

# Strip Tension Systems

## Pressductor® PillowBlock Load Cells



**Strip tension measurement for process lines  
including furnace sections**

# PillowBlock

– quality tension measurement for quality tension control

Keeping the tension constant in strip processes is essential for high product quality and productivity

The PillowBlock load cells are designed for reliable and long-term stable strip tension measurement in process lines like pickling, annealing and galvanizing lines.

The Pressductor® based load cells have for more than 50 years proven their superior performance in a large number of demanding applications.

The performance of the PillowBlock load cells is well-proven for applications characterized by heavy rolls, high speeds and severe conditions.

The key reason is the operating principle. ABB PillowBlock load cells produce signals as a result of magnetic change, which frees them from the limitations and design compromises of measurement technologies relying on some form of physical movement.

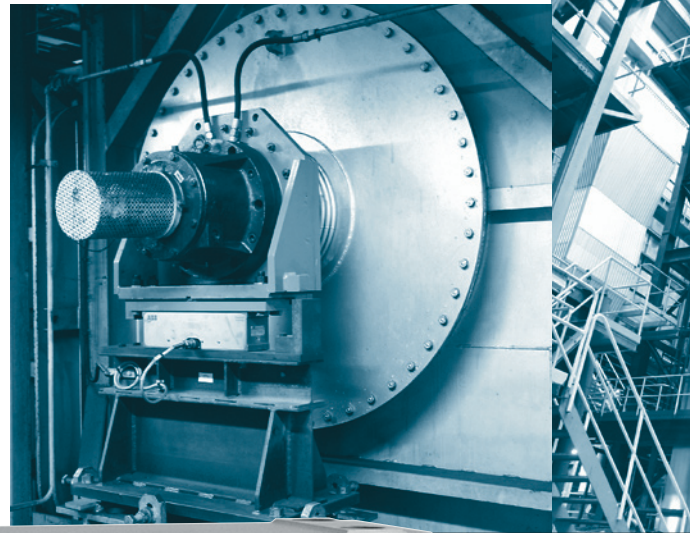
The result is a load cell that combines strong, low-impedance signal output with an exceedingly stiff and rugged construction. A reliable, high-performance load cell with exceptional resistance to vibration, overloads, extreme temperatures and otherwise harsh environments.

A complete PillowBlock measuring system consists of appropriately sized load cells and a tension electronics. A junction box is sometimes used to simplify the cabling and reduce cabling costs.

ABB offers two different types of PillowBlock load cells: one design intended for conventional vertical force measurement, and a second, unique design that measures only the horizontal force component resulting from strip tension on a roll.

Several models and nominal loads are available in standard stainless steel constructions as well as in acid-resistant and mill-duty versions.

The user-friendly digital signal-processing electronics provides a high level of functionality to cover a wide range of applications.





## The assurance of Pressductor® Technology

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



### 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 strip tension. The Pressductor® Technology operating principle provides 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 capacity. 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.

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

### There is a ABB PillowBlock load cell suitable for most strip processing lines.

The PillowBlock load cells are designed for reliable and long-term stable strip tension measurement in process lines like pickling, annealing and galvanizing lines.

The Pressductor® based load cells have for more than 50 years proven their superior performance in a large number of demanding applications.

### How the measurement signal is generated

Two commonly used transducer types – the strain gauge and the LVDT transducer – rely on physical movement in the transducer to produce a measurement signal (see drawings). Stretching, compression or bending motions are prerequisites for signal generation.

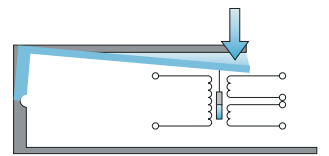
*Strain gauge:* Stretching alters resistance of electrical circuits.

ABB's exclusive Pressductor Transducer produces a signal as a result of changes in an electromagnetic field. This operating principle has its origin in a metallurgical phenomenon according to which mechanical forces alter the capacity of some steels to convey magnetic flux.

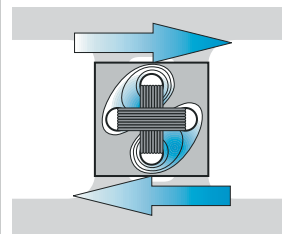
Two perpendicular windings of copper wire around a steel core combine to provide the transducer's measurement signal. A magnetic field is created in one of the windings, sized so there is no magnetic coupling between them.

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. This voltage – a comparatively strong transducer signal that is proportional to the force – is converted by the load cell system's electronics into the system output.

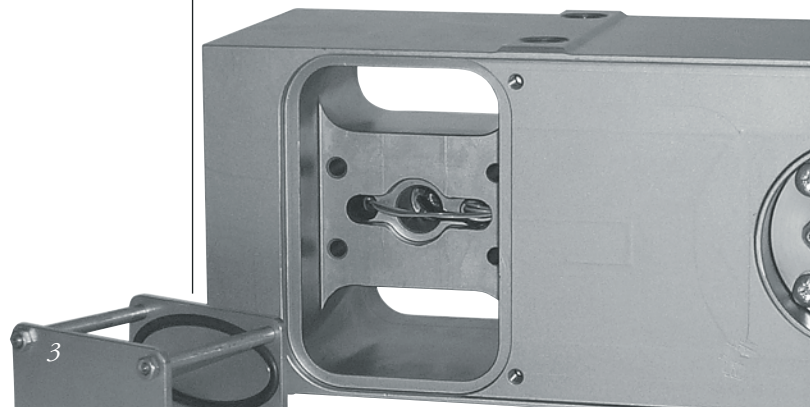
*Pressductor® Technology:* Mechanical force alters magnetic field.



*LVDT:* Movement of piston causes signal change in output coils.



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



# Selecting and sizing

– for best measurement accuracy

## Extended-range operation

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

## 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 strip processes is essential for high product quality and productivity. Continuously measuring the tension is an obvious prerequisite for accurate tension control. Drives and operator instruments need quick and accurate input to regulate tension levels and monitor line performance.

Most strip 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 line 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.

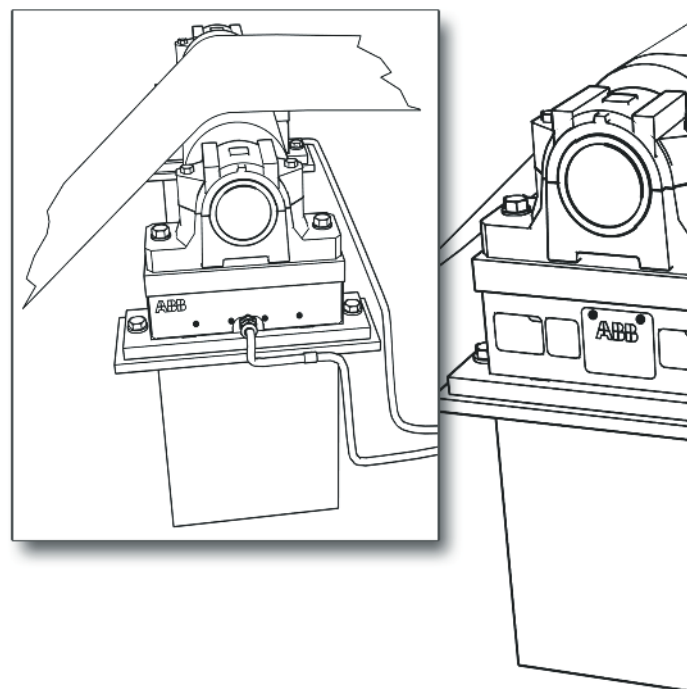
Quality measurement technology for superior tension control that will keep your processing lines productive and producing top-notch output... that's what you can expect from us. We're entirely devoted to providing process measurement systems and services, and we have 50 years of experience in the field. We have an extensive knowledge and experience in web and strip tension as well as force measurement for most purposes and applications.

## 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 strip 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 won't contribute to machine vibration. Since they don't measure the tare weight, but just the horizontal force component of the strip tension, they can be sized smaller than otherwise possible, measuring tension with greater accuracy.

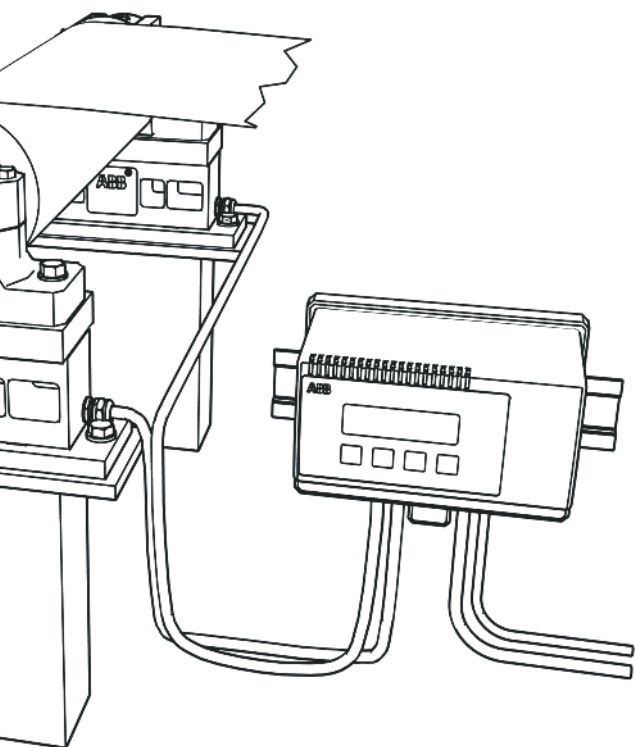
Application requirements may dictate the selection of a "vertical" load cell. But whenever an adequate horizontal force component is present (or can be developed), the horizontal cell should be considered.



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 strip ( $T$ ), the deflection angles ( $\alpha$  and  $\beta$ ), and the tare weight of the roll and bearings ( $Tare$ ).

The “horizontal” load cell senses the strip tension’s ( $T$ ) horizontal component ( $F_R$ ); not the vertical force ( $F_V$ ).

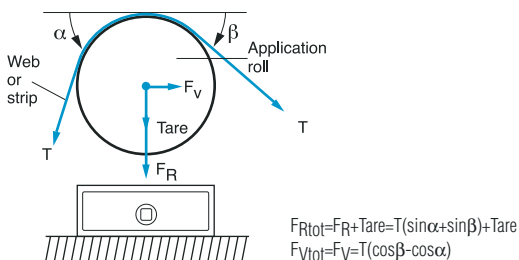
In this scenario, the measurement force ( $F_R$ ) is a function of only the tension in the strip ( $T$ ) and the strip angles ( $\alpha$  and  $\beta$ ). Since the tare force – the weight of the deflector roll and bearings – will not be measured, it can be very large compared to the strip tension without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



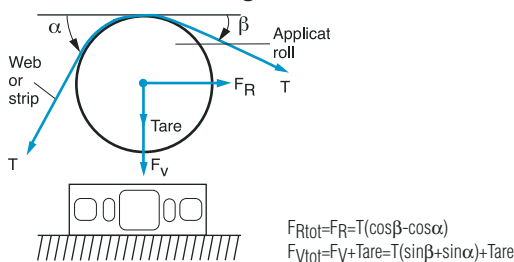
## Specifying the load cell

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



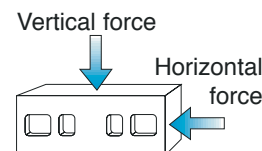
- $F_R$ = Force component of Tension in the measuring direction
- $F_{Rtot}$ = Total force in the measuring direction
- $F_V$ = Force component of Tension transverse to the measuring direction
- $F_{Vtot}$ = Total force in the transverse direction
- $T$ = Tension in strip
- $Tare$ = Weight of roll and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

## Application hint

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

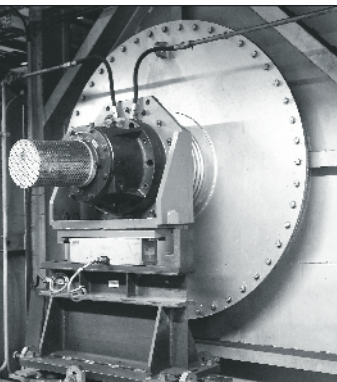
**1.** The proportion of strip tension that is actually sensed by the load cell should be at least 10 percent of total strip tension. For operational conditions producing values below 10 percent, consult ABB.

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

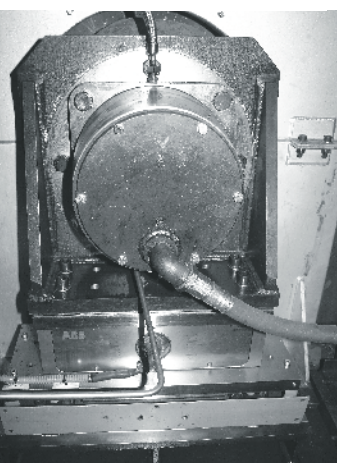


# Furnace section

## – design solutions



*Conventional design*  
ABB PillowBlock load cells,  
type PFTL 201C-20kN,  
installed in a CAL furnace  
section, with 90 degree  
wrap angle.



*Linear bearing design*  
ABB PillowBlock load cells,  
type PFCL 201C-20kN,  
installed in a CAPL fur-  
nace section, with 180  
degree wrap angle.

### Installations in furnace sections

Furnace sections in galvanizing and annealing lines are very demanding and it is crucial to control strip tension in a correct and accurate way.

The strip tension range is often large; the temperature in the furnace can reach 1000°C and at the load cell position it can be as high as 90°C. The elongation of the deflector rolls, from furnace start to process temperature, can be as large as 50 mm. In order to accommodate the large elongation, with a minimum of influence on measurement performance, the deflector roll installation has to be designed with care.

In order to keep up with the competition many mills are continuously working on improvements of the strip quality towards the end-users. To guarantee a high constant strip quality as well as eliminating the risk of strip breaks the mills want accurate control of strip tension in furnace sections. A prerequisite is then reliable strip tension measurement, independent of furnace temperature changes.

### ABB offers following design solutions:

#### Conventional design

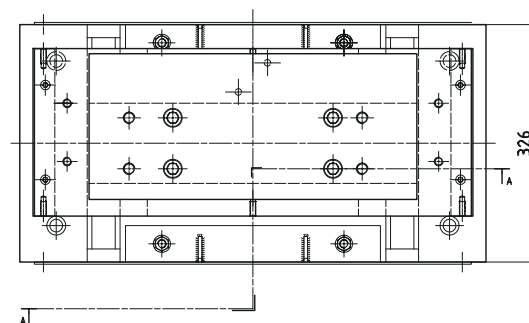
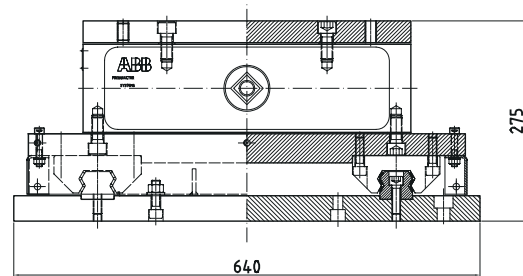
– with ABB standard load cells

This solution is recommended when there are low axial expansion forces. The ABB standard load cell have proven outstanding dependability in a number of furnace sections in galvanizing and annealing lines around the world.

#### Linear bearing design

– with ABB standard load cells

This solution is recommended when high axial forces can occur. In order to eliminate these axial forces ABB has a proven solution with a linear bearing unit on the free side of the roll.





Following benefits can potentially be achieved when using the ABB solution with linear bearing in furnace installations:

- The combination ABB Large PillowBlock load cells + Linear Bearing is proven to be very reliable with long-term stable measurement
- The Linear Bearing solution is insensitive to and unaffected by temperature variations
- The ABB load cells are virtually maintenance-free and the Linear Bearings require a minimum of service



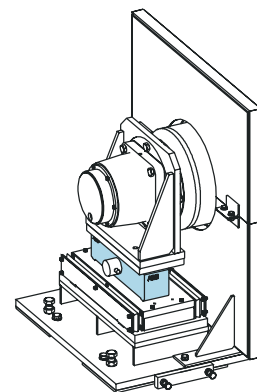
In order to drastically reduce the expansion friction on the free side, the standard ABB Large PillowBlock load cell and bearing housing are fitted on a linear bearing unit. The axial expansion friction coefficient drops from typically 0.2 inside a bearing housing in good condition, to <0.01 in a linear bearing unit.

ABB recommends considering the following issues in order to achieve best possible measurement performance in the furnace sections:

- Protection bellows around deflector roll shafts between furnace and bearing housings must be flexible to avoid axial forces caused by thermal expansions
- In order to reduce the load cell temperature variations, heat radiation shields may be fitted between load cells and furnace
- Deflector roll elongation must be accommodated by the free side bearing. The measurement influence can be minimized in two ways.
  - 1) Clearance between roll bearings and bearing housings on the free side bearing, as well as lubrication must be designed for actual operating conditions.
  - 2) ABB's proven solution with linear bearing on the free side of the roll can be utilized to accommodate the roll elongation.

ABB is working very close with the customer and together we always find the best solution. Thanks to the fact that standard load cells are used, the same type of load cells can be fitted both in the hot and cold sections of galvanizing and/or annealing lines. Another advantage is that the standard pedestal bearing houses can be used.

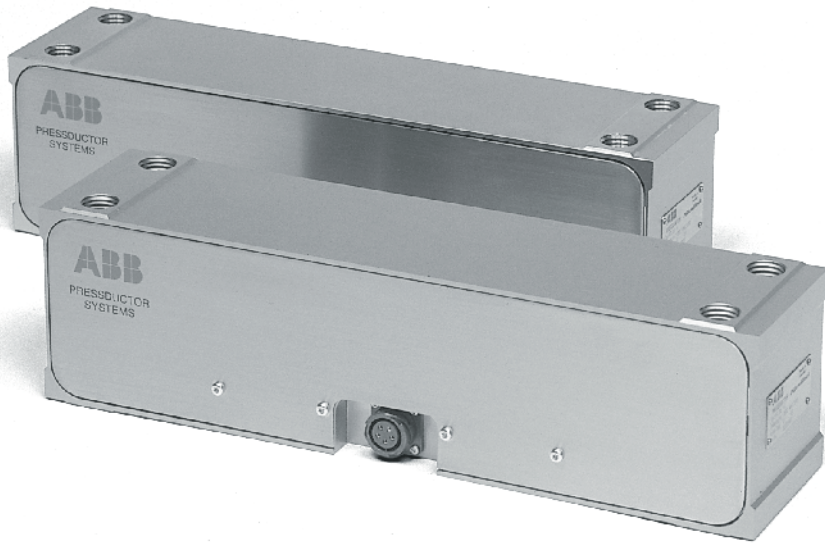
Consult ABB for advice how to design an optimal load cell installation in your furnace section.



ABB's proven solution with linear bearing on the free side of the roll can be utilized to accommodate the roll elongation.

# Pressductor® PillowBlock Load Cells

– horizontal force measurement 10 - 100 kN



In many strip processes, the strip tension inherently produces a horizontal force component on a roll... or, by design, it can be made to do so.

Using this horizontal force component to measure strip tension can be highly advantageous. The load cell can be sized to measure just the strip tension, excluding the tare weight of the roll. 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.

Four different models, with force measurement capacities ranging from 0.5 kN (112 lbs.) to 100 kN (22,500 lbs.), make up the family of horizontal load cells (PFTL 201 and PFTL 101).

Two versions of the PFTL 201 are available:

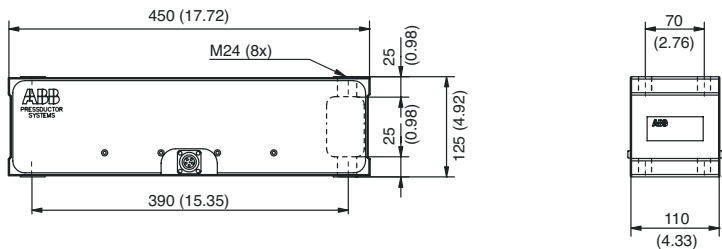
- The standard version PFTL 201C/D equipped with Cannon connector for the connection cable.
- The mill-duty version PFTL 201CE/DE with fixed connection cable in protective hose, best suited for positions with severe environments.

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

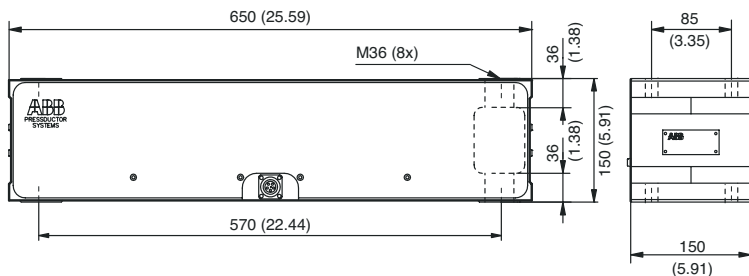
Key advantages:

- 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)



		PFTL 201C/CE			PFTL 201D/DE	
Properties						
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	
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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.

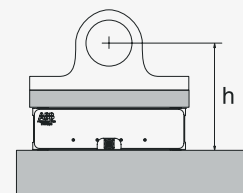
<sup>2)</sup> Maximum permitted loads without affecting load cell calibration.

<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

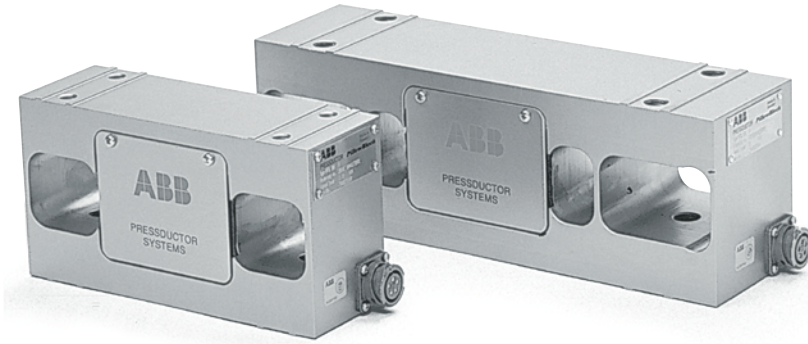
<sup>6)</sup> Applies for +20 – 80°C  
68 – 176°F



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

# Pressductor® PillowBlock Load Cells

– horizontal force measurement 0.5 - 20 kN

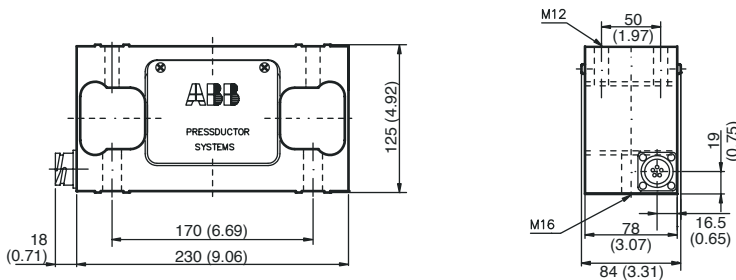


## Application hint

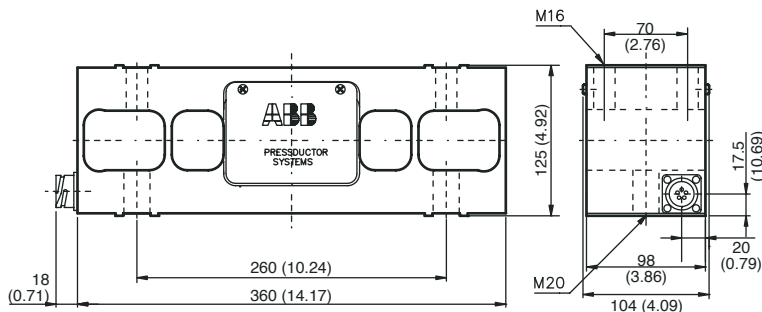
- ✓ Horizontally measuring load cells are ideal in applications with high tare loads and relatively small tensions, such as paper machines.
  - ✓ In applications where high overloads can occur in any direction, the high overload tolerance in all directions of ABB's horizontal PillowBlock load cell adds reliability.
  - ✓ If no horizontal resultant force is present, mounting the load cell on a slant will give rise to one.
- In process lines where the tension levels are relatively low, there are smaller sizes of horizontal PillowBlock load cells to choose from. These stainless steel load cells come in two standard sizes, PFTL 101A and PFTL 101B, and are made for measurement forces between 0.5 and 20 kN. They are machined from a solid block of stainless steel to the shape of two steel plates linked by four or six vertical membranes. This makes them insensitive to transverse load, but on the other hand they can measure in both horizontal directions.
- PillowBlock type PFTL 101 comes in three versions:
- PFTL 101A/B with standard Cannon cable connection.
  - PFTL 101AE/BE with 20 meter fixed cable and a degree of protection of IP 66<sup>1)</sup>.
  - PFTL 101AER/BER made in acid-resistant stainless steel and with 20 meter fixed cable.
- All load cells are delivered standard calibrated.

<sup>1)</sup> According to IEC 529, EN 60-529

## PFTL 101A



## PFTL 101B



mm (inch)

		PFTL 101A/AE/AER			PFTL 101B/BE/BER			
Properties								
Nominal load (rated capacity)	kN	0.5	1.0	2.0	2.0	5.0	10.0	20.0
	Lbs.	112	225	450	450	1125	2250	4500
Permitted load (in transverse direction)	kN	5.0	10.0	10.0	30.0	30.0	30.0	40.0
	Lbs.	1125	2250	2250	6740	6740	6740	9000
Overload capacity <sup>1)</sup>								
Measurement direction (horizontal)	kN	2.5	5.0	10.0	10.0	25.0	50.0	80.0
	Lbs.	562	1125	2250	2250	5625	11250	18000
Deflection <sup>2)</sup>	mm	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	1/1000 in.	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Spring constant	kN/mm	32	65	130	130	325	650	1300
	1000 lbs/in.	183	371	743	743	1857	3715	7430

## All load cells

Operating principle      Electromagnetic  
Pressductor® Technology

Accuracy class<sup>3)</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      IP 65<sup>5)</sup> (standard version)  
IP 66<sup>5)</sup> (mill-duty version)

Acid resistant version

Stainless steel      SIS      2348<sup>6)</sup>  
DIN 17440X2CrNiMo17 13 2

Degree of protection      IP 66/67<sup>5)</sup> (>NEMA 4)

Working temp. range      -10 to +105°C  
14 to 221°F

Zero point drift<sup>7)</sup>      %/°C      <±0.003  
%/°F      <±0.002

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

– 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.

These units are designed for strip 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 in e.g. rolling mills, galvanizing lines and pickling lines.

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.).

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 strip'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. With the capacity to measure strip tension ranges of up to 30:1, they provide valuable machine versatility in processing a variety of applications.

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 20 meter fixed connection cable in protective hose, best suited for applications in extremely severe environments.

## 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 in the strip processing line.

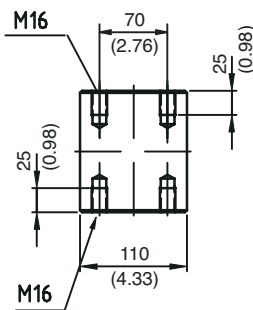
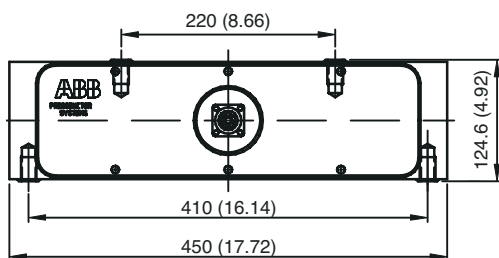


## PFCL 201C/CD/CE

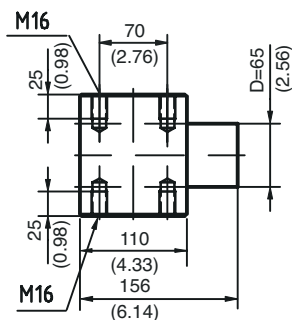
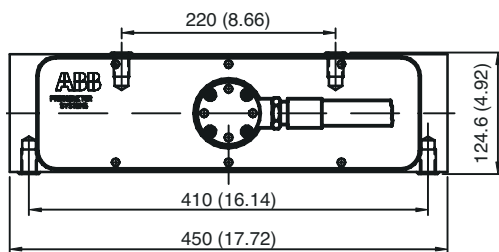
### Properties

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.	1690	3370	6740	16900
<b>Permitted load</b>					
Transverse direction (horizontal) h=300 mm	kN	2.5	5.0	10.0	25.0
	Lbs.	563	1125	2250	5625
<b>Overload capacity<sup>2)</sup></b>					
Measurement 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.	562	1125	2250	5620
Deflection <sup>3)</sup>	mm	0.02	0.02	0.02	0.02
	1/1000 in.	0.8	0.8	0.8	0.8
Spring constant	kN/mm	250	500	1000	2500
	1000 lbs/in.	1430	2860	5720	14300

### PFCL 201C/CD



### PFCL 201CE



mm (inch)

## All load cells

Operating principle	Electromagnetic Pressductor® Technology
Accuracy class <sup>4)</sup>	% $\pm 0.5$
Repeatability error	% $< \pm 0.05$
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 $< \pm 0.005$
	%/°F $< \pm 0.003$
Sensitivity drift <sup>6)</sup>	%/°C $< \pm 0.010$
	%/°F $< \pm 0.006$

<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.

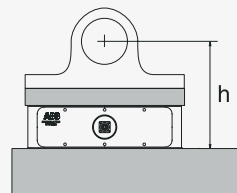
<sup>2)</sup> Maximum permitted loads without affecting load cell calibration.

<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 strip 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 strip 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.

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

<sup>1)</sup> 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 start-up 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**

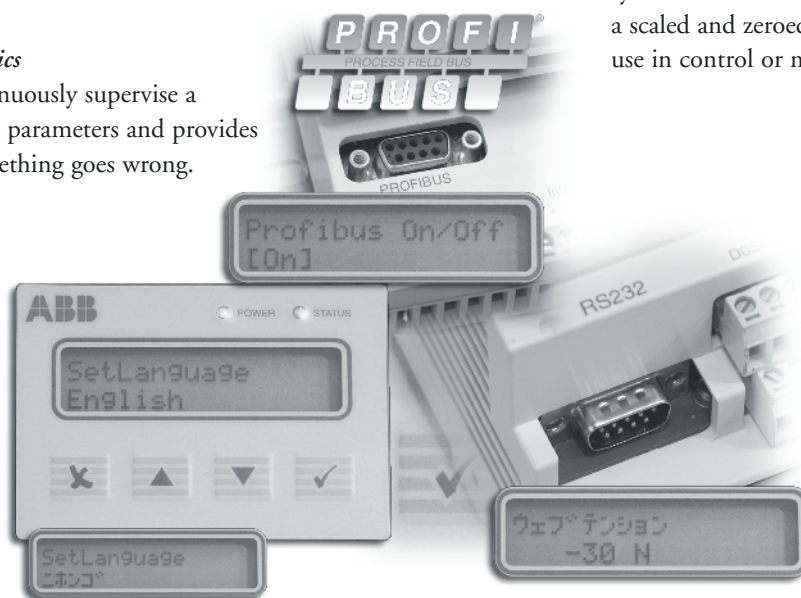
Versions PFEA 112 and PFEA 113 have fieldbus communication via Profibus-DP as standard. In contradiction to many other tension systems the PFEA 112 and PFEA 113 provide a scaled and zeroed tension output ready for use in control or monitoring.

- **Filter function**

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

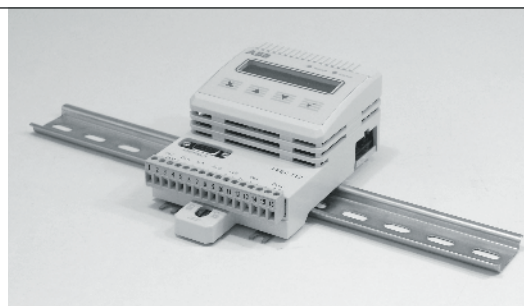
- **Commissioning without calibration weights**

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.

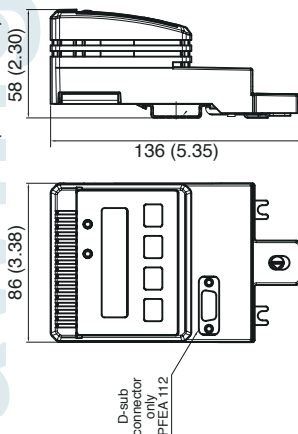
	PFEA 111	PFEA 112	PFEA 113
SD821 2.5 A	6	6	3*
SD822 5 A	12	12	6*
SD823 10 A	24	24	12*

\* Supply of digital outputs are not included

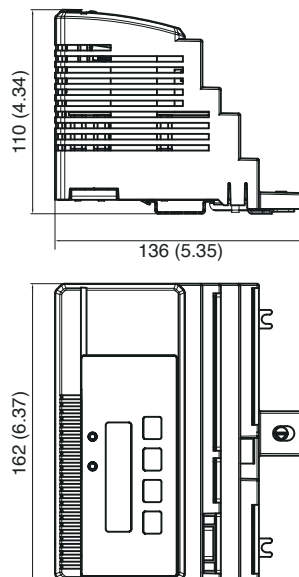
## Dimension drawings

mm (inch)

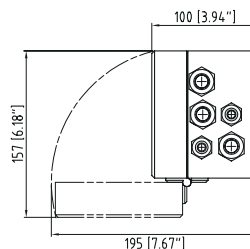
PFEA 111/112 IP 20 version (unsealed)



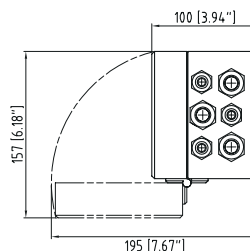
PFEA 113 IP 20 version (unsealed)



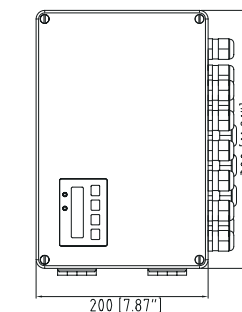
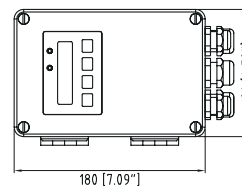
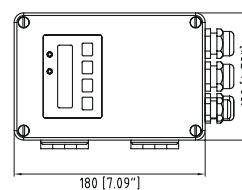
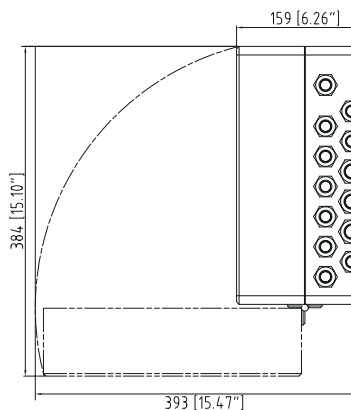
PFEA 111  
IP 65 version



PFEA 112  
IP 65 version



PFEA 113  
IP 65 version



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 )	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			
Electrical interference environment	As per EMC Directive 89/336/EEC		
Electrical safety	As per Low Voltage Directive 73/23/EEC		
	As per UL508 Industrial control equipment <sup>2)</sup>		
Ambient temperature	+5 - +55°C		
Degree of protection	IEC 529 Protection class IP 20 or IP 65		

<sup>1)</sup> English, German, Italian, French, Japanese, Portuguese

<sup>2)</sup> Not PFEA 112-65



# Ordering guide

Product				Product			
Product		Model designation	Ordering number	Product		Model designation	Ordering number
Load cells	Nominal load kN (lbs)			Nominal load kN (lbs)			
	0.5 (112)	PFTL 101A-0.5	3BSE004160R1		10.0 (2250)	PFTL 201C-10.0	3BSE007913R10
	0.5 (112)	PFTL 101AE-0.5	3BSE004211R1		10.0 (2250)	PFTL 201CE-10.0	3BSE007913R11
	0.5 (112)	PFTL 101AER-0.5	3BSE023010R1		20.0 (4500)	PFTL 201C-20.0	3BSE007913R20
	1.0 (225)	PFTL 101A-1.0	3BSE004166R1		20.0 (4500)	PFTL 201CE-20.0	3BSE007913R21
	1.0 (225)	PFTL 101AE-1.0	3BSE004212R1		50.0 (11250)	PFTL 201C-50.0	3BSE007913R50
	1.0 (225)	PFTL 101AER-1.0	3BSE023011R1		50.0 (11250)	PFTL 201CE-50.0	3BSE007913R51
	2.0 (450)	PFTL 101A-2.0	3BSE004172R1		50.0 (11250)	PFTL 201D-50.0	3BSE008922R50
	2.0 (450)	PFTL 101AE-2.0	3BSE004213R1		50.0 (11250)	PFTL 201DE-50.0	3BSE008922R51
	2.0 (450)	PFTL 101AER-2.0	3BSE023012R1		100.0 (22500)	PFTL 201D-100.0	3BSE008922R100
	2.0 (450)	PFTL 101B-2.0	3BSE004185R1		100.0 (22500)	PFTL 201DE-100.0	3BSE008922R101
	2.0 (450)	PFTL 101BE-2.0	3BSE004214R1				
	2.0 (450)	PFTL 101BER-2.0	3BSE023158R1		5.0 (1125)	PFCL 201C-5.0	3BSE027070R5
	5.0 (1125)	PFTL 101B-5.0	3BSE004191R1		5.0 (1125)	PFCL 201CD-5.0	3BSE029774R5
	5.0 (1125)	PFTL 101BE-5.0	3BSE004215R1		5.0 (1125)	PFCL 201CE-5.0	3BSE027062R5
	5.0 (1125)	PFTL 101BER-5.0	3BSE023159R1		10.0 (2250)	PFCL 201C-10.0	3BSE027070R10
	10.0 (2250)	PFTL 101B-10.0	3BSE004197R1		10.0 (2250)	PFCL 201CD-10.0	3BSE029774R10
	10.0 (2250)	PFTL 101BE-10.0	3BSE004216R1		10.0 (2250)	PFCL 201CE-10.0	3BSE027062R10
	10.0 (2250)	PFTL 101BER-10.0	3BSE023160R1		20.0 (4500)	PFCL 201C-20.0	3BSE027070R20
	20.0 (4500)	PFTL 101B-20.0	3BSE004203R1		20.0 (4500)	PFCL 201CD-20.0	3BSE029774R20
	20.0 (4500)	PFTL 101BE-20.0	3BSE004217R1		20.0 (4500)	PFCL 201CE-20.0	3BSE027062R20
	20.0 (4500)	PFTL 101BER-20.0	3BSE023161R1		50.0 (11250)	PFCL 201C-50.0	3BSE027070R50
					50.0 (11250)	PFCL 201CD-50.0	3BSE029774R50
					50.0 (11250)	PFCL 201CE-50.0	3BSE027062R50
Cables	Cable with male plug connector			15 m (49 ft)			3BSE018741R15
	Cable with male plug connector			30 m (98 ft)			3BSE018741R30
	Cable with male plug connector			50 m (164 ft)			3BSE018741R50
	Cable with male angled plug connector			15 m (49 ft)			3BSE018741R115
	Cable with male angled plug connector			30 m (98 ft)			3BSE018741R130
	Cable with male angled plug connector			50 m (164 ft)			3BSE018741R150
	Male plug connector without cable						YM 321 002-D
	Male angled plug connector without cable						3BSC860249R1
Junction box					PFXC 141 PFTC 101X		3BSE029997R1 3BSE009852R1
Tension Electronics	PFEA 111, IP 20				PFEA 111-20		3BSE050090R20
	PFEA 112, IP 20				PFEA 112-20		3BSE050091R20
	PFEA 113, IP 20				PFEA 113-20		3BSE050092R20
	PFEA 111, IP 65				PFEA 111-65		3BSE050090R65
	PFEA 112, IP 65				PFEA 112-65		3BSE050091R65
	PFEA 113, IP 65				PFEA 113-65		3BSE050092R65
	PFEA 113, IP 65, incl. 1 insulation amplifier PXUB 201 - Voltage output (connected to A01)				PFEA 113-65.1PXV		3BSE050092R165
	PFEA 113, IP 65, incl. 2 insulation amplifier PXUB 201 - Voltage output (connected to A01,2)				PFEA 113-65.2PXV		3BSE050092R265
	PFEA 113, IP 65, incl. 3 insulation amplifier PXUB 201 - Voltage output (connected to A01,2,3)				PFEA 113-65.3PXV		3BSE050092R365
	PFEA 113, IP 65, incl. 4 insulation amplifier PXUB 201 - Voltage output (connected to A01,2,3,4)				PFEA 113-65.4PXV		3BSE050092R465
	PFEA 113, IP 65, incl. 1 insulation amplifier PXUB 201 - Current output (connected to A01)				PFEA 113-65.1PXC		3BSE050092R1165
	PFEA 113, IP 65, incl. 2 insulation amplifier PXUB 201 - Current output (connected to A01,2)				PFEA 113-65.2PXC		3BSE050092R1265
	PFEA 113, IP 65, incl. 3 insulation amplifier PXUB 201 - Current output (connected to A01,2,3)				PFEA 113-65.3PXC		3BSE050092R1365
	PFEA 113, IP 65, incl. 4 insulation amplifier PXUB 201 - Current output (connected to A01,2,3,4)				PFEA 113-65.4PXC		3BSE050092R1465
Options							
Insulation amplifier PXUB 201					PXUB 201		3BSC630149R1
Relay board PXKB 201					PXKB 201		3BSC810039R1
Power supply unit SD821 (2.5 A)					SD821		3BSC610037R1
Power supply unit SD822 (5 A)					SD822		3BSC610038R1
Power supply unit SD823 (10 A)					SD823		3BSC610039R1
Floor cubicle MNS Select, ventilated IP 21 including 24 V power supplies							3BSE030582R21
Floor cubicle MNS Select, sealed IP 54 including 24 V power supplies							3BSE030582R54
Adapter plates for load cells PFTL 201 and PFCL 201 are available on request. Linear bearing solution – ask ABB for advice							

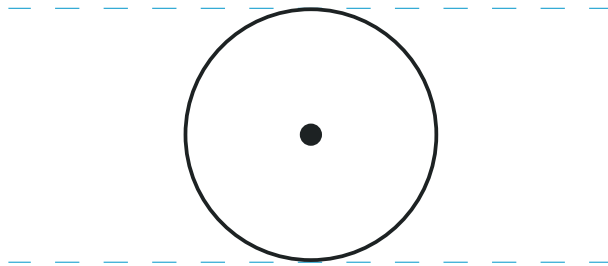
## Your application

*We can quickly assist you in determining the ideal specifications of one or several PillowBlock Tensiometer Systems. Simply fill in the details of your application on copies of this page and fax them to us.*

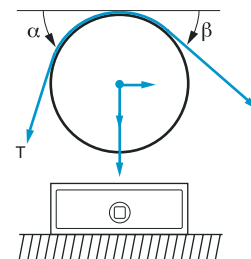
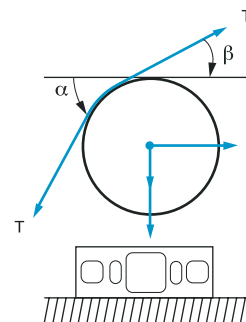
### Strip path

On the template at right, sketch the strip path of your application

Indicate the load cell position and close estimates of angles  $\alpha$ ,  $\beta$  and, if applicable  $\gamma$ , to the horizontal dashed lines, as appropriate.



### Examples



### Machine attributes

Please indicate the pertinent machine attributes below.

#### Roll specifications

Width \_\_\_\_\_ mm (in.)

Weight \_\_\_\_\_ kg (lbs.)

Shaft dia. \_\_\_\_\_ mm (in.)

Speed \_\_\_\_\_ rpm

#### Strip tension

Normal \_\_\_\_\_ kN or kN/mm (lbs. or pli)

Max. \_\_\_\_\_ kN or kN/mm (lbs. or pli)

Min. \_\_\_\_\_ kN or kN/mm (lbs. or pli)

#### Specify...

#### Strip width

Min. \_\_\_\_\_ mm (in.)

Max. \_\_\_\_\_ mm (in.)

### Please fill in your address information below

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Country \_\_\_\_\_

Tel \_\_\_\_\_

Fax \_\_\_\_\_

E-mail \_\_\_\_\_

**Please fax to:**  
**+46 21 34 00 05**

**or mail to:**

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Force Measurement  
S-721 59 Västerås  
Sweden

Tel: +46 21 32 50 00  
Fax: +46 21 34 00 05  
Internet: [www.abb.com/pressductor](http://www.abb.com/pressductor)



ABB ([www.abb.com](http://www.abb.com)) is a leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. The ABB Group of companies operates in around 100 countries and employs more than 110,000 people.

The main focus of ABB Process Automation is to provide customers with integrated solutions for control, plant optimization, and industry-specific application knowledge. Key customer benefits include improved asset productivity and energy savings.

ABB Force Measurement is a unit within ABB Process Automation. We provides equipment for accurate, reliable measurement and control in a broad range of applications in the metal, paper and marine industries.



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