



ENCARDIO RITE

ONE STOP MONITORING SOLUTIONS | HYDROLOGY | GEOTECHNICAL | STRUCTURAL | GEODETIC
Over 50 years of excellence through ingenuity

USERS' MANUAL

RESISTANCE STRAIN GAGE TYPE COMPRESSION LOAD CELL

MODEL ELC-210S



Doc # WI-6002.105 R00 | Feb 2012

ENCARDIO-RITE ELECTRONICS PVT. LTD.

A-7, Industrial Estate, Talkatora Road Lucknow, UP - 226011, India | P: +91 522 2661039-42 | Email: geotech@encardio.com | www.encardio.com

International: UAE | Qatar | Bahrain | Bhutan | Europe | USA

India: Lucknow | Delhi | Kolkata | Mumbai | Chennai | Bangalore | Hyderabad | J&K

Contents

1	INTRODUCTION	1
1.1	Specifications	1
1.2	Handling of load cell	1
1.3	Conventions used in this manual	1
1.4	How to use this manual	1
2	STRAIN GAGE TYPE COMPRESSION LOAD CELL	2
2.1	General description	2
2.1.1	Cable connection	2
2.2	Tools & accessories required for installation	2
2.3	Test certificate	3
3	INSTALLATION PROCEDURE	4
3.1	General	4
3.2	Preparation of sensor before installation	4
3.3	Typical Installation method for the measurement of load in Struts	4
3.4	Taking readings	5
3.5	Trouble shooting	6
3.5.1	Symptom: Load cell reading unstable	6
3.5.2	Symptom: Load cell fails to read	6

1 INTRODUCTION

Encardio-rite model ELC-210S is a heavy duty, precision load cell used to measure compressive loads in several applications due to the following features:

- Specially designed to suit stringent harsh industrial environments.
- Ideally suited for use with data acquisition systems.
- Having no moving parts & mechanical linkages, hence the system is stable.
- Load cells are temperature compensated within controlled limits, reducing the effect of temperature variation.

Model ELC-210 series load cell is ideally suited for measurement of compressive loads or forces and is extensively used in load measurement in struts. The electron beam welded sensor utilizes precision bonded foil strain gages connected in a simple Wheatstone bridge circuit. The output is derived from imbalances in the bridge circuit as load is sensed by the sensor. Typically the bridge circuit is excited by 10 V DC to give a full scale output of around 1.5 mV/V. Load applied to the cell can be measured by using any standard digital read-out unit suitable for resistance strain gage applications.



1.1 Specifications

Please refer data sheet.

1.2 Handling of load cell

The load cell should be handled very carefully during transportation and installation. It should not be dropped under any circumstances. In case, it is dropped, the impact generated will almost certainly result in a shift of zero reading. Refer to Encardio-rite application note AN-1 (data sheet 1147-96) for an appreciation of the magnitude of damage caused to a load cell by impact load.

CAUTION: The load cell should not be dropped under any circumstances because this may lead to its permanent damage.

1.3 Conventions used in this manual

WARNING! Warning messages calls attention to a procedure or practice, that if not properly followed could possibly cause personal injury.

CAUTION: Caution messages calls attention to a procedure or practice, that if not properly followed may result in loss of data or damage to equipment.

NOTE: Note contains important information and is set off from regular text to draw the users' attention.

1.4 How to use this manual

This users' manual is intended to provide you with sufficient information for making optimum use of the strain gage type load cell in your application.

The manual is divided into a number of sections. Each section contains a specific type of information.

For general description and dimensions: See § 2.1 'General description'.

For installation of strain gage type compression load cells: See § 3 'Installation procedure'.

2 STRAIN GAGE TYPE COMPRESSION LOAD CELL

2.1 General description

The internal construction of the load cell is columnar. The element of the load cell is made of martensitic stainless steel. The element is hardened to give better linearity and hysteresis. The strain gage used are of foil type and are bonded to the elements using special epoxy cements which are very reliable. The sectional area of the columnar element is varied in the different capacity load cells to give approximately the same mV/V output for a variation of zero to full load. A cover with glass to metal seal is welded to the element by electron beam welding machine to make the load cell hermetically sealed.

The load cells are very susceptible to eccentric loading. Providing a top plate of proper dimensions at the top reduces the effect. In some applications, a bottom plate may also be used at the bottom of the load cell.

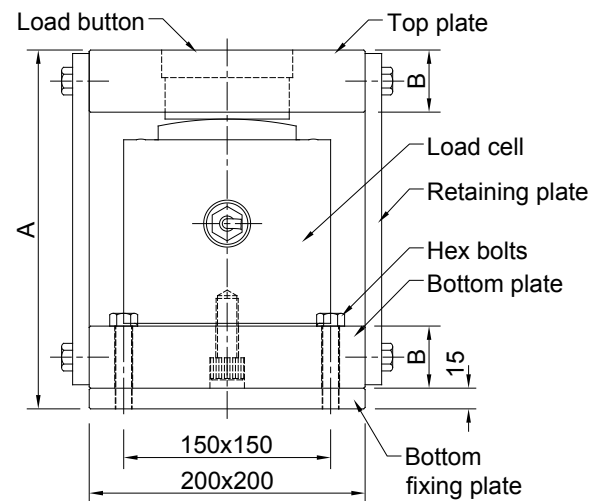
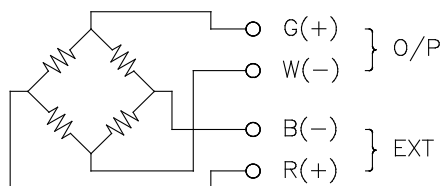


Figure-1 MOUNTING IN STRUT APPLICATIONS

Capacity kN	Mounting	A mm	Plate 200 Sq. mm B thickness
1000/1500	4 holes dia 13 at 150 Sq. mm	234	32
2000/2500/3500		260	45

2.1.1 Cable connection



Leads from the Wheatstone bridge circuit are terminated on a small printed circuit board (PCB), through a six-pin glass to metal seal in the cable holder assembly. No load output balancing, temperature compensation and full scale output balancing is done on the PCB. A suitable four core shielded cable is terminated through a cable joint housing and cable gland

2.2 Tools & accessories required for installation

The following tools / accessories are required for installation of the load cell:

- 2.2.1 Soldering iron 25 watt, temperature controlled
- 2.2.2 Rosin 63/37 solder wire RF-3C, 30 swg.
- 2.2.3 Wire stripper and cable cutter
- 2.2.4 Pliers 160 mm
- 2.2.5 Spanner set
- 2.2.6 Digital multi-meter

2.3 Test certificate

TEST CERTIFICATE

Date: _____
Temp. _____ °C

Customer:

P.O. No.

Instrument:

Model: ELC-210S compression type load cell

Capacity

1500 kN

Mfg. Sr. No.

Next calibration due on :

Dimension details

	Length(mm)	Width (mm)	Height (mm)
Top plate with load button	200	200	32
Bottom plate	200	200	32
Bottom fixing plate	200	200	15

General details

Input resistance	771	Ohm
Output rsistance	704	Ohm
Insulation resistance	>1000	Mega Ohm

Test data

Excitation Voltage 10.000 V

Input Load kN	Output (mV/V)	
	Cycle 1	Cycle 2
0	0.000	0.000
300	0.311	0.312
600	0.613	0.614
900	0.908	0.909
1200	1.213	1.212
1500	1.506	1.506

Max. non linearity 0.74 % fs

Rated output 1.506 mV/V @ 1500 kN

- Linear gauge factor**
- 1) 99.602 kN/mV (To be used to convert the mV o/p of load cell in engineering units when observations are taken in mV with Voltmeter or other read out units with customer)
 - 2) 1992.03 (To be used to read the o/p in engineering unit when Encardio-rite readout unit EDI-53L is used for observations. Refer to attached annexure-1)

Wiring configuration

Colour	Signal
Red	+ Excitaion
Black	- Excitation
Green	+ Output
White	- Output

Cable Length 2 meter cable (CS-0406- 4core)

Checked by _____

Tested by _____

3 INSTALLATION PROCEDURE

3.1 General

The Encardio-rite model ELC-210S series load cell is a heavy duty, precision load cell and is ideally suited for measurement of compressive load measurement between structural members. Because of no moving parts and mechanical linkages the load measurement system using the load cell is stable. The load cells are temperature compensated reducing the effect of temperature variation. Besides load cell, the measurement system includes top and bottom mounting plates, junction box, cable, switch box and a readout unit. A typical mounting arrangement scheme for strut applications is shown in figure 2

3.2 Preparation of sensor before installation

3.2.1 Check working of the Load cell as follows:

- Resistance measured by a digital multi-meter between red/black terminals should be $770 \text{ Ohms} \pm 5 \%$ and between green/white terminals should be $700 \text{ Ohm} \pm 1 \%$
- Resistance between any lead and outer casing should be $> 500 \text{ M Ohm}$.
- Using portable digital indicator measure zero balance of load cell. It should be between $\pm 0.2 \text{ mV/V}$.

3.3 Typical Installation method for the measurement of load in Struts

3.3.1 Structural contractor to prepare site/struts for mounting the load cells. Weld two base plates around $500 \text{ mm} \times 300 \text{ mm} \times 25 \text{ mm}$ on runner beam. These will support the struts over the runner beam at the location where the load cells have to be mounted. The faces of the struts have to be provided with support plates for mounting of load cells. With struts in position, lift load cell assembly by suitable means and position it between flanges at specified location. Weld the top plate and bottom fixing plate to the strut flanges.

CAUTION: Take care that load cells are not damaged by heating during welding to the support plates. Rags soaked in water must be wrapped around the load cells to avoid unnecessary increase in temperature during welding. Also ensure that there is no direct path for current to pass through the load cell during any welding operation. This may permanently damage the strain gages in the load cell.

NOTE: Preparing struts suitably for purpose of mounting load cells and providing appropriate tie rods, base plates and support plates is in scope of struts contractor. Tie rods can be of round, flat bars or angle iron. Installation procedures could be suitably modified according to the final load cell mounting schemes and site conditions as decided by ER installation personnel.

3.3.2 Strutting subcontractor to install load cells in struts under supervision. This includes making necessary changes in strutting system, providing shim plates for filling any gaps etc. such that load transfer to load cell is ensured. This can be discussed prior to implementation.

3.3.3 Remove the two retaining plates once the load cell system is installed. Preload the system to the specified value and check the load cell readings. Take corrective action in case the reading is not within the specified limits.

3.3.4 Anchor the signal cable from the load cells to the steel surface using adhesive lined or blind riveted cable clamps as appropriate. Route the cable to the local junction box. To let the adhesive bonds gain full strength, avoid unnecessary handling of the cable for the next 24 hours.

3.3.5 Mount a junction cum switch box at a suitable location where the load cell readings can be taken conveniently. Protect junction box from rain, wind & sunlight etc. by fixing a protective cover over it.

3.3.6 Terminate the load cells cable coming from local junction box into the switch box. The switch box

has ten input cable glands. The ones not in use should be kept blocked. A four-pin connector has been provided to assist in taking readings with the EDI-53L read-out unit.

3.3.7 Re-check the load cell readings with the EDI-53L read-out unit or with other read-out unit.

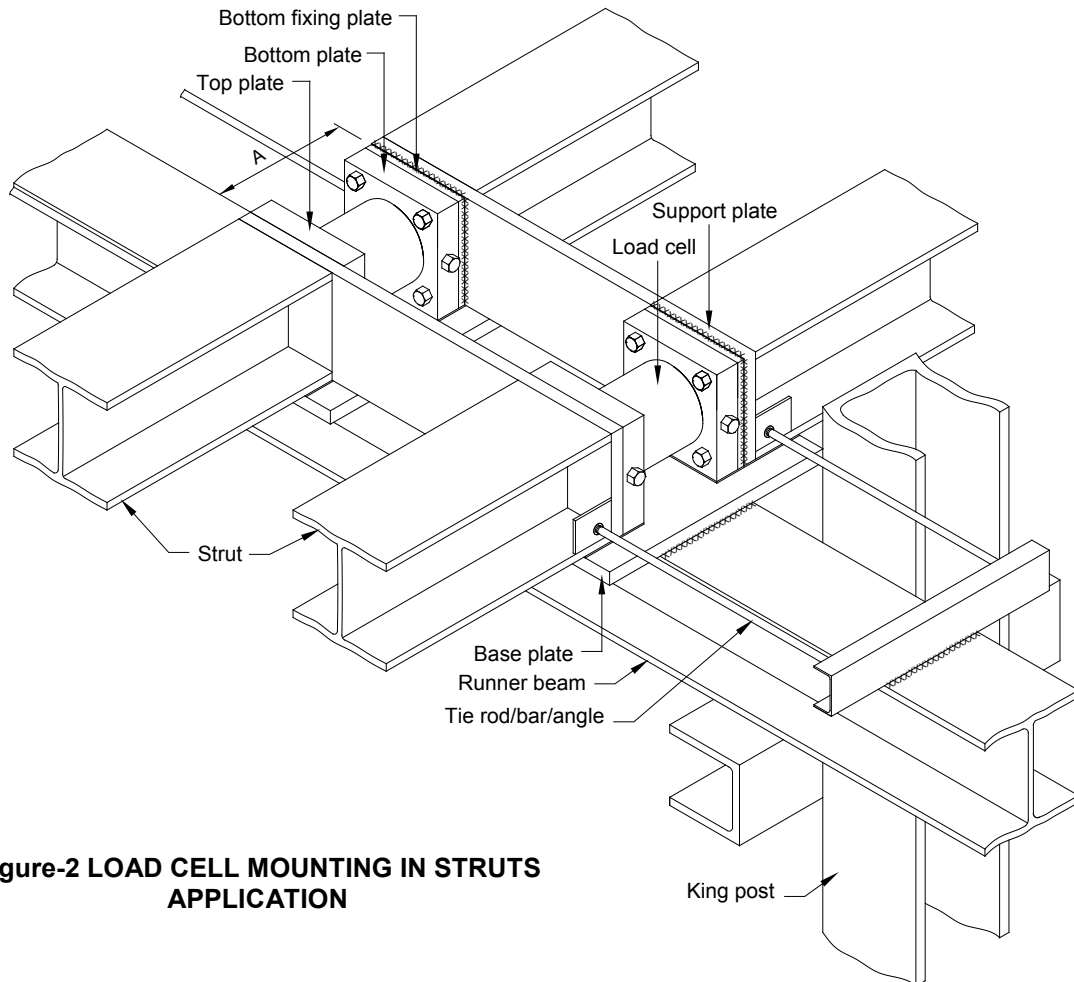


Figure-2 LOAD CELL MOUNTING IN STRUTS APPLICATION

NOTE: Sensors, cables and switch boxes should be properly identified with proper tags. Writing serial/code number and location on a strip of paper, placing strip near the item and covering it with a transparent plastic cello tape, can do temporary identification. Use paint for permanent identification, which is necessary to prevent errors in the long run and ease in operation.

CAUTION: Care should be taken that installed load cell, junction box, cable and switch box are properly protected against direct sunlight, wind effects, water and mechanical damage caused by normal construction activity, vehicular traffic and vandalism.

3.4 Taking readings

The load cell readings are taken by EDI-53L portable readout unit and are stored in its internal memory together with date and time the reading was taken.

3.4.1 Connect the load cell to the readout unit as per table given below.

EDI-53L TERMINAL	LOAD CELL WIRING
Red lead with red clip (Exc. +)	Red (Exc. +)
Black lead with black clip (Exc. -)	Black (Exc. -)
Red lead with yellow clip (I/P +)	Green (O/P +)
Black lead with yellow clip (I/P -)	White (O /P -)

3.4.2 Switch on the readout unit on and note the initial reading of load cell (I/P) in V

- 3.4.3 Restart the readout unit in SETUP mode & select the desired channel by entering ch-no. (0 to 250).
- 3.4.4 Select the desired measuring unit (kN) and enter the same.
- 3.4.5 Enter the initial reading noted above
- 3.4.6 Enter the gage factor as given in the individual test certificate of each load cell
- 3.4.7 Press the ENTER key when readout unit asks for X2.
- 3.4.8 Enter the desired decimal point (DP).
- 3.4.9 Press Esc to save and exit the SETUP.
- 3.4.10 Select the same channel (in which the gage factor, initial reading etc, has been entered) by pressing the ch. no. key to have the output data in engineering unit.

3.5 Trouble shooting

Once installed, remedial action is limited. Maintenance and trouble shooting is consequently confined to periodic checks of cable connection and functioning of the read-out unit. Refer to following list of problems and possible solutions should problems arise. For any additional help, consult factory.

3.5.1 Symptom: Load cell reading unstable

- Check insulation resistance. Resistance between any lead and outside casing should be $> 500 \text{ M Ohm}$. If not, cut a meter or so from end of cable and check again.
- Check if portable digital indicator works with another load cell. If not, the indicator may be malfunctioning. Consult manual of strain indicator for trouble shooting instructions.
- Use another portable digital indicator to take the reading.
- Check if there is a source of electrical noise nearby? General sources of electrical noise are motors, generators, transformers, arc welders and antennas. If so problem could be reduced by shielding from electrical noise.

3.5.2 Symptom: Load cell fails to read

- Cable may be cut or crushed. Check resistance between leads by a digital multi-meter. It should be $770 \text{ Ohm} \pm 5 \%$ between the red/black leads and $700 \text{ Ohm} \pm 1 \%$ between the green/white leads. If the cables are long, please add cable resistance when checking resistance (multiply by 2 for both leads). If resistance reads infinite or a very high value, a cut in the cable is suspected. If resistance reads very low ($< 100 \text{ Ohm}$), a short in cable is likely.
- Check if portable digital indicator works with another load cell? If not, the indicator may be malfunctioning. Consult manual of strain indicator for trouble shooting instructions.
- Use another portable digital strain indicator to take the reading.