INSTRUCTION MANUAL

ANCHOR LOAD CELL

Model ANCLO

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E10033-091030

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1 PRODUCT

1.1 DESCRIPTION

The ANCLO load cell is build with a hollow cylindrical core onto which eight to sixteen strain gages are bonded in pairs at 90° intervals around the periphery. Load cells less than 152 mm in diameter use 4 pairs of bonded strain gages whereas 152 mm or larger diameter load cells use eight pairs of bonded strain gages. The gages are wired in a full bridge configuration for temperature compensation, optimum sensitivity and the accurate measurement of non-uniformly distributed loads. The lead cable connects to the cell by

- either a detachable multi-pin electrical connector mounted on the cell
- or permanent factory wiring of the lead cable to the cell. The cable enters the cell through a watertight electrical connector

The standard load cells are protected against moisture intrusion and are splash proof. They may be made submersible by using an underwater cable connector and stainless steel construction as opposed to the standard plated steel.

An identification plate on the outside of the cell holds the following information:

- The serial number
- The capacity of the cell in kN

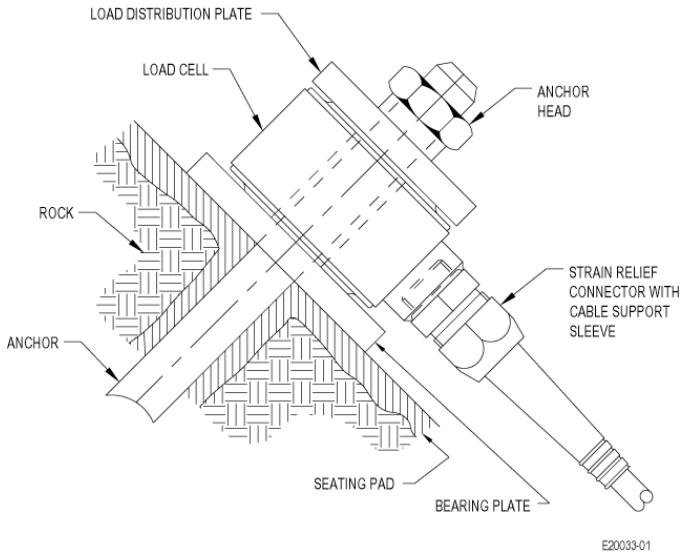


FIGURE 1: Anchor load cell.

1.2 SPECIFICATIONS

SPECIFICATIONS

Model	Anclo
	Standard Construction
Core:	Heat treated, black oxide, steel
Housing:	Zinc plated steel
Environmental:	Corrosion resistant, watertight, weatherproof
Cabling:	Detachable electrical connector or watertight cable connector
Electrical configuration:	According to cell diameter Dia. 152 mm or less: 4 pairs of bonded strain gages, full bridge Greater than 152 mm: 8 pairs of bonded stain gages, full bridge
Impedance:	700 Ω - 4 pairs or 1400 Ω - 8 pairs
Excitation voltage:	2 to 10 volts - 1.5 volts (P-3 readout unit) - 2.0 volts (P-3500 readout unit) - 2.5 volts (SENSLOG data acquisition) - 10.0 volts (PC with M3C conditioner)
Non-linearity:	≤ 0.5% F.S.
Resolution:	0.1% F.S.
Temperature sensitivity:	≤ 0.01% F.S./°C
Overload capacity:	2 x rated capacity
Operating temperature range:	-40 °C to +75 °C
Relative humidity:	0 - 100%
Temperature sensor:	Optional
Accuracy:	±0.5 °C

2 INSTALLATION

The load cell support surface should be smooth and perpendicular to the axis of the anchor or tieback. The use of a load bearing plate of suitable thickness between cell base and the bearing surface, and a load distribution plate between the anchor or tieback head and the load cell is required.

Load distribution on bearing plates that are too thin or improperly dimensioned will result in uneven load distribution causing erroneous results. The inside diameter of the load bearing and distribution plates should be identical to the inside diameter of the load cell.

The load distribution plate can be either a single plate or double spherically seated plates. Use of latter can compensate for misalignment of the bearing surface, load cell and distribution plate. Upon installation, locate the electrical connector downward to minimize the risk of damage.

Connector on load cell	Connection	IRC-41A cable color code
A	P+	RED
B	S+	GREEN
C	S-	WHITE
D	P-	BLACK

TABLE 1: Wiring code for connecting load cell to a "P3" or "P-3500" readout unit.

3 DATA READING AND ANALYSIS

3.1 GENERAL

Each load cell comes with a calibration certificate. The certificate lists the sensitivity factor used with a VISHAY strain indicator or equivalent.

Read each load cell immediately prior to installation. Record each reading under no-load conditions. This reading (under no-load), is the basis for calculating subsequent loads.

ANCLO load cells are temperature compensated for a range of -40 °C to +75 °C for equilibrium temperature conditions. It is recommended to protect it from direct sunlight.

If there is a wide discrepancy during storage temperature of the cell and the ambient temperature prior to installation, the cells should be conditioned to the ambient temperature until temperature equilibrium is reached. This ensures that initial reading, made under no-load conditions prior to installation, is a stable value to which subsequent measurements can be referenced.

ANCLO load cells can be read with most strain gage indicators. The following procedure applies to the P-3 or P-3500 VISHAY indicators.

3.2 CALCULATING THE GAGE FACTOR (for p-3500 readout unit only)

To determine the load (and the units of load) sensed by the ANCLO load cell and indicated by the P-3500, calculate the gage factor (G.F.) using the formula below and set the P-3500 gage factor using the gage factor button (4) to this value. (Refer to section 3.3 reading procedures).

$$G.F. = \frac{S \times 4000}{FSC}$$

Where:
- G.F. = Gage factor P-3500 set on the strain gage indicator
- S = Load cell sensitivity from calibration data sheet and identification plate on the load cell
- F.S.C. = Full Scale Count i.e. the number of readout units displayed that corresponds to the full scale of the load cell

The G.F. is inversely proportional to the F.S.C., and the F.S.C. must be chosen such that:

$$0.9 < G.F. < 4$$

These values are approximate. A value greater than 0.9 will ensure stable readings. A value less than 4 will ensure good sensitivity.

Sample G.F. determination:

If
- Load cell = Anclo -2000
- Capacity C = 2000 kN
- Sensitivity S = 2.000 mV/ V
- Gage factor G.F. = 1.000 (P-3500 readout)
- Initial reading L_o = 100 readout units
- Current reading L = 1700 readout units
- Readout unit constant = 4000
- U = 0.25 kN/unit (P-3500 display unit value)
- P = Load in kN

Assume a G.F. of 1.000

$$F.S.C. = \frac{S \times 4000}{G.F.}$$

$$F.S.C. = \frac{2.000\ mV/V \times 4000}{1.000}$$

$$F.S.C. = 8000\ units$$

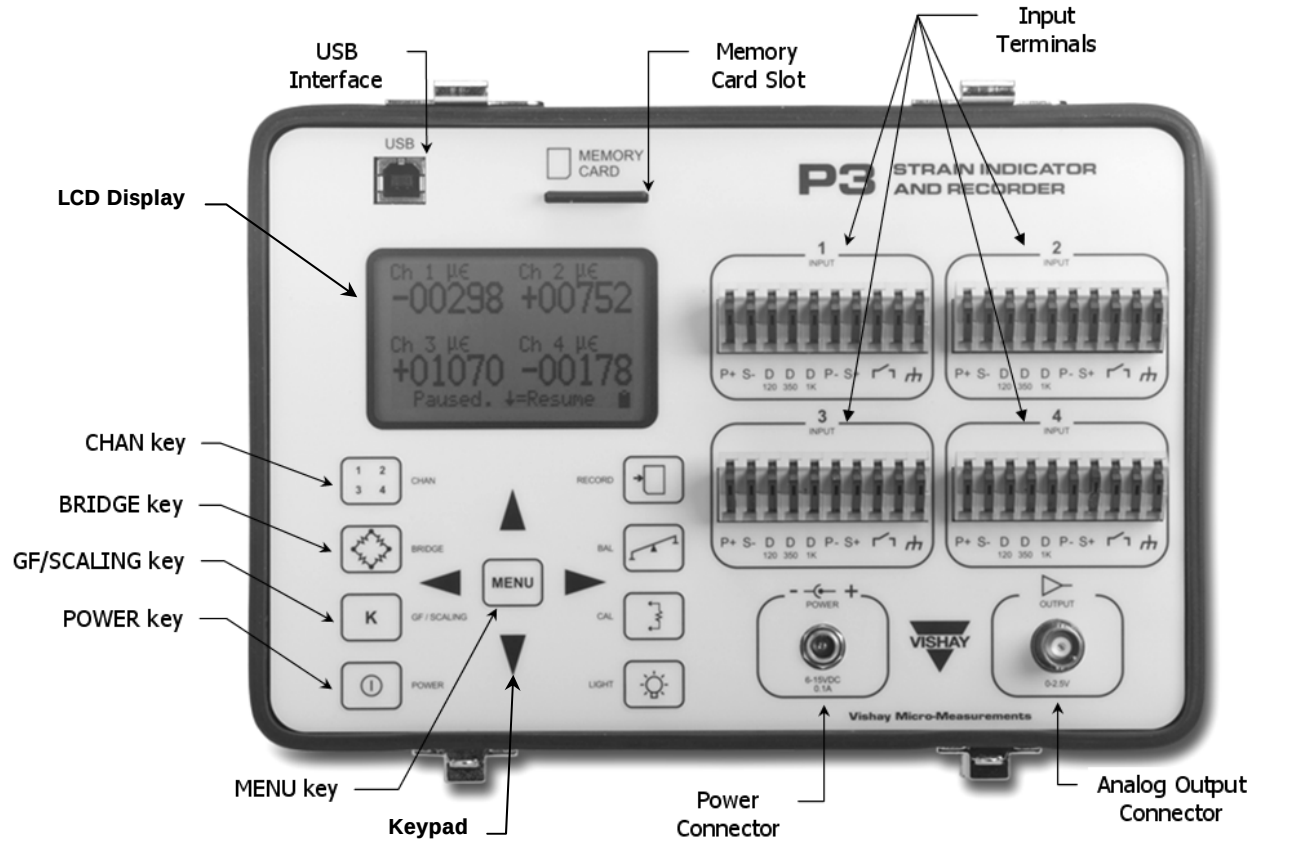
$$and\ U = \frac{C}{F.S.C.}$$

U can be increased to a suggested maximum of 1.0 kN / unit using a G.F. of 4.000, the maximum suggested G.F. value.

3.3 READOUT UNIT CONFIGURATION

3.3.1 FOR "P-3" READOUT UNIT

(For more details on other P-3 features, please refer to "P-3 Strain Indicator and Recorder Instruction Manual")



1. **Press POWER key**

2. **Press CHAN key**

   2.1. "**Chan**" Sub-menu

   2.1.1. Use left and right arrows to activate appropriate Channel

   2.1.2. Repeat step 2.1.1 for other Channel

   2.2. Confirm entry by pressing key MENU

3. **Press BRIDGE key**

   3.1. "**Bridge**" Sub-menu

   3.1.1. Use left and right arrows to select appropriate Bridge

   (For ANCLO Load Cell, select "Undef FB" for each channel to be used)

   3.1.2. Repeat step 3.1.1 for other channels

   3.2. Confirm entry by pressing key MENU

4. Press GF/SCALING key

4.1. "**Chan**" Sub-menu

4.1.1. Use left and right arrows to select appropriate Channel

4.1.2. Repeat step 4.1.1 for other Channels

4.2. "**Units**" Sub-menu

4.2.1. Set appropriate unit among available list

4.2.2. Repeat step 4.2.1 for other Channels

4.3. "**Full Scale**" Sub-menu

4.3.1. Set appropriate Full Scale (Displayed number corresponds to maximum load on the cell)

4.3.2. Repeat step 4.3.1 for other Channels

4.4. "**F.S. mV/V**" Sub-menu

4.4.1. Set sensitivity (in mV/V) according to load cell sensitivity value indicated on calibration data sheet

4.4.2. Repeat step 4.4.1 for other Channels

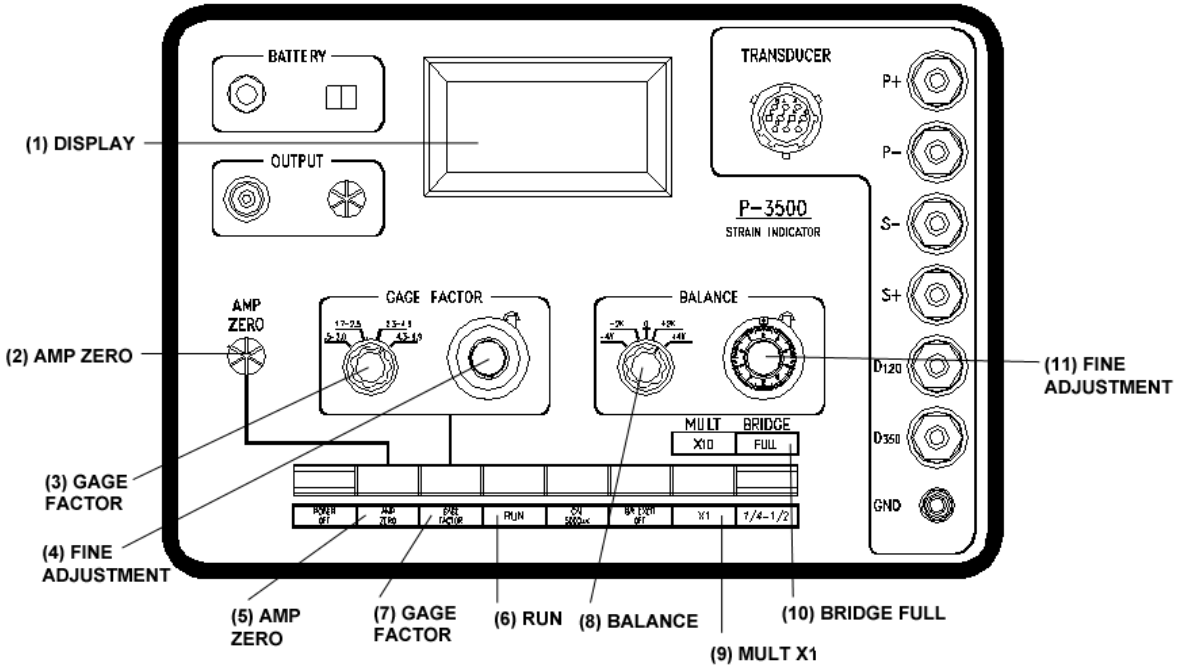
4.5. To return to reading display, confirm entries by pressing MENU key

5. Press BAL key (Optional Feature)

(This optional feature should be use carefully to prevent possible data overwriting. For more details on readings relative to an absolute ZERO, please refer to "Manual Balance" topic in "P-3 Strain Indicator and Recorder Instruction Manual")

3.3.2 FOR "P-3500" READOUT UNIT

Read ANCLO load cell using the P-3500 readout as follows:



1. Select BRIDGE FULL (10) and MULT X1 (9)
2. Connect the cell to the binding posts, P+/- and S+/-
3. Push the RUN button (6) and allow the unit to warm up for a few minutes
4. Push the AMP ZERO button (5) and turn the AMP ZERO (2) adjustment until the display reads ±0000

5. Push the GAGE FACTOR button (7). Set the gage factor switch (3) to the range corresponding to the gage factor calculated earlier, then rotate the fine adjustment knob (4) until the gage factor is displayed on the LCD(1)
6. Push the RUN button (6), and set the coarse (8) and fine (9) adjustment knobs as required to zero the P-3500 display

NOTE: RECORD THE SETTINGS OF BOTH, THE COARSE AND FINE ADJUSTMENT SETTINGS. THESE NUMBERS ARE VERY IMPORTANT! WITHOUT THE INITIAL BALANCE SETTINGS, ACTUAL LOADS CANNOT BE DETERMINED WITHOUT AGAIN UNLOADING THE CELL.

7. The number displayed will be in units U as previously calculated
8. Turn the unit power off

Notes:

A. The gage factor and balance must be individually set prior to reading each cell, these are unique numbers

B. After initial reading is taken:
Adjust balance controls to the values previously recorded

C. A sample field data sheet is provided **TABLE 3**

D. Refer to **TABLE 1** for connecting information

E. Refer to the P-3500 instruction manual for a complete description of the P-3500

3.4 INTERPRÉTATION

3.4.1 FOR "P-3" READOUT UNIT

(For more details on readings relative to an absolute ZERO, refer to "Manual Balance" topic in "P-3 Strain Indicator and Recorder Instruction Manual")

Actual load is obtained following this equation:

$$P = (L - L_o)$$

Where
- L = Current reading in P-3 units
- L_o = Initial reading in P-3 units
- P = Load in units

3.4.2 FOR "P-3500" READOUT UNIT

The AMP ZERO, BALANCE coarse and fine readings must be set and recorded above for both initial and current readings L_o and L.

$$P = (L - L_o)\ U$$

Where
- U = Value of one P-3500 unit value corresponding to G.F. as described above
- L = Current reading in P-3500 units
- L_o = Initial reading in P-3500 units
- P = Load in units of U

3.5 VERIFICATION OF CELL CIRCUIT

The cell circuit may be checked by reading resistance and comparing it with values below:

- Between P+ and P- wires: 700 ohms (1400 ohms when 8 pairs)
- Between S+ and S- wires: idem
- Other combination between wires: 500 ohms
- Between any wire and ANCLO/structure/shield: >1000 Mega ohms

4 MISCELLANEOUS

4.1.1 CONVERSION FACTORS

	To Convert From	To	Multiply By
LENGTH	Microns	Inches	3.94E-05
	Millimetres	Inches	0.0394
	Meters	Feet	3.2808
AREA	Square millimetres	Square inches	0.0016
	Square meters	Square feet	10.7643
VOLUME	Cubic centimetres	Cubic inches	0.06101
	Cubic meters	Cubic feet	35.3357
	Litres	U.S. gallon	0.26420
	Litres	Can–Br gallon	0.21997
MASS	Kilograms	Pounds	2.20459
	Kilograms	Short tons	0.00110
	Kilograms	Long tons	0.00098
FORCE	Newtons	Pounds-force	0.22482
	Newtons	Kilograms-force	0.10197
	Newtons	Kips	0.00023
PRESSURE AND STRESS	Kilopascals	Psi	0.14503
	Bars	Psi	14.4928
	Inches head of water*	Psi	0.03606
	Inches head of Hg	Psi	0.49116
	Pascal	Newton / square meter	1
	Kilopascals	Atmospheres	0.00987
	Kilopascals	Bars	0.01
	Kilopascals	Meters head of water*	0.10199
TEMPERATURE	Temp. in °F = (1.8 x Temp. in °C) + 32 Temp. in °C = (Temp. in °F – 32) / 1.8		

* at 4 °C

E6TabConv-990505

TABLE 2: Conversion Factors.

4.1.2 SAMPLE FIELD DATA SHEET

Model:	**Date:**
Serial number:	**Site:**
Gage factor G.F.:	**Initial no load (balance settings):**
Sensitivity S: mV/V	Coarse:
Load capacity:	Fine:
	Initial no load reading (on LCD display):

DATE	TIME	STRAIN READING U (units)	LOAD P	REMARKS

TABLE 3: Roctest - ANCLO Load Cell Sample Field Data Sheet.

4.1.3 CALIBRATION DATA SHEET

Model: ANCLO

Serial number: kN

Capacity max. excitation: **.....**VDC

Temperature: **.....**˚C

Cable model:

Cable length: **.....**meter(s)

Color code:

Red: Power P+
Black: Power P-
White: Signal S-
Green: Signal S+

First pass		Second pass		Average reading		Linear regression	
Load kN	Output mV/V	Load kN	Output mV/V	Load kN	Output mV/V	Load kN	Error (%F.S.)
	-		-		-		
	-		-		-		
	-		-		-		
	-		-		-		
	-		-		-		

Load cell sensitivity: **mV/V full scale**

Traceability number: Procedure number:
File name:

Calibrated by: _____ Date: _____

4.1.4 WIRING DIAGRAM

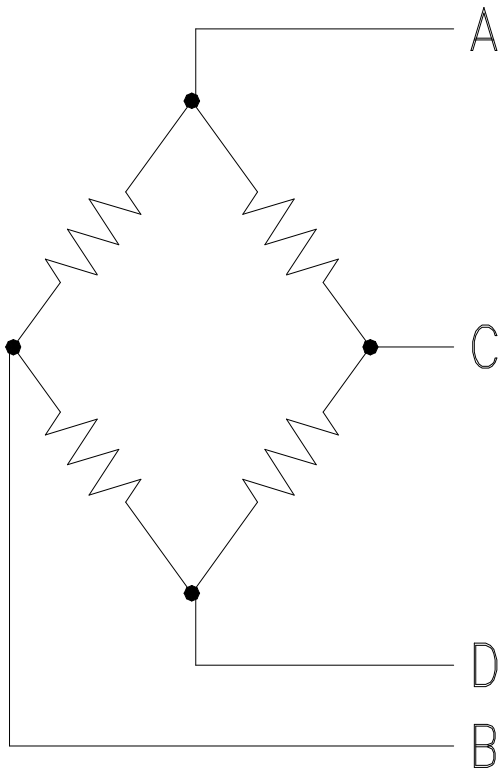


FIGURE 2: ANCLO Load cell wiring diagram (Full Bridge Configuration).