V1.0 July 2020

HYDRAULIC ANCHOR LOAD CELLS

HLC 6000 SERIES

INSTRUCTION MANUAL

CE

GEOSENSE

CONTENTS

1.0 INTRODUCTION

This manual is intended for all users of **Geosense® HLC-6000** series **load cells** manufactured by Geosense and provides information on their installation, operation and maintenance**.**

It is VITAL that personnel responsible for the installation and use of the Geosense® Hydraulic Load Cells READS and UNDERSTANDS the manual, prior to working with the equipment.

1.1 General Description

The primary uses for the **Geosense® HLC-6000 Series Hydraulic Anchor Load Cells** are used for measuring loads acting on:-

- Ground Anchors
- Rock bolts
- Tie backs

Particular features of the **Geosense® HLC-6000 Series Hydraulic Anchor Load Cells** are:-

- Robust stainless steel construction
- Accommodates some eccentric loading
- Reliable long term performance
- Rugged, suitable for demanding environments
- High accuracy
- Data logger compatible

They consist of a sensitive pressure pad formed by joining two stiff steel discs at their periphery. The void inside the cell is filled with de-aired fluid. When load is applied to the cell the pressure of the inside liquid changes. The changes in pressure correspond directly to the load applied.

Manufactured with a centre hole to accommodate anchors, rock bolts and tendons.
The pressure in the loads cell is measured either by a manometer or a vibrating wire transducer (VWDT-5000) which are available in the following models:

HLC-6000 - Manometer (scale in bar for pressure indication)
HLC-6500 - Vibrating wire transducer

1.2 Theory of operation

HLC-6000 Series Hydraulic Anchor Load Cells consist of a sensitive pressure pad. The void inside the cell is filled with de-aired fluid. When load is applied to the cell the pressure of the inside liquid changes. The changes in pressure correspond directly to the load applied.

The pressure inside the loads cell is measured either by a vibrating wire transducer or a

2.0 CONFORMITY

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Rougham, Bury St Edmunds
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Declaration of Conformity

We Geosense Ltd at the above address declare that the equipment detailed below complies with the requirements of the following EU Directive:-

The Electromagnetic Compatibility Directive 2014/30/EU

Restriction on the use of certain Hazardous Substances RoHS2 2017/2102/EU

Waste electrical & electronic equipment WEEE 2012/19/EU

Equipment description: **Hydraulic load cells**
Make/brand: **Geosense**
Model numbers: **HLC-6000, HLC-6500**

Compliance has been assessed with reference to the following harmonised standard:-

EN 61326-1:2006 Electrical equipment for measurement, control and laboratory use.
EMC requirements. General requirements.

EN 61010-2-032:2002
Safety requirements for electrical equipment for measurement, control, and laboratory use.

A technical file for this equipment is retained at the above address

Martin Clegg
Director

Rougham, July 2020

3.0 MARKINGS

Geosense **HLC-6000 Series Hydraulic Anchor Load Cells** are labelled with the following information:-

Manufacturers name & address

Product

Type/Model

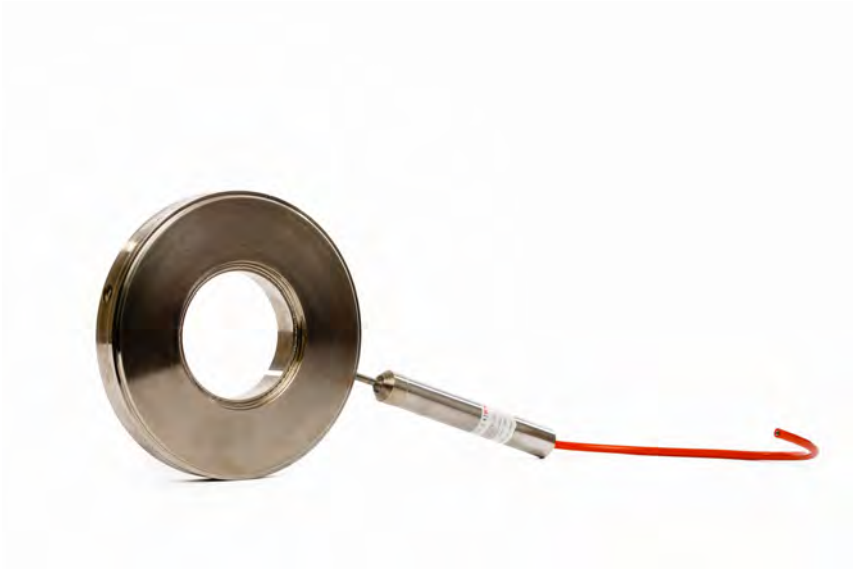
Range

Serial number

CE mark

WEEE mark

HLC-6000 with Manometer



HLC-6500 with VW Transducer

4.0 DELIVERY

This section should be read by all users of the **HLC-6000 Series Hydraulic Anchor Load Cells** manufactured by Geosense.

4.1 Packaging

HLC-6000 Series Hydraulic Anchor Load Cells are packed for transportation to site. Packaging is suitably robust to allow normal handling by transportation companies. Inappropriate handling techniques may cause damage to the packaging and the enclosed equipment. The packaging should be carefully inspected upon delivery and any damage MUST be reported to both the transportation company and **Geosense®**

4.2 Handling

Whilst they are a robust devices, **HLC-6000 Series Hydraulic Anchor Load Cells** are precision measuring devices. They and their associated equipment should always be handled with care during transportation, storage and installation.

Once the shipment has been checked it is recommended that **Geosense® Vibrating wire load cells** remain in their original packaging for storage or transportation.

Cable should be handled with care. Do not allow it to be damaged by sharp edges, rocks for example, and do not exert force on the cable as this my damage the interim conductors and render the installation useless.

4.3 Inspection/functionality

It is vital to check all the equipment in the shipment as soon as possible after taking delivery and well before installation is to be carried out. Check that all the components detailed on the documents are included in the shipment. Check that the equipment has not been physically damaged.

ALL **HLC-6000 Series Hydraulic Anchor Load Cells** carry a unique identification serial number which is located on the cable connection block.

All **HLC-6000 Series Hydraulic Anchor Load Cells** are supplied with individual calibration sheets that include their serial numbers and these will shipped with them.

Calibration Sheets contain VITAL information about the Geosense® Vibrating wire load cells. They MUST be stored in a safe place. Only copies should be taken to site.

4.3 Inspection/functionality contd...

Calibration Sheets contain VITAL information.
They MUST be stored in a safe place.
Only COPIES of calibration certificates should be taken to site
The original certificates should be stored safely.

4.3.1 Vibrating wire transducer

CHECK the VW transducer readings against the factory 'Zero Readings' on arrival to ensure they have not changed significantly due to damage during transportation. This is a basic 'out of the box' functional check.

Prior to carrying out a reading check, ensure that the load cells have been stored in a reasonably stable temperature for at least 30 – 60 minutes.

To carry out the check, connect a Vibrating Wire readout to the bare cable ends (Red connector to Red wire and Black connector to Black wire) – The Green and White connectors / wires are for the temperature sensor and are not required for this checking exercise - see the readout manual for connection guidance.

Record the values (and units) displayed on the readout together with the load cell serial numbers.

The "CHECK" readings should coincide with the factory zero on the calibration sheet (see the example calibration sheet in Section 9) within +/- 50 digits after barometric and temperature corrections are made.

The elevation of the **Geosense®** factory is +60 metres above sea level and barometric pressures change with altitude by approximately 1.2kPa per 100 metres.

4.3.2 Pressure gauge/manometer

Check the gauge offset is at zero

The 'CHECK Readings WILL be affected by changes in atmospheric pressure and temperature changes.

4.4 Storage

All **HLC-6000 Series Hydraulic Anchor Load Cells** and associated equipment should be stored in an environment that is protected from direct sunlight.

It is also recommended that cables be stored in a dry environment to prevent moisture migrating along inside them in the unlikely event of prolonged submersion of exposed conductors. The cables should also be protected from rodents and traffic.

5.0 INSTALLATION

This section of the manual is intended for all users of **HLC-6000 Series Hydraulic Anchor Load Cells** manufactured by **Geosense®** and is intended to provide guidance with respect to their installation.

It is VITAL that personnel responsible for the installation and use of the Geosense® HLC-6000 Series Hydraulic Anchor Load Cells READS and UNDERSTANDS the manual, prior to working with the equipment.

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As stated before, it is vital to check all the equipment in the shipment soon after taking delivery and well before installation is to be carried out. Check that all components that are detailed on the shipping documents are included.

5.1 General Issues

- Note serial number against location
- Mark cables for future identification. Use an appropriate coding system and mark cables at frequent intervals, not just at the ends.
- Protect the ends of the signal cable. Cables should be terminated at a waterproof box or with waterproof connectors.

5.2 General considerations

Ensure that the internal diameter of the cell is correct for the anchor strands or bolt head.

Ensure that the capacity of the cell is sufficient for the anchor including the tensioning.

Provide support brackets where necessary to ensure the load cell is kept centralised during installation.

5.3 Mounting surfaces

Mounting surfaces should be flat and parallel for optimum performance the mounting surface MUST be flat and perpendicular toi the direction of loading (anchor or rod). Very stiff abutment plates and load distribution plates is recommended.

The abutment plate (provided locally) is normally made to suit specific site requirements and the load distribution plate (supplied by Geosense) should be I inserted between the load cell and the anchor head (see next page)

5.3 Mounting surfaces contd…

Details shown below are for a typical installation but conditions may vary from site to site.

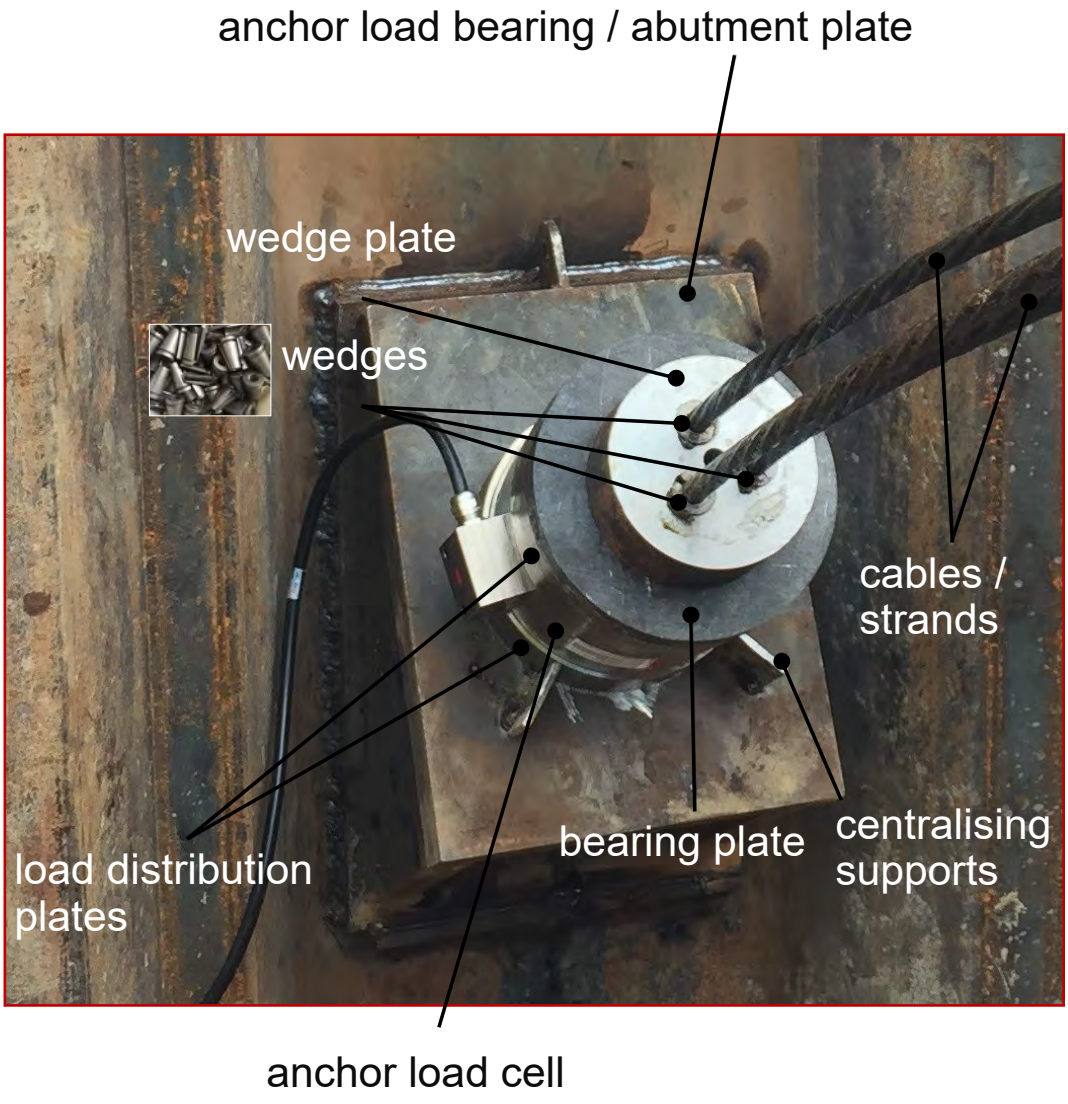
Before installing the following conditions should apply

The applied load must be perpendicular, centered, and uniform over the Load Cell surface.

Avoid load concentrations.

Make sure loading surfaces are accurately levelled and parallel.

If necessary fabricate an anchor load bearing/abutment plate



5.4 Installation

STEP 1

Place the Bearing Plate (optional) over the tensioning member(s) and onto the loading surface abutment plate

STEP 2
Lower the Load Cell over the tensioning member(s) and onto the loading surface (abutment plate)

TAKE A ZERO LOAD READING (SEE DATA HANDLING FOR VW)

STEP 3
Lower the Distribution Plate over the tensioning member(s) and onto the VW Hydraulic Load Cell

MAKE SURE THE LOAD CELL IS SUPPORTED & CENTRALISED

5.4 Installation contd...

STEP 4

Place the Wedge Plate over the tensioning member(s) and onto the load distribution plate and additional top load plate (optional)

STEP 5
Slowly lower the tensioning jack over the tensioning member(s)

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5.4 Installation contd...

STEP 6

Carefully lower the tensioning Jack onto the load distribution plate or top load plate where applicable

STEP 7

Tension the strands as required and take readings from the VW transducer or manometer as necessary

TAKE CARE NOT TO OVER RANGE THE LOAD CELL

If required protect the installation with a suitable cap

6.0 DATA HANDLING

The function of the instrument is to provide useful and reliable data. Accurate recording and handling of the data is essential if it is to be of any value.

6.1 Monitoring the Load Cell Readings

Geosense® HLC-6000 Series Hydraulic Anchor Load Cells contain a temperature sensor within the VW transducer. Where a load cell is installed in a zone where its temperature is likely to fluctuate significantly, records of both load and temperature data should be used to assess any affects that temperature have on the data (see section 6.6).

6.2 Portable Readouts

Geosense offer a range of readout and data logging options. Specific operation manuals are supplied with each readout device.

Below is a brief, step-by-step procedure for use with the **Geosense® VWR-1** portable readout.

1. Connect signal cable from the sensor to the readout following the wiring colour code. Conductor colours may vary depending upon the extension cable used. Commonly these are:

RED	=	VW +
BLACK	=	VW -
GREEN	=	Temp
WHITE	=	Temp

2. Press the ‘On/Off’ button to switch the unit on. Press it again to acquire a reading from the connected instrument.

3. The readout displays the Vibrating Wire readings in both ‘Frequency’ (in Hz) and Linear ‘B’ Digits (in $Hz^2/1000$). Temperature reading in both resistance (Ohms) and degrees C.

   For more details see the readout manual.

4. Press and hold down the On/Off’ button to switch the unit off.

Whilst it is not critical that the polarity be observed for most Vibrating Wire instruments, a better signal may be obtained if the correct polarity is adopted. Since the temperature sensor is a Thermistor, its connection polarity is not important.

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6.3 Data Reduction

6.3.1 Overview

Readings from a Vibrating Wire Transducer are in a form that is a function of frequency, rather than in units of pressure. Commonly the units would be either **Frequency** - Hz, **Linear B Digits** - $Hz^2/1000$ or $Hz^2/1000000$ **Linear B Digits** are required for all calculations.

To convert the readings to units of pressure some calculation is required. Calibration factors must be applied to the recorded values. For most Vibrating Wire sensors, these factors are unique and are detailed on the individual sensor calibration sheets. A unique calibration sheet is supplied with every **Geosense®** Vibrating Wire Transducer.

If the readout displays 'Frequency' values, (e.g. 2768.5 Hz) only a simple calculation is required to convert the readings to Linear Digits.

$$\text{Linear Digits } (Hz^2/1000) = (2768.5)^2 / 1000$$
$$= 7664.6$$

Certain data loggers store their Vibrating Wire data in Linear Digits but further divided by 1000. In this case the data would have to be multiplied by a further 1000 to maintain the standard Linear Digits ($Hz^2/1000$) format for standard calculations.

The first step to producing an engineering value is to convert the reading to Linear Digits ($Hz^2/1000$). An example of this calculation can be seen on the next page.

(1) Readout Display = 0.03612

$$\text{Linear Digits } (Hz^2/1000) = (1 / 0.03612 \times 10^{-2})^2 / 1000$$
$$= 7664.8$$

(2) Readout Display = 3612

$$\text{Linear Digits } (Hz^2/1000) = (1 / 3612 \times 10^{-7})^2 / 1000$$
$$= 7664.8$$

6.3.1 Data Reduction overview contd...

An instrument calibration sheet similar to the example in the Section 6.6 of this manual includes the following information:

Model	This refers to the Geosense model number.
Serial Number	This is a unique sensor identification number that can be found on the load cell body and, for long cables, at the end of the cable.
Works ID	Unique works batch and range code
Cal Date	Date the calibration was performed
Baro	Barometric Pressure at the time of calibration
Temp °C	Temperature at which the load cell was calibrated
Applied Pressure	Pressure applied to the transducer as part of the calibration cycle
Readings [digit]	Readings from the transducer as pressure is applied and as pressure is reduced, in steps. The average is calculated.
Calculated Pressure	Calculation of the applied pressure using the calculated 3rd order Polynomial for comparison with the actual Applied Pressure.
Error % FSO	Non Linearity expressed as a percentage of the transducers Full Scale.
Calibration Factors	‘‘Polynomial’ factors are provided for conversion to kN

An example of the calculation from Linear Digits ($Hz^2/1000$) to kN using a polynomial equation is given below:-

Calibration Factors for kN

A = - 5.14962E-10
B = 1.1669E-5
C = - 0.333375086
D = 2599.399697

Current Reading in Linear Digits = 8475

Equation

$$\text{Load in kN} = [\, A \times (\text{Reading})^3 \,] + [\, B \times (\text{Reading})^2 \,] + [\, C \times \text{Reading} \,] + D$$

$$= [-5.14962E\text{-}^{10} \times (8475)^3] + [1.1669E\text{-}5 \times (8475)^2] + [-0.333375086 \times 8475] + 2599.399697$$

$$= -313.468787 + 838.133218 + -2825.353854 + 2599.399697$$

$$= 298.710 \text{ kN}$$

6.5 CALIBRATION

Vibrating Wire

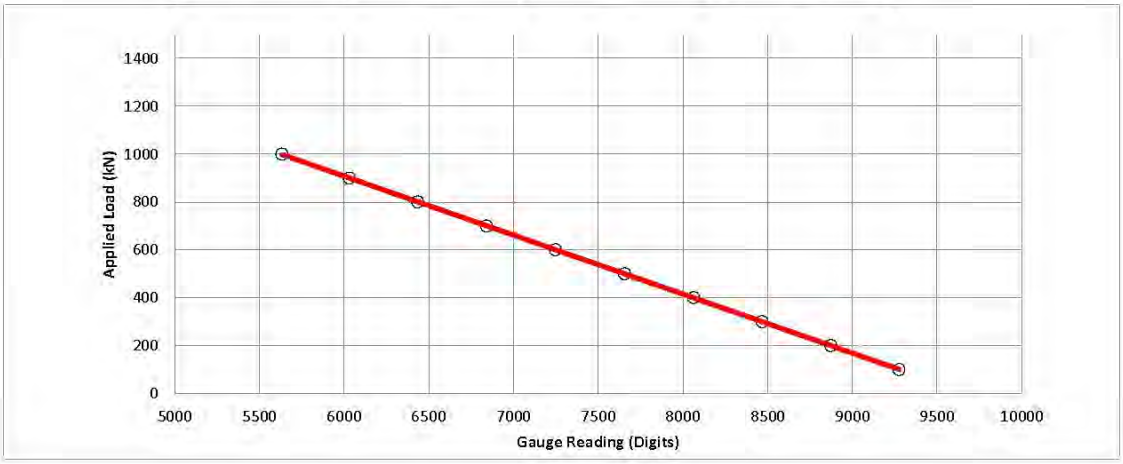
GEOSENSE QUALITY FORM
Form No G/QF/140B
ISS: 3
DATE: August 19
SIG: GC

VW HYDRAULIC LOAD CELL CALIBRATION

Model:	HLC 6500	Temp:	20°C
Serial No:	650152	Date:	20/12/2019
Capacity (kN):	1000		

Test Data:

Input Load	Output (Digits)	Theoretical Load	Error
kN	Cycle	kN	%F.S
0.00	9636.7	-	-
100.00	9276.9	99.82	-0.02%
200.00	8873.8	200.13	0.01%
300.00	8468.0	300.44	0.04%
400.00	8064.4	399.74	-0.03%
500.00	7656.6	499.81	-0.02%
600.00	7248.1	600.01	0.00%
700.00	6842.0	699.77	-0.02%
800.00	6434.6	800.21	0.02%
900.00	6030.9	900.31	0.03%
1000.00	5632.8	999.77	-0.02%



Note: Digits are $Hz^2 * 10^{-3}$ units.

a	b	c	d
-5.14962E-10	1.1669E-05	-0.333375086	2599.399697
Where Y=ax^3+bx^2+cx+d			

Approved By

Calibration With Force Standard Equipment No 099 Certificate No 01764 17F, Calibration With Voltage Equipment Standard No 111 Certificate No TE111-18, Traceability to National Standards, Certificate Ref No 21130

THIS CERTIFICATE IS VALID ONLY WHEN CARRYING THE OFFICIAL ORIGINAL STAMP OF GEOSENSE

6.5 CALIBRATION contd...

Pressure gauge/Manometer

GEOSENSE

GEOSENSE QUALITY FORM
Form No G/QF/140B
ISS: 2
DATE: MAY 18
SIG: GC

CALIBRATION CERTIFICATE

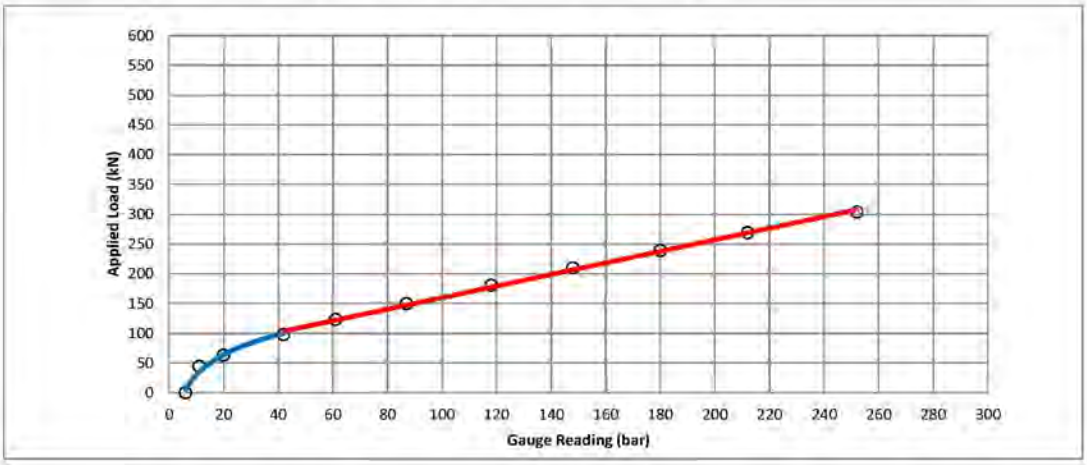
HLC-6000 SERIES

Model:	HLC 6000
Serial No:	1916003
Capacity (kN):	300

Temp:	21°C
Date:	05/02/2019

Test Data:

Input Load kN	Output (bar) Cycle	Theoretical Load kN	Error %F.S
0.10	6	-	-
44.39	11	47.20	0.92%
63.32	20	62.08	-0.41%
97.57	42	95.22	-0.77%
122.84	61	120.57	-0.75%
149.58	87	151.17	0.52%
180.33	118	182.90	0.84%
209.51	148	210.36	0.28%
238.99	180	238.08	-0.30%
268.48	212	266.22	-0.74%
303.92	252	305.14	0.40%



Polynomial Factor (kN) X Gauge Reading

a	b	c	d
1.05667E-05	-0.005502892	1.815969232	27.87412573

Where Y=ax^3+bx^2+cx+d

Approved By

The calibration has been made according to the quality management system ISO 9001:2015
Metroligical Chain: 3000kN Compact-Line Press Digimax Semiautomatic SN: 14006009
Pressure Treansmitter Gefran SN: 3195385
Multifunction Calibrator Fluke 715 SN: 2868197

THIS CERTIFICATE IS VALID ONLY WHEN CARRYING THE
OFFICIAL ORIGINAL STAMP OF GEOSENSE

Geosense Ltd . Nova House . Rougham . Bury St Edmunds . Suffolk . IP30 9ND . England

Tel: +44(0)1359 270457 . Fax: +44(0)1359 272860 . Email: info@geosense.co.uk . www.geosense.co.uk

6.6 Temperature Considerations

The environment which **HLC-6000 Series Hydraulic Anchor Load Cells** are often installed in environments that are subjected to significant variations in temperature and these changes will affect their readings.

Thermal influences are complex because it is not only the load cell that is affected but the element to which it is attached and whole structure that is affected. The rate of temperature change and the distribution of the thermal gradients also play a major part in influencing the actual load at any point and its effect on the load cell and its readings.

Consequently, in order to apply any correction for temperature it is necessary to first establish the effects of the temperature changes on the load cell and the medium in/on which it is installed.

A useful exercise to carry out on site to establish the in-situ effects of temperature changes is to observe the installed load cell readings, together with both ambient and cell temperatures, when no other factors are changing. This should be carried out prior to any loading or other structural changes / works are carried out.

An alternative, is to use a ‘No load”, load cell installed close to the monitoring cells. This will enable an assessment of temperature affects on the cell itself in the working environment for a particular location. For further discussion about ‘No load”, load cells please contact **Geosense®.**

For HLC-6000 series load cells fitted with a manometer engineering judgement will be required to understand any temperature effects.

7.0 MAINTENANCE

Geosense® HLC-6000 Series Hydraulic Anchor Load Cells are basically maintenance free device for most applications but the following should be considered during the service life:-

- Keep away from direct sunlight to avoid large thermal affects
- Keep the cable connection cap on when Readout not connected
- Avoid any impacts or significant vibration which can damage internal sensors
- Keep cables away from physical damage
- Keep cable ends waterproof

8.0 TROUBLESHOOTING

Unexpected readings

The following are common scenarios which lead to the readings and performance of load cells being questioned.

The reading taken on the Jack is taken at a different time from that taken on the load cell

The strand is tensioned using the jack, the locking collets are then replaced and the anchor left to take the load. It is at this point the load on the installed permanent cell is read and does not equate the load in the Jack prior to release. This is because of the Young's modulus of the anchor and all the slight play in the fixtures and fittings of the system that cause elasticity in the system, it is the release of the stored energy in the system whilst transferring load to the anchor and so at the same time through the load cell that cause this indifference. It is not the fault of the load cell installed but merely a part of the stressing process that is overlooked due to a lack of knowledge that trusting the instruments will help provide. It is recommended to carry out Lift Off Testing for cell reading versus jack reading to identify any loss of load transfer.

The use of a jack which is much longer than the squat load cells

This is more prone to inaccurate measurement of the loading due to eccentric loading causing the system more likely to contain bending moment in the system and so likely to cause friction between the ram and the seal, otherwise known as binding of the seal of the Jack. This will cause the loading to be over registered by the Jack. Unfortunately this is often understood as under registering load by the load cell. It is worth noting that each cell has been individually calibrated before despatch and not touched since while the ram has probably been used on site to install hundreds of anchors since its last cal date and so its calibration data must also be viewed as less valid.

8.0 TROUBLESHOOTING contd...

The ram size varies from the load cell size

This causes bending of the distribution plate which in turn causes over or under measurement of load depending on the ratios on the cell to jack area. There are two feasible ways to overcome this:-

i) Match the cell and jack ram sizes to each other. This is perhaps not the easiest solution as they will often have to be what is available.

ii) Make sure that suitably thick distribution plates are being used so that load will be distributed to the load cell as a UDL (Uniformly distributed load).

VW Load cell is giving unstable readings

- Are the readings alright with a different readout? If yes then suspect low battery
- Are the strain readings outside the range of the load cell (overloading)?
- Is there a source of electrical noise nearby such as a generator or motor?
- Is there any significant temperature effect?
- Is the correct swept frequency being used (readout or data logger)?

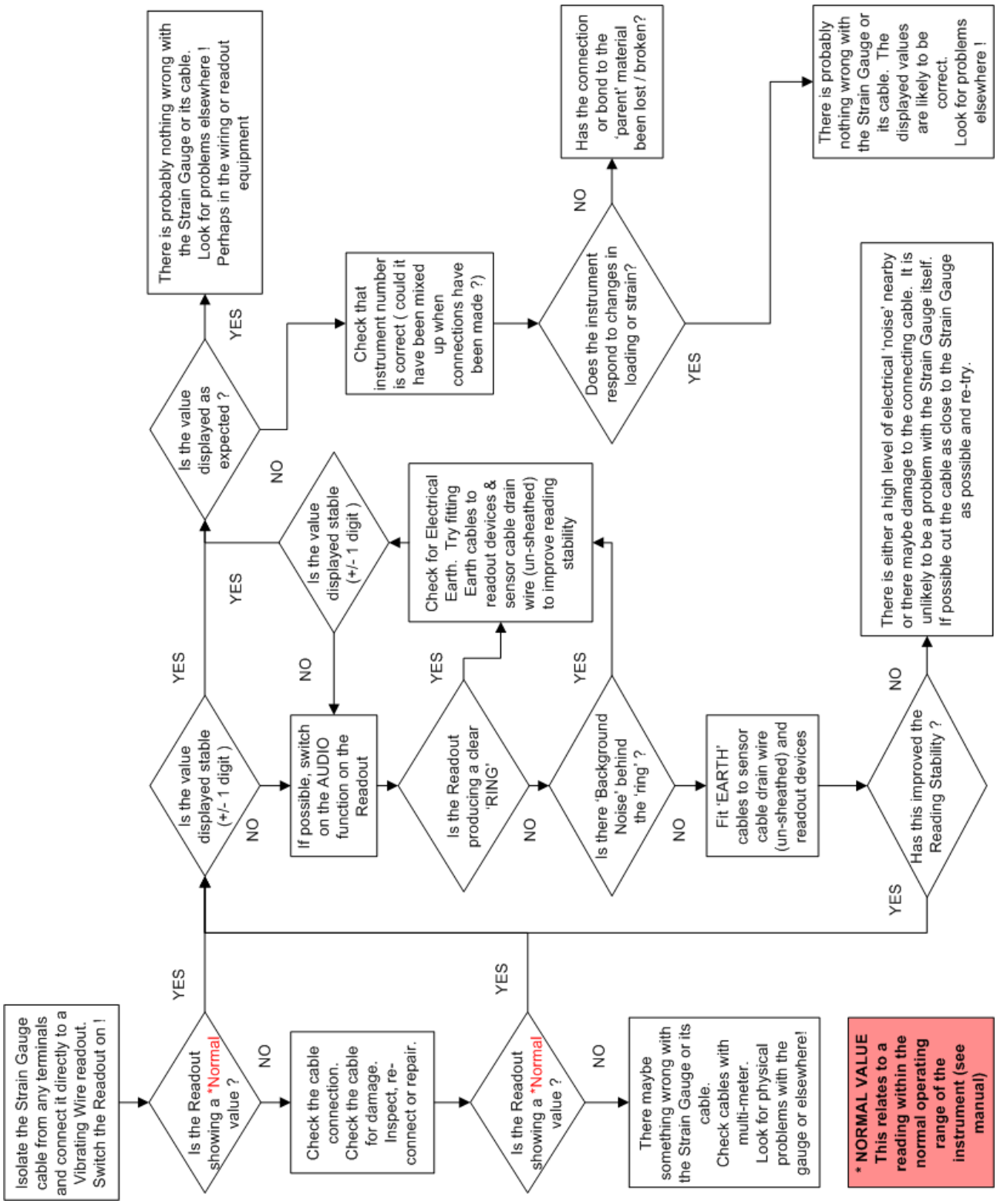
Manometer

- Where manometer fitted check for damage Check for leaks on the cell

8.0 TROUBLESHOOTING contd...

It is generally accepted that when a Vibrating Wire instrument is producing a stable reading on a suitable readout, the value will be correct. Only on very rare occasions will this be untrue.

In almost all cases, a fluctuating reading is a sign of a faulty signal from the sensor. The fault could be in either the sensor, the connecting cable, any switch boxes or the readout. The best way to fault find an instrument is to isolate it from all other instruments and connections. Where possible begin fault finding from the sensor itself.



9.0 SPECIFICATION

Description	HLC-6000	HLC-6500
Over range capacity	20% FS	20% FS
Resolution	10 kN class 1,0 ±1 %	0.5% FS
Accuracy	<1% FS[1]	<1% FS[1]
Temperature range	-30°C to + 85°C	-30°C to + 85°C
Material	High tensile, stress relieved steel	High tensile, stress relieved steel
Output signal	Manual	Frequency

[1] based on 3rd order polynomial

STANDARD DIMENSIONS other available on request)

Capacity (kN)	Internal diameter (mm)	Outside Diameter (mm)	Load Cell Height (mm)	Load distribution plate height (mm)
250	40	140	30	30
500	71	170	30	30
750	92	205	30	30
1000	110	235	30	30
1500	150	320	30	30
2000	210	405	30	30

10.0 SPARE PARTS

Geosense® HLC-6000 Series load cells do not have any replaceable parts.

11.0 RETURN OF GOODS

11.1 Returns procedure

If goods are to be returned for either service/repair or warranty, the customer should contact **Geosense®** for a **Returns Authorisation Number,** request a **Returned Equipment Report Form QF034.** Numbers must be clearly marked on the outside of the shipment.

Complete the **Returned Equipment Report Form QF034**, including as much detail as possible, and enclose it with the returned goods.

11.1.1 Chargeable Service or Repairs

Inspection & estimate
It is the policy of **Geosense®** that an estimate is provided to the customer prior to any repair being carried out. A set charge for inspecting the equipment and providing an estimate is also chargeable.

11.1.2 Warranty Claim

(See Limited Warranty Conditions)
This covers defects which arise as a result of a failure in design or manufacturing. It is a condition of the warranty that the **Geosense® Geosense® HLC-6000 Series** load cells must be installed and used in accordance with the manufacturer's instructions and has not been subject to misuse.

In order to make a warranty claim, contact **Geosense®** and request a **Returned Equipment Report Form QF034.** Tick the warranty claim box and return the form with the goods as above. You will then be contacted and informed whether your warranty claim is valid.

11.2 Packaging and Carriage

All used goods shipped to the factory **must** be packed in a suitable carton. If the original packaging is not available, **Geosense®** should be contacted for advice. **Geosense®** will not be responsible for damage resulting from inadequate returns packaging or contamination under any circumstances.

11.3 Transport & Storage

All goods should be adequately packaged to prevent damage in transit or intermediate storage.

12.0 LIMITED WARRANTY

The manufacturer, **Geosense Ltd**, warrants the **Geosense® HLC-6000 Series Hydraulic Anchor Load Cells** manufactured by it, under normal use and service, to be free from defects in material and workmanship under the following terms and conditions:-

The **Geosense® HLC-6000 Series Hydraulic Anchor Load Cells** shall be installed in accordance with the manufacturer's recommendations.

The equipment is warranted for 2 years from the date of shipment from the manufacturer to the purchaser.

The warranty is limited to replacement of part or parts which, are determined to be defective upon inspection at the factory. Shipment of defective part or parts to the factory shall be at the expense of the Purchaser. Return shipment of repaired/replaced part or parts covered by this warranty shall be at the expense of the Manufacturer.

Unauthorised alteration and/or repair by anyone which, causes failure of the unit or associated components will void this **LIMITED WARRANTY** in its entirety.

The Purchaser warrants through the purchase of the Geosense® HLC-6000 Series Hydraulic Anchor Load Cells that he is familiar with the equipment and its proper use. In no event shall the manufacturer be liable for any injury, loss or damage, direct or consequential, special, incidental, indirect or punitive, arising out of the use of or inability to use the equipment sold to the Purchaser by the Manufacturer.

The Purchaser assumes all risks and liability whatsoever in connection with the **Geosense® HLC-6000 Series Hydraulic Anchor Load Cells** from the time of delivery to Purchaser.

VIBRATING WIRE ANCHOR LOAD CELLS
HLC-6000 SERIES

Nova House . Rougham Industrial Estate . Rougham . Bury St Edmunds . Suffolk . IP30 9ND . England .

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