Features

- 0.5tf – 500tf capacities available.
- Overload 200% of rated capacity.
- Ultimate breaking load >500% of rated capacity.
- Temperature compensated Wheatstone bridge.
- Stainless steel construction as standard.
- Sealed to IP67 as standard.
- Ideal for hostile environments.
- Accuracy 0.25-2% FRL.
- mV/V output as standard with 4-20mA, ±5V and ±10V options available.
- Typically supplied with an anti-rotation plate and keep plate slot.
- Designed with a minimum of a 5:1 mechanical factor of safety.
- X/Y axis design options available.

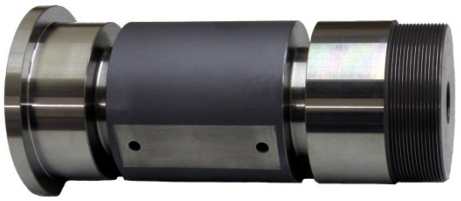
Introduction

Load cells are strain gauge based transducers which are used to measure load, overload, or tension conditions. Load pins are a version of load cell that are typically installed into machines in the place of solid shafts, whereas load cells act as a direct component in an assembly. Load pins designed by PCM work on the double shear stress method.

PCM load pins are entirely custom fit. All units are designed completely around customer needs and if required, assistance is available to guide these decisions from our experienced Technical team.

Load pins are versatile pieces of equipment and are used in a large variety of applications, such as: cranes, hoisting gear, winches, etc. Rope, chain, and brake anchors, bearing blocks, pivots and shackles, elevators, and floor conveyors as well as in applications for the agricultural, aviation, chemical and R&D industries.

An externally strain gauged load pin.



An internally strain gauged load pin.

As all load pins that PCM manufacture are made to order, we request that the load pin questionnaire (**Page 4** of this datasheet) is completed and sent into our Sales team. Once received, our team of engineers will review your enquiry and confirm if the load pin criteria is mechanically achievable and safe. We will then submit a quotation complete with a competitive lead time. When a purchase order has been received, a technical outline drawing and specification will be submitted to the customer for approval prior to manufacture.

All PCM load pins are supplied with calibration certificates obtained using test machines traceable to National Standards. However, we do recommend that an in-situ calibration is carried out to obtain maximum performance.

To complete your system, PCM can offer you built-in amplifiers if required, we can also supply almost any instrumentation desired, ranging from equipment such as wireless telemetry, large displays, cased panel/hand held indicators to summation devices and overload/slack rope detection equipment.

Please note that if a load pin does not suit your requirements, we also manufacture custom load cells which may prove more suitable. Please contact our Sales team for more information.

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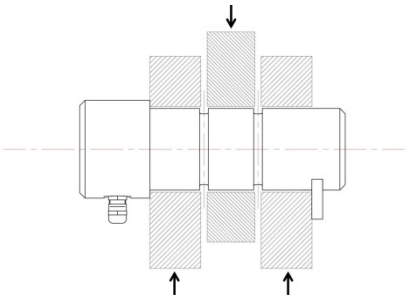
Load Pin Design



Load Pin using the Double Shear Measurement Principle

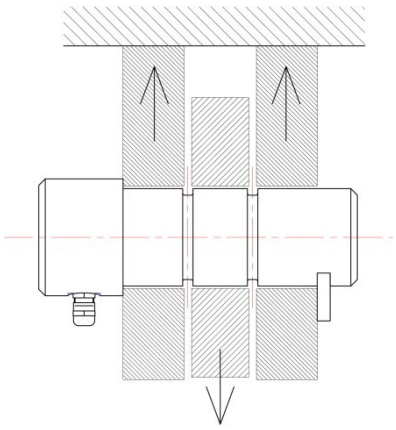
Load pins sense the force applied via strain gauges that are installed within a small bore along the neutral axis of the pin. The pin also has two grooves machined into the outer circumference to define its shear planes (located between where the forces are applied).

Load pins can be designed to fit many applications as direct replacements for clevis or pivot pins. They have an advantage over the use of any other load sensor as no change to the mechanical structure being monitored is usually required.

General Performance & Calibration

A load pin design is not as accurate as a load cell. This is for several reasons:

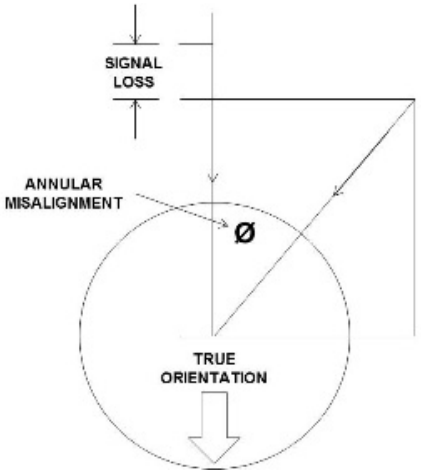
- An internally strain gauged bridge is bonded down the hole axially along the length of the pin. When the force is applied, the hole does not remain perfectly round and therefore produces a greater non-linearity than you would expect when using other load cell designs.
- The fittings that surround the load pin have a great bearing on the performance. If the fittings are worn (retro fit) or tight (friction) the output and repeatability are affected. It is for this reason we always recommend that load pin systems are calibrated in situ.

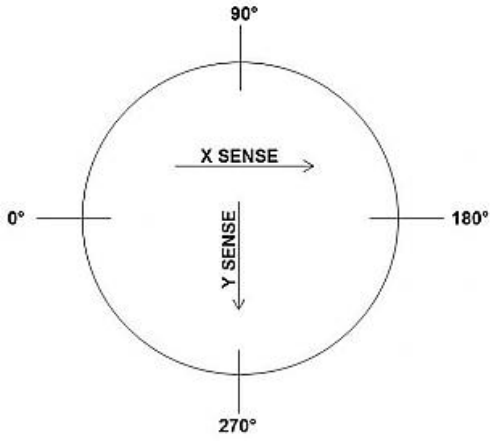


Typical Load Pin Installation

X/Y Load Pins

If you have an application where you expect to experience a high degree of angular variation, PCM can provide you with an X/Y load pin. Providing two outputs, which can be read simultaneously to calculate the true force applied to the pin, the direction of the force can also be calculated from the signal direction and magnitude of the X and Y signals.





Load Pin Retention

A load pin needs to be securely held in position to keep its orientation in both axial and rotation orientations. The pin is locked in place with respect to the assembly it is associated with. Fixing the orientation is essential to ensure the system supplies repeatable and accurate results.

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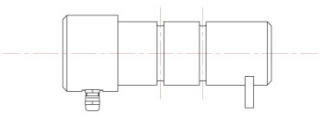
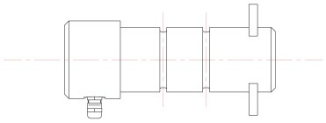
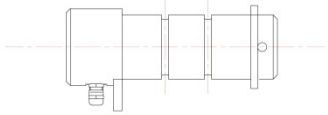
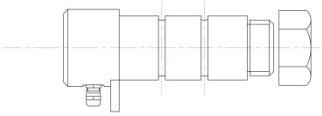
Standard load pins are designed to sense the force in one direction only (X/Y load pins are available). Forces applied at right angles to the single direction force will produce a zero output from the sensor.

To lock your load pin in place, see the standard options available to you from PCM below.

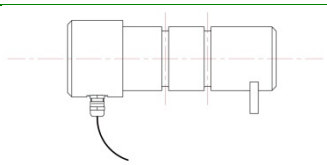
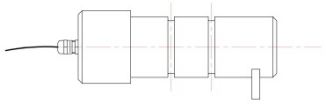
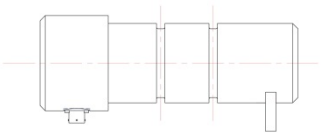
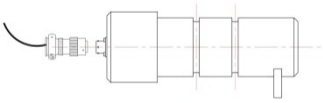
			
Single Keep Plate	*Double Keep Plate*	*Anti-Rotation Plate, Split Pin & Washer*	*Anti-Rotation Plate & Nut*

Cables & Connectors

It is important that the protection of the cabling system from any potential accidental damage either during installation or use is considered. There are several cable and connection options available.

1) The signal cable can exit via a gland arrangement. The cable is hard-wired to the Wheatstone bridge.
2) A plug and socket system can be incorporated. The cable can be removed during installation.
3) Extra protection can be provided over the standard polyurethane sheathed cable in the form of hydraulic hose. This provides excellent protection.

The standard cable exit and connector options available to you from PCM are shown below.

			
Radial Cable	*Axial Cable*	*Radial Connector*	*End Connector*

Typical Specification

PARAMETER	VALUE	UNITS
Capacities Range	Custom/Range: 0.5 to 500	tf
Number of Bridges	Up to 2	-
Rated Output	0.5-1.5	mV/V
Linearity & Non-Repeatability	0.25-2	±% Rated Output
Zero Return AFTER 30 MINUTES	0.2	±% of Applied Load
Zero Balance	1.5	±% of Rated Output
Temperature Range OPERATING	-10 to +80	°C
Temperature Range COMPENSATED	Ambient to 70	°C
Temperature Effect ON OUTPUT	0.1	±% of Applied Load/°C
Temperature Effect ON ZERO	0.02	±% of Applied Load/°C
Mechanical Limit SAFE OVERLOAD	200	% of Rated Capacity
Mechanical Limit ULTIMATE OVERLOAD	500	% of Rated Capacity
Excitation RECOMMENDED SUPPLY	10	Volts AC or DC
Excitation MAXIMUM SUPPLY	15	Volts AC or DC
Input Resistance	380	Ω
Output Resistance	350	Ω
Insulation Resistance	>2	GΩ at 50VDC
Construction	17-4pH Stainless Steel or Tool Steel	-
Environmental Protection	IP67 (Standard)	-
Cable	5m 7/0.2 4 core screened	-

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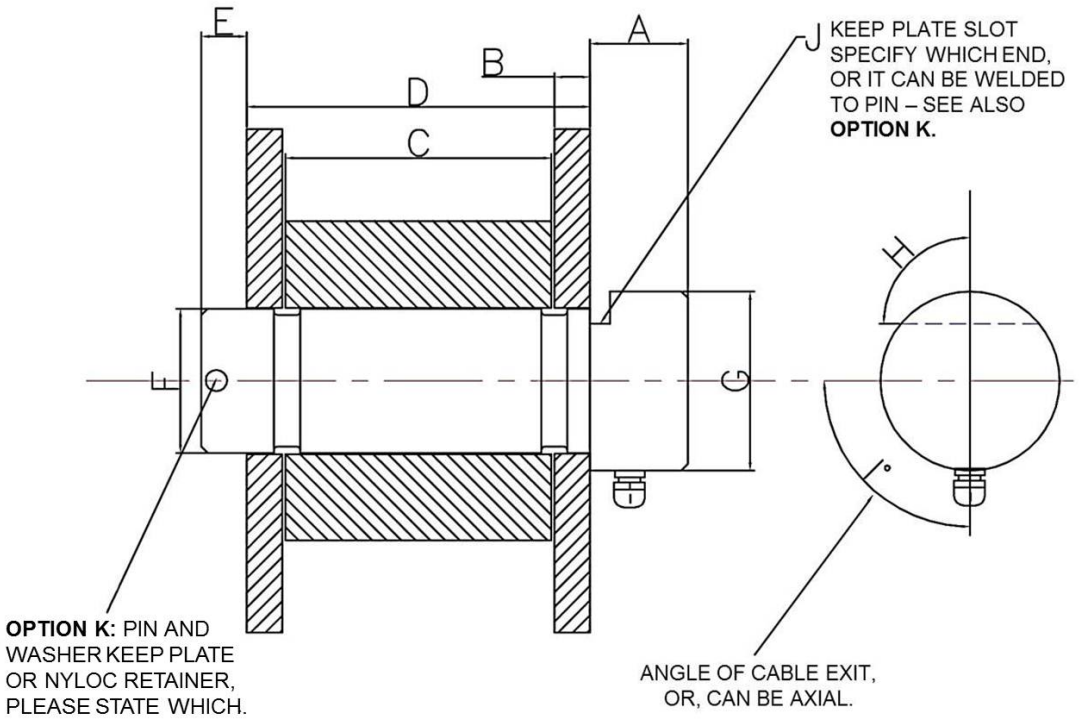

Referring to the diagram above, please complete the outline dimensions ***in millimeters*** in the table below. When the questionnaire is complete either scan and email it to sales@pcm-uk.com or transfer the information to email if easier.

A		**G**	
B		**H**	
C		**I**	
D		**J**	
E		**K**	
F			

Loading Direction	Please mark this on the diagram above.
Load (tf)	
Cable Length/Exit or Plug and Socket	
Operational Temperature Range	
Material	Stainless Steel / Tool Steel
Bridges	Single Bridge / Dual Bridge
Environmental Protection	IP67 (Standard) / Other
Force Direction	Single Direction / X/Y Axis
Load Pin Retention	

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1 Introduction

This guide covers load pins, typically used in cranes, and associated lifting equipment.

2 General Warnings

2.1 Do not weld near installed load pins, as leakage currents may destroy the load pin electric circuits.

2.2 Load pins are sealed units which must not be dismantled. Damaged load pins should be returned to PCM for repair and re-calibration.

2.3 Where an integral amplifier is fitted, do not carry out a leakage test. Where the load pin output is mV/V, the maximum voltage for leakage testing is 50V. “Hand generator” type testers must not be used.

3 Handling & Installation Warnings

3.1 The accuracy of the system is dependent upon correct installation of the load pin.

3.2 Load pins should not be handled or carried by means of the cable.

3.3 Large pins incorporate special lifting accessories – use these as directed.

3.4 Load pins must not be subjected to shock loads, such as using a hammer to force the pin into position.

4 Checks Before Installation

4.1 Visually inspect the load pin for damage on all outer surfaces, i.e. dents may indicate poor handling.

4.2 When fitted with a cable and gland, check that the cable is held securely by the gland and the gland is secure to the pin.

4.3 When fitted with a plug and socket, check the connector is secure on the cable and the pin. Check the plug and socket for any damage.

4.4 Check the cable for damage, such as cuts, abrasions, and crush.

5 Checks During Installation

5.1 Ensure the load direction arrow on the load pin (usually on the head) is aligned with the direction of load.

5.2 Ensure the pin is held captive to prevent movement in use, i.e. keep plate.

5.3 Ensure the support plates and sheave are centred on both grooves of the load pin and do not bridge across.

5.4 Ensure the support plates are not miss-aligned and the pin forced into position as this will induce bending moments adversely affecting load pin response.

6 Wiring & Electrical Installation

6.1 The wiring connections are given on the Calibration Certificate supplied with the pin.

6.2 Ensure the cable screen is connected to a good instrument earth.

6.3 Ensure no additional cable has been added to the load pin as this will alter the calibration response to that issued.

6.4 Where junction boxes are used check the connection devices are good quality, connection is tight and clean, and the box is free of moisture.

6.5 Load pin cabling must be kept away from high power cables and equipment, high output RF equipment and inductive loads and generators. Cables must not be run alongside power cables.

7 Zero Load and Full Load Output

7.1 The zero-load output given on the calibration certificate is the self-weight of the load pin or when at rest on a flat surface.

7.2 The load on an installed load pin will comprise dead load (including sheaves, ropes, hook block, drums etc.) and live load (load lifted). Therefore, the output with no live load will be greater than the zero-output indicated on the calibration certificate.

7.3 The full load output of the pin is shown on the calibration certificate, this is dependent upon design but is usually in the range 0.5 to 3mV/V.

8 Checks After Installation

8.1 With the load pin installed check the pin output is not negative, as this may indicate the pin is incorrectly mounted or subject to mis-alignment forces.

8.2 Apply load to the pin, the output should increase. If this does not check:

a. The load is being applied across the grooves of the pin.

b. The electrical connections to the output are correct.

9 Calibration

9.1 The response of the load pin is affected by how the pin is supported and loaded. The PCM calibration is carried out under laboratory conditions and may not represent installation conditions, it therefore may be necessary to carry out in-situ calibration using dead loads.

10 Operating Issues

10.1 During manufacture the load pin is subject to an overload which is more than the rated operating capacity of the pin. This overload is shown on the calibration certificate.

PCM load pins generally have a 150% overload capacity without affect to the performance of the pin, however the pin must not be subjected to overload on a regular basis.

10.2 Significant over-loading or shock-loading can result in zero offset in the load pin output, and zero shift must be investigated to determine any damage to the pin.

11 Fault Finding

11.1 For information and guidance please refer to PCM “Load Cell System – Fault Finding Guide”.

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