



Technical Manual  
**CAPACITIVE LOAD CELL**  
**TYPE MCL**

Doc. Ref CD1048K



BS EN ISO 9001  
Certificate No. FM13141



Affirmed by Declaration  
of Conformity

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## 1 INTRODUCTION

The MCL range of miniature load cells is based upon our well-proven capacitive sensor technique which enables us to produce an amplified high quality load cell with a small size and a competitive price.

The capacitive sensing element measures the deflection of an internal load ring which is the principle used by calibration standards. The main advantage of this principle is that it is very resistant to the effects of off-axial loading. In addition to being very small, the MCL and particularly the low range unit have a very low mass to capacity ratio.

The conditioning electronics are internal so the appropriate DC supply to the load cell produces an output of  $\pm 10V$  for the range of the load cell. The electronics are sealed inside the IP65 housing.

These tension/compression load cells are available as two different models:-

1. Frame size A with ranges  $\pm 50N$ ,  $\pm 100N$ ,  $\pm 250N$ ,  $\pm 500N$ ,  $\pm 1kN$ ,  $\pm 5kN$
2. Frame size B with ranges  $\pm 10kN$ ,  $\pm 15kN$ ,  $\pm 25kN$ ,  $\pm 50kN$ .

## 2 MECHANICAL INSTALLATION

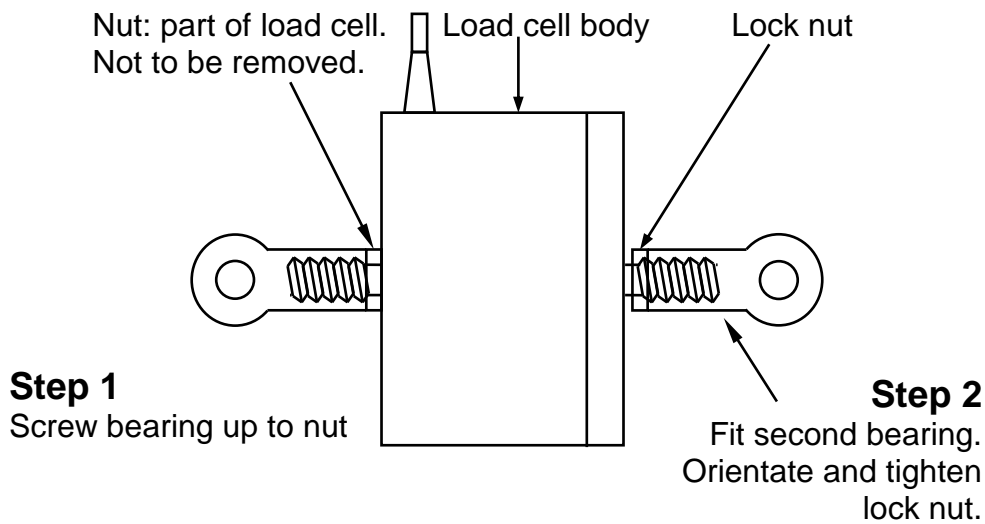
The construction of these load cells is based on a central load ring with deflecting diaphragms. The load ring assembly, diaphragm and electronic module are all contained in a housing. This outer housing provides environmental protection but is not very strong. When mounting these transducers, do **not** apply pressure or torque to the outer case. The load connection is made only to the threaded studs (male thread on frame A and female thread on frame B).

Do not apply torque or clamping load to the load cell body.

The load should be applied to the threaded studs.

If fitting rod-end bearings, use lock nuts. See example for frame size A below.

Fitting end bearings to frame size A transducers.



### Frame Size A - Thread Sizes

The thread size can vary and the actual thread size is given by the stock code number:

MCL RRRR TT/LL

Where RRRR is the range in Newtons

TT is the thread size (M6 or M8)

LL is the thread length (13, 18 or 25 mm)

### 3 ELECTRICAL INSTALLATION

The frame size A is fitted with a 2m long, four-core cable and frame size B is fitted with a four-pin connector (mate supplied).

| Frame Size A: | Core Colour     | Connection                  |
|---------------|-----------------|-----------------------------|
|               | Red             | Positive Supply (+15V)      |
|               | Blue            | Negative Supply (-15V)      |
|               | Black           | Output common and supply 0V |
|               | Yellow          | Output                      |
|               | Screen (sheild) | Ground                      |

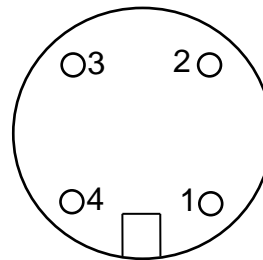
**Note:** Black (0V), screen/shield are connected to the body.

| Frame Size B: | Pin Number | Connection                  |
|---------------|------------|-----------------------------|
|               | 1          | Positive Supply (+15V)      |
|               | 2          | Negative Supply (-15V)      |
|               | 3          | Output                      |
|               | 4          | Output common and supply 0V |

**Note:** 4 (0V) is connected to the body.

Connector pin position:

View on solder pins at rear of free connector.



#### 3.1 Electrical Output

These units have a  $\pm 15V$  at 10mA supply and the output is  $\pm 10V$ ; +10V for tension, -10V for compression. The output common is at supply 0 volts.

The output voltage should be measured with a 10k $\Omega$  load.

#### 3.2 Output Noise

The noise content of the output signal is a limiting factor for the best resolution obtainable. The noise (output ripple, etc.) viewed on an oscilloscope is typically 5mV rms (15mV peak to peak), but when measured on a typical d.c. voltmeter (DMM) it gives 0.1mV average d.c.

This means that for non-dynamic load measurement the resolution limitation is 0.1mV which is 0.001% of full scale.

#### 3.3 Considerations in the Configuration of Instrumentation

The following R.D.P. instruments are suitable for use with the MCL:-

- E725-DC1
- 611 (PD1498)
- S7CT (PD1499)
- E525 (SO23)
- E308

## **4 INSTALLATION & EMC INFORMATION**

### **4.1 Installation Instructions**

- 1) Where customer-provided cable is used, this should be screened and of good quality.
- 2) Where the transducer is connected to an instrument (e.g. an amplifier), the cable screen should be grounded at the instrument end.
- 3) Ensure any d.c. supply is of good quality and performance, e.g. supply well smoothed and stable.
- 4) Ensure cable(s) connecting to the transducer is/are routed away from electrically noisy cables (e.g. heavy power cables) and away from obviously powerful sources of electrical noise (e.g. electric motors, relays and solenoids).
- 5) The body of the transducer should be earthed. If the transducer fixing attachments do not provide a good earth, then an earth strap should be used.

### **4.2 EMC Performance**

When subjected to radiated electromagnetic energy (as EN61000-4-3) an additional measuring error can occur at certain frequencies.

| R.F. Field Strength | Typical Maximum Error |
|---------------------|-----------------------|
| 10V/m               | 2%                    |
| 3V/m                | 0.2%                  |

### **4.3 Declaration of EMC Conformity**

#### **DECLARATION OF CONFOMITY**

RDP Electronics Ltd., Grove Street, Heath Town,  
Wolverhampton, WV10 0PY, U.K.

We declare that the product detailed in the Technical Manual, when installed as instructed, performs in conformity with the Electromagnetic Compatibility Directive 2004/108/EC and as such are duly CE marked.

## 5 EFFECTS OF EXTRANEIOUS FORCES

| Parameter              | Maximum Allowed                             | Effect on Output (see note 3) |
|------------------------|---------------------------------------------|-------------------------------|
| Torque                 | 375Nm (frame size B)<br>16Nm (frame size A) | Less than 0.25%               |
| Bending (see Note 1)   | 50% FS                                      | Less than 1.5%                |
| Sheer (see Note 2)     | 50% FS                                      | Less than 3%                  |
| Total Extraneous Force | 100% FS                                     | Less than 3%                  |

**Note 1** This defines a moment equivalent to a force of 50% FS applied at 90° to the free end of the loading stud.

**Note 2** This defines a force of 50% FS applied at 90° to the base of the loading stud.

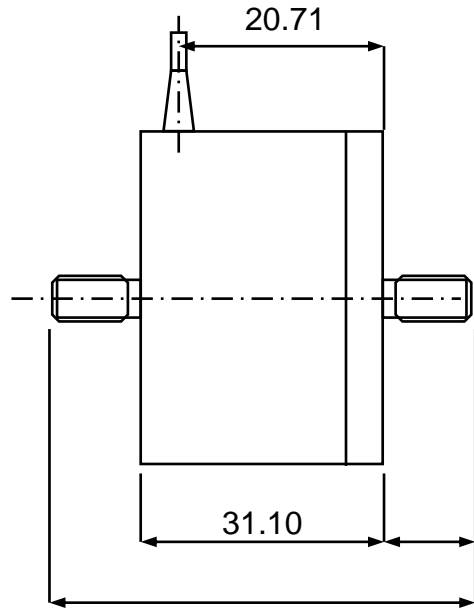
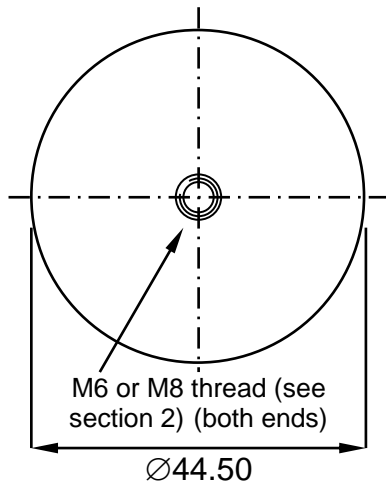
**Note 3** The "effect on the output" refers to the error in the measured (axial) load signal when the maximum extraneous load is applied. The percentage is of the particular load cell full scale range.

## 6 GENERAL SPECIFICATION

|                                    |                                                                         |
|------------------------------------|-------------------------------------------------------------------------|
| Supply (3 wire)                    | ±15V ±10% at 10mA                                                       |
| Output                             | ±10V, ±2%                                                               |
| Minimum Load Resistance            | 3k ohm                                                                  |
| Zero Force Output                  | 0V ±0.3V (cell sizes up to 250N)<br>0V ±0.15V (cell sizes 500N upwards) |
| Linearity Error                    | ±0.25% F.S. (±0.3% F.S. for ranges <500N)                               |
| Repeatability Error                | ±0.01% F.S.                                                             |
| Hysteresis                         | ±0.05% maximum                                                          |
| Resolution                         | Limited by elec. noise o/p (typically 0.01% F.S.)                       |
| Output Ripple                      | Noise 5mV (rms) (10kHz to 30kHz) 0.1mV averaged dc                      |
| Frequency Response                 | 100Hz (flat)                                                            |
| Temperature Coefficient            | ±0.02% F.S./°C                                                          |
| Operating Temperature              | -25°C to +75°C                                                          |
| Storage Temperature                | -40°C to +100°C                                                         |
| Deflection (FS)                    | 50 microns                                                              |
| Overload Capacity (without damage) | 100% over capacity (2 x F.S.)                                           |
| Electrical Termination             | Frame A: 2m screened cable<br>Frame B: connector                        |
| Environmental Protection           | IP65                                                                    |
| Weight                             | Frame size A: 80g (excluding cable)<br>Frame size B: 850g               |

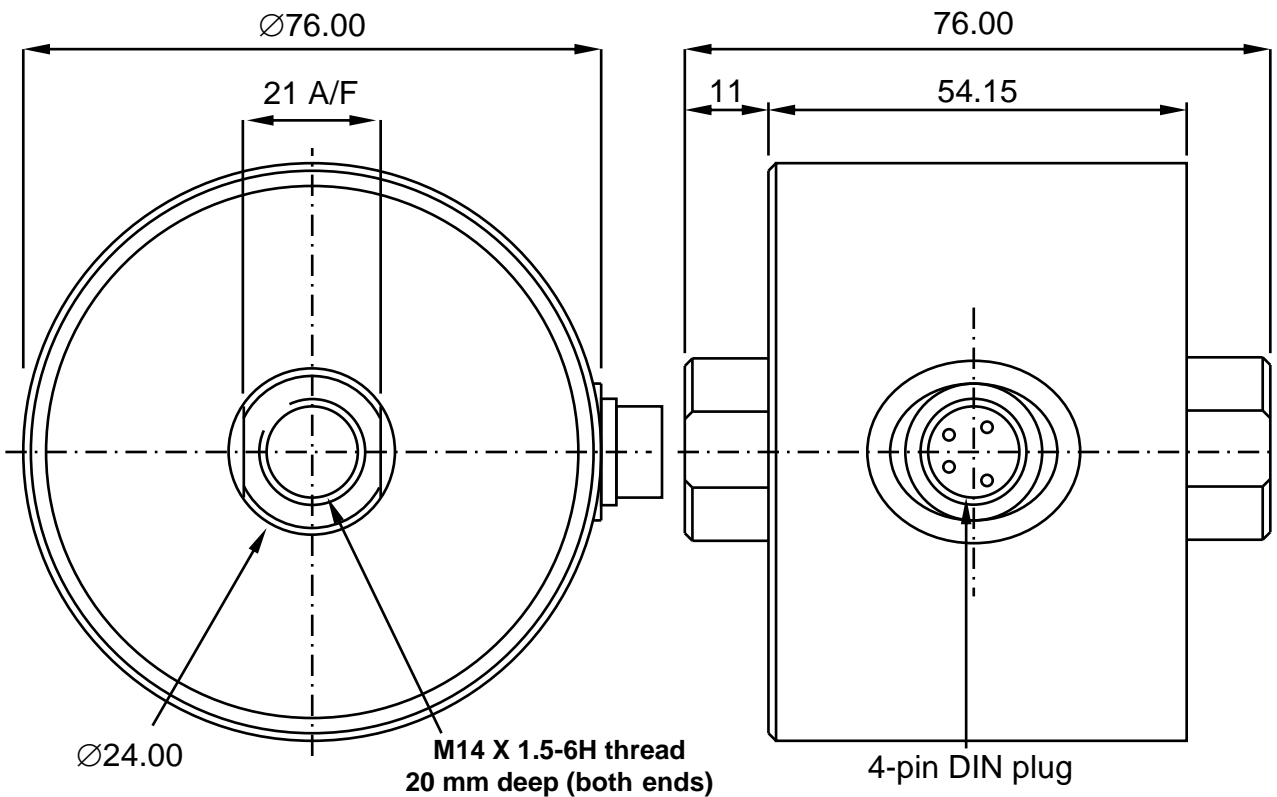
## 7 MECHANICAL DRAWINGS

### 7.1 Frame size A



For thread length, see section 2

### 7.2 Frame size B



Due to our policy of continual product development, we reserve the right to alter dimensions and specifications without notice. Dimensions are in mm.

## **8 WARRANTY AND SERVICE**

### WARRANTY.

R.D.P. Electronics products are warranted against defects in materials or workmanship. This warranty applies for one year from the date of delivery. We will repair or replace products that prove to be defective during the warranty period provided they are returned to R.D.P. Electronics.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranty of fitness for a particular purpose to the original purchaser or to any other person. R.D.P. Electronics shall not be liable for consequential damages of any kind.

If the instrument is to be returned to R.D.P. Electronics for repair under warranty, it is essential that the type and serial number be quoted, together with full details of any fault.

### SERVICE.

We maintain comprehensive after-sales facilities and the instrument can, if necessary be returned to our factory for servicing.

Equipment returned to us for servicing, other than under warranty, must be accompanied by an official order as all repairs and investigations are subject to at least the minimum charge prevailing at the date of return.

The type and serial number of the instrument should always be quoted, together with full details of any fault and services required.

### IMPORTANT NOTES.

1. No service work should be undertaken by the customer while the unit is under warranty except with the authorisation of RDP Electronics.
2. If the instrument is to be returned to R.D.P. Electronics for repair, (including repair under warranty) it is essential that it is suitably packed and that carriage is insured and prepaid. R.D.P. Electronics can accept no liability whatsoever for damage sustained during transit.
3. It is regretted that the above warranty only covers repairs carried out at our factory. Should the instrument have been incorporated into other equipment that requires our engineers to perform the repair on site, a charge will be made for the engineer's time to and from the site, plus any expenses incurred.

The aforementioned provisions do not extend the original warranty period of any product that has been either repaired or replaced by R.D.P. Electronics.

**THIS WARRANTY MAY BE NULL AND VOID SHOULD  
THE CUSTOMER FAIL TO MEET OUR TERMS OF PAYMENT.**