



**Web Tension Measurement evolves  
with Pressductor® Technology**

# Bringing quality and reliability to the measurement of web tension



## Changing Process Requirements

Today, web machinery is being equipped with more process automation than ever before, including closed-loop controls and recipe management. A wider range of materials must be processed at higher operating speeds – without sacrificing product quality or risking downtime.

Just a few years ago, slower machinery in many applications and less stringent product quality requirements often meant less emphasis on web tension control and tension data acquisition. The needs for accurate and reliable tension measurement were relatively limited.

But now, in most machinery applications, knowing what the web tension actually is at various points of the processing line has become a fundamental requirement for successful operations. The result is that the quality of tension measurements – good or bad – is showing up more quickly than ever before in both the product being processed and the operating efficiency of the line.

Performance improvement goals are difficult to achieve if your tension measurement load cells require constant replacement, or if you feel you cannot rely on the measured values. Furthermore, tension measurement systems mustn't require constant recalibration or replacement of components to perform at their best. The system should never detract from efficiency in machine operations or maintenance procedures.

In converting operations or on plastic film lines, on web printing presses or textile finishing machinery, recalibrating and replacing load cells that drift or malfunction can be a major preoccupation for maintenance departments.

## Quality Tension Measurement

ABB's load cells, based on the Pressductor® Technology, turn this situation around. Rugged enough to stand up to "real world" production environments, these high quality units deliver all the benefits of reliable web tension measurement. They also allow enough latitude in measurement range to handle a wide variety of applications, and have proven their superior performance in heavy duty applications in paper and metal industries for more than 40 years.



### *At the center of the web*

*ABB Force Measurement provide a range of solutions for the paper making and the paper, film and foil converting industries, as well as many other applications where constant web, wire or felt tension is a major requirement for continuous quality output.*

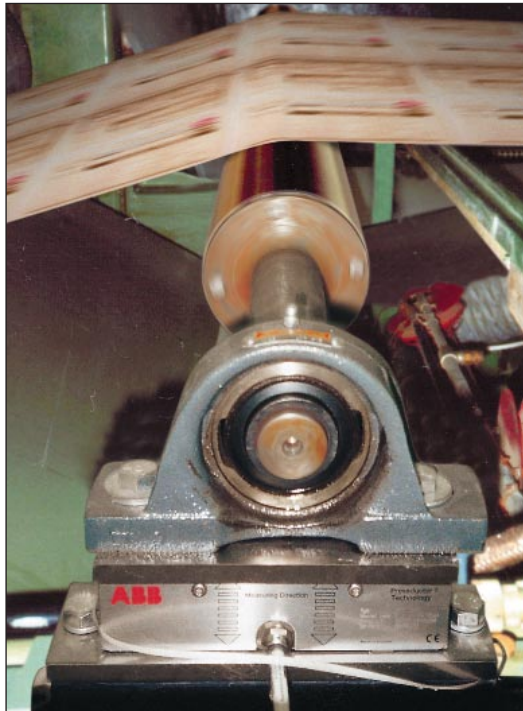
## Getting to know the family

ABB has a Pressductor load cell with a capacity and size to meet your specific web tension requirements

### Vertical Mini Series PillowBlock Tensiometer

The Vertical Mini Series PillowBlock Tensiometer Load Cell are designed to measure vertical forces in both directions on most types of web processing machinery used in the converting, plastic film, printing, textiles, and other industries.

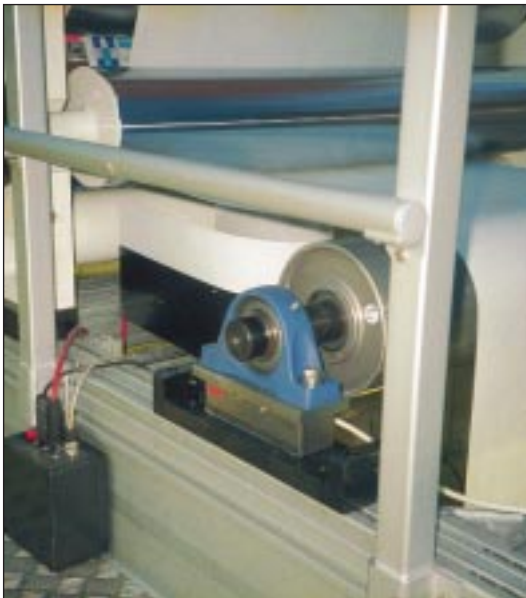
Three measurement sizes are available, with nominal capacities rated at 0.2, 0.5 and 1.0 kN, respectively (45, 112 and 225 lbs). These load cells are the perfect solution for replacement of strain gauge or LVDT load cells with poor measurement performance. Equipped with top and bottom adapter plates, they directly replace many other types of load cells.



### Horizontal Mini Series PillowBlock Tensiometer

The horizontal Mini Series measure only the horizontal force component of the web tension. So these load cells can be sized to the tension level alone, and function at the high end of their nominal load, where load cells perform best. The result: always optimal tension measurement performance – even when rolls are heavy and tension light.

Four sizes are available with nominal loads of 0.1, 0.2, 0.5 and 1.0 kN, respectively (22, 45, 112 and 225 lbs).





### Pressductor Radial Tensiometer

The Pressductor Radial Tensiometer (PRT) is ideal for medium- to light-tension applications on a wide range of web processing machinery used in the converting, plastic film, printing, textiles, and other industries. The system's radial load cells mount directly on the roll shaft.

For live (rotating) shaft applications, PRT load cells are available to fit a wide range of bearing and shaft sizes. The PRT are available in four sizes with nominal loads of 0.5, 1.0, 2.0 and 5.0 kN, respectively (112, 225, 450 and 1125 lbs). The load cells are easily mounted on either the inside or outside of machine walls. By using a mounting bracket, they can also be mounted on pedestals.



### PillowBlock Tensiometer

PillowBlock Tensiometer load cells are designed to measure tension in demanding processes with a continuous web in for instance paper, plastic foil and metal industries. The performance of these load cells is outstanding in applications characterized by heavy rolls, high speed and severe conditions.

These load cells measure only the horizontal force component which results in optimal performance even when rolls are heavy and tension light.

The PillowBlock Tensiometer Load Cells comes in seven sizes ranging from 0.5 up to 20 kN of force (112 up to 4500 lbs).

#### *From the top:*

*Pressductor Radial Tensiometer*

*PillowBlock Tensiometer – The Mini Series – Vertical*

*PillowBlock Tensiometer – The Mini Series – Horizontal*

*PillowBlock Tensiometer*

# The assurance of Pressductor® Technology

- *Maintenance-free operation*
- *Consistent measurement*
- *Exceptional stiffness*
- *Durable construction*
- *Long service life*

## How Is the Measurement Signal Generated?

It is an important question, because the operating principle of a force transducer has a great effect on how well it will perform and how stiff and vibration-free the entire load cell will be, as well as how sturdy and over-load-tolerant. All of these factors impact on the design, operation, and maintenance of the web processing machinery. ABB's proprietary Pressductor transducer technology produces a signal as a result of changes in an electromagnetic field when the load cell is subjected to mechanical force. It is an operating principle that has its origin in a metallurgical phenomenon according to which mechanical forces alter the ability of some steels to convey a magnetic field. Unlike the strain gauge and LVDT load cell technologies, physical movement (such as compression, stretching or bending) is not required for signal generation.

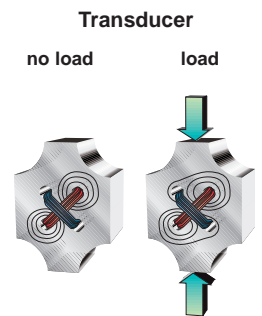
A Pressductor transducer (the sensor inside the load cell) is a simple and elegant design. Essentially, two perpendicular windings of copper wire around a

steel core combine to provide a measurement signal.

An electromagnetic field is created by continuously feeding an alternating current to one of the windings. The field is positioned in such a way that, since the windings are at right angles to each other, there is no magnetic coupling between them when the load cell is unstressed.

However, when the transducer is subjected to a force the magnetic field pattern changes. A portion of the field couples with the second winding and induces an AC voltage that reflects the tension exerted by the web on the measurement roll. This voltage –

a comparatively strong transducer signal – is converted by the load cell system's control unit into a system output.



The magnetic properties in the transducer are influenced by the mechanical force applied. The load cells produce their output signal as a result of magnetic change. No moving parts are used to generate the force measurement signal.

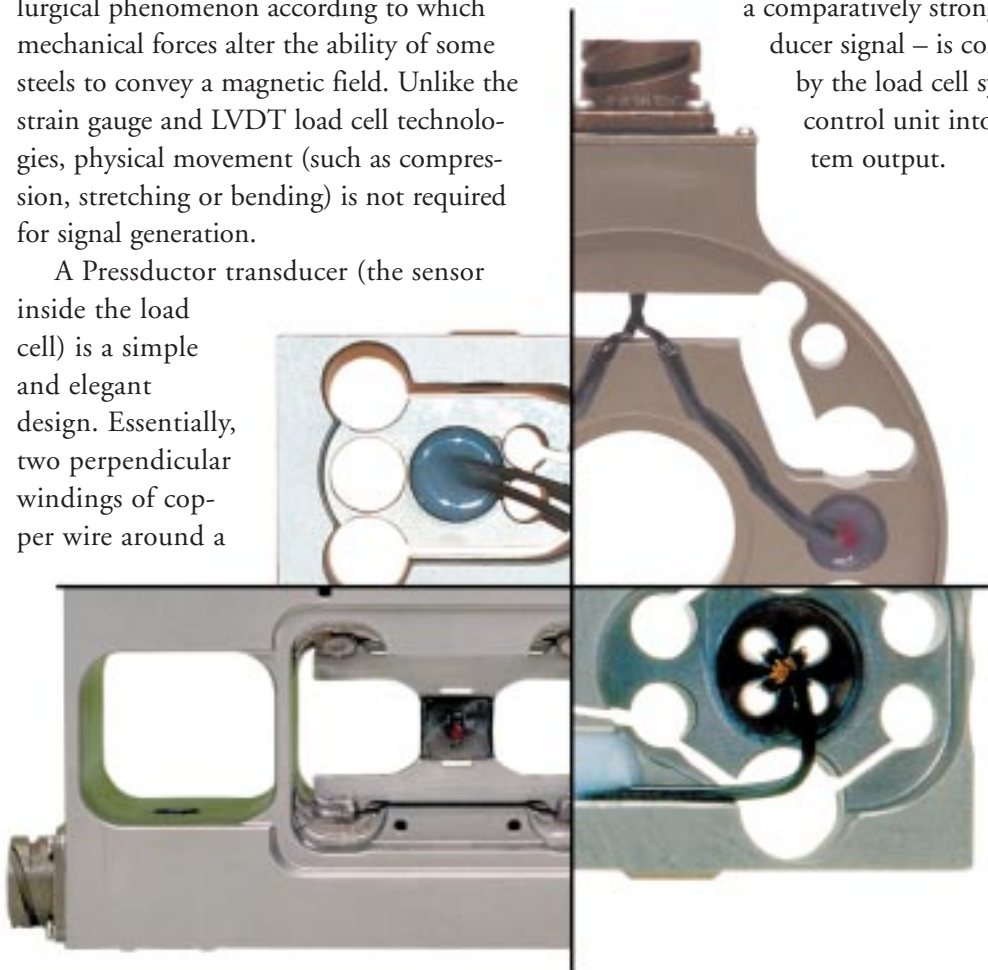




ABB is a world-wide organization committed to providing solutions for the generation, transmission, distribution and use of electrical power. It consists of 1000 companies in 140 countries.

As part of that group ABB Automation Products is one of the world's largest suppliers of industrial automation, products and services. Unique global resources provide the highest levels of customer value growing from in-depth knowledge and understanding of industry needs. Leading edge technology, specific application knowledge and an uncompromising commitment to quality make ABB Automation Products an important partner for industries in their drive for productivity, quality and profitability.

ABB Force Measurement is a division within ABB Automation Products. It provides equipment for accurate, reliable measurement and control in a broad range of applications from steel making to paper converting industries.



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Measurement Products

# Web Tension Systems Pressductor® PillowBlock Load Cells – the Mini Series

Power and productivity  
for a better world™



# Mini Series PillowBlock

Bringing quality and reliability to the measurement of web tension

## Introduction

ABB's Pressductor® load cells are sensitive and accurate yet rugged, reliable and compact. They can withstand high overloads and vibrations, and operate over a wide range of tensions: ideal for any web converting application such as coating, laminating, printing, slitting winding/unwinding and many others.

The well-proven Pressductor® load cells combined with the tension electronics, offer an easy to use/user-friendly web tension measurement system with superior long term performance leading to higher productivity and product quality and higher profit for the converter.

## Increased process uptime

In a web process running continuously, every minute of production time is precious. Even so, no production line runs without downtime. With Pressductor Mini-PillowBlock load cells the risk of web breaks can be reduced to a minimum, thus leaving as much time as possible for real production.

Thanks to a strong and stable signal deriving from the Mini-PillowBlock load cells, the upcoming web breaks are kept to an absolute minimum level.

## Tighter product tolerances

The ability to produce web to tighter tolerances minimizes the costs associated with non-conforming web. It also increases the web producer's accessible market to include products with tighter tolerance requirements.



Now all web processing machines can have load cells sized for optimal tension measurement performance – even machines with heavy rolls and light tension.

### Minimize maintenance

Share the experience, of virtually maintenance-free load cells, with thousands of other Mini-PillowBlock users. A robust load cell design with no fragile or ageing components makes this possible. Thanks to its robust design, the Mini-PillowBlock load cells work consistently for many years without any need for maintenance.

### Fast access to support and service

ABB provides customers with superior distinctive After Sales Service that really differentiates from the competition. You obtain advanced solutions to problems, service and professional consultation through our After Sales Service program. Expert engineers with extensive experience of all types of Force Measurement products are available to assist you through our world-wide network.



### There is a Mini Series PillowBlock load cell suitable for most web processing machinery used in the converting, printing, plastic film, textiles, and other industries.

In the converting industry, the Mini Series PillowBlock load cells are ideal on machinery for coating, laminating, embossing, and many other processes.

Mini Series PillowBlock systems are used on a wide range of printing presses – in both converting and commercial printing as well as newspaper and magazine production.

In the plastics industry, Mini Series PillowBlock Systems are used to optimize the production and processing of blown and cast film.

And in the textiles industries, machinery applications include nonwovens production as well as finishing operations like bleaching, desizing, dyeing, and printing.

In all web processing areas, Mini Series PillowBlock systems are used on the full range of winding machinery, from unwinds to slitter-rewinders.

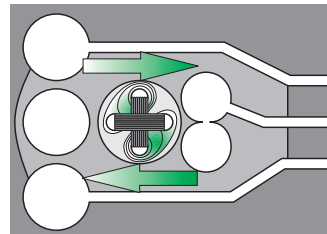
### The Pressductor® difference

Like ABB's other load cells based on Pressductor® Technology, Mini Series PillowBlock Load Cells rely on electromagnetic changes in the transducer, not on physical movement, to sense fluctuations in web tension. The Pressductor Technology operating principle provides exceptional improvements in load cell performance characteristics, including reliability (notably absence of drift), durability, repeatability, and wider measurement range.

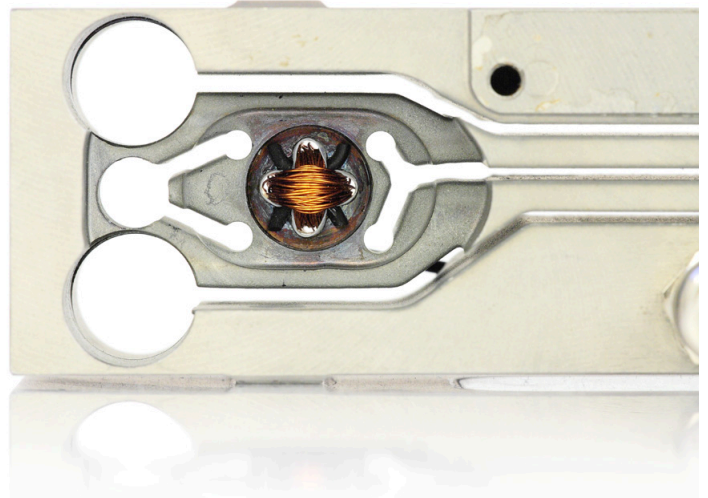
Machined from a solid block of steel, Mini Series load cells are rugged and stiff, affording high overload protection as well as an extended measurement range above the nominal load. And they won't contribute to machine vibration, even at high speeds.

Since the transducer action – the magnetic flux – takes place inside a steel core, environmental factors like dirt or fluids can't degrade performance and reliability. These stainless steel load cells don't require any physical seals.

Furthermore, low transducer impedance – less than a couple of ohms – helps eliminate susceptibility to radio-frequency and electromagnetic interference.



**Pressductor® Technology:**  
Mechanical force alters magnetic field.



# Mini Series PillowBlock Load Cells

Designed to measure either horizontal or vertical forces in both directions on most types of web processing machinery used in the converting, plastic film, printing, textiles, and other industries

## Extended-Range Operation

An extended range of measurement beyond the nominal load allows the Mini Series PillowBlocks to be sized for normal, as opposed to maximum, tension levels. As a result, they permit greater application flexibility on the web processing machinery.

These are some of the qualities that contribute to the Mini Series' excellent performance:

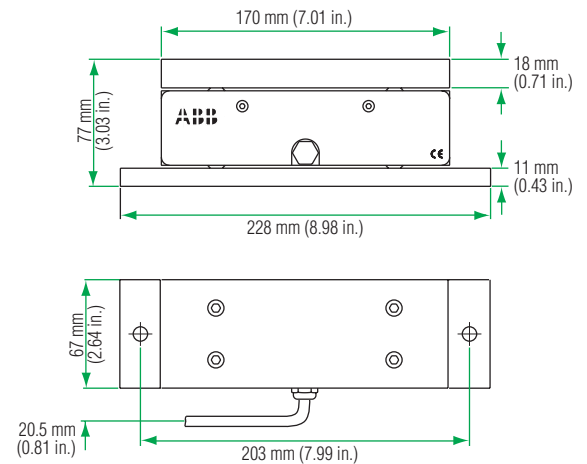
- Superior Design: ABB's exclusive Pressductor® Technology gives the Mini Series PillowBlocks exceptional sturdiness and makes them highly tolerant of operating conditions.
- Rugged Construction: Machined from a single block of stainless steel, Mini Series PillowBlocks provide a high level of protection against overloads and shock impact.
- Immunity to Environmental Stress: Load cell performance is unaffected by environmental factors like dust, fumes, fluids, and radio or electromagnetic interference. Sealing is not required.
- Overload Endurance: The system can handle overloads ranging up to 300 percent of nominal load without affecting load cell calibration.
- Extended Range: A standard "extended range" adds another 50 percent to measurement capacity for more versatile machine operation. Load cells can be specified for the web's normal tension range, but also accommodate occasional peak loads.
- Wide Measurement Range: The capacity to measure web tension variations of up to 30-to-1 provides valuable operating flexibility in processing a wide range of applications.
- Vibration-Free: High spring constant and low physical deflection reduce any contributions to machine vibration to negligible levels, even at high operating speeds.

## Designers appreciate...

- Remarkably high spring constant
- Wide measurement range
- High reliability

## Operators value a load cell with...

- No drift
- No recalibration
- No failures
- High reliability



## Easy to apply

Standard assemblies of load cells equipped with top and bottom mounting plates match the overall sizes of most commonly used types of pillow block load cells (see drawings to the left). They provide for direct substitutions of the UPB series of load cells as well as others.

The topside adapter plate secures the Mini Series load cell to the pillow block bearing housing, and the bottom plate is bolted to the pedestal.

Self-aligning pillow block bearings should be used in conjunction with the load cells. Standard pillow block bearings typically are self-aligning, whereas older, non-standard units may not be.

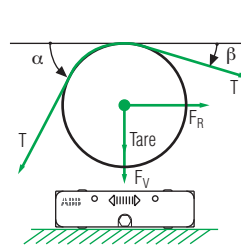
## Simple to size

The size, or nominal load, of a load cell is contingent on the anticipated force it will measure. When ABB's Mini Series load cell is mounted horizontally on a pedestal (the most common arrangement), the measurement force ( $F_{Rtot}$ ) is a function of the tension in the web ( $T$ ) and the deflection angles ( $\alpha$  and  $\beta$ ), and for the vertical load cells also the weight of the roll and bearings ( $Tare$ ). (See schematics to the right.)

Since load cells are typically used at both ends of a roll, rating the individual cell usually must be based on half of the resultant force. The ideal size of ABB load cells is the smallest nominal capacity rating accommodating that force level, as long as the force exceeds 10 percent of the rating. Before choosing a larger size, however, consider using the "extended range" feature of ABB load cells.  $F_{Vtot}$  should not exceed the overload specification for transverse forces.

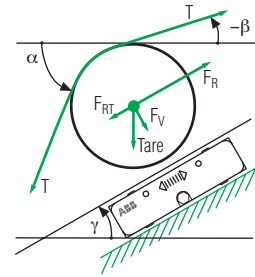
In instances where the force component in the measuring direction is insufficient or non-existent, the Mini Series PillowBlocks can be mounted at an angle.

## PFTL 301E



$$F_{Rtot} = T(\cos\beta - \cos\alpha)$$

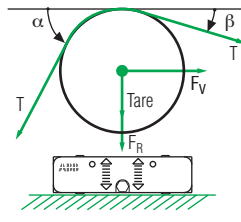
$$F_{Vtot} = F_V + Tare = T(\sin\beta + \sin\alpha) + Tare$$



$$F_{Rtot} = F_R - Tare \cdot \sin\gamma = T(\cos(\beta + \gamma) - \cos(\alpha - \gamma)) - Tare \cdot \sin\gamma$$

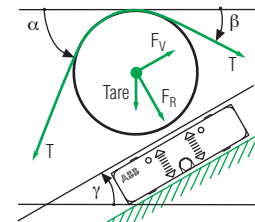
$$F_{Vtot} = F_V + Tare \cdot \cos\gamma = T(\sin(\alpha - \gamma) + \sin(\beta + \gamma)) + Tare \cdot \cos\gamma$$

## PFCL 301E



$$F_{Rtot} = F_R + Tare = T(\sin\alpha + \sin\beta) + Tare$$

$$F_{Vtot} = F_V = T(\cos\beta - \cos\alpha)$$



$$F_{Rtot} = F_R + Tare \cdot \cos\gamma = T(\sin(\alpha - \gamma) + \sin(\beta + \gamma)) + Tare \cdot \cos\gamma$$

$$F_{Vtot} = F_V - Tare \cdot \sin\gamma = T(\cos(\beta + \gamma) - \cos(\alpha - \gamma)) - Tare \cdot \sin\gamma$$

$F_R$  = Force component of Tension in the measuring direction

$F_{Rtot}$  = Total force in the measuring direction

$F_V$  = Force component of Tension transverse to the measuring direction

$F_{Vtot}$  = Total force in the transverse direction

$T$  = Tension in web

$Tare$  = Weight of roll and bearings

$\alpha, \beta$  = Deflection angles

$\gamma$  = Angle for load cell mounting

## Application Hint

Two "10 percent" application guidelines are useful in selecting load cell sizes:

**1** The proportion of web tension that is actually sensed by the load cell should be at least 10 percent of total web tension. For operational conditions producing values below 10 percent, consult ABB.

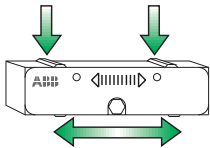
**2** During normal operation, the sensed force should not be less than 10 percent of the load cell's capacity.

# Mini Series PillowBlock Load Cells

- Quality load cells that eliminate drift and recalibration
- Wide operating range
- Easy to apply

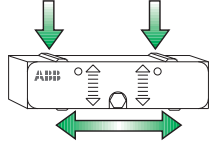
Measuring web tension horizontally – with a load cell that ignores vertical forces – means always being able to size the load cell to the tension... and achieve better results.

Vertical (transverse) force direction



Horizontal (measurement) force direction

Vertical (measurement) force direction



Horizontal (transverse) force direction

## Horizontal measurement PFTL 301E

The Horizontal Mini Series PillowBlock load cells for the web processing industries have the same dimensions as conventional load cells and mount in the same way. But they measure only the horizontal force component of the web tension. Unlike load cells that measure along the vertical axis, they are not forced to sense the roll weight along with the web tension. So these load cells can be sized to the tension level alone, and function at the high end of their measuring range, where load cells perform best. The result: always optimal tension measurement performance – even when rolls are heavy and tension light.

The Horizontal Mini Series includes four sizes of nominal loads at 0.1, 0.2, 0.5 and 1.0-kN, respectively (22, 45, 112 and 225 lbs.). Each model provides an extended measurement range of 50 per-



cent above the nominal load, and vertical overload tolerance of five times the nominal load. The load cells come with adapter plates for easy installation and 8 m (26.2-ft) of hardwired control cable.

## Vertical measurement PFCL 301E

The Vertical Mini Series PillowBlock is a “true” vertical force load cell, and measures only the total sum of the force components that are at a right angle to its top surface. The load cell is designed to measure vertical forces in both directions in most types of web processing machinery used in the converting, plastic film, printing, textiles, and other industries.

Three measurement sizes are available, with nominal load at 0.2, 0.5 and 1.0kN (45, 112 and 225 lbs.). Each model provides an extended measurement range of 50 percent above the nominal load. Equipped with top and bottom adapter plates, they directly replace many other types of load cells.



Properties		PFTL301E			
<b>Nominal load</b> (rated capacity)	kN	0.1	0.2	0.5	1.0
	Lbs.	22	45	112	225
<b>Extended load<sup>1)</sup></b>	kN	0.15	0.3	0.75	1.5
	Lbs.	33	67	169	337
<b>Permitted load</b> Transverse direction (vertical) h=135 mm	kN	0.3	0.6	1.5	3.0
	Lbs.	67	135	337	674
<b>Overload capacity<sup>2)</sup></b> Measurement direction (horizontal)	kN	0.3	0.6	1.5	3.0
	Lbs.	67	135	337	674
Transverse direction (vertical) h=135 mm	kN	0.5	1.0	2.5	5.0
	Lbs.	112	225	562	1125
<b>Deflection<sup>3)</sup></b>	mm	0.05	0.05	0.07	0.13
	1/1000 in.	2.0	2.0	2.8	5.0
<b>Spring constant</b>	kN/mm	2.0	4.0	7.0	8.0
	1000 Lbs./inch	11.3	22.4	39.7	44.6

#### All Load Cells

<b>Operating Principle</b>	Electromagnetic Pressductor® Technology	
<b>Accuracy class<sup>4)</sup></b>	%	±1.0
<b>Repeatability error</b>	%	<±0.1
<b>Operating range</b>	30:1	
<b>Stainless steel</b>	SIS	23875)
	DIN	X4CrNiMo165
<b>Working temp. range</b>	-10 to +80°C	
	14 to 176°F	
<b>Zero point drift<sup>6)</sup></b>	%/°C	<±0.015
	%/°F	<±0.008
<b>Sensitivity drift<sup>6)</sup></b>	%/°C	<±0.025
	%/°F	<±0.014

1) Values indicate the total capacity of the load cells when taking into account their permissible “extended capacity”. In the extended range, above the nominal load, some small decline in measurement accuracy may be experienced.

2) Maximum permitted loads without affecting load cell calibration.

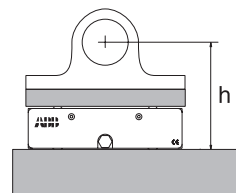
3) At nominal load.

4) Accuracy class is defined as the maximum deviation, and is expressed as a percentage of the sensitivity at nominal load. This includes linearity deviation, hysteresis and repeatability error.

5) Corrosion resistance properties similar to AISI 304

6) Applies for +20 – 60°C  
68 – 148°F

Properties		PFCL301E			
<b>Nominal load</b> (rated capacity)	kN	0.2	0.5	1.0	
	Lbs.	45	112	225	
<b>Extended load<sup>1)</sup></b>	kN	0.3	0.75	1.5	
	Lbs.	67	169	337	
<b>Permitted load</b> Transverse direction (vertical) h=135 mm	kN	0.05	0.125	0.25	
	Lbs.	11	28	56	
<b>Overload capacity<sup>2)</sup></b> Measurement direction (horizontal)	kN	0.6	1.5	3.0	
	Lbs.	135	337	674	
Transverse direction (vertical) h=135 mm	kN	0.3	0.75	1.5	
	Lbs.	67	169	337	
<b>Deflection<sup>3)</sup></b>	mm	0.020	0.024	0.040	
	1/1000 in.	0.8	0.8	1.2	
<b>Spring constant</b>	kN/mm	9.0	22.0	34.0	
	1000 Lbs./inch	52	124	197	



Height (h) from load cell's bottom surface to roll center line.

# Tension Electronics

## Bringing something new to web tension

The basic function of the tension electronics is to provide a 330 Hz excitation to the tension load cells and to process the measurement signals. It also provides outputs for control and/or indication of the measured tension.

The signal processing function of the tension electronics amplifies, rectifies, and filters the measurement signals from the load cells and provides an accurate and reliable output signal.

Covering a wide range of applications the Tension Electronics comes in three versions, with different levels of performance and functionality. All three versions have multi-language digital display and configuration keys. The configuration keys being used for setting different parameters and to check the status of the tension system. The 2 x 16 character display can present sum, difference or individual load cell signals. All three versions are available in both DIN-rail version and enclosed IP65<sup>1)</sup> version for mounting in more severe environments.



### PFEA 111

A cost effective, compact and user friendly tension electronics providing an accurate and reliable fast analog SUM signal from two load cells for control and/or monitoring. The display can show the SUM individual A & B and difference signal. The small size and DIN-rail mount make this unit very easy to integrate into many types of electrical cabinets.

### PFEA 112

This unit provides the same functionality and user friendliness as the PFEA 111 with the addition of fieldbus communication via Profibus-DP.

### PFEA 113

This advanced tension electronics can supply up to four load cells and has six configurable analog outputs for control and/or monitoring of web tension. The output signals are also available on Profibus-DP.

Another useful feature is the possibility to, via the digital input or Profibus, switch the gain for two different web paths. Alternatively, the digital input could be used for remote gain scheduling or zero set. This unit also includes a self-diagnostic function and four configurable digital outputs for alarms and level detection. Status of self-diagnostic functions are also available on Profibus-DP.

By combining up to three PFEA 113 the system can handle segmented roll applications, i.e. winders, with up to 12 load cells.

The high level of functionality and user-friendliness make the PFEA 113 one of the most complete tension electronics on the market.

1) According to IEC 529, EN 60-529

## Features and benefits

### - Interactive menu

The tension electronics has a unique interactive menu which guides the commissioning step by step, eliminating the potential for making mistakes and significantly reducing startup time. – An extremely helpful tool.

### - Built-in self diagnostics

The electronics continuously supervise a number of important parameters and provides error messages if something goes wrong.

### - Multi-language display

The multi-language display is a great feature that helps to eliminate mistakes, during start-up and/or operation of the tension system.

### - Load memory

The resetable load memory stores max. load values. A useful tool for maintenance.

### - Analog outputs

Individual scaling and filtering of all analog outputs.

### - Fieldbus communication

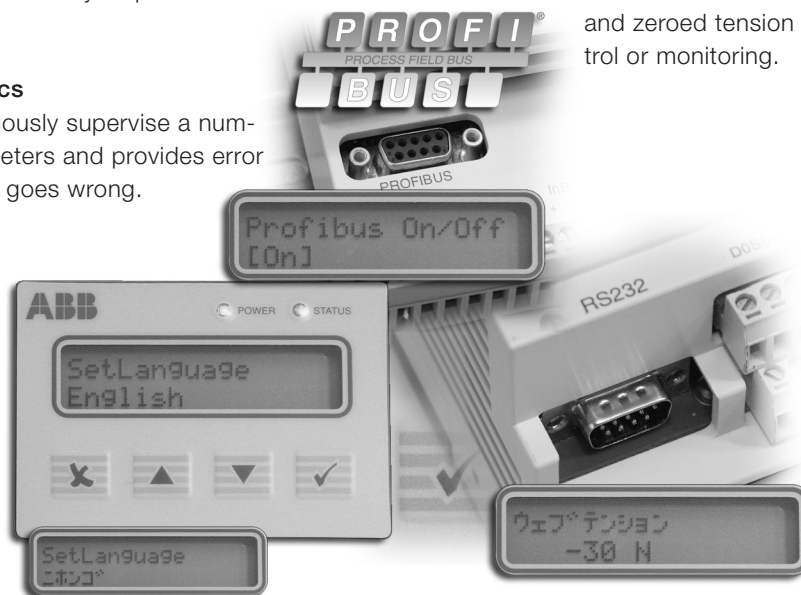
Versions PFEA 112 and PFEA 113 have fieldbus communication via Profibus-DP as standard. In contradiction to many other tension systems the PFEA 112 and PFEA 113 provide a scaled and zeroed tension output ready for use in control or monitoring.

### - Filter function

All units come with a selectable filter function for removal of roll unbalance, machine vibrations and other disturbances.

### - Commissioning without calibration weights

All Pressductor load cells are standard calibrated to the same sensitivity before delivery from ABB factory. This means that the fastest and most accurate way to commission a tension system is to use a calculated value instead of using calibration weights.



## Mounting

To provide flexibility of mounting, all three versions of the Tension Electronics are available in two mounting alternatives. For mounting on a standard DIN-rail the IP 20 and for wall mounting the IP 65.

## Floor cubicle

Floor cubicle type MNS Select is available for housing of up to 24 pcs. of PFEA 111/112 or 12 pcs. of PFEA 113 when mounted on 19" plates. Exact numbers depend on the combination of different tension electronics and the number of optional units used.

Options

To meet certain special application requirements the following options are available:

Insulation amplifier PXUB 201

The insulation amplifier can be used when galvanic insulation is required for analog output signals. The insulation amplifier can be connected to all versions and PFEA 113 - IP 65 can hold up to four PXUB 201.

Supply voltage	+24 V (20 - 253 V AC/DC)	
Current consumption	10 mA + external load	
Signal range	Input	Output
	0 - ±10 V	0 - ±10 V
	0 - ±10 V	0 - ±20 mA
	0 - 10 V	4 - +20 mA
Rated insulation voltage	600 V (basic)	

Relay board PXKB 201

PXKB 201 is DIN-rail mounted and can be mounted in the IP 65 versions of the Tension Electronics together with the insulation amplifier. PFEA 113-65 can hold up to four PXKB 201.

Supply voltage	+24 V DC	
Power consumption	18 mA	
Contact data	AC	6 A at 250 V
	DC	6 A at 250 V

Power supply unit

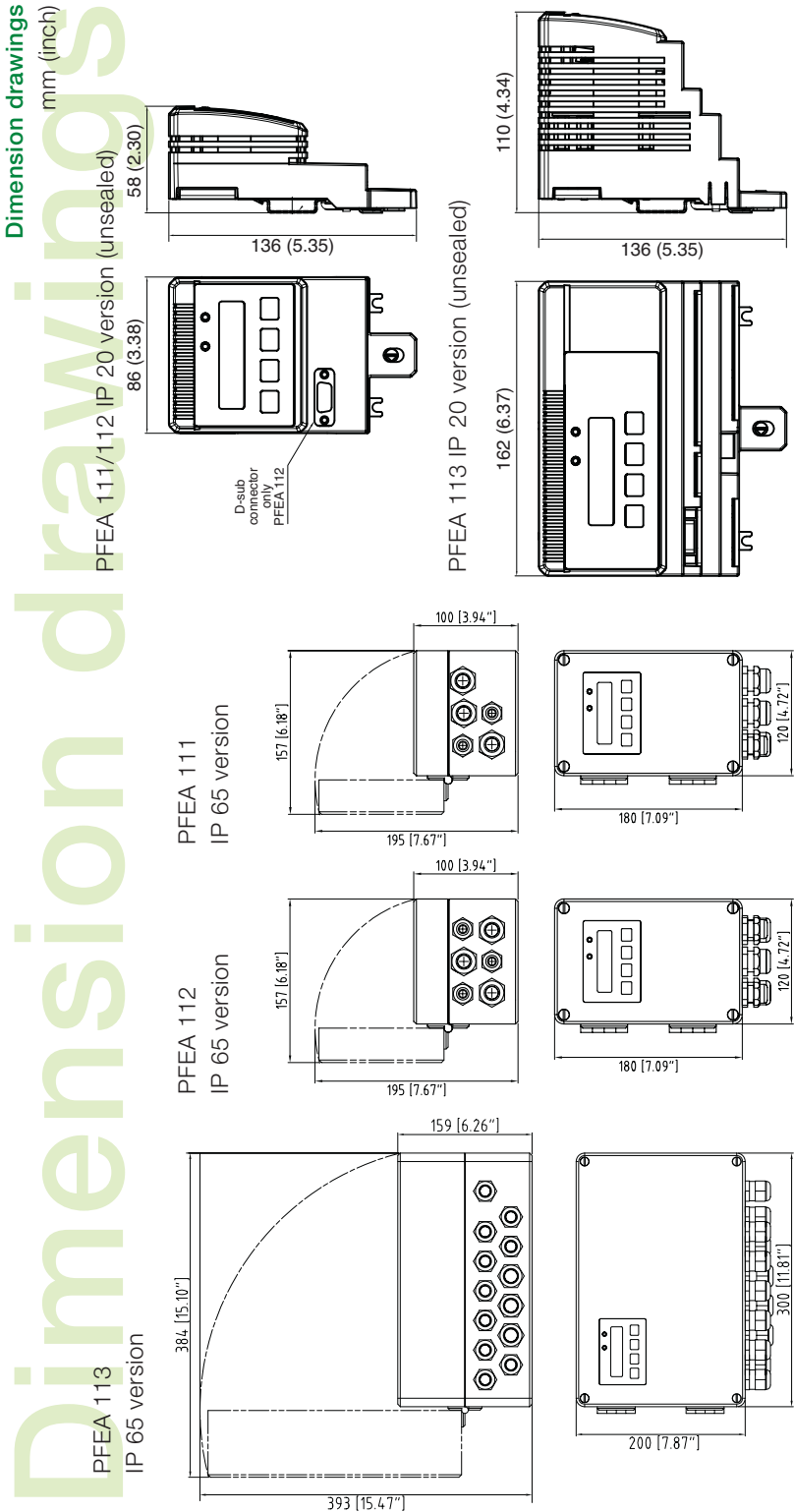
When using the DIN-rail IP 20 version of the electronics and 24 V main supply is not available, ABB offer optional power supply units.

The compact units transform main supply from 110 - 120 V/207 - 240 V AC to 24 V DC for supply of the PFEA 111, 112 and 113.

Three power supply units with different power ratings are available. The table below indicates max. number of electronics per power supply unit.

	PFEA 111	PFEA 112	PFEA 113
SD831 3 A	6	6	3*
SD832 5 A	12	12	6*
SD833 10 A	24	24	12*

\* Supply of digital outputs are not included



Data	PFEA 111	PFEA 112	PFEA 113
<b>Power supply</b>			
IP 20 Voltage		DC 24 V (18 - 36 V)	
Power requirement	7.5 W	7.5 W	12 W
IP 65 Main voltage	DC 24 V (18 - 36 V) 100 (-15%) - 240 (+10%) V AC		
Frequency	45 - 65 Hz		
<b>Number of load cells</b>	2	2	4
<b>Load cell excitation</b>			
Current	0.5 A rms, 330 Hz	0.5 A rms, 330 Hz	0.5 A rms, 330 Hz
Max. load	2 load cells Plus 5 $\Omega$ cable resistance	2 load cells Plus 5 $\Omega$ cable resistance	4 load cells Plus 10 $\Omega$ cable resistance
<b>Inputs</b>			
Digital inputs (remote zero or gain scheduling)	-	-	1
Analog inputs (connection of multiple PFEA 113 units)	-	-	2
<b>Outputs</b>			
Analog outputs (voltage or current)	-	-	6
-5 - +11 V (max. load 5 mA)	1	1	-
0 - 21 mA (max. load 550 $\Omega$ )	1	1	-
Selectable filter			
Step response (0 - 90%) can be set for each output	15, 30, 75, 250, 750, 1500 ms	15, 30, 75, 250, 750, 1500 ms	5, 15, 30, 75, 250, 750, 1500 ms
Scaling function of analog outputs	Yes	Yes	Yes
Digital outputs (Status OK and/or Level detectors)	-	-	4
Self diagnostics, Status OK			
LED (green/red)	Yes	Yes	Yes
Alarm on Digital output	-	-	Yes
Alarm via Profibus	-	Yes	Yes
Multi language interactive display <sup>1)</sup>	Yes	Yes	Yes
Selectable tension units on the display	N, kN, kg and lbs, N/m, kN/m, kg/m, pli		
Maximum load memory	Yes	Yes	Yes
Zero offset memory	Yes	Yes	Yes
<b>Communication</b>			
Profibus DP, baud rate up to 12 Mbit	-	Yes	Yes
GSD-file	-	ABB_0716.GSD	ABB_0717.GSD
<b>Environmental tolerance</b>			
Electrical environment	As per EMC Directive 89/336/EEC As per Low Voltage Directive 73/23/EEC As per UL508 Industrial control equipment <sup>2)</sup>		
Electrical interference environment			
Electrical safety			
Ambient temperature	+5 - +55°C		
Degree of protection	IEC 529 Protection class IP 20 or IP 65		

1) English, German, Italian, French, Japanese, Portuguese

2) Not PFEA 112-65

# Contact us

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Measurement Products

# Web Tension Systems Pressductor® Radial Load Cells

Power and productivity  
for a better world™



# Pressductor® Radial Load Cells

A quality load cell system for dependable tension measurement

## Introduction

ABB's Pressductor® load cells are sensitive and accurate yet rugged, reliable and compact. They can withstand high overloads and vibrations, and operate over a wide range of tensions: ideal for any web converting application such as coating, laminating, printing, slitting winding/unwinding and many others.

The well-proven Pressductor® load cells combined with the tension electronics, offer an easy-to-use/user-friendly web tension measurement system with superior long term performance leading to higher productivity and product quality and higher profit for the converter.

## Increased process uptime

In a web process running continuously, every minute of production time is precious. Even so, no production line runs without downtime. With Pressductor® Radial load cells (PRT load cells) the risk of web breaks can be reduced to a minimum, thus leaving as much time as possible for real production.

Thanks to a strong and stable signal deriving from the PRT load cells, the upcoming web breaks are kept to an absolute minimum level.

## Tighter product tolerances

The ability to produce web to tighter tolerances minimizes the costs associated with non-conforming web. It also increases the web producer's accessible market to include products with tighter tolerance requirements.



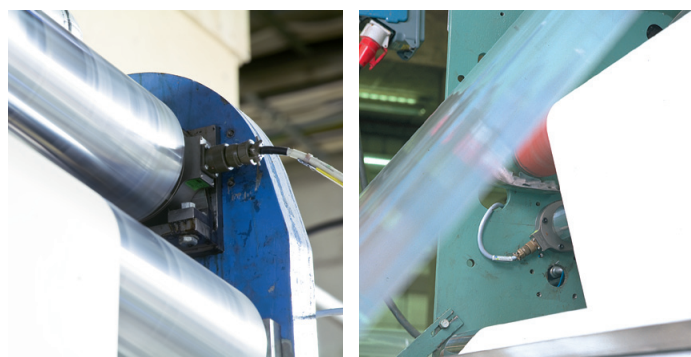
A Pressductor® transducer produces its measurement signal without requiring any physical movement in the transducer measurement element. And it generates a strong signal at comparatively low stress levels. So there is no possibility of fatigue leading to drift and deteriorating measurement performance.

### Minimize maintenance

Share the experience, of virtually maintenance-free load cells, with thousands of other Pressductor® load cell users. A robust load cell design with no fragile or ageing components makes this possible. Thanks to its robust and compact design, the PRT load cells work consistently for many years without any need for maintenance.

### Fast access to support and service

ABB provides customers with superior distinctive After Sales Service that really differentiates from the competition. You obtain advanced solutions to problems, service and professional consultation through our After Sales Service program. Expert engineers with extensive experience of all types of Force Measurement products are available to assist you through our world-wide network.



**There is a shaft-mounted PRT tension measurement load cell suitable for most web processing machinery used in the converting, printing, plastic film, textiles, and other industries.**

In the converting industry, the PRT load cells are ideal on machinery for coating, laminating, embossing, and many other processes.

PRT load cells are used on a wide range of printing presses – in both converting and commercial printing as well as newspaper and magazine production.

In the plastics industry, PRT load cells are used to optimize the production and processing of blown and cast film.

And in the textiles industries, machinery applications include nonwovens production as well as finishing operations like bleaching, desizing, dyeing, and printing.

In all web processing areas, PRT load cells are used on the full range of winding machinery, from unwinds to slitter-rewinders.

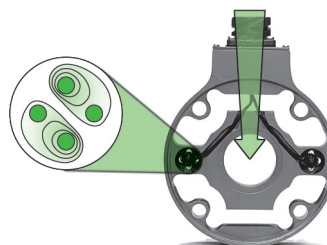
### The Pressductor® difference

Like ABB's other load cells based on Pressductor® Technology, PRT load cells rely on electromagnetic changes in the transducer, not on physical movement, to sense fluctuations in web tension. The Pressductor Technology operating principle provides exceptional improvements in load cell performance characteristics, including reliability (notably absence of drift), durability, repeatability, and wider measurement range.

Machined from a solid block of steel, PRT load cells are rugged and stiff, affording high overload protection as well as an extended measurement range above the nominal load. And they do not contribute to machine vibration, even at high speeds.

Since the transducer action – the magnetic flux – takes place inside a steel core, environmental factors like dirt or fluids can't degrade performance and reliability. These stainless steel load cells don't require any physical seals.

Furthermore, low transducer impedance – less than a couple of ohms – helps eliminate susceptibility to radio-frequency and electromagnetic interference.



**Pressductor® Technology: Mechanical force alters magnetic field.**



# Simple to size and easy to apply

Designers appreciate remarkably high spring constant and very narrow profile

Operators value a load cell with high reliability

## Application Hint

Two "10 percent" application guidelines are useful in selecting load cell sizes:

**1** The proportion of web tension that is actually sensed by the load cell should be at least 10 percent of total web tension. For operational conditions producing values below 10 percent, consult ABB.

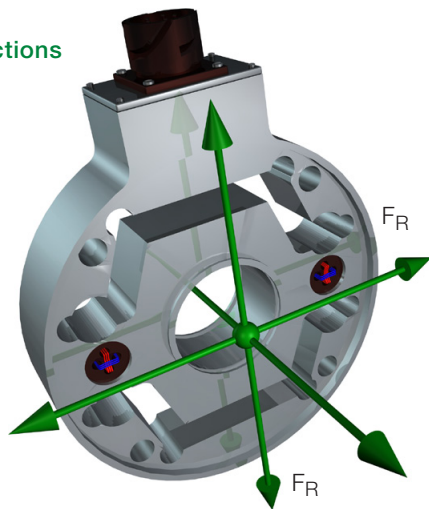
**2** During normal operation, the sensed force should not be less than 10 percent of the load cell's capacity.

Calculating the forces exerted on load cells in a specific application allows you to determine the ideal load cell size specification. Force calculations and load cell sizing are typically conducted in collaboration with ABB; this page provides an overview of the considerations that play a role in this stage of the specification process.

The orientation of PRT load cells on the end of the roll shaft can be adjusted to perform measurements in the most advantageous direction for each application.

In sizing PRT load cells, both the web tension and the weight of the roll and bearings (tare weight) should be considered. If the load cell is oriented vertically or diagonally with respect to the force of gravity, the tare force will contribute to the total force level sensed by the PRT load cell system. If the load cell is oriented horizontally, the tare force will be perpendicular to the measurement axis, and so will not be sensed.

## Force directions



$F_R$  = Force component of Tension in the measuring direction

$F_{Rtot}$  = Total force in the measuring direction

$F_V$  = Force component of Tension transverse to the measuring direction

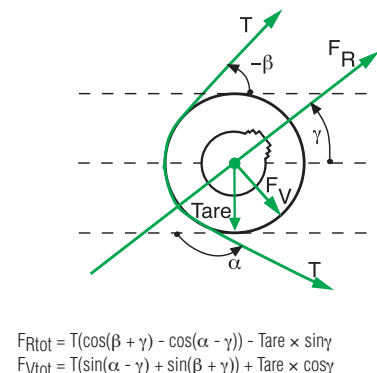
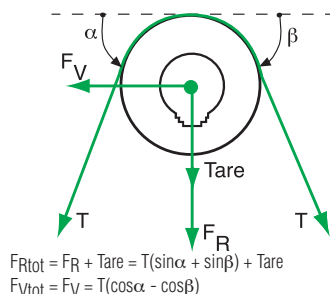
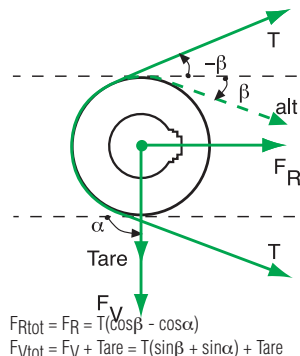
$F_{Vtot}$  = Total force in the transverse direction

$T$  = Tension in web

$Tare$  = Weight of roll and bearings

$\alpha, \beta$  = Deflection angles

$\gamma$  = Angle for load cell mounting



## Calculating the Forces

The PRT load cell measures bidirectionally along its measurement axis (see illustration). Once the load cell is oriented and the measurement axis determined, the force components exerted on the load cells of a roll are easily calculated as functions of the web tension, tare force, and deflection angles. Since most systems involve two load cells, the calculated forces are divided by 2 to obtain the forces exerted on each individual load cell. The diagrams on this page illustrate three scenarios, involving horizontal, vertical and diagonal measurement axes.

When horizontal, the measurement force ( $F_{Rtot}$ ) is a function of just the tension in the web ( $T$ ) and the deflection angles ( $\alpha$  and  $\beta$ ). Since the weight of the roll and bearings ( $Tare$ ) is not sensed, the load cells can be sized to measure low tension levels even on a comparatively heavy roll. However, the perpendicular force ( $F_{Vtot}$ ) – which does include  $Tare$  – should not exceed the overload rating.

When the measurement force ( $F_{Rtot}$ ) is vertical, it includes the weight of the roll and bearings ( $Tare$ ), and the load cell must be sized accordingly. In effect, the weight of the roll and bearings are using up some of the measurement range of the load cell.

A diagonal load force orientation requires a more complex calculation. Here, the forces sensed in both the measurement direction and the perpendicular direction include a portion of the tare as well as the web tension, and the angle formed by the measurement axis and the horizontal axis ( $\gamma$ ) enters into the calculation.

# Pressductor® Radial Load Cells

Designed to measure web tension on most types of web processing machinery used in the converting, plastic film, printing, textiles, and other industries

Four standard sizes measure web tension from 0.1 to 100 kN. With its extended-capacity feature, the PRT load cell is capable of measuring tension reliably over a 30:1 range. Superior overload characteristics in all force directions (up to 500%) eliminate overload failures for all practical purposes. Exceptionally high spring constant virtually precludes load cell contributions to machine vibration, even at very high machinery speeds. The performance of the load cells is unaffected by environmental factors like dust, corrosion, and radio or electromagnetic interference.

## Extended-Range Operation

Beyond their nominal capacity, PRT load cells have an extended range of measurement – so they can be sized for normal, as opposed to maximum, tension levels. As a result, they can process a wider variety of materials.

Properties		PFRL 101A	PFRL 101B	PFRL 101C			PFRL 101D
Nominal load (rated capacity)	kN	0.5	1.0	0.5	1.0	2.0	5.0
	Lbs.	112	225	112	225	450	1125
Extended load <sup>1)</sup>	kN	0.75	1.5	0.75	1.5	3.0	7.5
	Lbs.	169	337	169	337	675	1687
Overload <sup>2)</sup>							
	Measurement direction	kN	5.0	2.5	5.0	10.0	25.0
		Lbs.	1125	562	1125	2250	5625
Transverse to measurement direction	kN	2.5	3.0	1.25	2.5	5.0	10.0
	Lbs.	562	674	281	562	1125	2250
Axial	kN	2.5	5.0	2.5	5.0	10.0	25.0
	Lbs.	562	1125	562	1125	2250	5625
Spring constant		kN	50	100	50	100	500
Deflection <sup>3)</sup>	1000 Lbs./inch	286	572	286	572	1143	2858
	mm	0.01	0.01	0.01	0.01	0.01	0.01
	1/1000 inch	0.4	0.4	0.4	0.4	0.4	0.4

## All Load Cells

Operating Principle	Electromagnetic Pressductor® Technology
Accuracy class <sup>4)</sup>	% ±0.5
Repeatability error	% <±0.1
Operating range	30:1
Stainless steel	SIS 2387 <sup>5)</sup>
	DIN X4CrNiMo165

Working temp. range	-10 to +80°C 14 to 176°F
Zero point drift <sup>6)</sup>	%/°C <±0.015 %/°F <±0.008
Sensitivity drift <sup>6)</sup>	%/°C <±0.015 %/°F <±0.008

<sup>1)</sup> Values indicate the total capacity of the load cells when taking into account their permissible “extended capacity”. In the extended range, above the nominal load, some small decline in measurement accuracy may be experienced.

<sup>2)</sup> Maximum permitted loads without affecting load cell calibration.

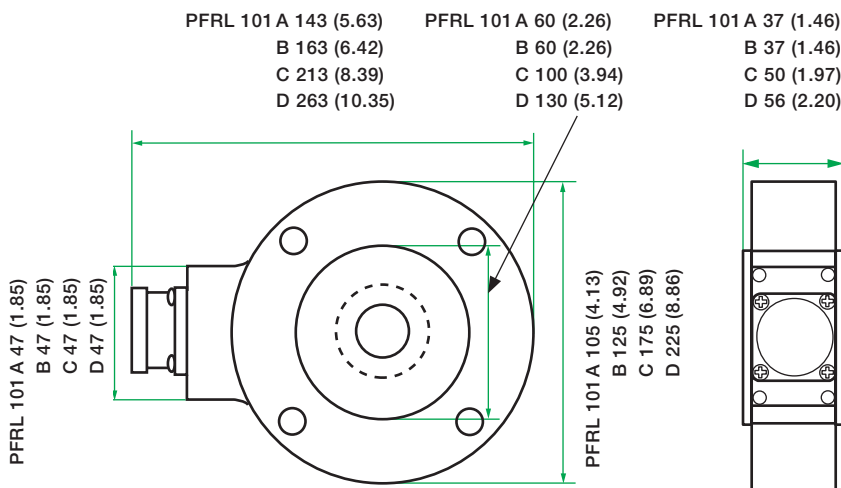
<sup>3)</sup> At nominal load.

<sup>4)</sup> Accuracy class is defined as the maximum deviation, and is expressed as a percentage of the sensitivity at nominal load. This includes linearity deviation, hysteresis and repeatability error.

<sup>5)</sup> Corrosion resistance properties similar to AISI 304

<sup>6)</sup> Applies for +20 – 80°C  
+68 – 176°F

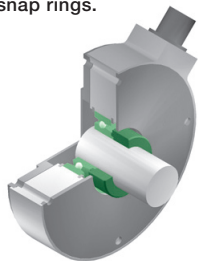
## PRT dimensions



mm (inch)

# Shaft sizes and bearing recommendations

The bearing is press fit to the roll shaft, and the assembly is slip fit to the load cell and secured with snap rings.



**Application Hint**  
Thermal expansion of the roll is accommodated by installing snap rings on both sides of the bearing in just one load cell.

PRT load cells work well with both rotating (live) and non-rotating (dead) shafts. For live shaft applications, many different bearing types and sizes can be used. The load cell and the shaft can be integrated by first press-fitting the selected bearing onto the shaft and then sliding the assembly into the center hole of the PRT load cell. Or, alternatively, the roll shaft may be machined to create a shoulder that one side of the bearing rests against, while the other side is restricted by a snap ring.

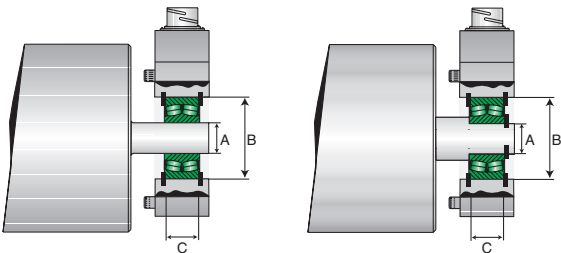
In live shaft assemblies, the roll is held securely in place by snap rings installed in grooves on each side of the bearing in the center hole of the load cell. Thermal expansion of the roll is accommodated by installing snap rings on both sides of the bearing in just one load cell.

The table below presents a sampling of bearing specifications for PRT load cells for various shaft

diameters and bearing types. Other bearing types and sizes can be accommodated, including both conventional SKF bearings and many self-locking Torrington-type bearings.

The table includes typical examples of bearings for a variety of shaft diameters, based on specific load cell capacities, center hole diameters, and bearing widths (distance between snap rings). Of course, bearing load and rotational speed are also important specification criteria that must be considered when selecting an appropriate bearing. Only the bearings for the largest shaft diameters that fit standard PRT load cells are shown; many other options are available. ABB applications engineers can provide assistance with bearing selection.

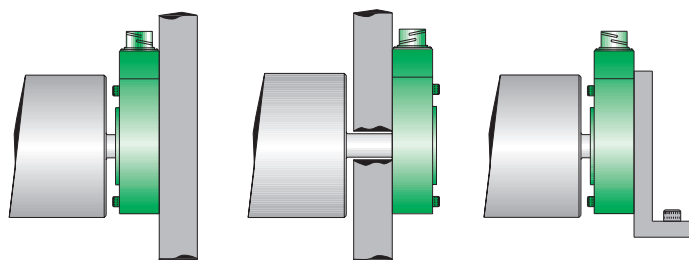
Load Cell		PFRL 101A				PFRL 101B			PFRL 101C			PFRL 101D	
Nominal load	kN	0.5	0.5	0.5	0.5	1.0	1.0	1.0	0.5	1.0	2.0	5.0	5.0
	lbs	112	112	112	112	225	225	225	112	225	450	1125	1125
Load cell hole dia.	mm	32	35 <sup>1)</sup>	35 <sup>1)</sup>	40	40	47	52	80	80	80	110	125
	inch	1.26	1.38	1.38	1.57	1.57	1.85	2.05	3.15	3.15	3.15	4.33	4.92
Dist. between snap rings	mm	14	11	14	16	16	18	18	23	23	23	28	28
	inch	0.55	0.43	0.55	0.63	0.63	0.71	0.71	0.91	0.91	0.91	1.10	1.10
Self-aligned ball bearing SKF# shaft dia.		2201E	1202E	2202E	2203E	2203E	2204E	2205E	2208E	2208E	2208E	2212E	2214E
	mm	12	15	15	17	17	20	25	40	40	40	60	70
	inch	0.47	0.59	0.59	0.67	0.67	0.79	0.98	1.57	1.57	1.57	2.36	2.76
Spherical roller bearing SKF# shaft dia.								22205E	22208E	22208E	22208E	22212E	22214E
	mm							25	40	40	40	60	70
	inch							0.98	1.57	1.57	1.57	2.36	2.76



A = Shaft diameter  
B = Load cell hole diameter  
C = Distance between snap rings  
<sup>1)</sup> Please specify desired snap ring distance when ordering

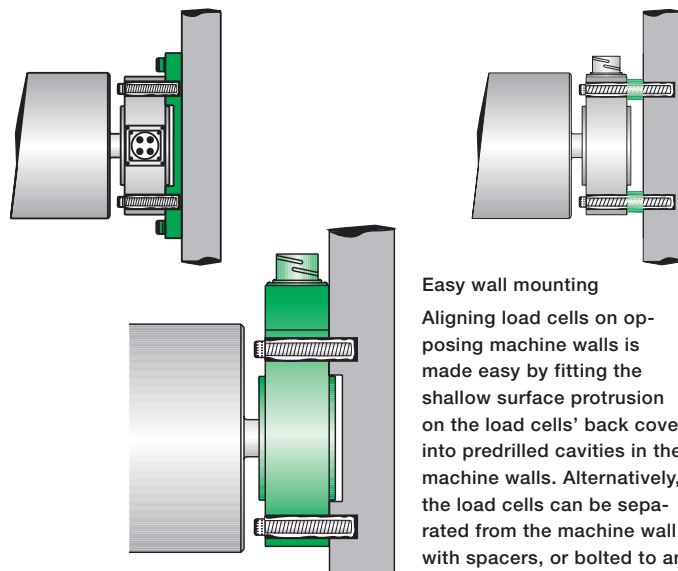
**Note:**  
Bearing specifications in table are samples. PRT load cells can accommodate bearings for many other shaft diameters besides those shown.

# Mounting options



## Three ways to mount

PRT load cells mount with equal ease on the inner and outer side of machine walls. In locations where pedestal mounting is required, a specially designed angle bracket extends the usefulness of the radial load cell.



## Easy wall mounting

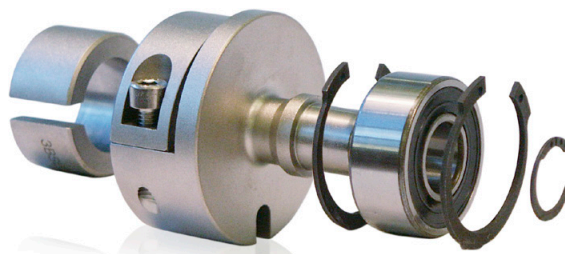
Aligning load cells on opposing machine walls is made easy by fitting the shallow surface protrusion on the load cells' back cover into predrilled cavities in the machine walls. Alternatively, the load cells can be separated from the machine wall with spacers, or bolted to an adapter plate.

## Dead shaft adapter kit

For applications with non-rotating shaft ends ABB provides an optional dead shaft adapter kit for PFRL 101A and PFRL 101B. The kit consists of a self-aligning bearing to manage misalignments, adapter for different shaft diameters and an anti-rotation pin.

Dead shaft adapter kit is available for following shaft diameters:

3/4", 1", 1 1/8", 1 1/4", 1 1/2",  
20 mm, 25 mm and 30 mm.



For dead shaft rolls ABB provides a dead shaft kit with an adapter that clamps onto the non-rotating roll shaft.

## Grease nipple

ABB recommends to use sealed bearings that will meet most demands in web handling machinery without the need for regular greasing operations. However, if greasable bearings must be used, ABB offers, as an option, load cells modified for grease nipples. This option is available for PFRL 101B, PFRL 101C and PFRL 101D.



# Tension Electronics

## Bringing something new to web tension

The basic function of the tension electronics is to provide a 330 Hz excitation to the tension load cells and to process the measurement signals. It also provides outputs for control and/or indication of the measured tension.

The signal processing function of the tension electronics amplifies, rectifies, and filters the measurement signals from the load cells and provides an accurate and reliable output signal.

Covering a wide range of applications the Tension Electronics comes in three versions, with different levels of performance and functionality. All three versions have multi-language digital display and configuration keys. The configuration keys being used for setting different parameters and to check the status of the tension system. The 2 x 16 character display can present sum, difference or individual load cell signals. All three versions are available in both DIN-rail version and enclosed IP65<sup>1)</sup> version for mounting in more severe environments.



### PFEA 111

A cost effective, compact and user friendly tension electronics providing an accurate and reliable fast analog SUM signal from two load cells for control and/or monitoring. The display can show the SUM individual A & B and difference signal. The small size and DIN-rail mount make this unit very easy to integrate into many types of electrical cabinets.

### PFEA 112

This unit provides the same functionality and user friendliness as the PFEA 111 with the addition of fieldbus communication via Profibus-DP.

### PFEA 113

This advanced tension electronics can supply up to four load cells and has six configurable analog outputs for control and/or monitoring of web tension. The output signals are also available on Profibus-DP.

Another useful feature is the possibility to, via the digital input or Profibus, switch the gain for two different web paths. Alternatively, the digital input could be used for remote gain scheduling or zero set. This unit also includes a self-diagnostic function and four configurable digital outputs for alarms and level detection. Status of self-diagnostic functions are also available on Profibus-DP.

By combining up to three PFEA 113 the system can handle segmented roll applications, i.e. winders, with up to 12 load cells.

The high level of functionality and user-friendliness make the PFEA 113 one of the most complete tension electronics on the market.

1) According to IEC 529, EN 60-529

# Features and benefits

## - Interactive menu

The tension electronics has a unique interactive menu which guides the commissioning step by step, eliminating the potential for making mistakes and significantly reducing startup time. – An extremely helpful tool.

## - Built-in self diagnostics

The electronics continuously supervise a number of important parameters and provides error messages if something goes wrong.

## - Multi-language display

The multi-language display is a great feature that helps to eliminate mistakes, during start-up and/or operation of the tension system.

## - Load memory

The resetable load memory stores max. load values. A useful tool for maintenance.

## - Analog outputs

Individual scaling and filtering of all analog outputs.

## - Fieldbus communication

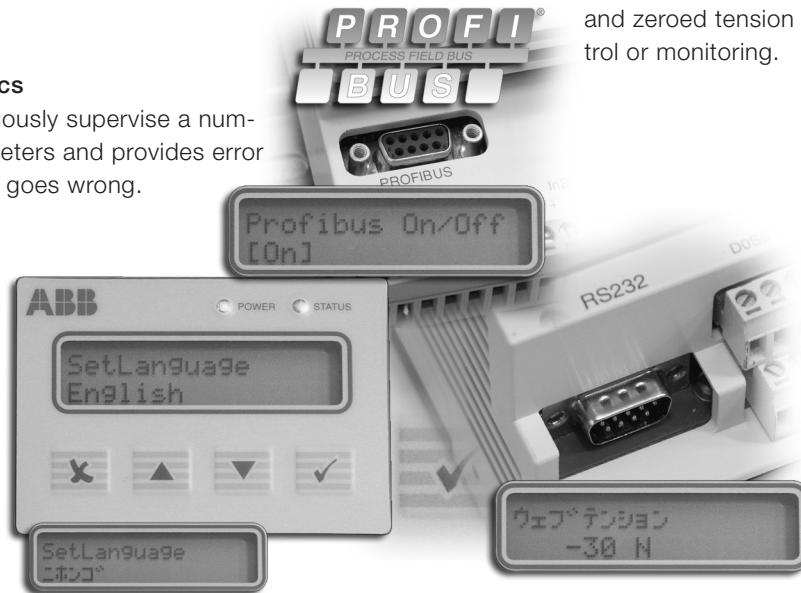
Versions PFEA 112 and PFEA 113 have fieldbus communication via Profibus-DP as standard. In contradiction to many other tension systems the PFEA 112 and PFEA 113 provide a scaled and zeroed tension output ready for use in control or monitoring.

## - Filter function

All units come with a selectable filter function for removal of roll unbalance, machine vibrations and other disturbances.

## - Commissioning without calibration weights

All Pressductor load cells are standard calibrated to the same sensitivity before delivery from ABB factory. This means that the fastest and most accurate way to commission a tension system is to use a calculated value instead of using calibration weights.



## Mounting

To provide flexibility of mounting, all three versions of the Tension Electronics are available in two mounting alternatives. For mounting on a standard DIN-rail the IP 20 and for wall mounting the IP 65.

## Floor cubicle

Floor cubicle type MNS Select is available for housing of up to 24 pcs. of PFEA 111/112 or 12 pcs. of PFEA 113 when mounted on 19" plates. Exact numbers depend on the combination of different tension electronics and the number of optional units used.

## Options

To meet certain special application requirements the following options are available:

### Insulation amplifier PXUB 201

The insulation amplifier can be used when galvanic insulation is required for analog output signals. The insulation amplifier can be connected to all versions and PFEA 113 - IP 65 can hold up to four PXUB 201.

Supply voltage	+24 V (20 - 253 V AC/DC)	
Current consumption	10 mA + external load	
Signal range	Input	Output
	0 - ±10 V	0 - ±10 V
	0 - ±10 V	0 - ±20 mA
	0 - 10 V	4 - +20 mA
Rated insulation voltage	600 V (basic)	

### Relay board PXKB 201

PXKB 201 is DIN-rail mounted and can be mounted in the IP 65 versions of the Tension Electronics together with the insulation amplifier. PFEA 113-65 can hold up to four PXKB 201.

Supply voltage	+24 V DC	
Power consumption	18 mA	
Contact data	AC	6 A at 250 V
	DC	6 A at 250 V

### Power supply unit

When using the DIN-rail IP 20 version of the electronics and 24 V main supply is not available, ABB offer optional power supply units.

The compact units transform main supply from 110 - 120 V/207 - 240 V AC to 24 V DC for supply of the PFEA 111, 112 and 113.

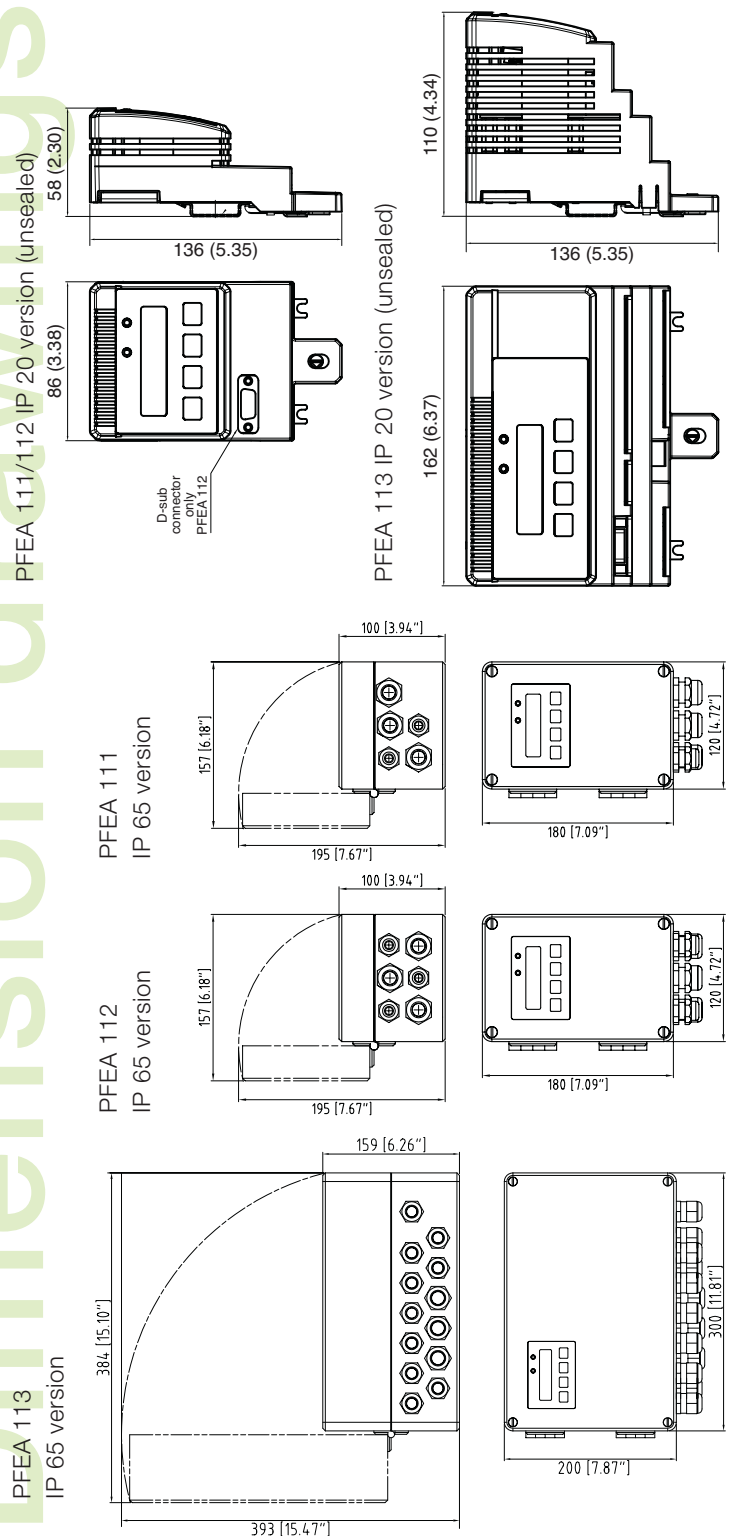
Three power supply units with different power ratings are available. The table below indicates max. number of electronics per power supply unit.

	PFEA 111	PFEA 112	PFEA 113
SD831 3 A	6	6	3*
SD832 5 A	12	12	6*
SD833 10 A	24	24	12*

\* Supply of digital outputs are not included

## Dimension drawings

mm (inch)



Data	PFEA 111	PFEA 112	PFEA 113
<b>Power supply</b>			
IP 20 Voltage		DC 24 V (18 - 36 V)	
Power requirement	7.5 W	7.5 W	12 W
IP 65 Main voltage	DC 24 V (18 - 36 V) 100 (-15%) - 240 (+10%) V AC		
Frequency	45 - 65 Hz		
<b>Number of load cells</b>	2	2	4
<b>Load cell excitation</b>			
Current	0.5 A rms, 330 Hz	0.5 A rms, 330 Hz	0.5 A rms, 330 Hz
Max. load	2 load cells Plus 5 $\Omega$ cable resistance	2 load cells Plus 5 $\Omega$ cable resistance	4 load cells Plus 10 $\Omega$ cable resistance
<b>Inputs</b>			
Digital inputs (remote zero or gain scheduling)	-	-	1
Analog inputs (connection of multiple PFEA 113 units)	-	-	2
<b>Outputs</b>			
Analog outputs (voltage or current)	-	-	6
-5 - +11 V (max. load 5 mA)	1	1	-
0 - 21 mA (max. load 550 $\Omega$ )	1	1	-
Selectable filter			
Step response (0 - 90%) can be set for each output	15, 30, 75, 250, 750, 1500 ms	15, 30, 75, 250, 750, 1500 ms	5, 15, 30, 75, 250, 750, 1500 ms
Scaling function of analog outputs	Yes	Yes	Yes
Digital outputs (Status OK and/or Level detectors)	-	-	4
Self diagnostics, Status OK			
LED (green/red)	Yes	Yes	Yes
Alarm on Digital output	-	-	Yes
Alarm via Profibus	-	Yes	Yes
Multi language interactive display <sup>1)</sup>	Yes	Yes	Yes
Selectable tension units on the display	N, kN, kg and lbs, N/m, kN/m, kg/m, pli		
Maximum load memory	Yes	Yes	Yes
Zero offset memory	Yes	Yes	Yes
<b>Communication</b>			
Profibus DP, baud rate up to 12 Mbit	-	Yes	Yes
GSD-file	-	ABB_0716.GSD	ABB_0717.GSD
<b>Environmental tolerance</b>			
Electrical environment	As per EMC Directive 89/336/EEC As per Low Voltage Directive 73/23/EEC As per UL508 Industrial control equipment <sup>2)</sup>		
Electrical interference environment			
Electrical safety			
Ambient temperature	+5 - +55°C		
Degree of protection	IEC 529 Protection class IP 20 or IP 65		

1) English, German, Italian, French, Japanese, Portuguese

2) Not PFEA 112-65

# Contact us

## **ABB AB**

### **Process Automation**

Force Measurement

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3BSE030912R0301 Rev A 2013-04



Measurement Products

# Web Tension Systems Pressductor® PillowBlock Load Cells

Power and productivity  
for a better world™



# PillowBlock

## Quality tension measurement for quality tension control

### Introduction

ABB's Pressductor® PillowBlock load cells are sensitive and accurate yet rugged, reliable and compact. The performance of the Pressductor® PillowBlock load cells is unsurpassed for paper mill applications characterized by heavy rolls, high speeds and severe conditions – in some instances they are the only viable option. They can withstand high overloads and vibrations, and operate over a wide range of tensions.

The well-proven Pressductor® load cells combined with the tension electronics, offer an easy-to-use/user-friendly web tension measurement system with superior long term performance leading to higher productivity and product quality and higher profit for the web producer.

### Increased process uptime

In a web process running continuously, every minute of production time is precious. Even so, no production line runs without downtime. With Pressductor® PillowBlock load cells the risk of web breaks can be reduced to a minimum, thus leaving as much time as possible for real production.

Thanks to a strong and stable signal deriving from the PillowBlock load cells, the upcoming web breaks are kept to an absolute minimum level.

### Tighter product tolerances

The ability to produce web to tighter tolerances minimizes the costs associated with non-conforming web. It also increases the web producer's accessible market to include products with tighter tolerance requirements.



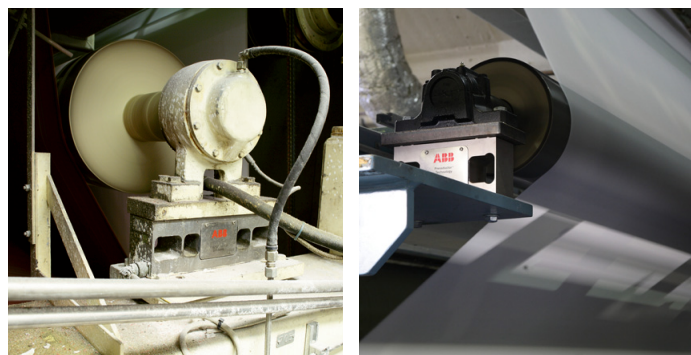
Reliable Tension Measurement  
– from Board to Tissue  
– from Wire to Winder

### Minimize maintenance

Share the experience, of virtually maintenance-free load cells, with thousands of other PillowBlock users. A robust load cell design with no fragile or ageing components makes this possible. Thanks to its robust design, the PillowBlock load cells work consistently for many years without any need for maintenance, also in the toughest paper mill applications.

### Fast access to support and service

ABB provides customers with superior distinctive After Sales Service that really differentiates from the competition. You obtain advanced solutions to problems, service and professional consultation through our After Sales Service program. Expert engineers with extensive experience of all types of Force Measurement products are available to assist you through our world-wide network.



### There is a PillowBlock load cell suitable for most web processing machinery used in the paper processing industries

In the paper industry, the PillowBlock load cells are ideal in wire, press and dryer sections as well as in coaters, calenders and winders.

In the converting industry, the PillowBlock load cells have proven their superior performance in laminator and coater machinery.

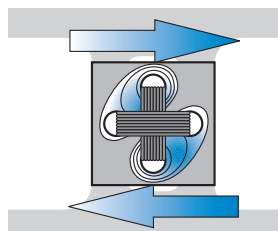
### The Pressductor® difference

Like ABB's other load cells based on Pressductor® Technology, PillowBlock Load Cells rely on electromagnetic changes in the transducer, not on physical movement, to sense fluctuations in web tension. The Pressductor Technology operating principle provides exceptional improvements in load cell performance characteristics, including reliability (notably absence of drift), durability, repeatability, and wider measurement range.

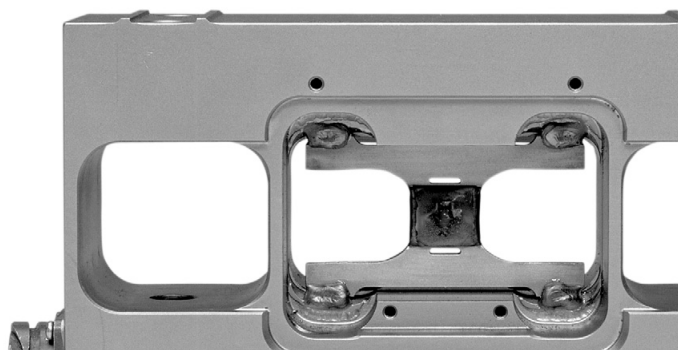
Machined from a solid block of steel, the load cells are rugged and stiff, affording high overload protection as well as an extended measurement range above the nominal load. And they do not contribute to machine vibration, even at high speeds.

Since the transducer action – the magnetic flux – takes place inside a steel core, environmental factors like dirt or fluids can't degrade performance and reliability. These stainless steel load cells don't require any physical seals.

Furthermore, low transducer impedance – less than a couple of ohms – helps eliminate susceptibility to radio-frequency and electromagnetic interference.



**Pressductor® Technology:**  
Mechanical force alters magnetic field.



**PillowBlock**  
50 1963 – 2013  
years of experience

#### Extended-Range Operation

An extended range of measurement beyond the nominal load allows the PillowBlock to be sized for normal, as opposed to maximum tension levels. As a result, they permit greater application flexibility on the processing machinery.

#### Designers appreciate...

- Remarkably high spring constant
- Wide measurement range
- High reliability

#### Operators value a load cell with...

- No drift
- No recalibration
- No failures
- High reliability

#### Measurement essentials

Keeping the tension constant in web processes is essential for high product quality and productivity. Continuously measuring the tension is an obvious prerequisite for tension control. Drives and operator instruments need quick and accurate input to regulate tension levels and monitor machine performance.

Most web processing lines put a premium on long-term reliability, in addition to accuracy and overall performance. The measurement system, after all, is the front line of machine control, exposed to all the rigors of the operating environment. The costs associated with downtime and poor product bring out the true value of its components.

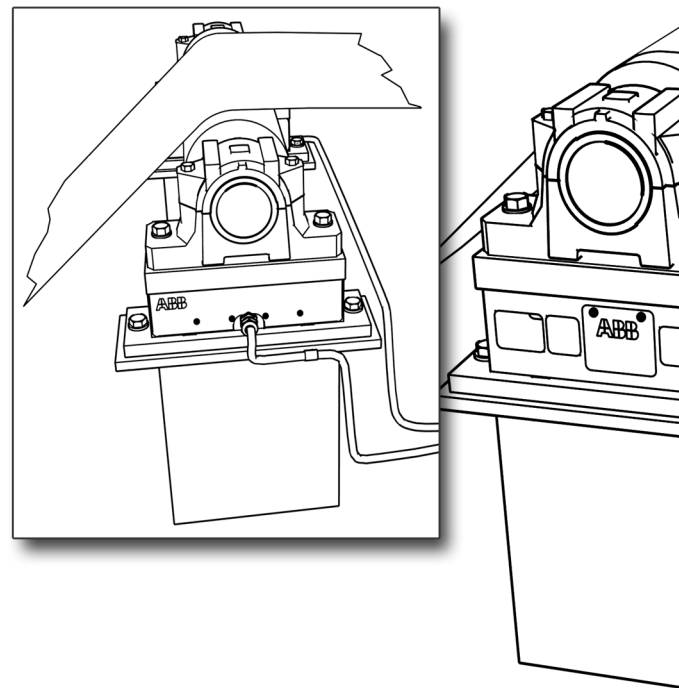
Quality measurement technology for superior tension control that will keep your processing lines productive and producing top-notch output... that's what you can expect from us. We're entirely devoted to providing process measurement systems and services, and we have 60 years of experience in the field. We are the experts in web and strip tension as well as force measurement for virtually any purpose.

#### Selecting and sizing load cells

Two types of ABB PillowBlock load cells are designed for either conventional vertical force measurement or to sense the horizontal force component that may arise as the processed material partially wraps around a measurement roll.

Using the "horizontal" load cells can be quite advantageous. By design, they can be made exceptionally sturdy, rugged, and stiff. So, requirements for recalibration, other maintenance, or replacement are negligible, and they do not contribute to machine vibration. Since they don't measure the tare weight, but just the horizontal force component of the web tension, they can be sized smaller than otherwise possible, measuring tension with greater accuracy.

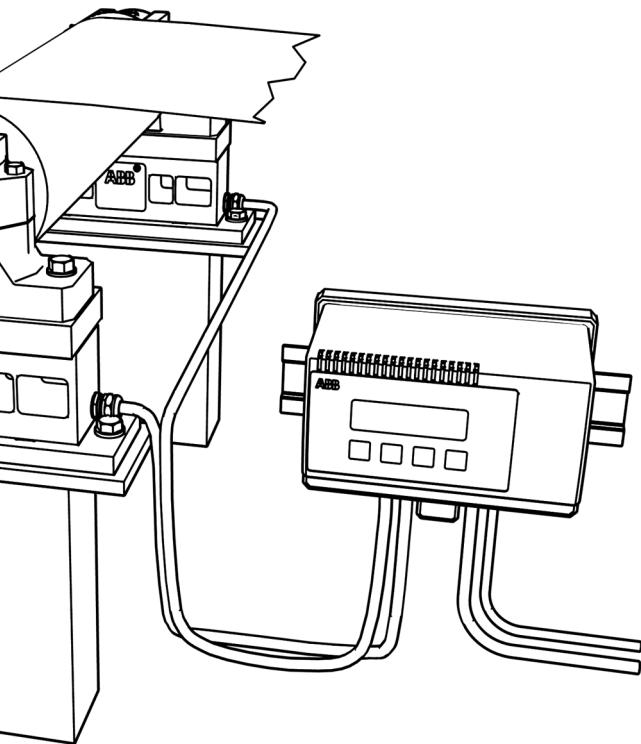
Application requirements may dictate the selection of a "vertical" load cell. But whenever an adequate horizontal force component is present (or can be developed), the horizontal load cell should be considered.



The size, or nominal load, of a load cell is contingent on the anticipated force it will measure. When a "vertical" load cell is mounted horizontally (the most common arrangement), the measurement force ( $F_R$ ) is a function of the tension in the web ( $T$ ), the deflection angles ( $\alpha$  and  $\beta$ ), and the tare weight of the roll and bearings ( $Tare$ ).

The "horizontal" load cell senses the web tension's ( $T$ ) horizontal component ( $F_R$ ); not the vertical force ( $F_V$ ).

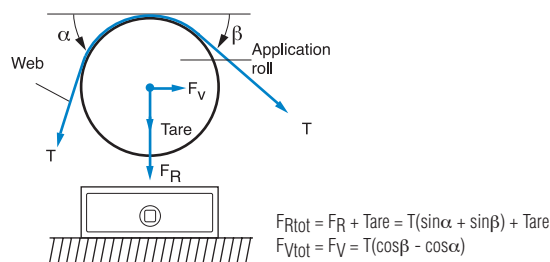
In this scenario, the measurement force ( $F_R$ ) is a function of only the tension in the web ( $T$ ) and the web angles ( $\alpha$  and  $\beta$ ). Since the tare force – the weight of the deflector roll and bearings – will not be measured, it can be very large compared to the web tension without affecting the accuracy of the tension measurement.



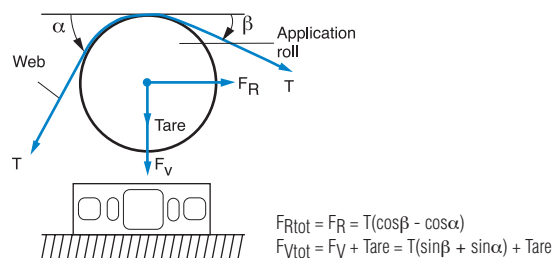
## Specifying the load cell

Since load cells are typically used at both ends of a roll, rating the individual cell is usually based on half of the resultant force. The ideal load cell size is usually the smallest nominal capacity rating accommodating that force level, so long as the force exceeds 10 percent of the nominal load. Before choosing a larger size, however, consider using the "extended range" feature of ABB load cells. And always verify that overload specifications will not be exceeded in either direction.

## Vertical measuring load cells



## Horizontal measuring load cells



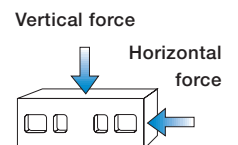
- $F_R$ = Force component of Tension in the measuring direction
- $F_{Rtot}$ = Total force in the measuring direction
- $F_V$ = Force component of Tension transverse to the measuring direction
- $F_{Vtot}$ = Total force in the transverse direction
- $T$ = Tension in web
- $Tare$ = Weight of roll and bearings
- $\alpha, \beta$ = Deflection angles

## Application Hint

Two "10 percent" application guidelines are useful in selecting load cell sizes:

**1** The proportion of web tension that is actually sensed by the load cell should be at least 10 percent of total web tension. For operational conditions producing values below 10 percent, consult ABB.

**2** During normal operation, the sensed force should not be less than 10 percent of the load cell's capacity.



# Pressductor® PillowBlock Load Cells

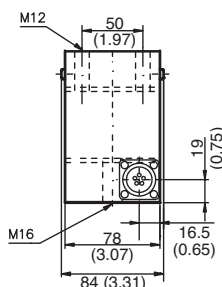
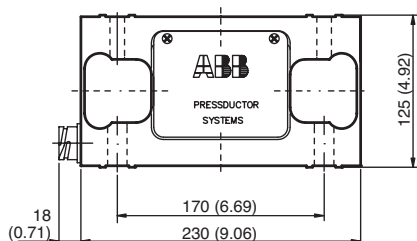
Horizontal force measurement 0.5 – 20 kN



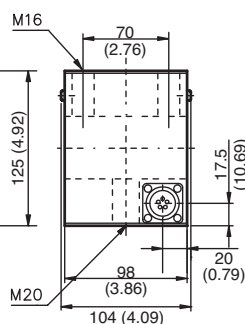
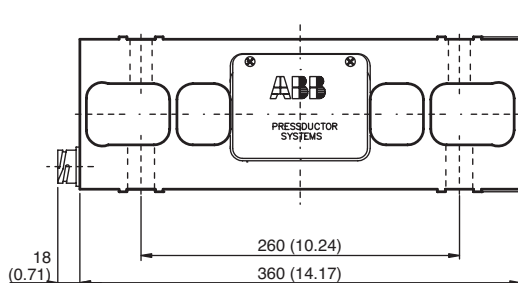
## Application Hint

- Horizontally measuring load cells are ideal in applications with high tare loads and relatively small tensions, such as paper machines.
- In applications where high overloads can occur in any direction, the high overload tolerance in all directions of ABB's horizontal PillowBlock load cell adds reliability.
- If no horizontal resultant force is present, mounting the load cell on a slant will give rise to one.

## PFTL 101A



## PFTL 101B



mm (inch)

ABB PillowBlock horizontal load cells are ideal in applications characterized by low tension levels, heavy rolls and high operating speeds – a scenario often encountered in the paper industry.

Using the horizontal force component to measure web tension can be highly advantageous. The load cell can be sized to measure just the web tension, excluding the tare weight of the roll, which, on a big paper machine, for example, can be far greater than the tension in the web. The result is optimized measurement accuracy.

Solid stainless steel construction combines sensitivity and accuracy with exceptional ruggedness and high spring constant. The units tolerate overloads up to five times their nominal capacity, and combined with the electronics are designed to provide stable output even when subjected to intense vibration.

The PillowBlock comes in three versions: The standard Version, PFTL 101A/B, is often used for accurate measurement in the paper industry, for instance paper machines, calenders, coaters and winders. Load cells are designed for demanding applications with, for instance, heavy rolls, wide tension range and high speed.

For web tension measurement in dryer sections in paper machines, the mill-duty version, PFTL 101AE/BE, is recommended. This version has a fixed connection cable and a degree of protection of IP 66<sup>1)</sup>, which provides accurate and reliable measurement with long service life.

The acid resistant version, PFTL 101AER/BER, is designed for the wet end of the paper machines and has a degree of protection of IP 66/67<sup>1)</sup>.

All load cells are delivered standard calibrated.

1) According to IEC 529, EN 60-529

Properties	PFTL 101A/AE/AER				PFTL 101B/BE/BER			
Nominal load (rated capacity)	kN Lbs.	0.5 112	1.0 225	2.0 450	2.0 450	5.0 1125	10.0 2250	20.0 4500
Permitted load								
Transverse direction	kN Lbs.	5.0 1125	10.0 2250	10.0 2250	30.0 6750	30.0 6750	30.0 6750	40.0 9000
Overload capacity <sup>1)</sup>								
Measurement direction (horizontal)	kN Lbs.	2.5 563	5.0 1125	10.0 2250	10.0 2250	25.0 5625	50.0 11250	80.0 18000
Deflection <sup>2)</sup>	mm 1/1000 in.	0.015 0.6	0.015 0.6	0.015 0.6	0.015 0.6	0.015 0.6	0.015 0.6	0.015 0.6
Spring constant	kN/mm 1000 lbs/in.	32 183	65 371	130 743	130 743	325 1857	650 3715	1300 7430

#### All Load Cells

Operating Principle	Electromagnetic Pressductor® Technology	
Accuracy class <sup>4)</sup>	%	±0.5
Repeatability error	%	<±0.05
Operating range	30:1	
Standard/mill-duty version		
Stainless steel	SIS	2383 <sup>4)</sup>
	DIN	17440X12CrMoS17
Degree of protection	IP65 <sup>5)</sup> (standard version)	
	IP66 <sup>5)</sup> (mill-duty version)	
Acid resistant version		
Stainless steel	SIS	2348 <sup>6)</sup>
	DIN	17440X2CrNiMo17 13 2
Degree of protection	IP66/67 <sup>5)</sup>	
Working temp. range	-10 to +105°C	
	+14 to +221°F	
Zero point drift <sup>7)</sup>	%/°C	<±0.003
	(<±0.008 PFTL 101AER/BER)	
	%/°F	<±0.002
	(<±0.005 PFTL 101AER/BER)	
Sensitivity drift <sup>7)</sup>	%/°C	<±0.015
	%/°F	<±0.007

<sup>1)</sup> Maximum permitted loads without affecting load cell calibration.

<sup>2)</sup> At nominal load.

<sup>3)</sup> Accuracy class is defined as the maximum deviation, and is expressed as a percentage of the sensitivity at nominal load. This includes linearity deviation, hysteresis and repeatability error.

<sup>4)</sup> Corrosion resistance properties similar to AISI 430F

<sup>5)</sup> According to IEC 529, EN 60-529

<sup>6)</sup> Corrosion resistance properties similar to AISI 316L

<sup>7)</sup> Applies for +20 – 80°C  
+68 – 176°F

# Pressductor® PillowBlock Load Cells

Horizontal force measurement 10 – 100 kN

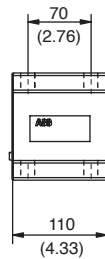
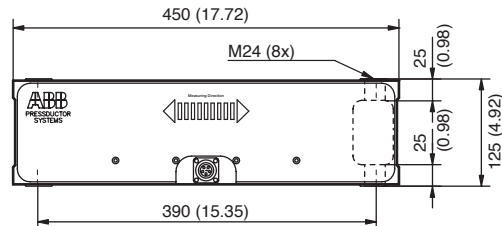


ABB's "horizontal" Pressductor® load cells are specifically designed for horizontal force measurement.

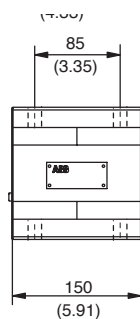
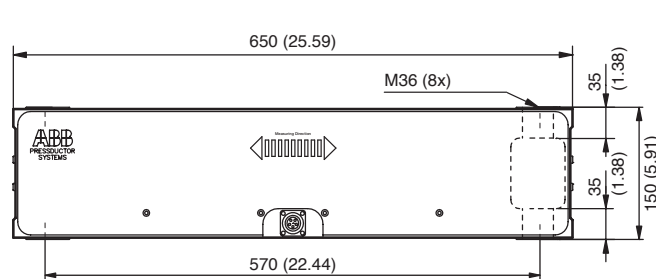
Key advantages:

- Smaller load cell sizes can be specified since the tare weight won't be a factor
- Inherently sturdier designs are virtually maintenance-free
- No contribution to machine vibration

## PFTL 201C



## PFTL 201D



mm (inch)

In many web processes, the web tension inherently produces a horizontal force component on a roll... or, by design, it can be made to do so. Paper machines and machinery processing plastics, foils or textiles are typical examples.

Using this horizontal force component to measure web tension can be highly advantageous. The load cell can be sized to measure just the web tension, excluding the tare weight of the roll, which, on a big paper machine, for example, can be far greater than the tension in the web. The result is optimized measurement accuracy.

Another advantage is that ABB's unique horizontal load cell – specifically designed to measure this force component – provides stiffness levels and overload tolerances in all force directions that are significantly greater than what can be achieved with vertical load cells.

Solid stainless steel construction combines sensitivity and accuracy with exceptional ruggedness and high spring constant. The units tolerate overloads up to ten times their nominal capacity, and combined with the electronics are designed to provide stable output even when subjected to intense vibration.

Two versions of the PFTL 201 are available:

- The standard version PFTL 201C/D equipped with Cannon connector for the connection cable.
- The mill-duty version PFTL 201CE/DE with fixed connection cable in protective hose, best suited for wire and felt tension applications in paper machines.

Properties		PFTL 201C/CE			PFTL 201D/DE	
Nominal load (rated capacity)	kN	10.0	20.0	50.0	50.0	100.0
	Lbs.	2250	4500	11250	11250	22500
Extended load <sup>1)</sup>	kN	15.0	30.0	75.0	75.0	150.0
	Lbs.	3375	6750	16875	16875	33750
Permitted load						
Transverse direction (vertical) h=300 mm	kN	100.0	200.0	250.0	500.0	500.0
	Lbs.	22500	45000	56250	112500	112500
Overload capacity <sup>2)</sup>						
Measurement direction (horizontal)	kN	100.0	200.0	500.0	500.0	1000.0
	Lbs.	22500	45000	112500	112500	225000
Transverse direction (vertical) h=300 mm	kN	100.0	200.0	250.0	500.0	500.0
	Lbs.	22500	45000	56250	112500	112500
Deflection <sup>3)</sup>	mm	0.010	0.020	0.050	0.025	0.050
	1/1000 in.	0.4	0.8	2.0	1.0	2.0
Spring constant	kN/mm	1000	1000	1000	2000	2000
	1000 lbs/in.	5720	5720	5720	11440	11440

#### All Load Cells

Operating Principle	Electromagnetic Pressductor® Technology	
Accuracy class <sup>4)</sup>	%	±0.5
Repeatability error	%	<±0.05
Operating range		30:1
Stainless steel	SIS	2387 <sup>5)</sup>
	DIN	X4CrNiMo165
Working temp. range		-10 to +90°C
		+14 to +194°F
Zero point drift <sup>6)</sup>	%/°C	<±0.005
	%/°F	<±0.003
Sensitivity drift <sup>6)</sup>	%/°C	<±0.010
	%/°F	<±0.006

<sup>1)</sup> Values indicate the total capacity of the load cells when taking into account their permissible "extended capacity". In the extended range, above the nominal load, some decline in measurement accuracy may be experienced.

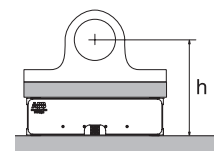
<sup>2)</sup> Maximum permitted loads without affecting load cell calibration.

<sup>3)</sup> At nominal load.

<sup>4)</sup> Accuracy class is defined as the maximum deviation, and is expressed as a percentage of the sensitivity at nominal load. This includes linearity deviation, hysteresis and repeatability error.

<sup>5)</sup> Corrosion resistance properties similar to AISI 304

<sup>6)</sup> Applies for +20 – 80°C  
+68 – 176°F



Height (h) from load cell's bottom surface to roll center line.

# Pressductor® PillowBlock Load Cells

Vertical force measurement 5.0 – 50.0 kN



For applications that demand vertical force measurement, the standard and mill-duty versions of ABB's "vertical" PillowBlock load cell provide the best in measurement range and durability.

## Extended-Range Operation

An extended range of measurement beyond the nominal load allows ABB's PillowBlock load cells to be sized for normal, as opposed to maximum, tension levels. As a result, they permit greater application flexibility on the web processing machinery.

These units are designed for web tension measurement in applications where it is essential or advantageous to determine the vertical force component.

Machined from a single block of stainless steel, they have exceptionally high tolerance for overloads, shock and impact, in addition to high immunity to dust and corrosion.

The standard construction is of highly resistant stainless steel with potted internal components. Mill-duty versions are available for exceptionally hostile environments. They are ideal for the wet end of a paper machine.

The family of "vertical" load cells comprises units in four operating ranges offering measurement capacities from 5 kN (1,125 lbs.) to more than 50 kN (11,250 lbs.), covering applications with tensions levels in excess of 1,000 kN (225,000 lbs.).

ABB's vertical load cells, like their counterparts for horizontal measurement, feature an extended operating load range. Up to 50 percent more measurement capacity is available in this range with fully retained performance characteristics, except some decline in measurement accuracy. As a result, in most applications, the load cells can safely be specified for the web's normal tension range, but still will accommodate substantial peak loads.

In fact, both types of ABB PillowBlock load cells feature an exceptionally wide measurement range.

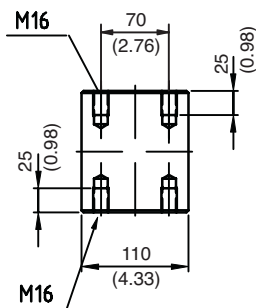
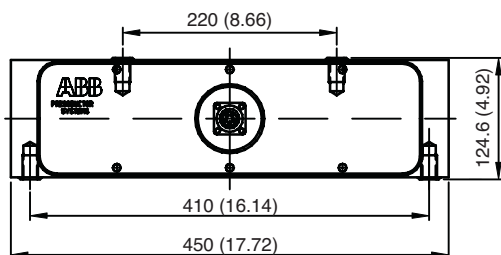
Installation in existing equipment can be simplified by use of top and bottom adapter plates, which can be supplied by ABB.

Three versions are available:

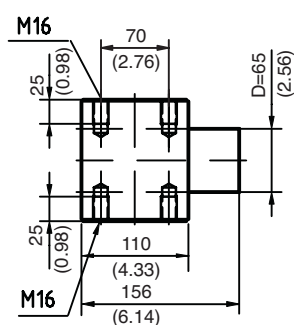
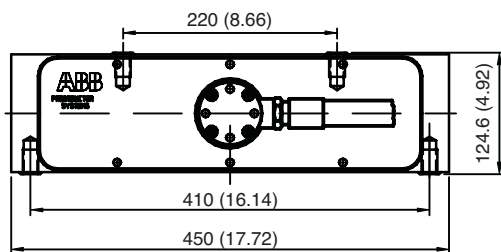
- The standard version PFCL 201C equipped with Cannon connector for the connection cable.
- PFCL 201CD equipped with a tight cable gland and 20 m TEFLON® insulated connection cable
- The mill-duty version PFCL 201CE with fixed connection cable in protective hose, best suited for wire and felt tension applications in paper machines.

TEFLON® is a registered trademark of DuPont

## PFCL 201C/CD



## PFCL 201CE



mm (inch)

Properties		PFCL 201C/CD/CE			
Nominal load (rated capacity)	kN	5.0	10.0	20.0	50.0
	Lbs.	1125	2250	4500	11250
Extended load <sup>1)</sup>	kN	7.5	15.0	30.0	75.0
	Lbs.	1688	3375	6750	16875
Permitted load					
Transverse direction (horizontal) h=300 mm	kN	2.5	5.0	10.0	25.0
	Lbs.	563	1125	2250	5625
Overload capacity <sup>2)</sup>					
Measurment direction (vertical)	kN	50.0	100.0	200.0	500.0
	Lbs.	11250	22500	45000	112500
Transverse direction (horizontal) h=300 mm	kN	2.5	5.0	10.0	25.0
	Lbs.	563	1125	2250	5625
Deflection <sup>3)</sup>					
Spring constant	mm	0.02	0.02	0.02	0.02
	1/1000 in.	0.8	0.8	0.8	0.8
	kN/mm	250	500	1000	2500
	1000 lbs/in.	1430	2860	5720	14300

#### All Load Cells

Operating Principle	Electromagnetic Pressductor® Technology	
Accuracy class <sup>4)</sup>	%	±0.5
Repeatability error	%	<±0.05
Operating range		30:1
Stainless steel	SIS	2387 <sup>5)</sup>
	DIN	X4CrNiMo165
Working temp. range		-10 to +90°C
		+14 to +194°F
Zero point drift <sup>6)</sup>	%/°C	<±0.005
	%/°F	<±0.003
Sensitivity drift <sup>6)</sup>	%/°C	<±0.010
	%/°F	<±0.006

<sup>1)</sup> Values indicate the total capacity of the load cells when taking into account their permissible "extended capacity". In the extended range, above the nominal load, some decline in measurement accuracy may be experienced.

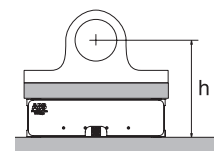
<sup>2)</sup> Maximum permitted loads without affecting load cell calibration.

<sup>3)</sup> At nominal load.

<sup>4)</sup> Accuracy class is defined as the maximum deviation, and is expressed as a percentage of the sensitivity at nominal load. This includes linearity deviation, hysteresis and repeatability error.

<sup>5)</sup> Corrosion resistance properties similar to AISI 304

<sup>6)</sup> Applies for +20 – 80°C  
+68 – 176°F



Height (h) from load cell's bottom surface to roll center line.

# Tension Electronics

## Bringing something new to web tension

The basic function of the tension electronics is to provide a 330 Hz excitation to the tension load cells and to process the measurement signals. It also provides outputs for control and/or indication of the measured tension.

The signal processing function of the tension electronics amplifies, rectifies, and filters the measurement signals from the load cells and provides an accurate and reliable output signal.

Covering a wide range of applications the Tension Electronics comes in three versions, with different levels of performance and functionality. All three versions have multi-language digital display and configuration keys. The configuration keys being used for setting different parameters and to check the status of the tension system. The 2 x 16 character display can present sum, difference or individual load cell signals. All three versions are available in both DIN-rail version and enclosed IP65<sup>1)</sup> version for mounting in more severe environments.

### PFEA 111

A cost effective, compact and user-friendly tension electronics providing an accurate and reliable fast analog SUM signal from two load cells for control and/or monitoring. The display can show the SUM individual A & B and difference signal. The small size and DIN-rail mount make this unit very easy to integrate into many types of electrical cabinets.

### PFEA 112

This unit provides the same functionality and user friendliness as the PFEA 111 with the addition of fieldbus communication via Profibus-DP.

### PFEA 113

This advanced tension electronics can supply up to four load cells and has six configurable analog outputs for control and/or monitoring of web tension. The output signals are also available on Profibus-DP.

Another useful feature is the possibility to, via the digital input or Profibus, switch the gain for two different web paths. Alternatively, the digital input could be used for remote gain scheduling or zero set. This unit also includes a self-diagnostic function and four configurable digital outputs for alarms and level detection. Status of self-diagnostic functions are also available on Profibus-DP.

By combining up to three PFEA 113 the system can handle segmented roll applications, i.e. winders, with up to 12 load cells.

The high level of functionality and user-friendliness make the PFEA 113 one of the most complete tension electronics on the market.

1) According to IEC 529, EN 60-529



# Features and benefits

## - Interactive menu

The tension electronics has a unique interactive menu which guides the commissioning step by step, eliminating the potential for making mistakes and significantly reducing startup time. – An extremely helpful tool.

## - Built-in self diagnostics

The electronics continuously supervise a number of important parameters and provides error messages if something goes wrong.

## - Multi-language display

The multi-language display is a great feature that helps to eliminate mistakes, during start-up and/or operation of the tension system.

## - Load memory

The resetable load memory stores max. load values. A useful tool for maintenance.

## - Analog outputs

Individual scaling and filtering of all analog outputs.

## - Fieldbus communication

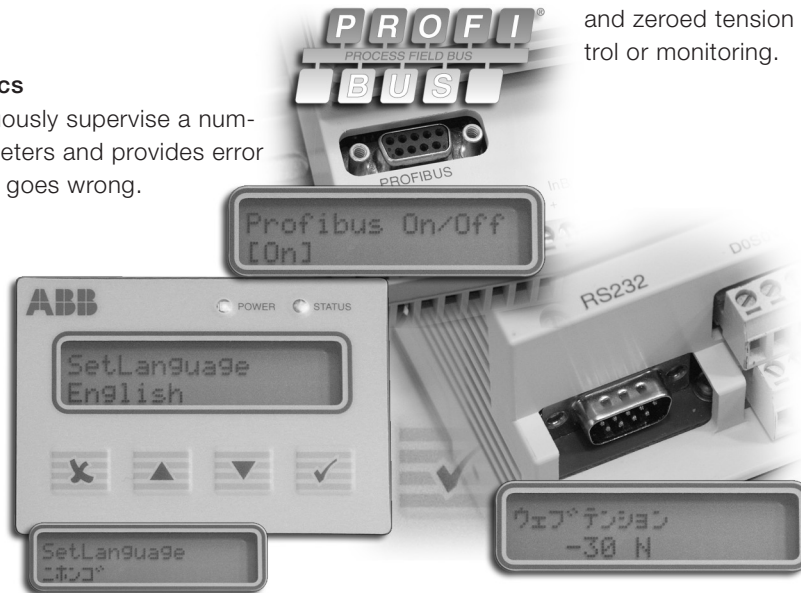
Versions PFEA 112 and PFEA 113 have fieldbus communication via Profibus-DP as standard. In contradiction to many other tension systems the PFEA 112 and PFEA 113 provide a scaled and zeroed tension output ready for use in control or monitoring.

## - Filter function

All units come with a selectable filter function for removal of roll unbalance, machine vibrations and other disturbances.

## - Commissioning without calibration weights

All Pressductor load cells are standard calibrated to the same sensitivity before delivery from ABB factory. This means that the fastest and most accurate way to commission a tension system is to use a calculated value instead of using calibration weights.



## Mounting

To provide flexibility of mounting, all three versions of the Tension Electronics are available in two mounting alternatives. For mounting on a standard DIN-rail the IP 20 and for wall mounting the IP 65.

## Floor cubicle

Floor cubicle type MNS Select is available for housing of up to 24 pcs. of PFEA 111/112 or 12 pcs. of PFEA 113 when mounted on 19" plates. Exact numbers depend on the combination of different tension electronics and the number of optional units used.

Options

To meet certain special application requirements the following options are available:

Insulation amplifier PXUB 201

The insulation amplifier can be used when galvanic insulation is required for analog output signals. The insulation amplifier can be connected to all versions and PFEA 113 - IP 65 can hold up to four PXUB 201.

Supply voltage	+24 V (20 - 253 V AC/DC)	
Current consumption	10 mA + external load	
Signal range	Input	Output
	0 - ±10 V	0 - ±10 V
	0 - ±10 V	0 - ±20 mA
	0 - 10 V	4 - +20 mA
Rated insulation voltage	600 V (basic)	

Relay board PXKB 201

PXKB 201 is DIN-rail mounted and can be mounted in the IP 65 versions of the Tension Electronics together with the insulation amplifier. PFEA 113-65 can hold up to four PXKB 201.

Supply voltage	+24 V DC	
Power consumption	18 mA	
Contact data	AC	6 A at 250 V
	DC	6 A at 250 V

Power supply unit

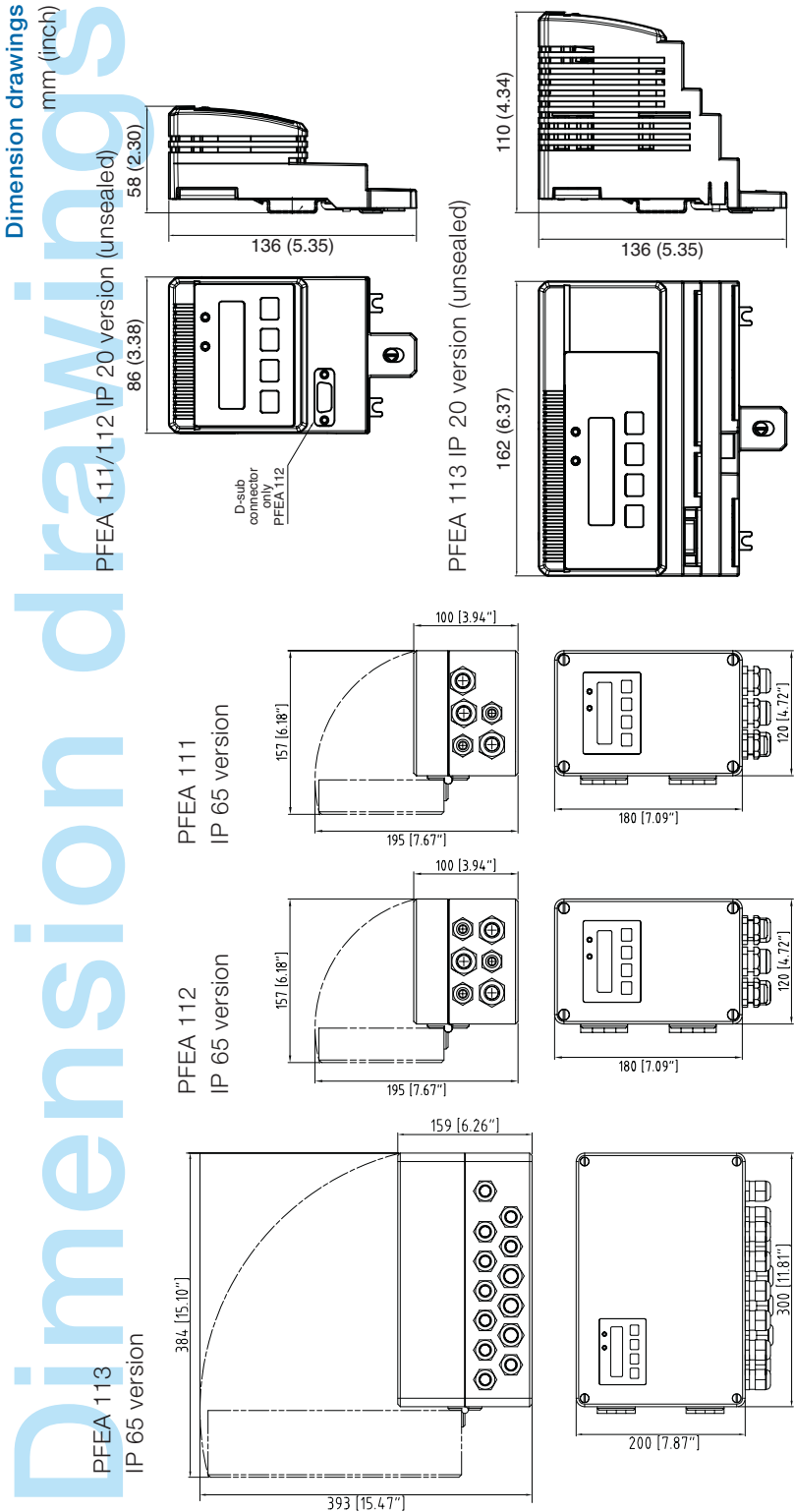
When using the DIN-rail IP 20 version of the electronics and 24 V main supply is not available, ABB offer optional power supply units.

The compact units transform main supply from 110 - 120 V/207 - 240 V AC to 24 V DC for supply of the PFEA 111, 112 and 113.

Three power supply units with different power ratings are available. The table below indicates max. number of electronics per power supply unit.

	PFEA 111	PFEA 112	PFEA 113
SD831 3 A	6	6	3*
SD832 5 A	12	12	6*
SD833 10 A	24	24	12*

\* Supply of digital outputs are not included



Data	PFEA 111	PFEA 112	PFEA 113
<b>Power supply</b>			
IP 20 Voltage		DC 24 V (18 - 36 V)	
Power requirement	7.5 W	7.5 W	12 W
IP 65 Main voltage	DC 24 V (18 - 36 V) 100 (-15%) - 240 (+10%) V AC		
Frequency	45 - 65 Hz		
<b>Number of load cells</b>	2	2	4
<b>Load cell excitation</b>			
Current	0.5 A rms, 330 Hz	0.5 A rms, 330 Hz	0.5 A rms, 330 Hz
Max. load	2 load cells Plus 5 $\Omega$ cable resistance	2 load cells Plus 5 $\Omega$ cable resistance	4 load cells Plus 10 $\Omega$ cable resistance
<b>Inputs</b>			
Digital inputs (remote zero or gain scheduling)	-	-	1
Analog inputs (connection of multiple PFEA 113 units)	-	-	2
<b>Outputs</b>			
Analog outputs (voltage or current)	-	-	6
-5 - +11 V (max. load 5 mA)	1	1	-
0 - 21 mA (max. load 550 $\Omega$ )	1	1	-
Selectable filter			
Step response (0 - 90%) can be set for each output	15, 30, 75, 250, 750, 1500 ms	15, 30, 75, 250, 750, 1500 ms	5, 15, 30, 75, 250, 750, 1500 ms
Scaling function of analog outputs	Yes	Yes	Yes
Digital outputs (Status OK and/or Level detectors)	-	-	4
Self diagnostics, Status OK			
LED (green/red)	Yes	Yes	Yes
Alarm on Digital output	-	-	Yes
Alarm via Profibus	-	Yes	Yes
Multi language interactive display <sup>1)</sup>	Yes	Yes	Yes
Selectable tension units on the display	N, kN, kg and lbs, N/m, kN/m, kg/m, pli		
Maximum load memory	Yes	Yes	Yes
Zero offset memory	Yes	Yes	Yes
<b>Communication</b>			
Profibus DP, baud rate up to 12 Mbit	-	Yes	Yes
GSD-file	-	ABB_0716.GSD	ABB_0717.GSD
<b>Environmental tolerance</b>			
Electrical environment	As per EMC Directive 89/336/EEC As per Low Voltage Directive 73/23/EEC As per UL508 Industrial control equipment <sup>2)</sup>		
Electrical interference environment			
Electrical safety			
Ambient temperature	+5 - +55°C		
Degree of protection	IEC 529 Protection class IP 20 or IP 65		

1) English, German, Italian, French, Japanese, Portuguese

2) Not PFEA 112-65

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