



Technical Manual  
**GENERAL LOAD CELL  
APPLICATION NOTES**

**Doc. Ref CD1039G**

This manual applies to units of mod status 4 ONWARDS



BS EN ISO 9001  
Certificate No. FM13141



Affirmed by Declaration  
of Conformity

**USA & Canada  
RDP Electrosense Inc.**

2216 Pottstown Pike  
Pottstown, PA 19465  
U.S.A.

Tel (610) 469-0850  
Fax (610) 469-0852  
E-mail [info@rdpe.com](mailto:info@rdpe.com)  
[www.rdpe.com](http://www.rdpe.com)

**All other countries  
RDP Electronics Ltd**

Grove Street, Heath Town,  
Wolverhampton, WV10 0PY  
United Kingdom

Tel: +44 (0) 1902 457512  
Fax: +44 (0) 1902 452000  
E-mail: [sales@rdpe.com](mailto:sales@rdpe.com)  
[www.rdpe.com](http://www.rdpe.com)

# GENERAL LOAD CELL APPLICATION NOTES

## Please read these notes carefully before attempting to install a load cell

**REMEMBER**, although load cells may look extremely rugged, they contain delicate sensing devices and can be very easily damaged by misuse rendering the unit unserviceable or subject to an expensive repair

1. **DO NOT** allow the load cell to swing by its cable.
2. **DO NOT** allow a load cell to drop onto the floor.
3. **Low rating load cells** can be easily damaged by squeezing between fingers. Always handle these devices with extreme care as they can easily be overloaded
4. **NEVER** hammer a load cell into place. Shock loads can permanently damage some units
5. **NEVER** exceed the specified input voltage rating when energizing a load cell. Over voltage will overheat the strain gauges and cause them to burn out
6. **DO NOT** apply excessive torque between the centre and outer diameters of the cell. See below.
7. **ENSURE**, wherever possible, that the cell cannot be overloaded,
8. **BEWARE** of shock loadings. These can be very high and, although of short duration, can easily cause permanent damage.
9. **ENSURE** the surface to which a load cell is to be attached is flat within 0.0002" (i.e. 2 parts in ten thousand) and that the surface finish is better than 16 micro-inch.
10. **For Flat Load Cells**, use a good quality steel for the base, having a minimum hardness of Rockwell C30 (B105). In order to avoid distortion and consequent errors, ensure the mounting plate thickness is at least 1.5 times the cell height.
11. **ENSURE** loadings are only applied axially to a cell otherwise errors will occur.
12. **ENSURE** no extraneous torque and/or bending loads are applied to a cell as these can easily overload and destroy it.
13. In any event, the sum of all forces applied to a cell must **NEVER** total to a figure in excess of the cell rating. (refer to cell data sheet for details).
14. When a radiused load button is used for compression loadings, the load must be applied via a hardened flat surface. **DO NOT** attempt to shape the loading surface to match the load button.
15. It is often difficult to mount sub-miniature cells and generally is achieved with external clamping or adhesives.  
Care should be taken to ensure that adhesive is not present between the loading surfaces, and if clamps are used they should be confined to the side wall area and never allowed to clamp the central loading section. Failure to fix a cell correctly will result in a poor performance and a loss of accuracy.

The following information will help determine the correct torque tightening values for centre and hold down bolts.

**It is most important to appreciate that a load cell cannot withstand unlimited torque on the sensing structure of the cell. Please, therefore, take this fact into account when tightening central connecting bolts. Do not allow the torque to be transmitted into the load cell body.**

### Hold-Down Bolts

For universal cells it is important that the cell outer ring in contact with the mounting surface remains fully located during tensile and compressive loading. If this is not ensured, then non-linearity may result.

As most load cell mounting bases are manufactured from softer materials than the heat treated load cell, the inter-surface pressure should be kept high. As a general rule, load cells should whenever possible be evenly bolted down with a load equivalent to twice the cell rating. This can usually be easily achieved with the smaller capacity cells.

The table below provides details of the maximum recommended torques for standard 12.9 grade steel metric cap screws lubricated on the thread and under the head with a molybdenum based grease.

When the x 2 factor can be applied, the required tightening load/bolt can be calculated from:

$$P = \frac{\text{Load Cell Rating} \times 2}{\text{Number of Bolts}}$$

This then gives the pre-tension in each bolt and the torque required to induce this tension can then be determined by the empirically derived equation;

where :  
 T = KDP  
 T = the tightening torque in Nm  
 D = nominal bolt diameter in mm  
 P = pre-tension in kN  
 K = the torque coefficient

Assume K = 0.17 for standard alloy steel bolts lubricated with molybdenum based grease.

Obviously care must be taken to ensure that the bolts are not over-stressed and generally should not be loaded beyond 75% of their maximum yield value. This may influence the choice of bolt type and/or base material.

The following table is provided as a helpful guide.

The large diameter centre bolt should also be pre-tensioned to the full cell rating if the cell is to be used in tension and compression. **This can best be achieved by simply applying full-scale tensile load and then tightening down the locking nut with a small amount of torque.** This will ensure that the thru-bolt cannot move in the threads in normal universal operation. If in doubt, please consult our Technical Department.

**EG. CHARACTERISTICS FOR STD. 12.9K GRADE ALLOY STEEL METRIC CAP SCREWS**

Nom Size	Min Tensile Strength kN	Recommended Max Torque Nm	Approx Tension Induced kN
M1.4	1.18	0.22	0.66
M1.6	1.52	0.29	0.90
M2.0	2.46	0.66	1.43
M2.5	4.02	1.3	2.4
M3	5.98	2.4	3.5
M4	10.49	4	6.0
M5	16.99	11	10
M6	24	18	14
M8	44	43	26
M10	69	83	40
M12	100	120	58
M14	137	215	80
M16	188	310	108
M18	230	430	134
M20	293	560	170
M24	422	950	246

\* Data for threads M4 to M24 based on bolt grade 12.9k. Other bolt grades will have significantly lower values.

# 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.**