NOVARIS

Application Note
(0015-D80V1)

SURGE PROTECTION FOR LOAD CELLS

Novaris Pty Ltd
72 Browns Road Kingston
P.O. Box 2010 Kingston
Tasmania 7050 Australia

+61 3 6229 7233
sales@novaris.com.au
www.novaris.com.au

CONTENTS

1. Introduction

1.1 Load cells are used in many applications in industry from weigh bridges to raw material silos. They are extremely sensitive devices and must be correctly protected from transient voltages to avoid damage. These transients can be generated by other co-located electrical equipment or the direct and indirect effects of lightning.

1.2 This application note applies to the range of Novaris load cell protectors as listed below.

LCP-18	LCP-18-PCB
LCP-36	LCP-36-PCB
IS-LCP-18	IS-LCP-18-PCB
IS-LCP-36	IS-LCP-36-PCB

1.3 Novaris load cell protectors (LCP) are available in two basic types to suit different installation conditions, an IP65 rated aluminium enclosure type for outdoors and a printed circuit board (PCB) only version for indoor or cabinet installations. In addition to these there are options for the system voltage, 18 or 36 volts, and intrinsically safe versions that have the IEC Ex certifications for use in hazardous areas.

1.4 These products protect against the effects of lightning induced surges and other transient over voltages. They provide both common-mode and transverse-mode protection, which is essential for the effective protection of load cells.

1.5 **Load cell calibration:** Novaris LCPs will not affect the calibration of the load cells they are protecting so no additional calibration or testing is required when LCPs are installed.

1.6 Novaris LCPs are suitable for both 4 and 6 wire load cells and measuring instruments.

1.7 **Measuring Instrument protection:** The measuring instrument or connections to a process control system are also vulnerable to surge damage. It is recommended that both the signal lines from the load cells and the power for the measuring equipment be protected. This is especially important if the measuring equipment and its power supply use a different earth connection to the load cells. The signal lines to the load cells can be protected with a suitable LCP and the power can be protected using a surge diverter or a plug-in filter, if the system is particularly sensitive. Suitable devices for 230V AC power are;

Novaris SDD1-50-275 surge diverter
Novaris PP10A2-50-xx plug-in filter

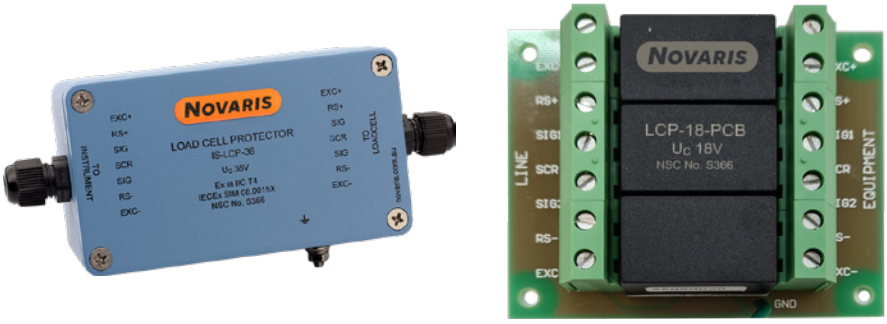

Figure 1. Novaris Load Cell Protectors

2. Before Installation

It is critical to mount the LCP immediately adjacent to the load cell it is protecting due to the extreme sensitivity of the load cell to voltage transients. Before installation commences survey the site and plan where each LCP will be located and how it will be mounted next to each load cell. One LCP is required for each load cell in the system being protected. The number of LCPs in the system should equal the number of actual load cells, and often one additional LCP to protect the measuring instrument or process control system as noted in section 1.7.

2.1 Select the correct type of LCP from the list in section 1.2 and ensure that the maximum operating voltage of the signal lines does not exceed the clamping voltage of the load cell protector. This is stated in the product datasheets.

2.2 Ensure that the maximum operating current of the signal lines does not exceed the maximum load current of the load cell protectors as stated in the product datasheets.

2.3 Turn the power off before beginning the installation.

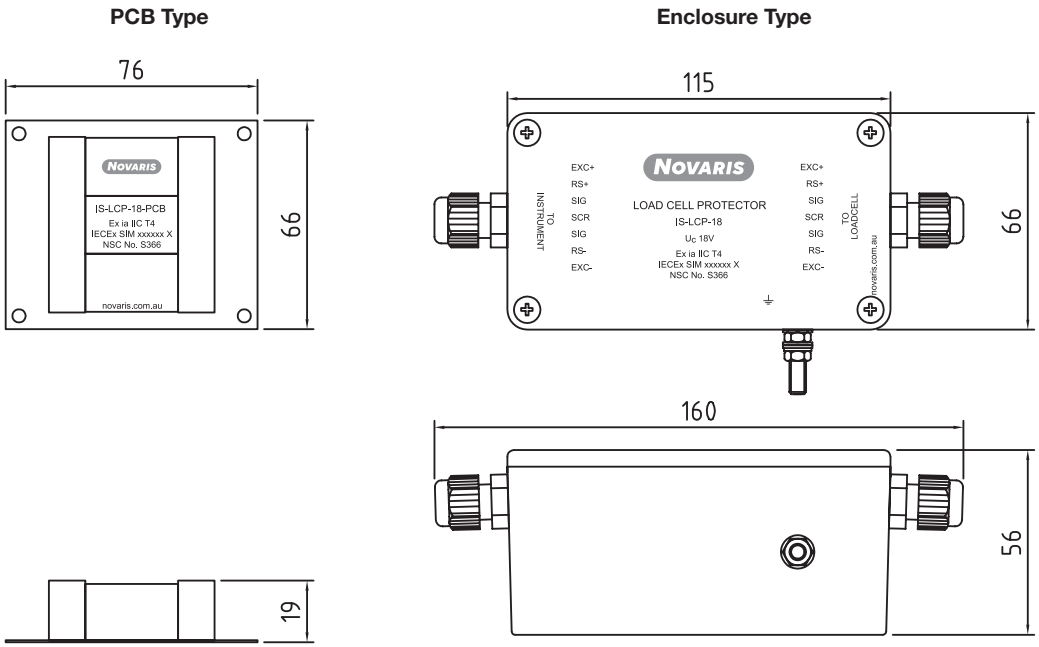

Figure 2. Dimensions of the Load Cell Protectors

3. Installation

3.1 **Point of Connection:** The surge protector should be connected at the closest practical point to the load cell to be protected.
One LCP is required for each load cell in the system being protected. Do not install an LCP at a termination point for multiple loadcells, this will not guarantee full protection.

3.2 **Mounting:** The standard LCPs come in an IP65 enclosure and are suitable for installation in exposed environments.

The LCP-xx-PCB units are not fitted with an enclosure and must be mounted on stand-offs at least 5mm tall to protect the unit from short circuits to the rear of the PCB. The LCP-xx-PCB must not be installed in an exposed environment, it requires a suitably rated weatherproof enclosure if it is to be installed outdoors.

3.3 **Isolation for IS LCPs:** The IS certified units must be galvanically isolated using a suitable safety barrier where the hazardous area boundary is located.

3.4 **Control equipment:** If the control/measuring equipment is located more than 5 meters away from the furthest loadcell, or in a building enclosure using a separate earth from the loadcells then it is recommended to install an additional LCP to protect the control equipment, see section 1.7 for full details on protecting control equipment.

3.5 **Wiring:** Load cell protectors are connected in series with the equipment (Figure 3).
The load cell or measuring equipment to be protected is connected to the load cell (equipment) side of the load cell protector. The field wiring is connected to the instrument (line) side of the load cell protector.

For 4-wire load cells, the RS+ and RS- terminals are left unconnected.

3.6 **Earthing:** The LCP must be earthed to the same point as the load cell it is protecting. The earth stud of the LCP must be directly connected to the load cell body (e.g. the metal enclosure of the load cell). The connection should be made using multistranded wire with cross-sectional area of at least 4mm2 and kept as short and straight as possible. Do not make loops in this earth wire. See note below as to why this point is critical;

Test the earth system for each load cell/LCP combination, ideally each earth should test out to be less than 5 ohms resistance, if it is more than 25 Ohms then take remedial action and add extra earth rods as necessary.

IMPORTANT NOTE: Because the earth is shunt-connected, the inductance of the connection has a significant effect on performance, the more inductance in this connection then the higher the voltage that will be added to the let-through voltage of the LCP itself. This means, **the length of the earth connection must be kept as short as possible.** This is not the case with the other connections because they are series connected. Failure to follow this guidance may result in surge damage to a load cell.

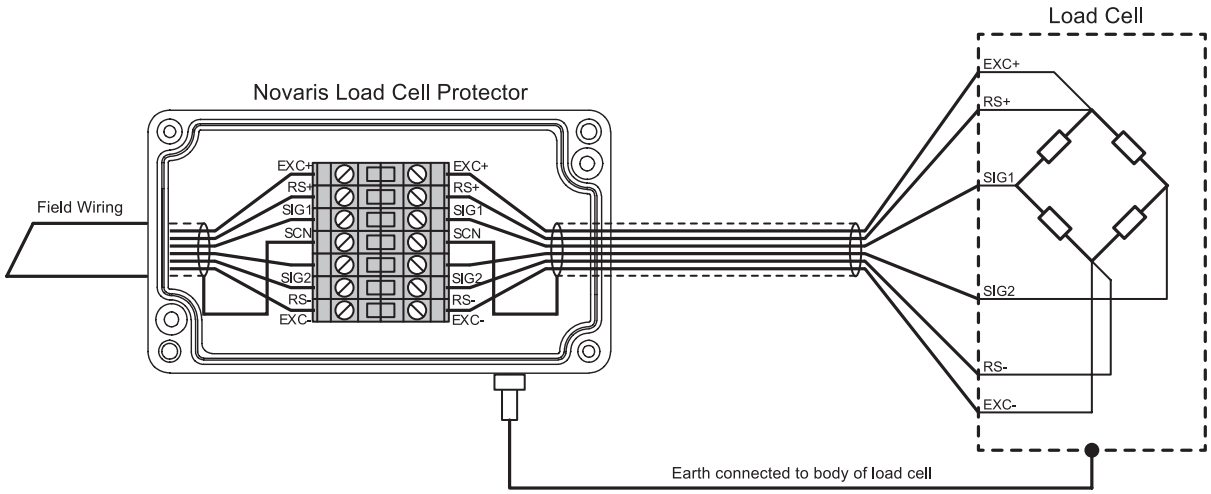

Figure 3. Installation of Load Cell Protector

4. After Installation

4.1 Check the installation by testing that the equipment is operating correctly.

4.2 Novaris load cell protectors are extremely robust and require very little maintenance. Periodic inspection of cabling and glands is recommended along with the normal calibration testing of the whole system.

4.3 Test the earth of each load cell/LCP combination at least once every 2 years to ensure that the figures detailed in section 3.6 are maintained.

4.4 Novaris load cell protectors have no user serviceable parts. Please contact Novaris for a replacement unit.