- 2 (1 standard, 1 optional)

Voltage:

- 24 V DC

Drive:

- 2 Loops for each transmitter PSU,  
45 mA max.

# ControlMaster CM30

## Universal process controller, 1/4 DIN

### Communications

**Note.** Only one communications option can be fitted per controller.

### IrDA service port (standard)

Baud rate:

- Up to 115 kBaud

Distance:

- Up to 1 m (3 ft)

Functions:

- Firmware upgrade
- Configuration upload / download

### Ethernet (optional)

Type:

- 10BaseT

Connector:

- RJ 45

Protocols:

- TCP/IP
- HTTP
- MODBUS TCP (Slave)

Web server:

- Built-in – enables remote monitoring using standard web browsers

Email

- Can be configured to be sent on the occurrence of a specified event
- Up to 3 recipients
- Up to 4 trigger sources with configurable tag

### MODBUS \* RTU (optional)

Baud rate:

- Up to 115 kBaud

Isolation:

- Galvanically isolated from the rest of the circuitry, 500 V DC for 1 minute

\* MODBUS is a registered trademark of the MODBUS-IDA organization

## EMC

### Emissions & immunity

Meets requirements of IEC 61326 for an Industrial Environment

## Environmental

### Operating temperature range

-0 to 55 °C (32 to 131 °F)

### Operating humidity range

5 to 95 % RH (non-condensing)

### Storage temperature range

-20 to 70 °C (-4 to 158 °F)

### Enclosure sealing

Front face:

— IP 66 & NEMA 4X

Rest of enclosure:

— IP 20

### Vibration

Conforms to EN60068-2-6

## Safety

### Approvals and certifications

EN 61010-1

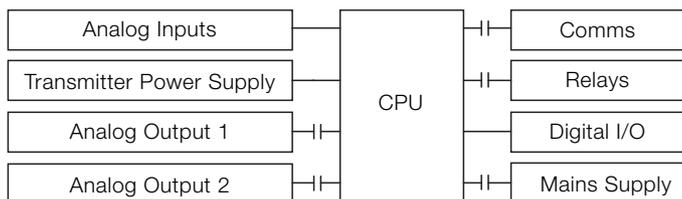
cULus

### General safety

Pollution category 2

Insulation category 2

### Isolation



## Key

—||— = Isolation

## Electrical

### Supply ranges

100 V to 240 V AC  $\pm 10\%$  (90 V min. to 264 V max.) 50 / 60 Hz  
10 to 36 V DC (optional)

### Power consumption

10 W max.

### Power interruption protection

No effect for interrupts of up to 60 ms

## Physical

### Size

97 x 97 x 141 mm (3.8 x 3.8 x 5.5 in.)

### Weight

0.5 kg (1.1 lb) approx. (unpacked)

### Panel cutout

92 x 92 mm (3.6 x 3.6 in.), 121 mm (4.8 in.) behind panel

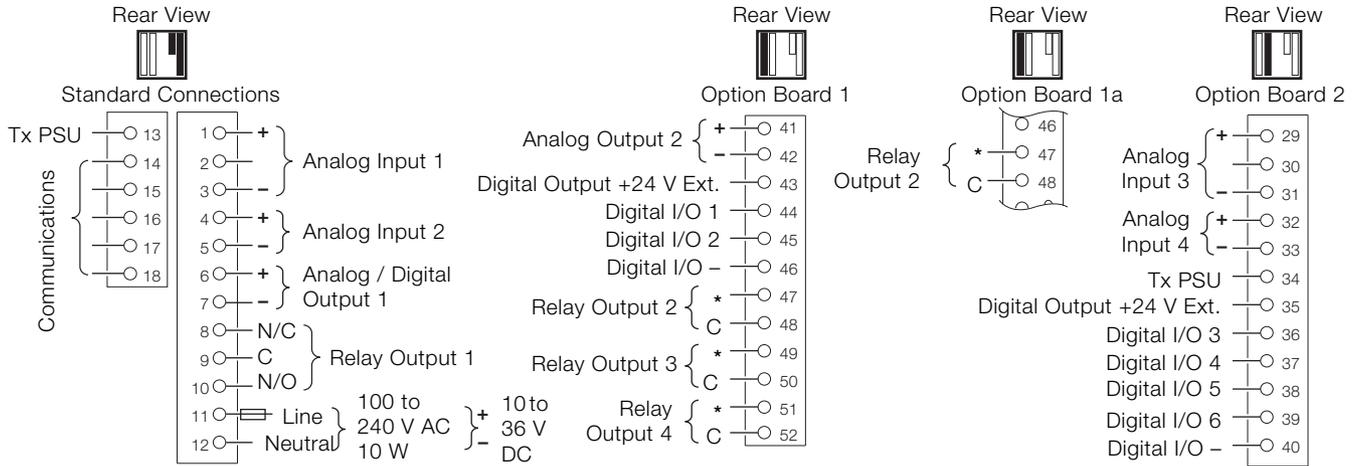
### Case material

Glass-filled polycarbonate

# ControlMaster CM30

## Universal process controller, 1/4 DIN

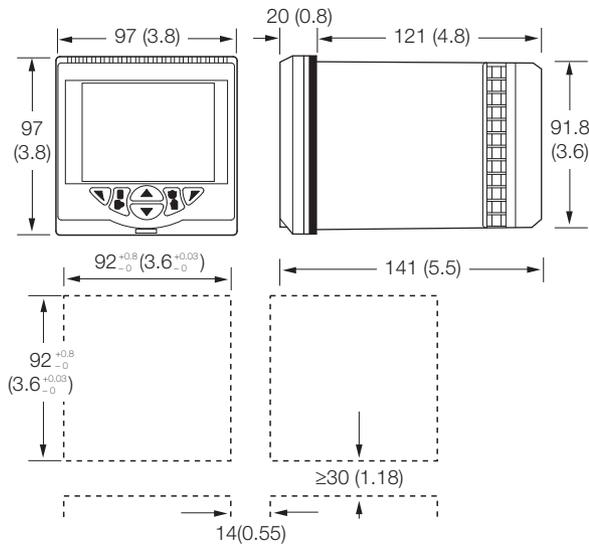
### Electrical connections



\* N/O or N/C selection made via jumper

### Overall dimensions

Dimensions in mm (in.)



### Standard accessories

Included with each controller:

- Panel mounting clamps
- Instruction manual
- Bezel release tool
- Cold junction thermistor

### Optional accessories

- PC configuration kit CM30/0712
- After-sales engineered configuration service ENG/CON

## Ordering information

ControlMaster CM30 universal process controller, 1/4 DIN	CM30/	X	X	X	X	X	X	X	/XXX
<b>I/O build</b>									
2 analog inputs, 1 analog O/P and 1 relay (Basic)		0							
2 analog inputs, 1 analog output and 2 relays (Basic + option board 1a)		1							
2 analog inputs, 2 analog outputs, 2 digital I/O and 4 relays (Basic + option board 1)		2							
4 analog inputs, 2 analog outputs, 6 digital I/O and 4 relays (Basic + option boards 1 and 2)		3							
<b>Template / Functionality level</b>									
Base			0						
Standard			S						
Extended			E						
Dual loop			D						
<b>Communications</b>									
None				0					
Ethernet				E					
RS 485 MODBUS				M					
<b>Approval</b>									
Standard CE					S				
cULus approval					U				
<b>Power Supply</b>									
100 ... 240 V AC						0			
10 ... 36 V DC						1			
<b>Language</b>									
English								E	
German								G	
French								F	
Italian								I	
Spanish								S	
<b>Special features</b>									
None									0
Unbranded front panel *									B
<b>Configuration</b>									
Standard									STD
Custom configuration (customer to complete and supply CM30 custom configuration sheet – <a href="#">INF11/091-EN</a> )									CUS
Engineered configuration (customer to supply configuration details required)									ENG

\* Not available in conjunction with cULus approval.

# Contact us

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3KXC403001R1001



Sales



Service



Software

# ControlMaster CM15

## Universal process indicator, 1/8 DIN

Making process control easy



### Comprehensive display of process status

- Crystal-clear, full-color TFT display
- User-customizable

### Exceptionally easy to use

- Intuitive user interface and clear text prompts make installation, commissioning and operation quick and simple

### Comprehensive I/O

- 2 universal inputs, 1 analog output and 1 relay fitted as standard

### Frequency input

- Direct, high accuracy connection to electromagnetic flowmeters

### Scalable to match application requirements

- Comprehensive hardware and software options

### Totalization and counter functions

- Calculation and display of flow total values
- Pulse counting capability

### Problem-solving capability

- Flexible functionality including math, logic and totalization providing power to solve complex application requirements

### Built to survive

- IP 66 and NEMA 4X environmental protection

### Flexible connectivity

- Ethernet and MODBUS® communications

# ControlMaster CM15

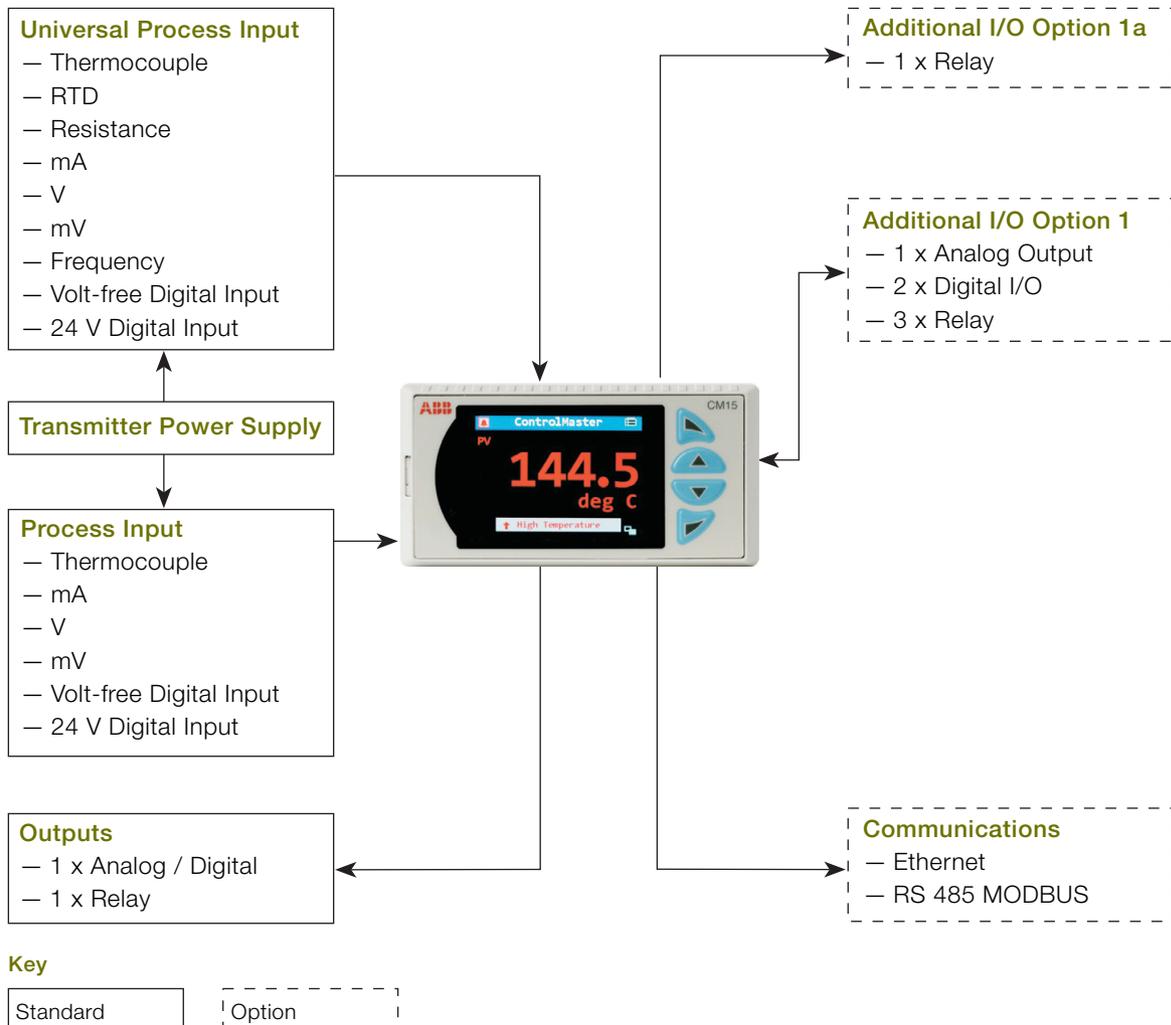
## Universal process indicator, 1/8 DIN

### Overview

The ControlMaster CM15 is a feature-packed, 1/8 DIN, universal process indicator. A crystal-clear, full-color, TFT display shows operators exactly the information they need to know and provides operation and configuration menus in full text making the CM15 intuitive to use and very quick to install and commission.

Available as a basic indication-only model, or enhanced through plug and play function keys and I/O modules, the CM15 offers totalization, level, math, logic, counter and alarm functions making it extremely flexible and able to solve many demanding application requirements.

MODBUS and Ethernet communication options ensure easy integration and connectivity to supervisory or control systems.



## Highly scalable

The CM15 is highly scalable in terms of both hardware and software, enabling it to meet the demands of simple indication duties through to more complex applications. The basic CM15 provides basic indication, totalization and level functionality. Templates and functionality can be increased by adding function keys to the basic model as shown in Fig. 1, while retaining previous templates and functionality.

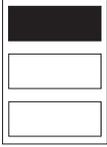
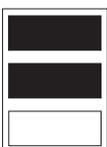
Level	Function Keys	Template	Functionality
Base	0 	Single PV indication Single PV with totalizer Single totalizer Single level with volume	Process alarms Totalization Volume computation — Specific gravity compensation Minimum, maximum and average calculation
Standard	1 		Logic Math Custom linearizers Delay timers Real time alarms Template customization
Dual	2 	Dual PV indication Dual PV with totalizer Dual totalizer Dual level with volume	Display customization

Fig. 1: Overview of template options

# ControlMaster CM15

## Universal process indicator, 1/8 DIN

### Powerful operator display

The CM15 features a full-color 5.5 cm (2.2 in.) display for displaying detailed process information to the user. Process details such as alarm messages and diagnostic information are displayed clearly in full text without the need for difficult-to-read scrolling displays.

#### Example of an operator page

Automatic selection of standard display templates immediately makes best use of the CM15's display. Extensive customization features then enable the displayed information to be tailored to suit the process requirements.

### Diagnostics and alarm status display

The diagnostics and alarm status display provides detailed information on any active alarm or diagnostic condition. The operator can see, at-a-glance, the status of any alarm condition present within the process. Additionally, diagnostic messages are presented clearly to the operator, enabling rapid notification and simple diagnosis of any critical instrument status condition.

Historical information of diagnostic messages can also be viewed in the indicator's diagnostic log.



Fig. 2: Single PV indication template display

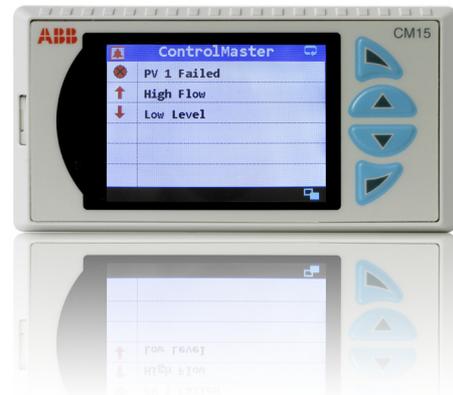


Fig. 4: Alarm status display

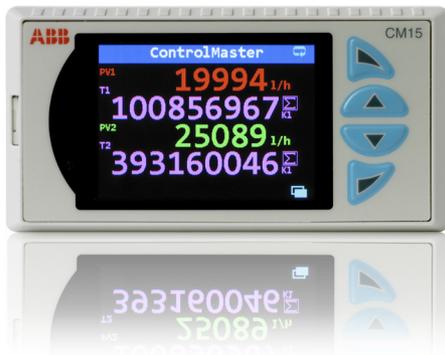


Fig. 3: Dual PV and totalization display

## Exceptionally easy to use

The CM15's full text display and simple-to-navigate, pop-up menu makes operation exceptionally easy.

A programmable soft key enables commonly used functions, such as alarm acknowledgement and display selection, to be accessed easily by the operator.



Fig. 5: Pop-up menu

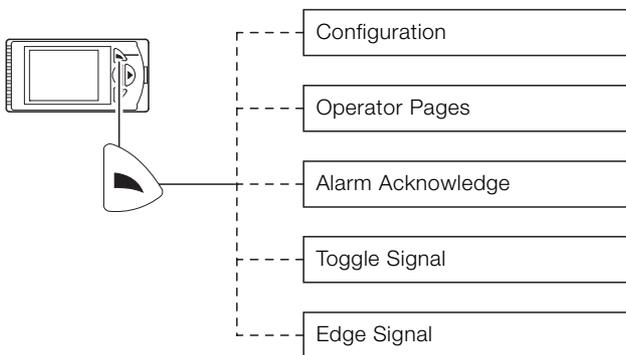


Fig. 6: Programmable soft key

# ControlMaster CM15

## Universal process indicator, 1/8 DIN

### Problem solving flexibility

Extensive functionality is available to provide flexible problem-solving capability; making the CM15 much more than just a process indicator.

#### Process alarms

8 independent process alarms can monitor any analog signal within the CM15, enabling extensive process monitoring capability. Alarms can be used to drive physical outputs or soft-wired to other functions within the indicator.

#### Real-time alarms

The 'alarm clock' functionality provided by the CM15's real-time alarms enables time-of-day decisions to be introduced into the indicator's actions or specific functions to be triggered routinely at specified times.

#### Delay timers

Event sequencing is enabled through the use of the CM15's delay timers. A predetermined delay and output duration can be programmed into each delay timer and timers can be linked together.

#### Custom linearizers

The CM15 has 2 independent 20-point custom linearizers that can be applied to any analog signal within the indicator. These linearizers can be used in applications such as level-to-volume conversion of a non-linear tank level or to accommodate special input signals or output devices.

#### Math

8 math blocks provide arithmetic, averaging, min. / max. hold, square root and signal switching functionality. Simple equations can be performed in a single math block or multiple math blocks can be nested together to construct complex equations.

Signal switching 'multiplexing' math blocks switch between 2 analog signals based on a trigger signal. For example, a backup sensor could be selected automatically on failure of a primary sensor.

#### Logic

8 comprehensive logic equations provide powerful interlock functionality. Inputs and outputs of the logic equations can be soft-wired to any digital signal within the indicator to maximize flexibility.

#### Totalizer

2 totalizers are available on the CM15. The totalizers can be configured to perform multiple functions:

- integration against an analog signal to totalize flow
- counting digital pulses
- totalization of flow based on a frequency signal from an electromagnetic flow meter

#### Frequency input

For maximum accuracy the CM15 can accept a frequency signal from an electromagnetic flow meter. The frequency signal can be totalized and displayed; an instantaneous flow rate can also be calculated and displayed on screen.

## Communications

Extensive communication options enable the CM15 to be integrated into larger control systems easily or connected to other process instrumentation.

### Ethernet

Optional Ethernet communications enable ControlMaster to be integrated in to an Ethernet network quickly. The following functionality is provided:

#### – Email

Notification of a critical process event or status can be made by email. Multiple events can trigger an email that can be sent to multiple recipients

#### – Webserver

ControlMaster's integrated webserver enables the current status of the process and indicator to be viewed remotely using a standard web browser

#### – MODBUS TCP

Process values and status can be communicated to and from the CM15 in real-time using MODBUS TCP, enabling it to be integrated easily into larger control systems or connected to a data recorder

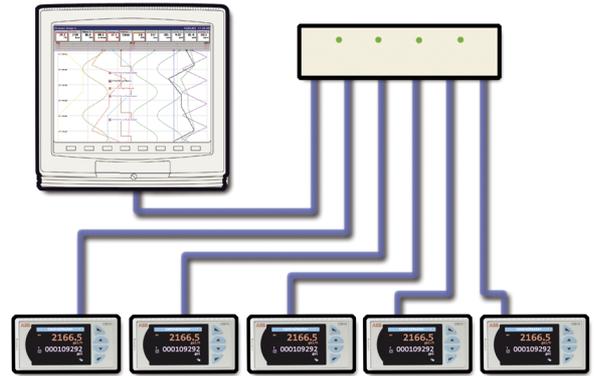


Fig. 8: ControlMasters connected to a ScreenMaster

### RS 485 MODBUS

Using RS 485 MODBUS, values and status can be communicated to and from the indicator in real-time via an RS 485 connection.

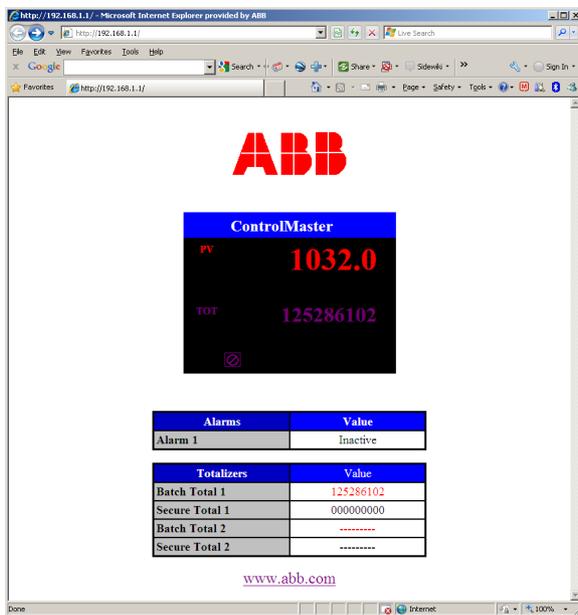


Fig. 7: Web server

# ControlMaster CM15

## Universal process indicator, 1/8 DIN

### PC configuration

In addition to configuration via the front panel, the CM15 can be configured offline using ABB's Asset Vision Basic, a Device Type Manager (DTM)-based configuration package.

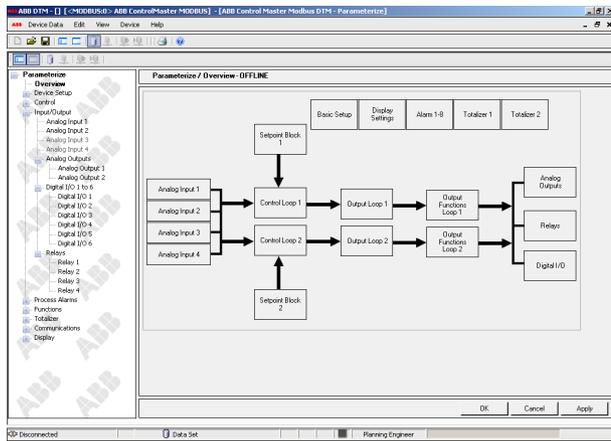


Fig. 9: PC Configuration software

Configuration files can be stored locally on a PC and transferred to the indicator via its front panel infrared port.

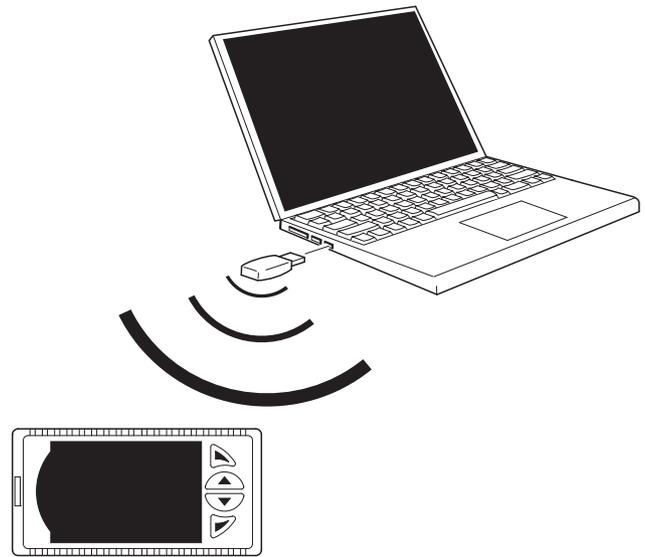


Fig. 10: Transferring a configuration file via the infrared port

PC configuration software for ControlMaster is available for download from [www.abb.com/instrumentation](http://www.abb.com/instrumentation).

## Application templates

To minimize commissioning time, the CM15 features up to 8 preconfigured templates. Simply selecting the required template configures the CM15's function blocks and display automatically. Customization of the preconfigured templates is also possible, providing the flexibility to create customized solutions.

### Single PV indication

This template provides indication of a single process value. The example in Fig. 11 shows the CM15 being used to indicate the temperature of a heat treatment furnace

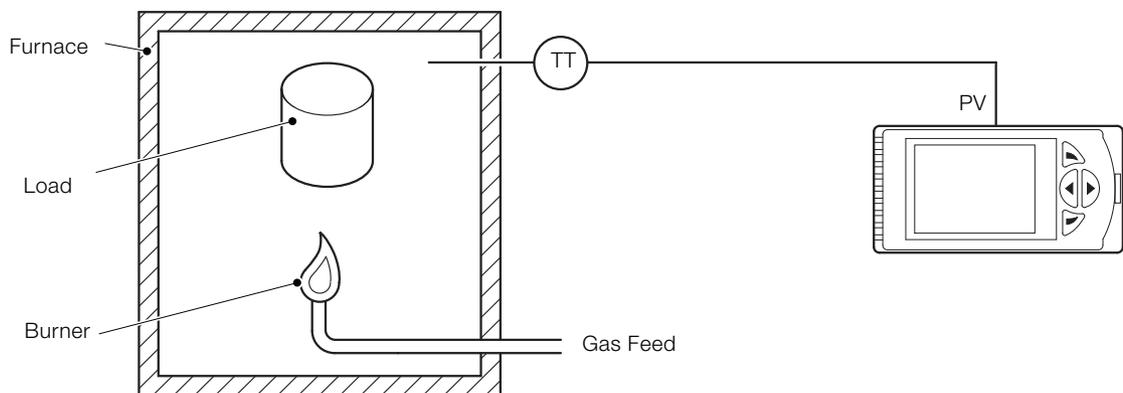


Fig. 11: Single PV indication

### Single PV with totalization

This template adds totalization to the single PV indication template. In the example in Fig. 12, the CM15 is monitoring a pipeline to provide indication of instantaneous flow rate and totalization and could be connected to the flowmeter via an analog (for example 4 to 20 mA) or frequency signal.

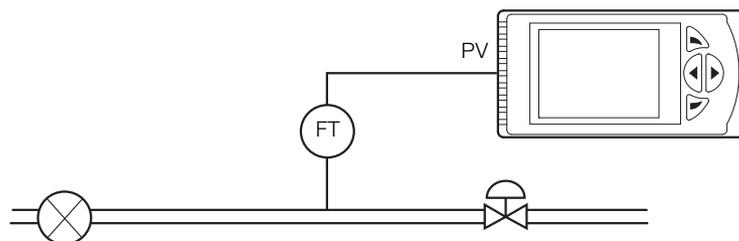


Fig. 12: Single PV with totalization

# ControlMaster CM15

## Universal process indicator, 1/8 DIN

### Single totalizer

This template provides totalization only. Fig. 13 shows the CM15 being used to count the number of products passing a specific point on a production line.

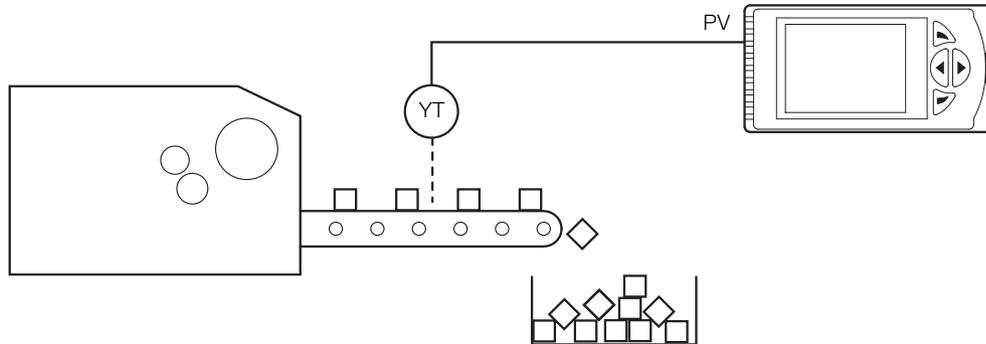


Fig. 13: Single totalizer

### Single level with volume

The single level with volume template adds level specific functions to the single PV indication template. The volume contained within a vessel can be calculated and indicated and products of varying specific gravity accounted for. In Fig. 14, the CM15 is shown monitoring the level of product in a storage tank and calculating the associated volume.

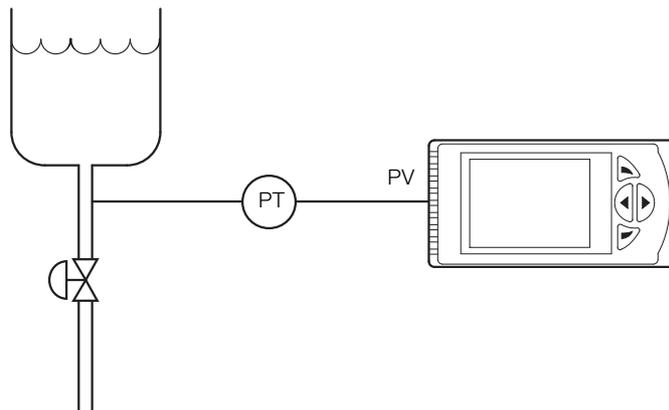


Fig. 14: Single level with volume

### Dual indication

This template provides indication of 2 process values. Variations of this template are available providing dual PV with totalization, dual totalization or dual level indication. The example in Fig. 15 shows a single CM15 providing indication of both the flow through, and temperature of, a heat exchanger.

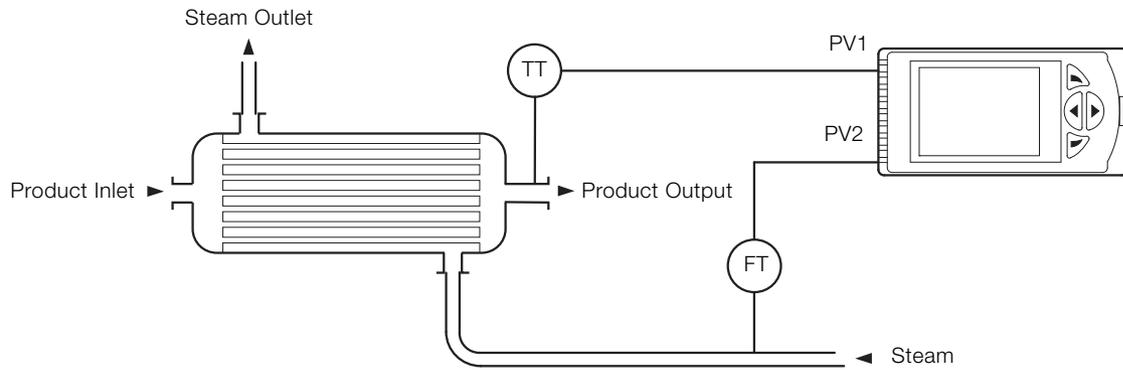


Fig. 15: Dual indication

# ControlMaster CM15

## Universal process indicator, 1/8 DIN

### Technical specification

#### Operation

##### Display

Color, 1/4 VGA TFT, liquid crystal display (LCD) with built-in backlight

##### Language

English, German, French, Italian and Spanish

##### Operator keypad

4 tactile membrane keys

#### Security

##### Password protection

Basic / Advanced – user-assigned password protection (not set at factory)

#### Standard functions

Base templates:

- Single PV indication
- Single PV indication + totalizer
- Counter
- Single PV indication + level

Dual templates

- Dual PV indication
- Dual PV indication + totalizer
- Dual counter
- Dual PV indication + level

#### Process alarms

Number:

- 8

Types:

- High / Low process
- High / Low latch

Source

- Fully configurable  
(for example – PV, Analog input, Math block inbuilt)

Hysteresis:

- Level and time

Alarm enable:

- Enable / Disable individual alarms via a digital signal

#### Acknowledgement

Via front panel keys or digital signals

#### Real-time alarms \*

Number:

- 2

Programmable:

- Time
- Day
- Duration

\* Indicator fitted with standard function key only

### Math blocks \*

Number:

- 8

Operators:

- +, –, x, /
- Average, Maximum, Minimum
- High / Low / Median select
- Square root
- Multiplexer

### Delay timers \*

Number:

- 2

Programmable:

- Delay
- Duration

### Logic equations \*

Number:

- 8

Elements:

- 15 per equation

Operators:

- OR, AND, NOR, NAND, NOT, EXOR

### Custom linearizer \*

Number:

- 2

Elements:

- 20 breakpoints

### Analog inputs

#### Universal process inputs

Number:

- 1 standard

Type:

- Voltage
- Current
- Resistance (ohms)
- 3-Wire RTD
- Thermocouple
- Digital volt-free
- Digital 24 V
- Frequency

#### Non-universal process inputs

Number:

- 1 standard

Type:

- Voltage
- Current
- Thermocouple \*
- Digital volt-free
- Digital 24 V

### Thermocouple types

B, E, J, K, L, N, R, S, T

### Resistance thermometer

Pt100

### Other linearizations

$\sqrt{x}$ ,  $x^{3/2}$ ,  $x^{5/2}$ , custom linearization

### Digital filter

Programmable 0 to 60 s

\* Indicator fitted with standard function key only

\* Only if universal process input is configured as 'Thermocouple'

# ControlMaster CM15

## Universal process indicator, 1/8 DIN

### Display range

-9999 to 99999

### Update rate

125 ms

### Common mode noise rejection

> 120 dB at 50 / 60 Hz with 300 Ω imbalance resistance

### Normal (series) mode noise rejection

> 60 dB at 50 / 60 Hz

### CJC rejection ratio

0.05 °C/°C change in ambient temperature

### Temperature stability

0.02 %/°C or 2 μV/°C (1 μV/°F)

### Long term (input) drift

< 0.1 % of reading or 10 μV annually

### Input impedance

> 10 MΩ (mV input)

10 Ω (mA input)

### Inputs

Thermocouple	Maximum range °C (°F)	Accuracy (% of reading)
B	-18 to 1800 (0 to 3270)	0.1 % or ±2 °C (3.6 °F) (above 200 °C [392 °F]) *
E	-100 to 900 (-140 to 1650)	0.1 % or ±0.5 °C (0.9 °F)
J	-100 to 900 (-140 to 1650)	0.1 % or ±0.5 °C (0.9 °F)
K	-100 to 1300 (-140 to 2350)	0.1 % or ±0.5 °C (0.9 °F)
L	-100 to 900 (-140 to 1650)	0.1 % or ±1.5 °C (2.7 °F)
N	-200 to 1300 (-325 to 2350)	0.1 % or ±0.5 °C (0.9 °F)
R	-18 to 1700 (0 to 3000)	0.1 % or ±1 °C (1.8 °F) (above 300 °C [540 °F]) *
S	-18 to 1700 (0 to 3000)	0.1 % or ±1 °C (1.8 °F) (above 200 °C [392 °F]) *
T	-250 to 300 (-400 to 550)	0.1 % or ±0.5 °C (0.9 °F) (above -150 °C [-238 °F]) *

\* Accuracy is not guaranteed at temperatures below this value

RTD	Maximum range °C (°F)	Accuracy (% of reading)
Pt100	-200 to 600 (-325 to 1100)	0.1 % or ±0.5 °C (0.9 °F)

Linear inputs	Standard analog input	Accuracy (% of reading)
Millivolts	0 to 150 mV	0.1 % or ±20 μV
Milliamperes	0 to 50 mA	0.2 % or ±4 μA
Volts	0 to 25 V	0.2 % or ±20 mV
Resistance (low)	0 to 550 Ω	0.2 % or ±0.1 Ω
Resistance (high)	0 to 10 kΩ	0.5 % or ±10 Ω
Sample Interval	125 ms per sample	

### Digital inputs

Type	Volt-free or 24 V
Minimum pulse duration	Single input configured – 250 ms Both inputs configured as analog or digital – 500 ms

### Frequency input\*

Frequency range	0 to 6000 Hz
1-signal	15 to 30 V
0-signal	-3 to 5 V

\*For use with devices with open collector outputs

## Outputs

### Retransmission outputs

Number:

- 2 (1 standard, 1 optional)

Isolation:

- Galvanically isolated from the rest of the circuitry, 500 V for 1 minute

Analog range:

- 0 to 20 mA programmable

Load:

- 750  $\Omega$  max.

Accuracy:

- 0.25 % of output or  $\pm 10 \mu\text{A}$

### Relays

Number:

- 4 (1 standard, 3 optional)

Type:

- Standard with changeover contacts
- Optional contacts selectable as NO or NC (by jumper)

Relay 1 contact rating:

- 5 A, 240 V

Relay 2, 3 and 4 contact ratings at maximum ambient temperature of 40 °C (104 °F):

- 5 A, 240 V

Relay 2, 3 and 4 contact ratings at maximum ambient temperature of 55 °C (131 °F):

- 2 A, 240 V

Update rate:

- 125 ms

## Digital I/O

Number:

- 2 (optional)

Type:

- User-programmable as input or output
- Minimum input pulse duration – 125 ms

Input:

- Volt-free or 24 V DC
- 1-signal 15 to 30 V
- 0-signal –3 to 5 V
- Conforms to IEC 61131-2

Output:

- Open collector output
- 30 V, 100 mA max. switched
- Conforms to IEC 61131-2

Update rate:

- 125 ms

### 2-Wire transmitter power supply

Number:

- 1 standard

Voltage:

- 24 V DC

Drive:

- 2 loops, 45 mA max.

# ControlMaster CM15

## Universal process indicator, 1/8 DIN

### Communications

**Note.** Only one communications option can be fitted per indicator.

### IrDA service port (standard)

Baud rate:

- Up to 115 kBaud

Distance:

- Up to 1 m (3 ft)

Functions:

- Firmware upgrade
- Configuration upload / download

### Ethernet (optional)

Type:

- 10BaseT

Connector:

- RJ 45

Protocols:

- TCP/IP
- HTTP
- MODBUS TCP (Slave)

Web server:

- Built-in – enables remote monitoring using standard web browsers

Email:

- Can be configured to be sent on the occurrence of a specified event
- Up to 3 recipients
- Up to 4 trigger sources with configurable tag

### MODBUS \* RTU (optional)

Baud rate:

- Up to 115 kBaud

Isolation:

- Galvanically isolated from the rest of the circuitry, 500 V DC for 1 minute

\* MODBUS is a registered trademark of the MODBUS-IDA organization

## EMC

### Emissions & immunity

Meets requirements of IEC 61326 for an Industrial Environment

## Environmental

### Operating temperature range

0 to 55 °C (32 to 131 °F) \*

### Operating humidity range

5 to 95 % RH (non-condensing)

### Storage temperature range

-20 to 70 °C (-4 to 158 °F)

### Enclosure sealing

Front face:

— IP 66 & NEMA 4X

Rest of enclosure:

— IP 20

### Vibration

Conforms to EN60068-2-6

## Safety

### Approvals and certifications

EN 61010-1

cULus

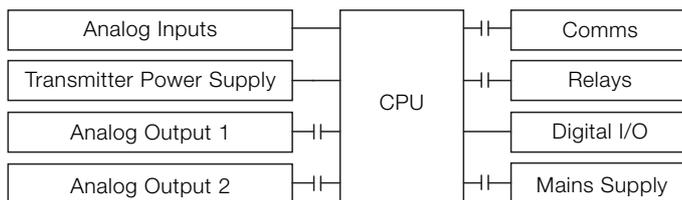
### General safety

Overvoltage Class III on mains, Class II on inputs and outputs

Pollution category 2

Insulation category 2

### Isolation



## Key

—||— = Isolation

## Electrical

### Supply ranges

100 V to 240 V AC  $\pm 10\%$  (90 V min. to 264 V max.) 50 / 60 Hz  
10 to 36 V DC (optional)

### Power consumption

10 W max.

### Power interruption protection

No effect for interrupts of up to 60 ms

## Physical

### Size

50 x 97 x 141 mm (2.0 x 3.8 x 5.5 in.)

### Weight

0.38 kg (0.84 lb) approx. (unpacked)

### Panel cutout

45 x 92 mm (1.8 x 3.6), 120 mm (4.8 in.) behind panel

### Case material

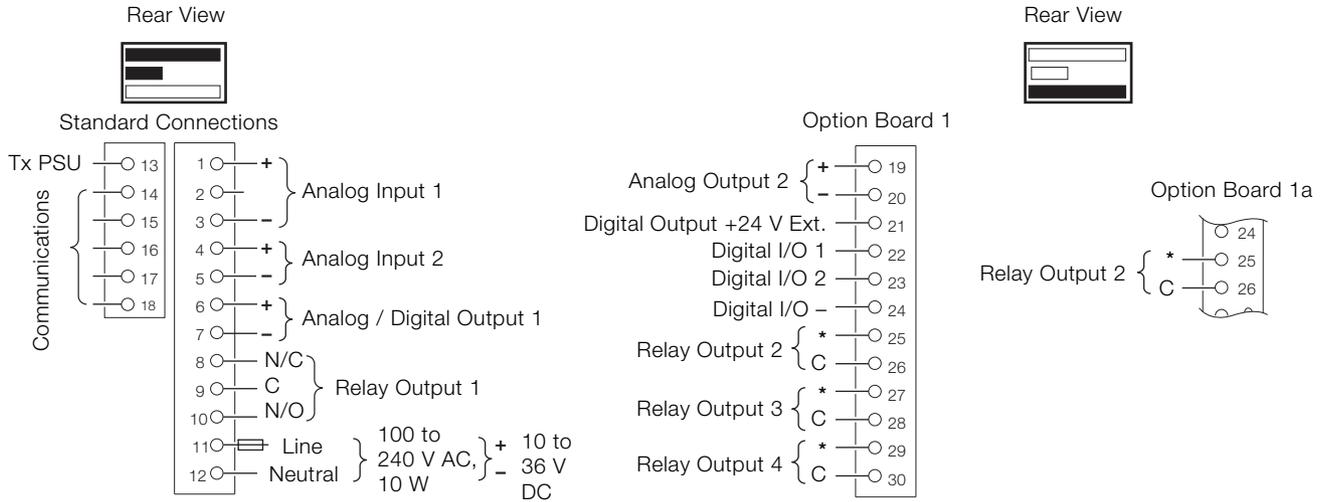
Glass-filled polycarbonate

\* Restrictions may apply – refer to relay specification on page 15

# ControlMaster CM15

## Universal process indicator, 1/8 DIN

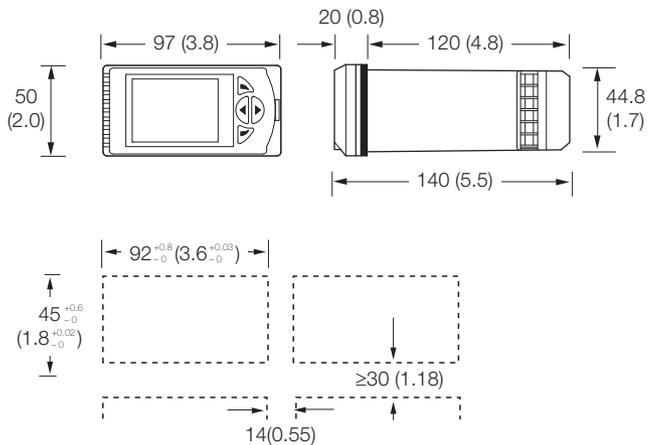
### Electrical connections



\* N/O or N/C selection made via jumper

### Overall dimensions

Dimensions in mm (in.)



### Standard accessories

Included with each indicator:

- Panel mounting clamps
- Instruction manual
- Bezel release tool
- Cold junction thermistor

### Optional accessories

- PC configuration kit CM30/0712
- DIN rail mounting kit CM10/0715
- After-sales engineered configuration service ENG/IND

## Ordering information

ControlMaster CM15 universal process indicator, 1/8 DIN	CM15/	X	X	X	X	X	X	X	/XXX
<b>I/O build</b>									
2 analog inputs, 1 analog O/P and 1 relay (Basic)		0							
2 analog inputs, 1 analog output and 2 relays (Basic + option board 1a)		1							
2 analog inputs, 2 analog outputs, 2 digital I/O and 4 relays (Basic + option board 1)		2							
<b>Template / Functionality level</b>									
Base			0						
Standard			S						
Dual point indication			D						
<b>Communications</b>									
None				0					
Ethernet				E					
RS 485 MODBUS				M					
<b>Approval</b>									
Standard CE					S				
cULus approval					U				
<b>Power supply</b>									
100 ... 240 V AC						0			
10 ... 36 V DC						1			
<b>Language</b>									
English							E		
German							G		
French							F		
Italian							I		
Spanish							S		
<b>Special features</b>									
None								0	
Unbranded front panel *								B	
<b>Configuration</b>									
Standard									STD
Custom configuration (customer to complete and supply CM15 custom configuration sheet – <a href="#">INF11/089-EN</a> )									CUS
Engineered configuration (customer to supply configuration details required)									ENG

\* Not available in conjunction with cULus approval.

# Contact us

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[www.abb.com/recorders](http://www.abb.com/recorders)

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3KXC401501R1001



Sales



Service



Software

# ControlMaster CMF160

## Universal process indicator, fieldmount

Making process indication easy

Measurement made easy



### Cost saving field-mount design

- Wall-, pipe- or panel-mountable
- No need for an instrument panel
- IP66 and NEMA4X environmental protection

### Comprehensive display of process status

- Crystal-clear, full-color TFT display
- User-customizable

### Exceptionally easy to use

- Intuitive user interface and clear text prompts ensure installation, commissioning and operation are quick and simple

### Comprehensive I/O

- Up to 4 universal inputs, 4 analog outputs, 6 digital I/O and 6 relays

### Frequency input

- Direct, high accuracy connection to electromagnetic flowmeters

### Scalable to match application requirements

- Comprehensive hardware- and software-options

### Totalization and counter functions

- Calculation and display of flow total values
- Pulse-counting capability

### Problem-solving capability

- Flexible functionality including math, logic and totalization providing power to solve complex application requirements

### Flexible connectivity

- Ethernet and MODBUS® communications

### Duty / Assist pump control

- Control of up to 6 pumps

# ControlMaster CMF160

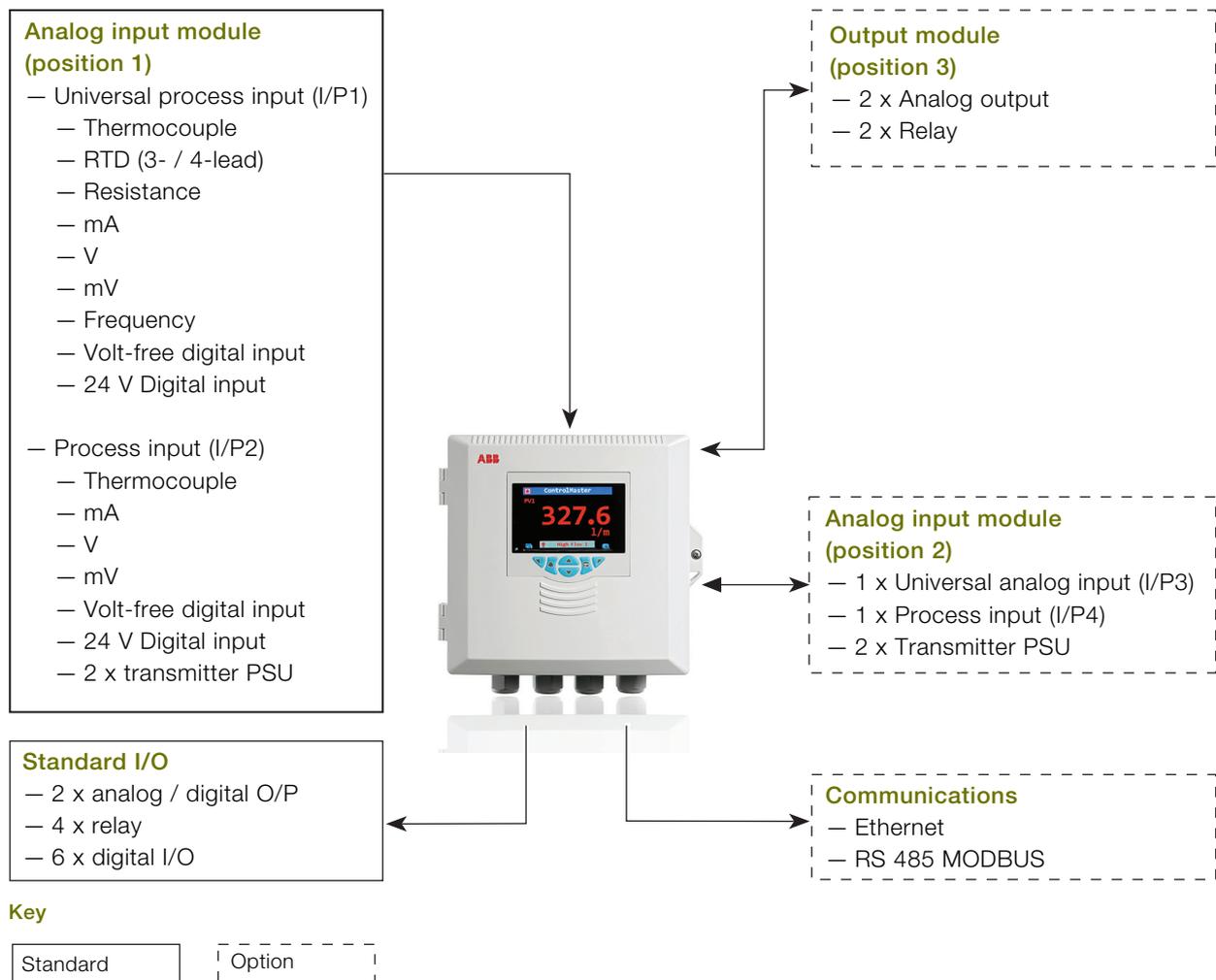
## Universal process indicator, fieldmount

### Overview

The ControlMaster CMF160 is a feature-packed, 1/8 DIN, universal process indicator. With a unique field-mountable design that enables wall-, or pipe-mounting without the need for an additional enclosure. A crystal-clear, full-color, TFT display shows operators exactly the information they need to know and provides operation and configuration menus in full text, making the CMF160 intuitive to use and very quick to install and commission.

Available as a basic indication-only model, or enhanced through plug-and-play function keys and I/O modules, the CMF160 offers totalization, level, math, logic, counter and alarm functions making it extremely flexible and able to solve many demanding application requirements.

MODBUS and Ethernet communication options ensure easy integration and connectivity to supervisory or control systems.



## Highly scalable

The CMF160 is highly scalable in terms of both hardware and software, enabling it to meet the demands of simple indication duties through to more complex applications. The base CMF160 provides basic indication, totalization and level functionality. Templates and functionality can be increased by adding function keys to the basic model as shown in Fig. 1, while retaining previous templates and functionality.

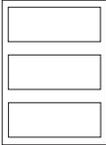
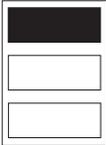
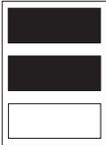
Level	Function keys	Template	Functionality
Base	0 	Single PV indication Single PV with totalizer Single totalizer Single level with volume	Process alarms Totalization Volume computation Specific gravity compensation Minimum, maximum and average calculation
Standard	1 		Logic Math Custom linearizers Delay timers Real time alarms Bank Control Template customization
Dual	2 	Dual PV indication Dual PV with totalizer Dual totalizer Dual level with volume	Display customization

Fig. 1: Overview of template options

# ControlMaster CMF160

## Universal process indicator, fieldmount

### Powerful operator display

The CMF160 features a full-color 5.5 cm (2.2 in.) display for displaying detailed process information to the user. Process details such as alarm messages and diagnostic information are displayed clearly in full text without the need for difficult-to-read scrolling displays.

#### Example of an operator page

Automatic selection of standard display templates immediately makes best use of the CMF160's display. Extensive customization features then enable the displayed information to be tailored to suit the process requirements.

### Diagnostics and alarm status display

The diagnostics and alarm status display provides detailed information on any active alarm or diagnostic condition. The operator can see, at-a-glance, the status of any alarm condition present within the process. In addition, diagnostic messages are presented clearly to the operator, enabling rapid notification and simple diagnosis of any critical instrument status condition. Historical information of diagnostic messages can also be viewed in the indicator's diagnostic log.



Fig. 2: Single PV indication template display



Fig. 3: Dual PV and totalization display

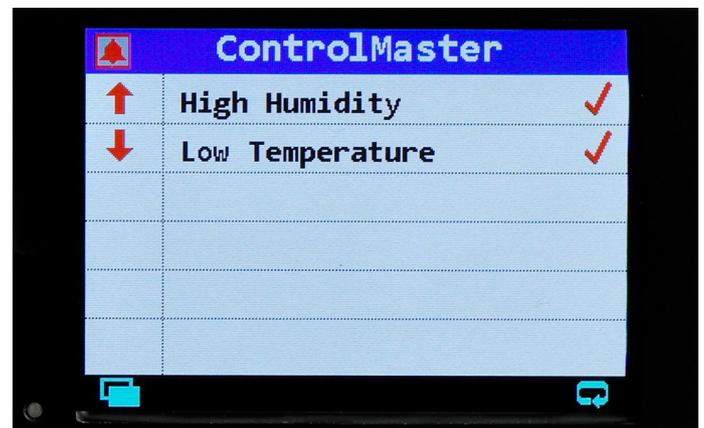


Fig. 4: Alarm status display

## Exceptionally easy to use

The CMF160's full text display and simple-to-navigate, pop-up menu makes operation exceptionally easy.

A programmable soft key enables commonly used functions, such as alarm acknowledgement and display selection, to be accessed easily by the operator.



Fig. 5: Pop-up menu

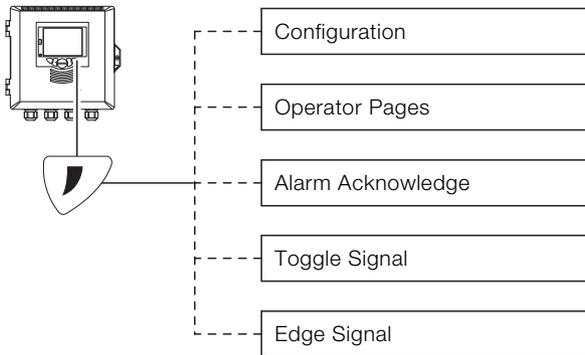


Fig. 6: Programmable soft key

# ControlMaster CMF160

## Universal process indicator, fieldmount

### Problem solving flexibility

Extensive functionality is available to provide flexible problem-solving capability; making the CMF160 much more than just a process indicator.

#### Process alarms

8 independent process alarms can monitor any analog signal within the CMF160, enabling extensive process monitoring capability. Alarms can be used to drive physical outputs or soft-wired to other functions within the indicator.

#### Real-time alarms

The 'alarm clock' functionality provided by the CMF160's real-time alarms enables time-of-day decisions to be introduced into the indicator's actions or specific functions to be triggered routinely at specified times.

#### Delay timers

Event sequencing is enabled through the use of the CMF160's delay timers. A predetermined delay and output duration can be programmed into each delay timer and timers can be linked together.

#### Custom linearizers

The CMF160 has 2 independent 20-point custom linearizers that can be applied to any analog signal within the indicator. These linearizers can be used in applications such as level-to-volume conversion of a non-linear tank level or to accommodate special input signals or output devices.

#### Math

8 math blocks provide arithmetic, averaging, min. / max. hold, square root and signal switching functionality. Simple equations can be performed in a single math block or multiple math blocks can be nested together to construct complex equations.

Signal switching 'multiplexing' math blocks switch between 2 analog signals based on a trigger signal. For example, a backup sensor could be selected automatically on failure of a primary sensor.

#### Logic

8 comprehensive logic equations provide powerful interlock functionality. Inputs and outputs of the logic equations can be soft-wired to any digital signal within the indicator to maximize flexibility.

#### Totalizer

2 totalizers are available on the CMF160. The totalizers can be configured to perform multiple functions:

- integration against an analog signal to totalize flow
- counting digital pulses
- totalization of flow based on a frequency signal from an electromagnetic flow meter

#### Frequency input

For maximum accuracy the CMF160 can accept a frequency signal from an electromagnetic flow meter. The frequency signal can be totalized and displayed; an instantaneous flow rate can also be calculated and displayed on screen.

## Communications

Extensive communication options enable the CMF160 to be integrated into larger control systems easily or connected to other process instrumentation.

### Ethernet

Optional Ethernet communications enable ControlMaster to be integrated in to an Ethernet network quickly. The following functionality is provided:

#### – Email

Notification of a critical process event or status can be made by email. Multiple events can trigger an email that can be sent to multiple recipients

#### – Webserver

The CMF's integrated webserver enables the current status of the process and indicator to be viewed remotely using a standard web browser

#### – MODBUS TCP

Process values and status can be communicated to, and from, the CMF160 in real-time using MODBUS TCP, enabling it to be integrated easily into larger control systems or connected to a data recorder

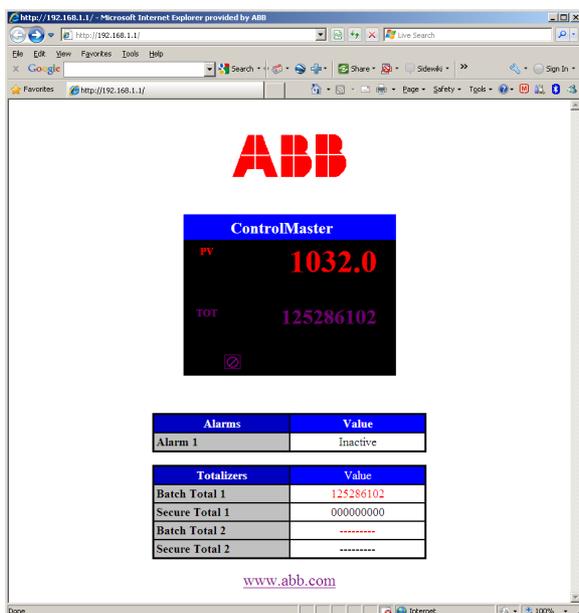


Fig. 7: Integrated web server

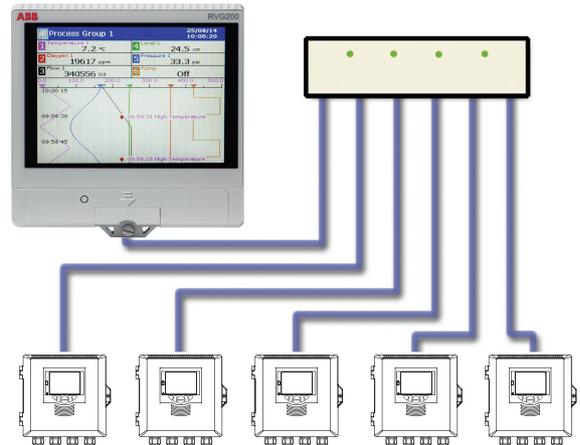


Fig. 8: ControlMaster CMFs connected to a ScreenMaster

### RS 485 MODBUS

Using RS 485 MODBUS, values and status can be communicated to, and from, the indicator in real-time via an RS 485 connection.

### PC Configuration Backup

Once configured using the intuitive on-screen configuration menus, a CMF160s configuration can then be backed up to a PC using an infrared connection. In addition to being saved for future use, configurations backed up to a PC can be downloaded to other CMF160 indicators.

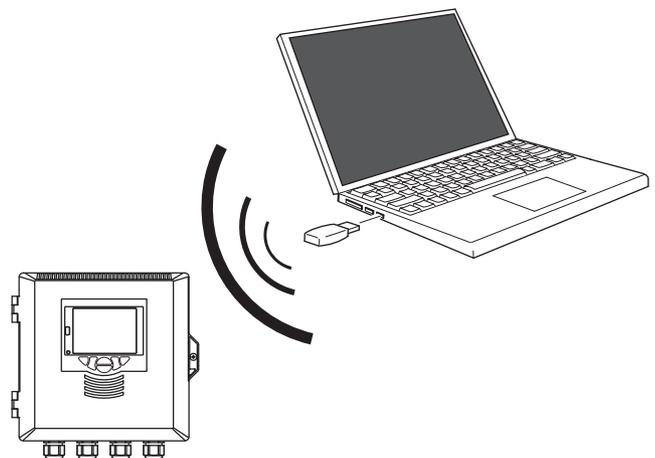


Fig. 9: Transferring a configuration file via the infrared port

# ControlMaster CMF160

## Universal process indicator, fieldmount

### Bank control

Bank control enables improved control of multi-element output devices such as banks of heaters, pumps and fans. Aimed at minimizing wear caused by over-use of one specific 'duty' device, bank control enables wear to be levelled by sharing duty and assist handling between every device in the bank. Ideal for pump control applications in the water and waste water industry. Up to six pumps can be controlled each with independent on and off trip points (see Fig. 10). The CMF160's universal process input, complete with transmitter power supply, makes it suitable for connection to many kinds of standard level transmitters.

Bank control provides users the choice of either 'Rotate' or 'First In, First Out (FIFO)' wear-levelling schedules. Rotate cycles which pump is the first to switch on during a pumping event. FIFO ensures that the last pump to switch on is the last pump to be called again. Fig. 11 details Rotate and FIFO cycling for a 3-pump system.

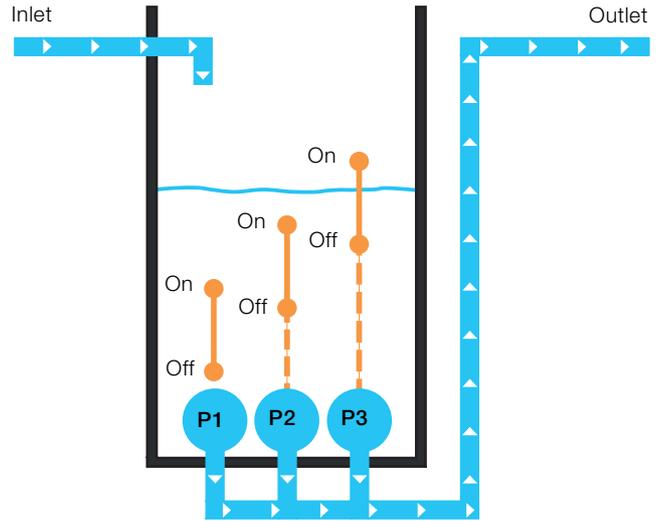


Fig. 10: Independent on and off trip points

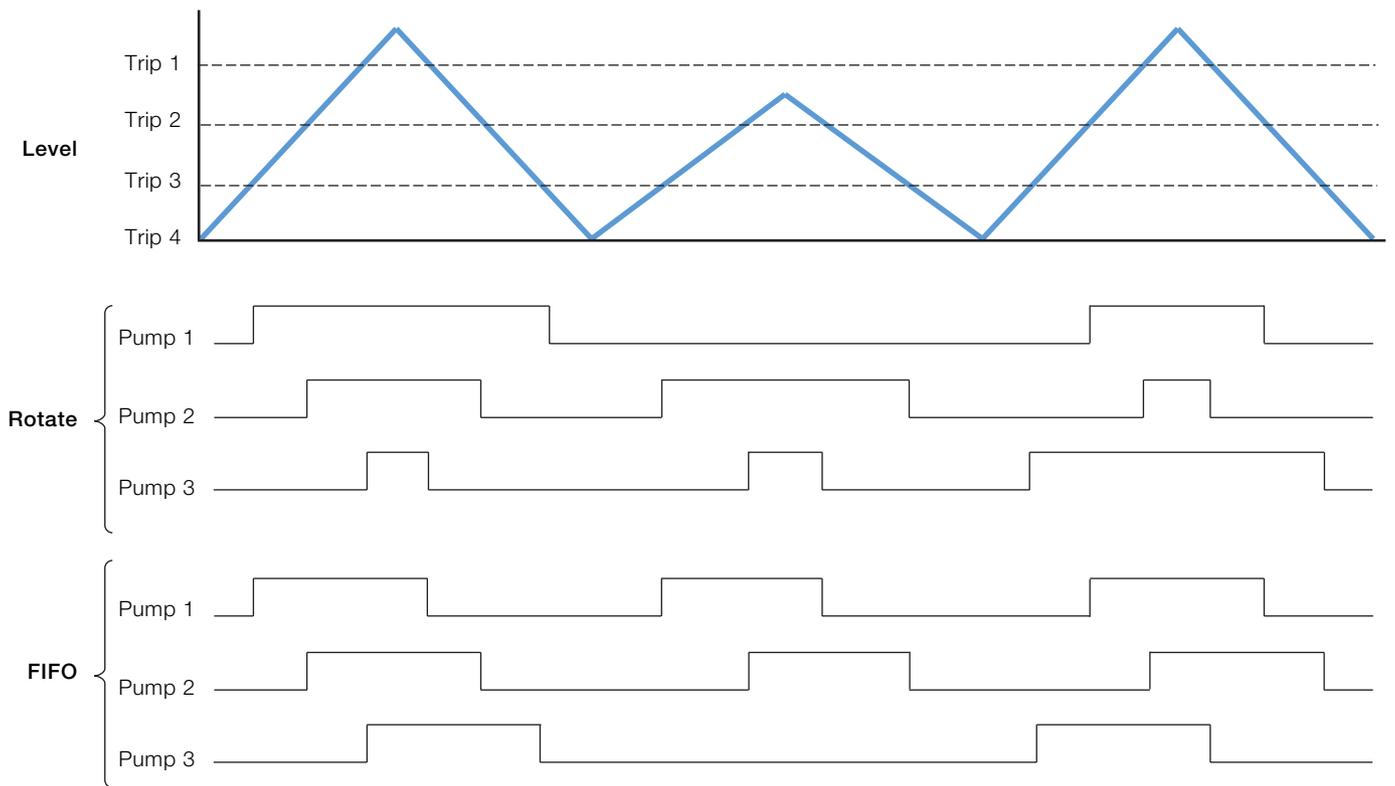


Fig. 11: Rotate and FIFO cycling for a 3-pump system

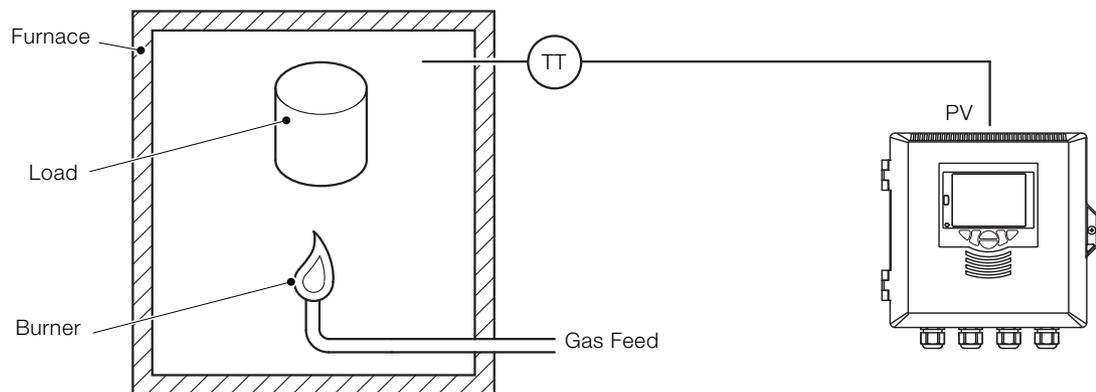
## Application templates

To minimize commissioning time, the CMF160 features up to 8 pre-configured templates. Simply selecting the required template configures the CMF160's function blocks and display automatically. Customization of the pre-configured templates is also possible, providing the flexibility to create versatile solutions.

### Single PV indication

This template provides indication of a single process value.

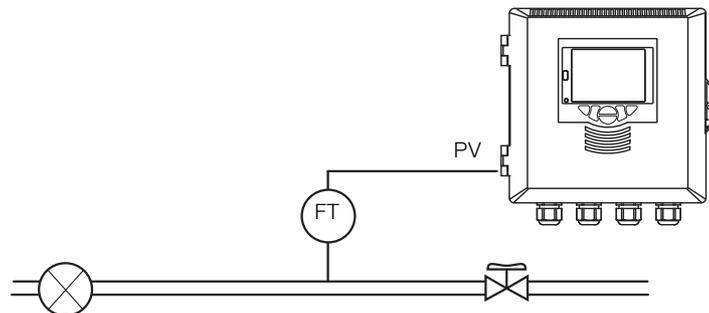
In this example, the CMF160 is indicating the temperature of a heat treatment furnace:



### Single PV with totalization

This template adds totalization to the single PV indication template.

In this example, the CMF160 is monitoring a pipeline to provide indication of instantaneous flow rate and totalization and could be connected to the flowmeter via an analog (for example 4 to 20 mA) or frequency signal:



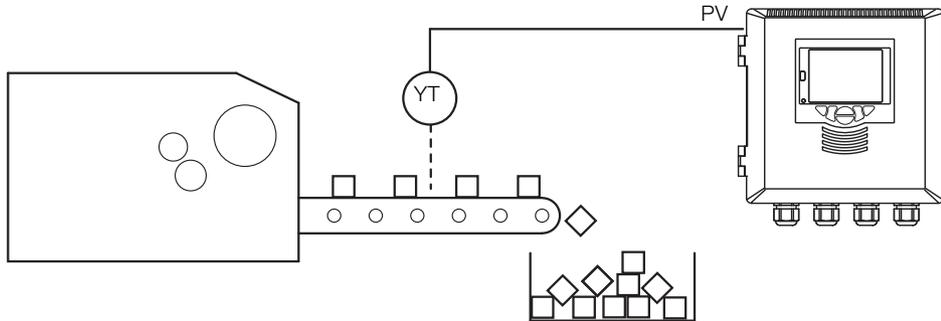
# ControlMaster CMF160

## Universal process indicator, fieldmount

### Single totalizer

This template provides totalization only.

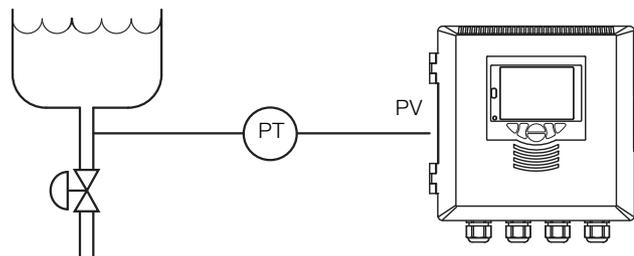
In this example, the CMF160 is counting the number of products passing a specific point on a production line:



### Single level with volume

The single level with volume template adds level specific functions to the single PV indication template. The volume contained within a vessel can be calculated and indicated and products of varying specific gravity accounted for.

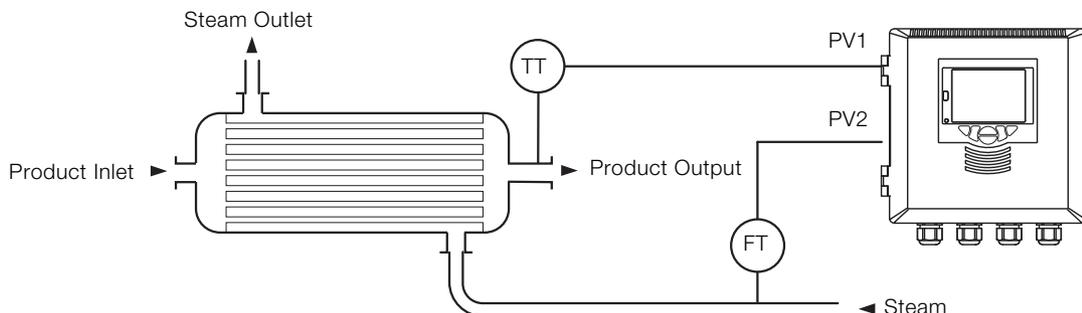
In this example, the CMF160 is monitoring the level of product in a storage tank and calculating the associated volume:



### Dual indication

This template provides indication of 2 process values. Variations of this template are available providing dual PV with totalization, dual totalization or dual level indication.

In this example, a single CMF160 is providing indication of both the flow through, and temperature of, a heat exchanger:



## Technical specification

### Operation

#### Display

Color, 1/4 VGA TFT, liquid crystal display (LCD) with built-in backlight

#### Language

English, German, French, Italian and Spanish

#### Operator keypad

4 tactile membrane keys

### Security

#### Password protection

Basic / Advanced – user-assigned password protection (not set at factory)

### Standard functions

Base templates:

- Single PV indication
- Single PV indication + totalizer
- Counter
- Single PV indication + level

Dual templates

- Dual PV indication
- Dual PV indication + totalizer
- Dual counter
- Dual PV indication + level

### Process alarms

Number:

- 8

Types:

- High / Low process
- High / Low latch

Source

- Fully configurable  
(for example – PV, Analog input, Math block in-built)

Hysteresis:

- Level and time

Alarm enable:

- Enable / Disable individual alarms via a digital signal

### Acknowledgement

Via front panel keys or digital signals

### Real-time alarms\*

Number:

- 2

Programmable:

- Time
- Day
- Duration

### Math blocks\*

Number:

- 8

Operators:

- +, –, x, /
- Average, Maximum, Minimum
- High / Low / Median select
- Square root
- Multiplexer

### Delay timers\*

Number:

- 2

Programmable:

- Delay
- Duration

### Logic equations\*

Number:

- 8

Elements:

- 15 per equation

Operators:

- OR, AND, NOR, NAND, NOT, EXOR

\*Functionality level 'Standard' and above only

# ControlMaster CMF160

## Universal process indicator, fieldmount

### Custom linearizer\*

Number:

- 2

Elements:

- 20 breakpoints

### Bank control\*

Number of outputs:

- 6

Wear levelling:

- Rotate or FIFO

### Analog inputs

#### Universal process inputs

Number:

- 1 Standard
- 1 Optional

Type:

- Voltage
- Current
- Resistance (ohms)
- 3-Wire RTD
- 4-Wire RTD
- Thermocouple
- Digital volt-free
- Digital 24 V
- Frequency

#### Non-universal process inputs

Number:

- 1 Standard
- 1 Optional

Type:

- Voltage
- Current
- Thermocouple\*\*
- Digital volt-free
- Digital 24 V

### Thermocouple types

B, E, J, K, L, N, R, S, T

### Resistance thermometer

Pt100

### Other linearizations

$\sqrt{x}$ ,  $x^{3/2}$ ,  $x^{5/2}$ , custom linearization

### Digital filter

Programmable 0 to 60 s

### Display range

–9999 to 99999

### Update rate

125 ms

### Common mode noise rejection

> 120 dB at 50 / 60 Hz with 300  $\Omega$  imbalance resistance

### Normal (series) mode noise rejection

> 60 dB at 50 / 60 Hz

### CJC rejection ratio

0.05  $^{\circ}\text{C}/^{\circ}\text{C}$  change in ambient temperature

### Temperature stability

0.02 %/ $^{\circ}\text{C}$  or 2  $\mu\text{V}/^{\circ}\text{C}$  (1  $\mu\text{V}/^{\circ}\text{F}$ )

### Long term (input) drift

< 0.1 % of reading or 10  $\mu\text{V}$  annually

### Input impedance

> 10  $\text{M}\Omega$  (mV input)  
10  $\Omega$  (mA input)

\*Functionality level 'Standard' and above only

\*\*Only if universal input 1 on the same input module is configured as 'Thermocouple'

## Inputs

Thermocouple	Maximum range °C (°F)	Accuracy (% of reading)
B	-18 to 1800 (0 to 3270)	0.1 % or ±2 °C (3.6 °F) (above 200 °C [392 °F])*
E	-100 to 900 (-140 to 1650)	0.1 % or ±0.5 °C (0.9 °F)
J	-100 to 900 (-140 to 1650)	0.1 % or ±0.5 °C (0.9 °F)
K	-100 to 1300 (-140 to 2350)	0.1 % or ±0.5 °C (0.9 °F)
L	-100 to 900 (-140 to 1650)	0.1 % or ±1.5 °C (2.7 °F)
N	-200 to 1300 (-325 to 2350)	0.1 % or ±0.5 °C (0.9 °F)
R	-18 to 1700 (0 to 3000)	0.1 % or ±1 °C (1.8 °F) (above 300 °C [540 °F]) *
S	-18 to 1700 (0 to 3000)	0.1 % or ±1 °C (1.8 °F) (above 200 °C [392 °F])*
T	-250 to 300 (-400 to 550)	0.1 % or ±0.5 °C (0.9 °F) (above -150 °C [-238 °F])*
RTD	Maximum range °C (°F)	Accuracy (% of reading)
Pt100	-200 to 600 (-325 to 1100)	0.1 % or ±0.5 °C (0.9 °F)

\*Accuracy is not guaranteed at temperatures below this value

Linear inputs	Standard analog input	Accuracy (% of reading)
Millivolts	0 to 150 mV	0.1 % or ±20 µV
Milliamps	0 to 45 mA	0.2 % or ±10 µA
Volts	0 to 25 V	0.2 % or ±20 mV
Resistance (low)	0 to 550 Ω	0.2 % or ±1 Ω
Resistance (high)	0 to 10 kΩ	0.1 % or ±5 Ω
Sample Interval	125 ms per sample	

## Digital inputs

Type	Volt-free or 24 V
Minimum pulse duration	Single input configured – 250 ms Both inputs configured as analog or digital – 500 ms
Volt-free	Contact open > 10 MΩ / contact closed < 100 KΩ

## Frequency input\*\*

Frequency range	0 to 6000 Hz
1-signal	15 to 30 V
0-signal	-3 to 5 V

\*\*For use with devices with open collector outputs

## Outputs

### Retransmission outputs

— 4 (2 standard, 2 optional)

Isolation:

— Galvanically isolated from the rest of the circuitry,  
500 V for 1 minute

Analog range:

— 0 to 20 mA programmable

Load:

— 750 Ω max.

Accuracy:

— 0.25 % of output or ±10 µA

### Relays

Number:

— 6 (4 standard, 2 optional)

Type:

— Standard with changeover contacts

Contact ratings:

— 2 A, 240 V

Update rate:

— 125 ms

# ControlMaster CMF160

## Universal process indicator, fieldmount

### Digital I/O

Number:

- 6 (standard)

Type:

- User-programmable as input or output
- Minimum input pulse duration – 125 ms

Input:

- Volt-free:
  - contact open > 10 M $\Omega$
  - contact closed < 100 K $\Omega$
- 24 V DC
  - 1-signal 15 to 30 V
  - 0-signal –3 to 5 V
- TTL
  - Low: 0 to 0.8 V
  - High: 2 to 5 V
- Conforms to IEC 61131-2

Output:

- Open collector output
- 30 V, 100 mA max. switched
- Conforms to IEC 61131-2

Update rate:

- 125 ms

### 2-Wire transmitter power supply

Number:

- 1 optional

Voltage:

- 24 V DC

Drive:

- 2 loops, 45 mA max.

### Communications

**Note.** Only one communications option can be fitted per indicator.

#### IrDA service port (standard)

Baud rate:

- Up to 115 kBaud

Distance:

- Up to 1 m (3 ft)

Functions:

- Firmware upgrade
- Configuration upload / download

#### Ethernet (optional)

Type:

- 10BaseT

Connector:

- RJ 45

Protocols:

- TCP/IP
- HTTP
- MODBUS TCP (Slave)

Web server:

- Built-in, enables remote monitoring using standard web browsers

Email:

- Can be configured to be sent on the occurrence of a specified event
- Up to 3 recipients
- Up to 4 trigger sources with configurable tag

#### MODBUS RTU (optional)

Baud rate:

- Up to 115 kBaud

Isolation:

- Galvanically isolated from the rest of the circuitry, 500 V DC for 1 minute

## EMC

### Emissions & immunity

Meets requirements of IEC 61326 for an Industrial Environment

## Environmental

### Operating temperature range

0 to 55 °C (32 to 131 °F)

### Operating humidity range

5 to 95 % RH (non-condensing)

### Storage temperature range

-20 to 70 °C (-4 to 158 °F)

### Enclosure sealing

IP 66 & NEMA 4X

## Safety

### General safety

Overvoltage Class III on mains, Class II on inputs and outputs

Pollution Degree 2, Insulation Class 1

### Approvals and certifications

EN 61010-1

cULus (optional):

– UL file number E236966

UL Class 1, Divison 2 (optional):

– Groups A, B, C and D

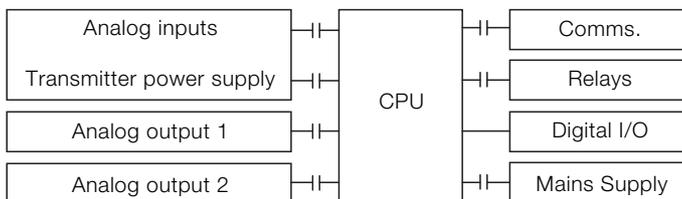
– Temperature rating T4

– In accordance with ANSI / ISA 12.12.01-2013 and

CAN / CSA C22.2 No. 213-M1987

– UL file number E474414

## Isolation



## Key

—||— = Isolation

## Electrical

### Supply ranges

100 V to 240 V AC  $\pm 10\%$  (90 V min. to 264 V max.) 50 / 60 Hz

### Power consumption

25 W max.

### Power interruption protection

No effect for interrupts of up to 60 ms

## Physical

### Size

194 x 214 x 98 mm (7.6 x 8.4 x 3.8 in.)

### Weight

1.5 kg (3.3 lb) approx. (unpacked)

### Panel cutout

186 x 186 mm (7.3 x 7.3 in.)

### Case material

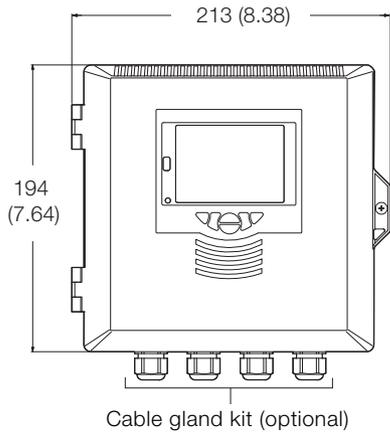
Glass-filled polycarbonate



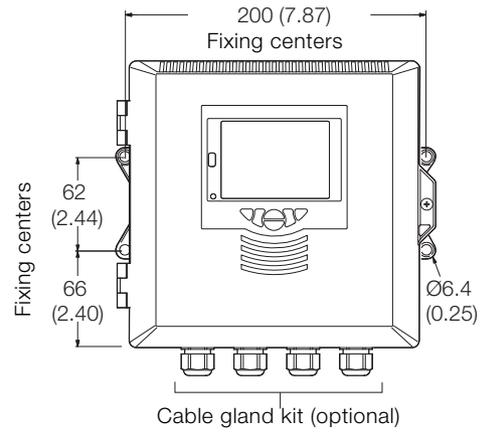
# Overall dimensions

Dimensions in mm (in.)

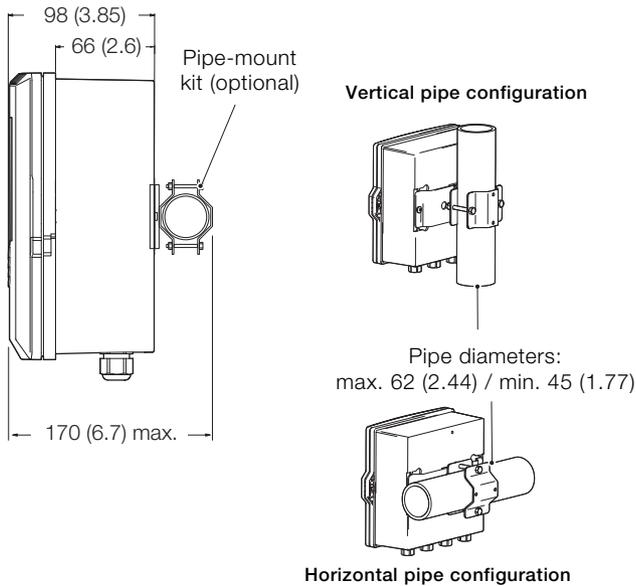
## Transmitter



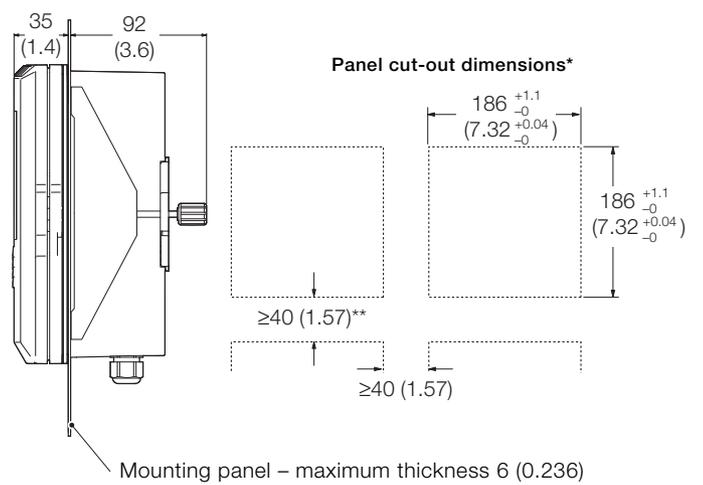
## Wall mount option



## Pipe mount option



## Panel mounting



\* To DIN43700

\*\* ≥150 mm (6 in.) if (optional) cable glands fitted

# ControlMaster CMF160

## Universal process indicator, fieldmount

### Ordering information

ControlMaster CMF160 universal process indicator, fieldmount	CMF160	AN	AN	AN	A	N	A	N	A	N	A	N	A	N	A	N	A	OPT
<b>Option module 1</b>																		
Dual analog input	A2																	
<b>Option module 2</b>																		
Not fitted		Y0																
Dual analog input	A2																	
<b>Option module 3</b>																		
Not fitted		Y0																
Analog and relay output	H2																	
<b>Template / Functionality level</b>																		
Base					A													
Standard					B													
Dual point indication					C													
<b>Communications</b>																		
Not fitted						0												
Ethernet						1												
RS 485 MODBUS						2												
<b>Approval</b>																		
Standard CE								A										
cULus approval								B										
UL Class 1 Div. 2								C										
<b>Power supply</b>																		
90 to 264 V AC									1									
<b>Branding</b>																		
ABB Standard										A								
Unbranded front panel and start-up screen										B								
<b>HMI language</b>																		
English											5							
German											1							
Spanish											3							
French											4							
Italian											2							
<b>Expansion 1</b>																		
None																Y		
<b>Configuration</b>																		
Standard (factory default)																		1
Custom (configuration details required)																		2
Engineered (requirement details required)																		3

ControlMaster CMF160 universal process indicator, fieldmount	CMF160	AN	AN	AN	A	N	A	N	A	N	A	N	A	N	A	N	A	OPT
<b>Mounting hardware</b>																		
Wall																	A	
Wall and panel																	B	
<b>Cable glands</b>																		
None (blanking plugs)																		0
Standard cable gland pack																		1
Ethernet cable gland pack																		2
<b>Expansion 2</b>																		
None																		Y
<b>Calibration certificate</b>																		
Certificate of calibration																		C1
<b>Printed instruction manual</b>																		
English																		M5
German																		M1
Spanish																		M3
French																		M4
Italian																		M2

Product ordering code example:

CMF160 A2 Y0 H2 B 0 A 1 A 5 Y 1 A 1 Y-C1-M5

## Standard accessories

- Included with each indicator:
- Commissioning instructions

## Optional accessories

- PC configuration backup kit CM30/0714
- Pipe mounting kit CM40/0700 (page 17)
- Weathershield kit CM40/0702 (see Fig. 13)
- After-sales engineered configuration service ENG/CON

### Weathershield kit (pipe- and wall-mount installations)

Dimensions in mm (in.)

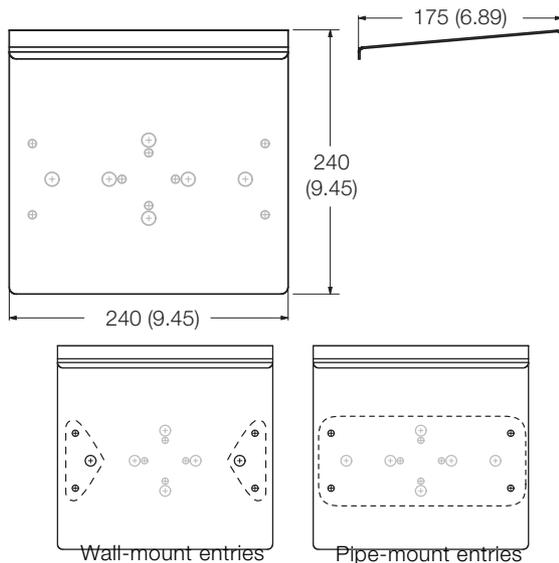


Fig. 13: Weathershield kit (pipe- and wall-mount installations)

## Acknowledgements

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Sales



Software



Service

# C160

## Wall-/Pipe Mounted Universal Process Indicator

C160 – reliable process indicator, wherever it's needed



**High visibility LED display**

– the clearest view of your process status

**0.1% measurement accuracy**

– precise indication of process measurement

**IP66/NEMA4X wall-/pipe-mounted weatherproof enclosure**

– reliability in the harshest environments

**Analog and relay outputs as standard**

– alarm and retransmission facilities built-in

**Totalizer and math functions**

– 6-digit totals and max./min. values

**Universal process input with transmitter power supply**

– direct connection for any process signal

**RS485/Modbus serial communications**

– SCADA, PLC and open system integration

**C160**

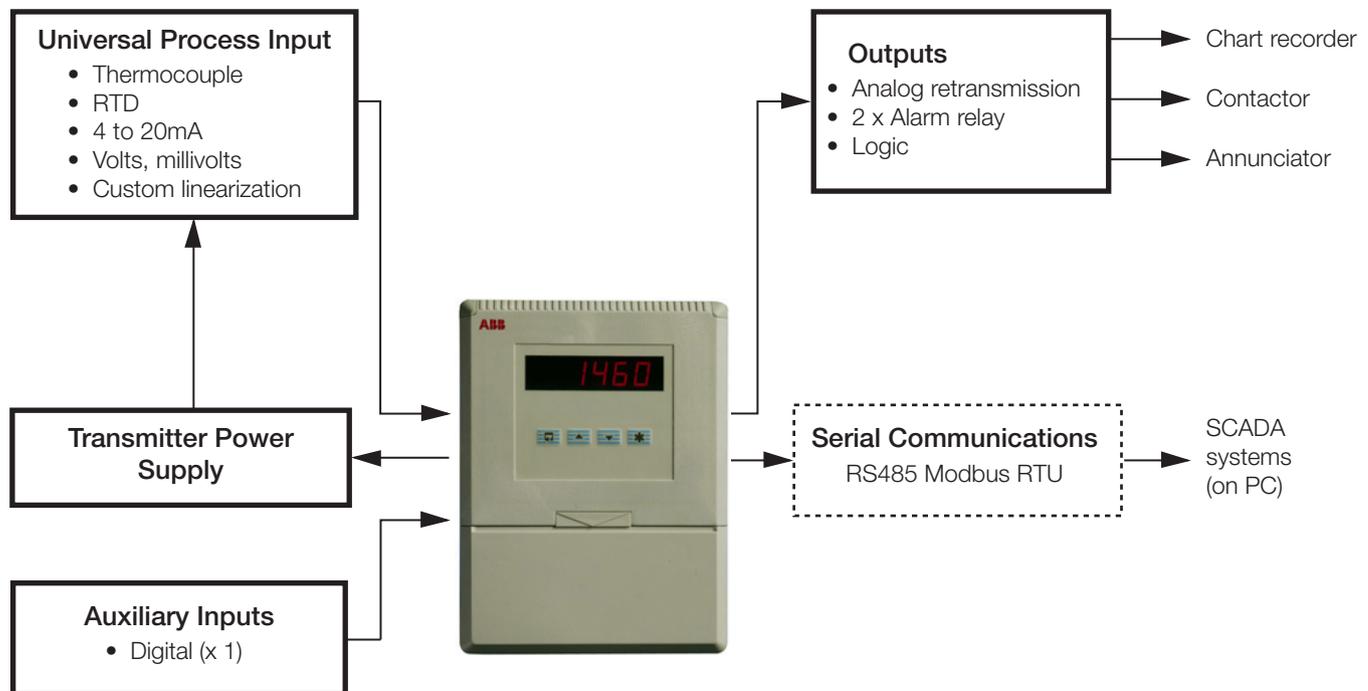
The C160 Universal Wall-mounting Indicator is a highly versatile, 5-digit industrial display indicator, with the capability to measure and indicate temperature, pressure, flow, level and other process variables.

The standard C160 provides a retransmission output and two alarm relays, with the option to add RS485 communications to suit your application.

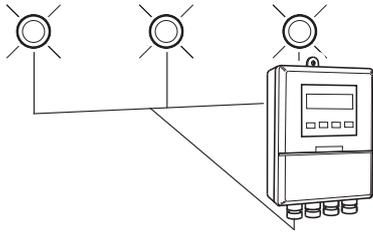
With all-round IP66/NEMA4X protection as standard, and superior RF immunity, the C160 has been designed to provide reliable indication in the harshest environments.



*Pipe-mounted C160 Indicator*

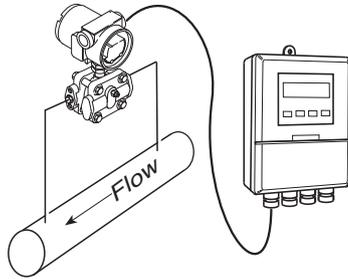


KEY: Standard Option



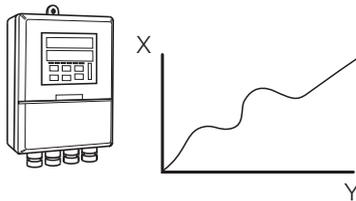
### Display and Alarm

The C160's two built-in 5A relays can be used to annunciate high or low process alarms. Active alarms are indicated by flashing LEDs to the right of the main display.



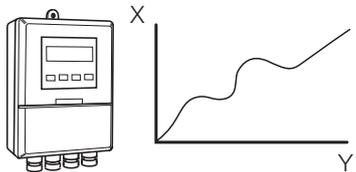
### Isolated Retransmission

The C160 has, as standard, a 4 to 20mA output for retransmission of the process variable to a chart recorder or data logger.



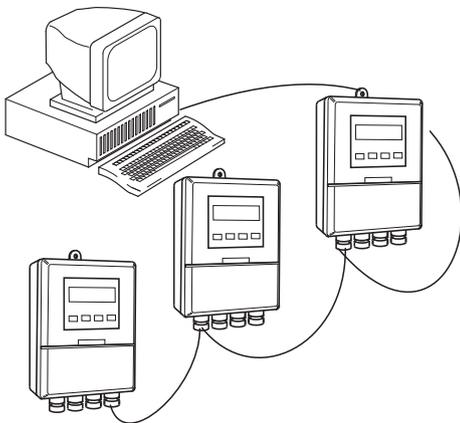
### Custom Linearization

As standard the C160 has a 20-breakpoint linearizer suitable for volume calculation. (Factory setup using PC configurator).



### Flow Totalization, 6 digits

A standard feature in the C160 is flow totalization. This totals any 4 to 20mA flow signal. With the built-in transmitter power supply and root extraction this makes the C160 ideal for use with Differential Pressure devices such as the WEDGEMASTER. It can also be configured for simple batch control by use of preset and predetermined totals.



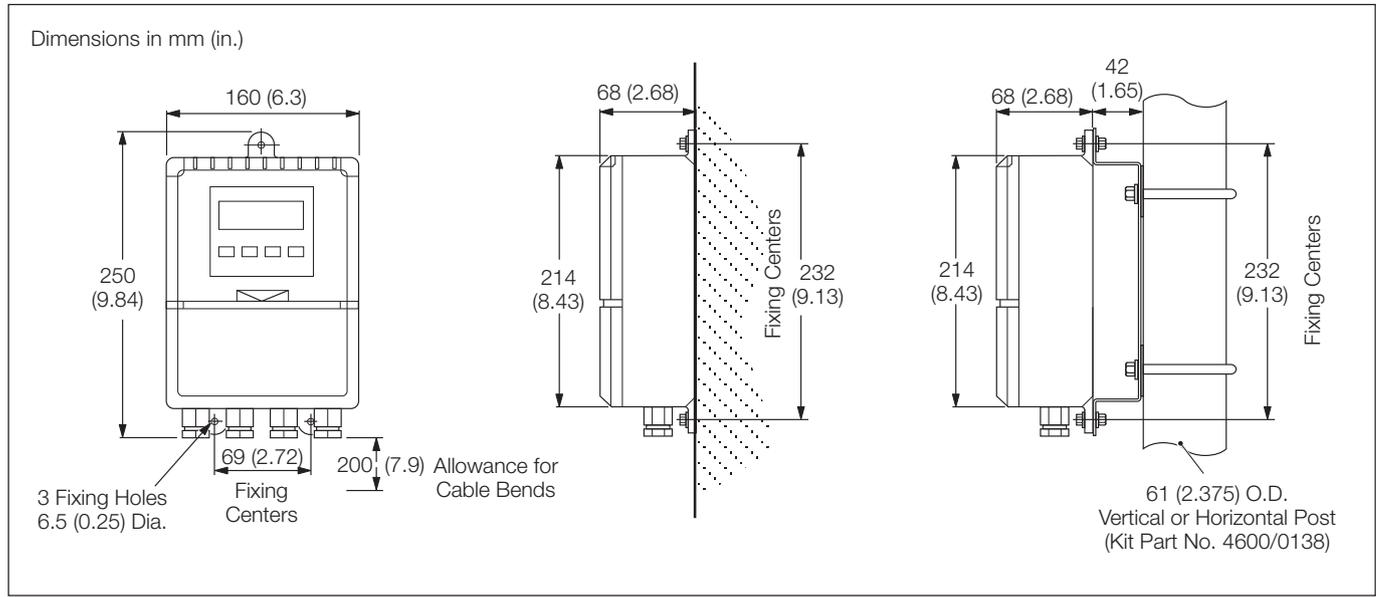
### RS485/Modbus

Fitted with an optional RS485 serial communication board the C160 can communicate with PLCs and SCADA systems using the Modbus protocol.

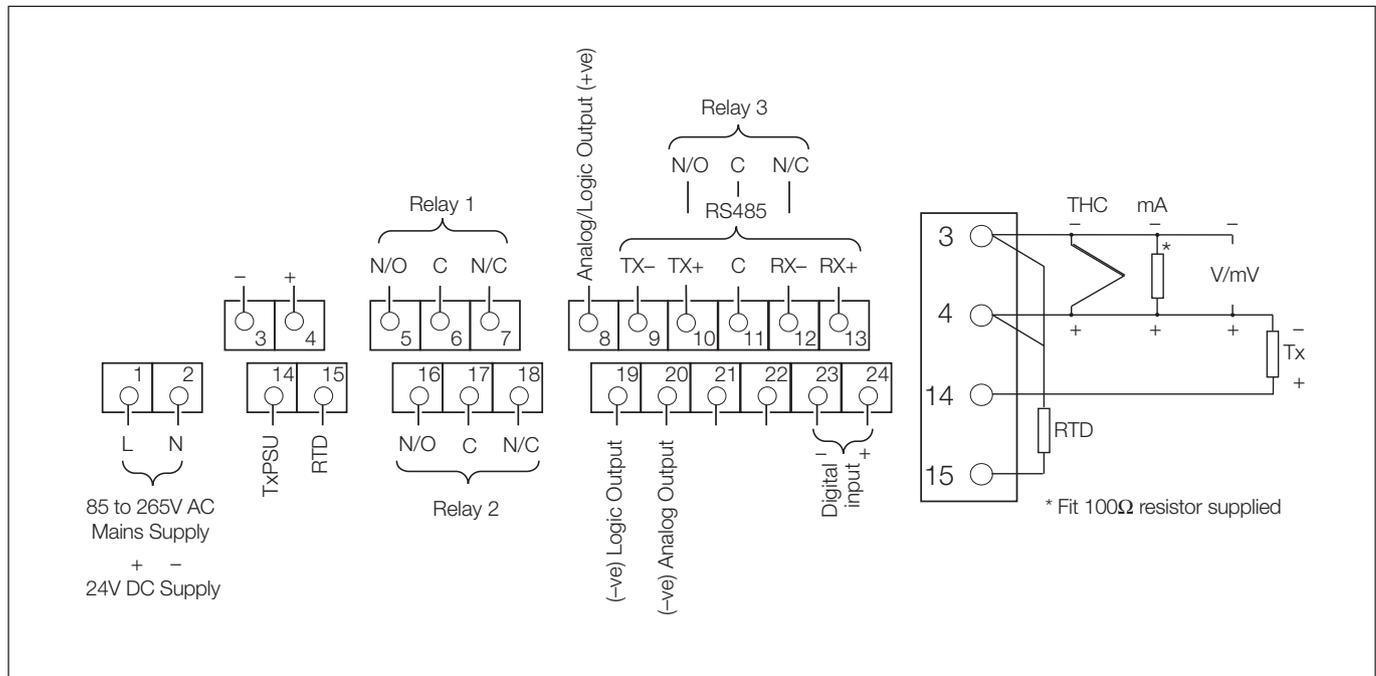




### Overall Dimensions



### Electrical Connections



**Ordering Information**

C160 Wall-/Pipe Mounted Universal Process Indicator	C160	/	X	X	X	X	/	X	X	X	X
<b>Relay Option</b>											
2 relays + 1 digital input + 4 to 20mA retransmission + logic output	0	1									
3 relays + 1 digital input + 4 to 20mA retransmission + logic output	0	2									
<b>Modbus Option</b>											
2 relays + 1 digital input + 4 to 20mA retransmission + logic output + RS485 Modbus	0	3									
<b>Power Supply</b>											
85V to 265V AC (M20 fitted with cable glands)											0
24V DC (M20 fitted with cable glands)											1
85V to 265V AC (NPT fitted with blanking plugs)											2
24V DC (NPT fitted with blanking plugs)											3
<b>Build</b>											
ABB Standard											0
<b>Programming/Special Features</b>											
Configured to factory standard											S T D
Configured to customer requirements											C U S
Special features											S P X X

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3KXJ301102R1001

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# L160

## Wall-/Pipe-Mount Level Indicator

L160 – the flexible level system that meets your needs



**High visibility 5-digit LED display**

- clear multi-functional indication

**Analog and 2-relay outputs as standard**

- high, low, latch and rate alarms, plus isolated retransmission

**IP66 (NEMA 4X) enclosure**

- designed for use in wet environments

**Maths function included as standard**

- SG correction, tank volume calculation, plus a 20-point linearizer

**Max./Min. and Average levels**

- as standard the L160 can store these values

**Wide range of sensor inputs**

- built-in 24V DC power supply

**RS485/Modbus serial communications**

- SCADA, PLC and open system integration

**L160**

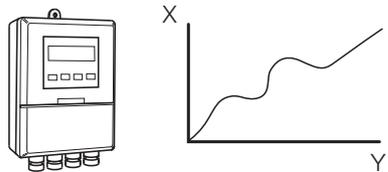
The L160 Universal Wall-/Post-mount Level Indicator is a highly versatile unit, accepting inputs from a wide range of level sensors offered by ABB and third party suppliers.

As standard the L160 has a 5-digit indicator with IP66 all-round protection. It includes two alarm relays, 4 to 20mA retransmission, logic output, logic input and selectable maths function which can make corrections for SG or calculate tank volume calculation.

A 20-point linearizer is included for volumes in horizontal or dished-end tanks. There is also a feature to store the max./min./average values.

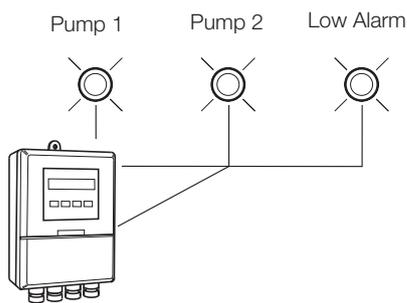
The RS485 Modbus serial communications option builds total system flexibility.





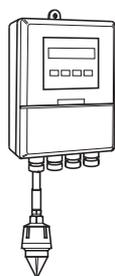
**Custom Linearization**

As standard the L160 has a 20-breakpoint linearizer suitable for volume calculation. (Factory setup using PC configurator).



**Multiple Alarm Control Option**

The L160 accommodates up to three relays to indicate a range of alarm states, i.e. pump control, with rate of change feature giving optimum pump utilization.



**Maximum/Minimum Level Detection**

As standard the L160 includes the ability to retain the highest and lowest level values. This is a particularly useful feature for unmanned sites, allowing a visiting operator to check quickly for abnormal levels.

## Specification

### Operation

#### Display

High-intensity, 7-segment, 1 x 5-digit LED display	
Three alarm LED indicators	
Display range	-9999 to +99999
Display resolution	±1 digit
Display height	14mm (0.56 in.)

#### Configuration

User-defined via front panel

---

### Standard Functions

#### Alarms

Number	Three user-defined
Types	High/Low process High/Low latch Fast/Slow rate

#### Alarm hysteresis

0 to 100% of range

#### Math functions

Maximum and minimum value detection
Average level
SG correction
Tank volume calculation
20-breakpoint custom linearizer (factory configured)

---

### Analog Inputs

#### Input type

1 to 10 mA, 4 to 20 mA or customize via PC Configurator

#### Input sampling rate

250ms

#### Accuracy

Indicator	0.2% of reading
Output	<0.2% of span

#### Sensor power supply

24V, 30mA max. powers one 2-wire transmitter  
± 3V, 15mA (power for P851/P861 sensors)\*

\*Option board

### Outputs – Standard Build

#### Retransmission

Analog, configurable in the range 4 to 20mA	
Max. load	15V (750Ω at 20mA)
Isolation	500V DC from sensor input (not isolated from logic output)

#### Logic output

18V DC at 20mA	
Min. load	400Ω
Isolation	500V from sensor input (not isolated from retransmission output)

#### Relay output

Two relays as standard (SPDT) 5A at 115/230V AC, 5A at 24V DC  
Assignable to alarms

---

### Options

One build can be selected from:

Type 01	Two relays + retransmission + logic output + digital input (Standard Build)
Type 02	Three relays + retransmission + logic output + digital input
Type 03	Two relays + retransmission + logic output + digital input + Modbus
Type 04	Two relays + logic output + retransmission + P851/P861 power supply

---

### I/O

#### Relay output

SPDT 5A at 115/230V AC  
Assignable to alarms

#### Digital input

Type	Volt-free
Minimum pulse	250ms

#### Modbus serial communications

Connections	RS422/RS485, 2- or 4-wire
Speed	2.4k or 9.6k baud rate
Protocol	Modbus RTU slave

**Electrical****Voltage (supply)**

85 to 265V AC 50/60Hz

24V DC optional

**Power consumption**

&lt;6VA (85 to 265V AC)

&lt;5W (24V DC)

**Power interruption protection**

&lt;60ms/&lt;3 cycles, no effect

&gt;60ms/&gt;3 cycles, instrument returns to operation after a controlled reset

---

**Physical****Size**160mm wide x 250mm high x 68mm  
(6.3 in. wide x 9.84in. high x 2.68 in.)**Weight**

2kg (4.5 lb)

**Environmental****Operating limits**

-10 to 55°C (14 to 131°F)

5 to 95% RH non-condensing

**Temperature stability**

&lt; 0.02% of reading or 2μV/°C (1μV/°F)

**Enclosure**

IP66 (NEMA 4X)

---

**EMC****Emissions**

Meets requirements of EN50081-2

**Immunity**

Meets requirements of EN50082-2

**Design and manufacturing standards**

CE mark

**Electrical safety**

EN61010-1



**Ordering Information**

L160 Wall-/Pipe- Mount Level Indicator*	L160 /	X	X	X	X	/	X	X	X	X
<b>Options</b>										
2 relays + retransmission + logic output		0	1							
3 relays + retransmission + logic output + digital input		0	2							
2 relays + retransmission + logic output + digital input + Modbus		0	3							
2 relays + retransmission + logic output + P851/P861 power supply		0	4							
<b>Power supply</b>										
85V to 265V AC (M20)									0	
24V DC									1	
<b>Build</b>										
ABB Standard										0
<b>Programming/Special Features</b>										
Configured to factory standard										S T D
Configured to customer requirements										C U S
Special features										S P X X

\* For pipe-mounting, order kit no. 4600/0138

**Accessories**

PC Configuration Kit (part no. C100/0700)

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