

DCS Continuous Capacitive Liquid Level Sensor

The Deeter Capacitive Sensor (DCS) is a reliable alternative to our range of float switches, specifically designed for use in cryogenic applications.



Features Include:

- Microprocessor Based Pulse – Counting Technology
- Probe Lengths can be made to measure to suit specific applications – maximum 6m
- Suitable for non-conductive liquids only.
- Easy Push Button Set-up of Span and Zero Points.
- Zero-low maintenance required.
- Also available with ATEX/ IECEx Ia certification. Please contact the sales office for more information.

Specifications

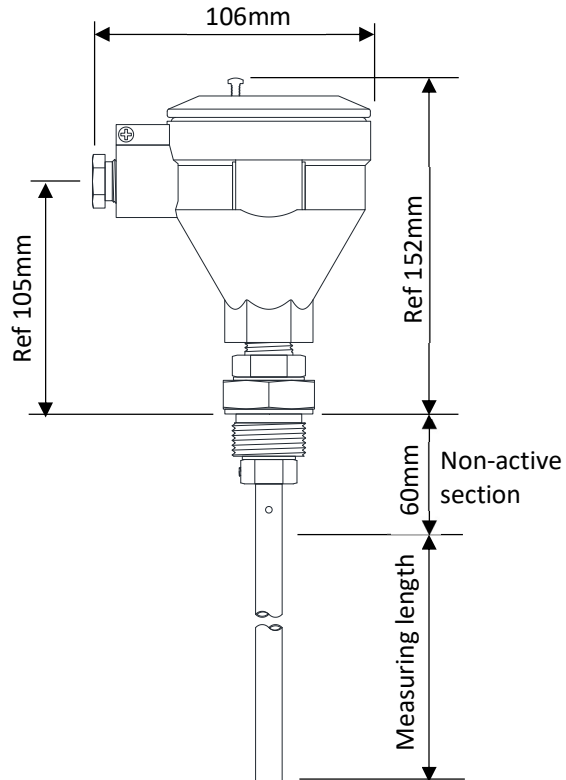
ELECTRICAL DATA	
Operating Voltage	15 - 30VDC
Operating Current	< 50mA
Stem Capacitance (Air)	< 150pF /m
Resolution	< 2mm +/- 0.5mm
Operating Temperature (Head)	-20°C to +65°C
Stem Temperature (Standard Version)	-40°C to +120°C
Stem Temperature Limits (Wide-temp Version)	-200°C to +200°C
Output Accuracy	±1% @ 50% full scale deflection (20°C)
Current Output Signal 1 two wire	4 - 20mA
Voltage Output Signal 2 two wire	0 - 10Vdc
Zero, Span	4 - 20mA
Calibration (Zero, Span)	Stored in non-volatile memory
Dielectric Constant of Liquid (- ε -)	> 1.4
Response time (currently)	1000ms
Response time (enhanced)	250ms / 500ms
MECHANICAL DATA	
Max Operating Pressure (1" thread at ambient temp)	10 Bar
Enclosure Rating	IP66 / IP68
Electrical Connections	Screw Terminals
Head Material	Aluminium (316L version available)
Stem Material	316L Stainless Steel
Other wetted parts	PTFE
Maximum Stem length	Up to 3m (for lengths > 6m contact Sales)
Mounting Orientation	Vertical
Cable Entry	M20 x 1.5p with cable gland fitted for 6-8mm cable
Mounting Thread	1" BSP Parallel (standard, other threads available)
EMC Standards	EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4, EN61000-4-2

All electrical equipment should be installed by a qualified/certified electrician.

Deeter Electronics Ltd follows a policy of continual development of its products and reserves the right to change specifications and/or features without notice.

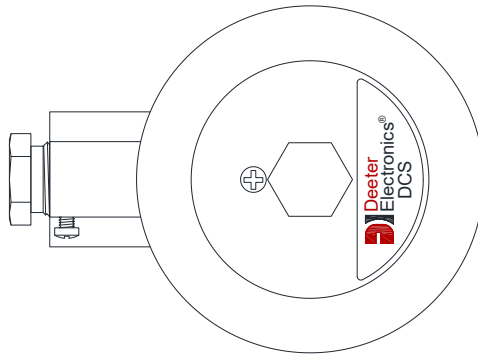
Dimensions

The DCS can be ordered with any length of sensor stem up to 5975mm (19' 7¼"). The stem length is the active measuring length of the sensor and should not be confused with the stem depth. The stem depth is 60mm longer and includes the non-active section above the sensing length. The stem depth (measuring +60mm) is the length from the shoulder of the mounting thread to the end of the stem probe. Non-standard mounting may have a different length of non-active section.



Identification

The sensor bears a single label on the lid identifying the manufactures name and the letters 'DCS'. The label does not include the stem length.



Operation

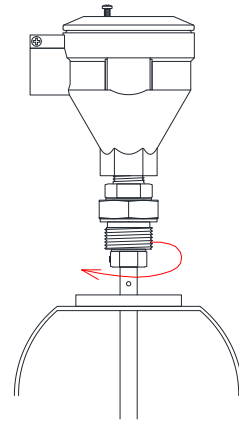
The DCS is suitable for measuring non viscous liquids with a dielectric constant (also known as relative permittivity) shown in the tabulated data above. Liquids with a dielectric constant below this value will conduct electricity and prevent the sensor from reading the capacitance ratio required to make an accurate level reading. Viscous liquids may produce a delayed level reading, block the sensor stem and eventually dislodge the internal stem spacers.

The sensor stem is constructed from a stainless steel 316 tube around a stainless steel 316 solid rod. The rod is held central inside the tube using a PTFE spacer with cut outs to allow the liquid to flow inside the tube. A breather hole at the top of the stem equalises the air pressure.

Mounting

The DCS sensor is normally mounted by screwing the 1" BSP parallel male thread into the top of the tank/vessel using a spanner on the 41.2mm (1-5/8") hexagon. Do not tighten using the smaller thread adaptor or hexagon section on the aluminium head.

Where necessary an elastomer washer or bonded seal suitable for the liquid and environment can be fitted. The DCS can be mounted at an angle from vertical. The liner output can be adjusted to compensate for the difference between the perpendicular height and the stem measuring length in calibration and setup procedure below.



A DCS with a short sensing length can be mounted horizontally to give a binary level indication. When mounting horizontally ensure the breather holes aligns vertically to allow the liquid to drain from both the top and bottom of the stem.

The DCS stem is constructed from stainless steel, PTFE and epoxy resin to withstand extreme temperatures and most chemicals. The plant manager/engineer must confirm suitability of these materials in your process liquid and temperature range.

Fast moving or frequently changing liquid direction may bend or cause metal fatigue at the top of a long DCS stem. Baffles should be installed to shield the stem if required.

A fast draining tank containing a viscous liquid may dislodge the stem spacers. A stillage tube with a small drain hole should be installed to slow the liquid level change if required.

The DCS must not be mounted where the stem will be subject to vibration or shock. The effect of water hammer should also be considered.

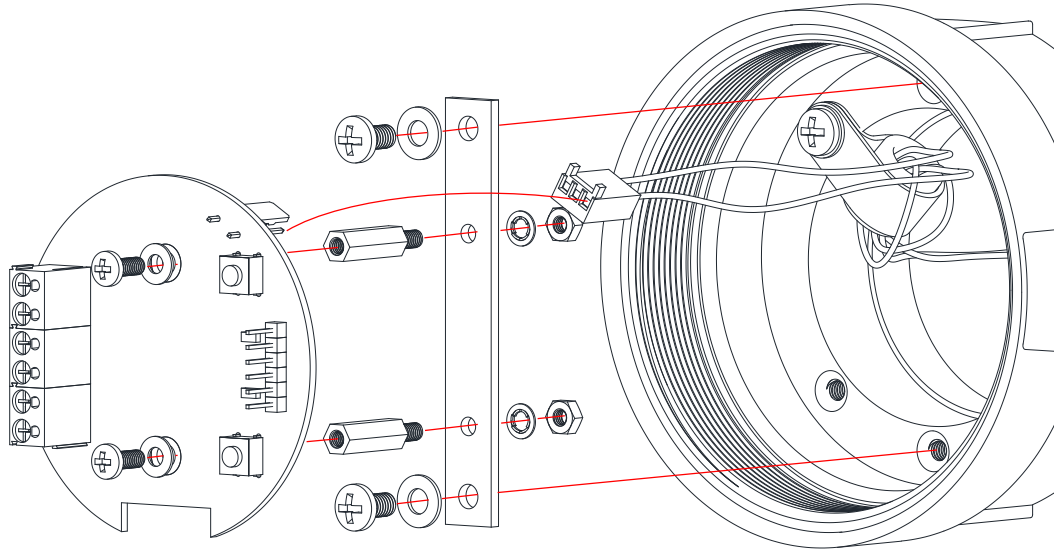
The circuit board contained in the head is thermally insulated from the stem process temperature, however ventilation may be required to ensure the head does not exceed -20°C or +85°C.

Wiring

Unscrew the top of the DCS head by hand or using a 19mm (3/4") Allen key.

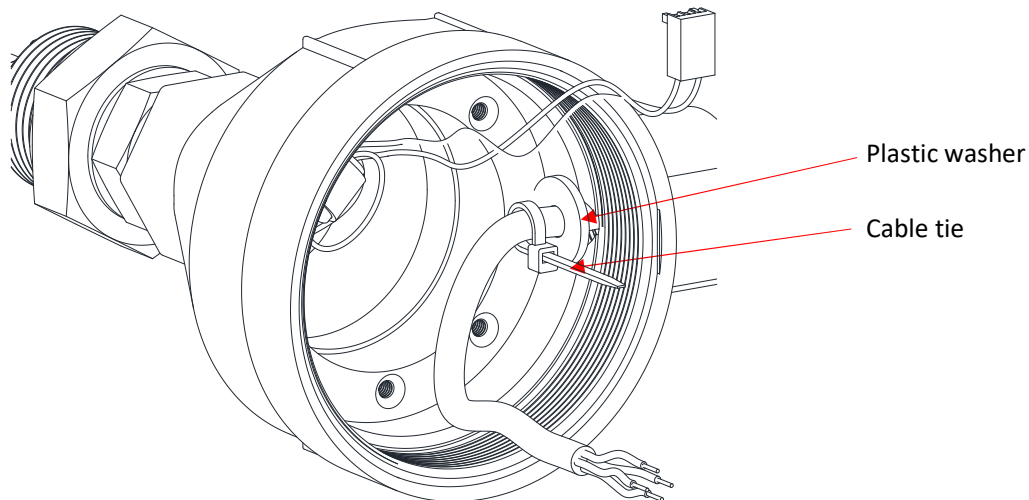
It is normally best to remove the circuit board from the head while wiring the DCS. Anti-static handling of the control board should be observed. To remove the control board unscrew the two M3 screws retaining the board and pull off the two wire connector.

Unless a simple un-grounded approach is required remove the bridge that's used to support the control circuit in the head by unscrewing the two M4 screws holding it to the head.



The DCS head is provided with a cable gland for cable diameters between 6 and 8mm. For smaller diameters cable, replaced with a suitable sized M20x1.5 gland.

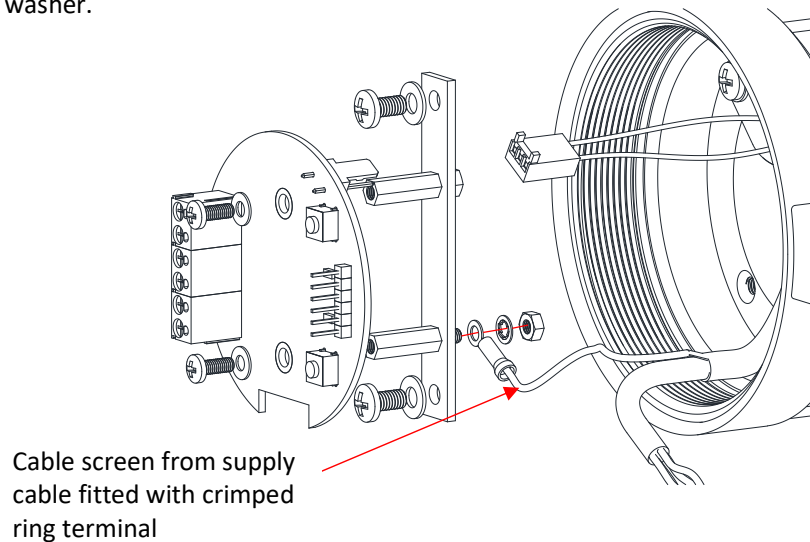
Feed the connecting cable through the gland and through the plastic washer which will be used later with a cable tie to make a cable restraint.



To reduce the effects of EMC (Electromagnetic Compatibility) in an industrial environment the DCS control circuit can be earthed by connecting to either a screened supply cable or by connecting to an earthed tank/vessel via the DCS chassis.

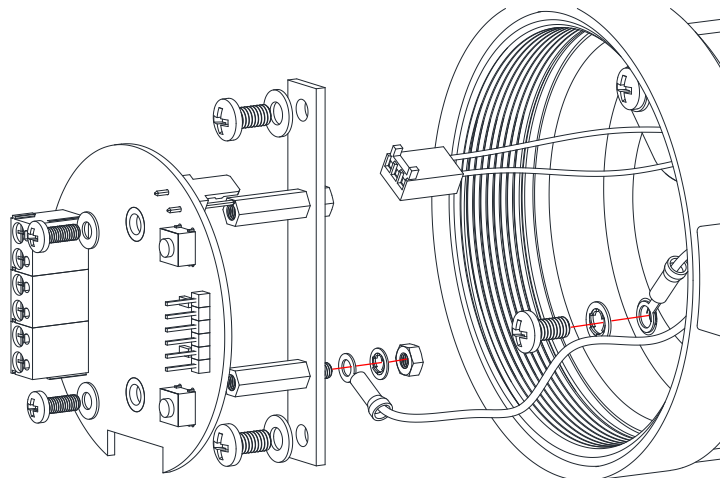
1) Screened cable:

Crimp the ring terminal provided to the cable screen before fixing the ring to the base of one of the metal pillars supporting the control board. To avoid causing a short circuit on the control board the screen wire must be fixed to the base of the metal pillar using the M3 nut and washer.



2) Tank earth:

Using the link wire provided connect it to the terminal head using an M4 screw and washer. Connect the other end to one of the metal pillars supporting the control board. To avoid causing a short circuit on the control board the link wire must be fixed to the base of the metal pillar using the M3 nut and serrated washer.



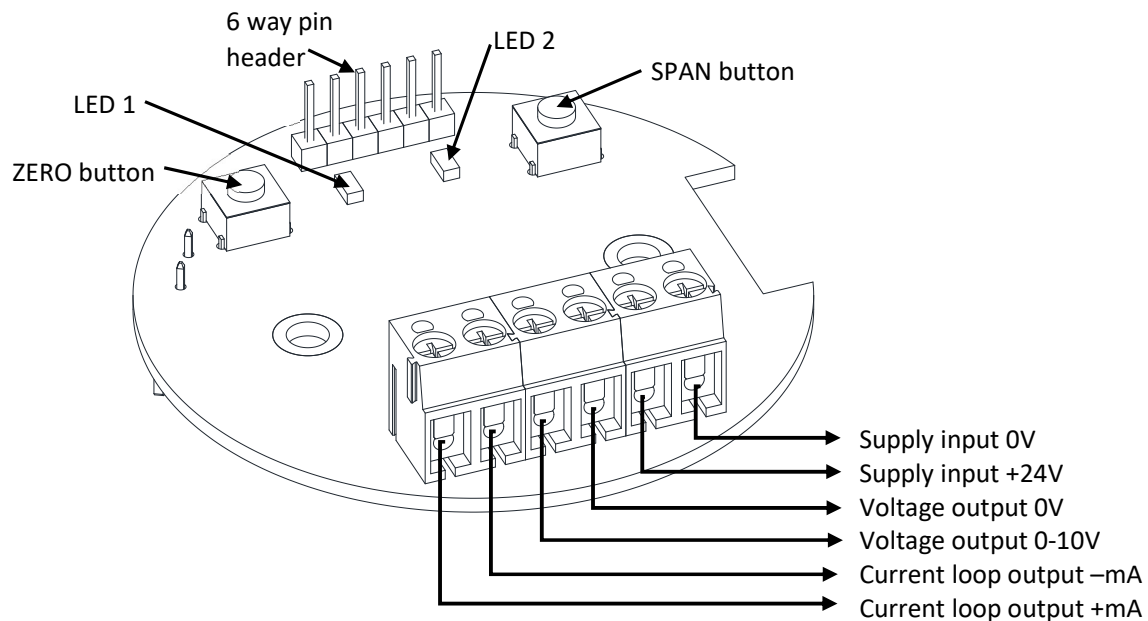
If required, both the cable screen and chassis may be connected to the metal pillars as described above.

Circuit board connections.

The 6 screw terminals can each accept a 22 to 14AWG (0.32 to 2.1mm² wire).

Strip 4 to 5mm of insulation from the wire ends before inserting into the terminal opening and tightening the screw.

Do not make any connection the 6 way pin header.



The sensor outputs the liquid level as a varying voltage or varying current.

Connection can be made to voltage, current or both voltage and current outputs.

Once all connections are made,

Re-assemble the circuit board support bridge (with earth wire attached) using two M4 screws and serrated washer.

Re-connect the 2 wire sensor plug the 2 pin header on the back of the circuit board.

Adjust cable length inside the head and tighten the tie wrap to form a cable clamp.

Re-assemble the circuit board on to the two metal posts using two M3 screws and flat washers.

Setup and calibration

The DCS sensor has been factory set to measure a liquid with a known resistivity. It is unlikely that your process liquid has the same resistivity so calibration will be required.

With the sensor stem submerged in the process liquid to the height required for 20mA or 10V output – press the button marked SPAN for > 1 second. The LED No2 will illuminate to confirm the set point has been made.

With the end of the sensor stem above the liquid height or submerged in the process liquid to the height required for 4mA or 0V output – press the button marked ZERO for > 1 second. The LED No2 will illuminate to confirm the set point has been made.

Although it may be common to calibrate the maximum output (SPAN) at the highest level and minimum output (ZERO) with the stem out of the liquid, it is possible to calibrate maximum and minimum output at any point along the length of the measuring probe.

Maintenance & repair

1) If required the sensor head can be removed from the stainless steel mounting. Caution: unscrewing the head without removing the two wires from the head will strain the wire seal in the potted section and distort the wire resistance. This will cause irreparable damage.

To remove the head

Remove the circuit board and its support bridge.

Disconnect the 2 wire sensor plug from the circuit board.

Disconnect the wires from the plug by pressing in the crimp retainer on the side of the plug. Remove the wires and crimps from the connector plug.

Unravel the wires from the ferrite ring held in a P-clip.

Loosen the grub screw at the base of the head.

Unscrew the alloy head from the stainless steel thread. Do not unscrew the stainless steel adaptor from the stainless steel hexagon plug which forms the mounting thread.

Re-assembly:

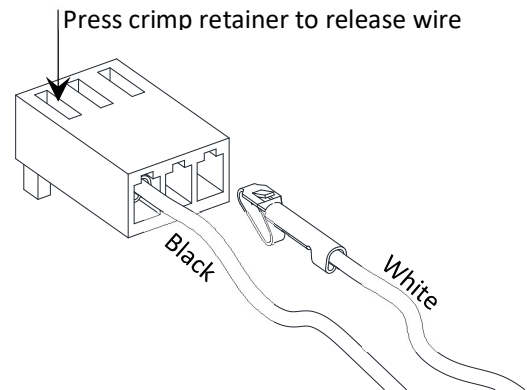
Fit the head.

Ensure the probe wires loop through the ferrite ring.

Ensure the black wire connects to the left side of the connector plug as shown in the diagram.

Assemble circuit board mounting and reconnect the 2 wire plug.

Check calibration.



2) Do NOT unscrew the stainless steel adaptor from the mounting plug. This will cause irreparable damage to the potted seal.

3) Do NOT adjust lock nut at the top of the sensor probe. This will cause irreparable damage to the potted seal.

4) The connection head is rated IP67. Avoid external steam cleaning.

5) Do not cut the stem probe. The stem can be manufactured to any length prior to purchase.

6) Small dents to the stem tube are unlikely to affect the output. Large dents or a bent stem will affect the performance.

Storage

Clean the stem probe and flush the stem insides with clean water if necessary.

Strap the stem to a length of wood to prevent accidental dents and bends to the stem.

Transport

Transport in a crate to prevent the stem probe from receiving damage.

Transport horizontal whenever possible.