DCS IS Intrinsically Safe Capacitive Liquid Level Sensor

The DCS IS is an intrinsically safe capacitive level sensor which is a reliable alternative to our range of float switches, specifically designed for use in cryogenic applications.

II 1GD
Ex ia IIC T(*) Ga
Ex ia IIIB T_{200}(*) Da
-40°C≤Ta≤+70°C
* Temperature class options to suit environment and process temperatures:

T4 / T145ºC for process temperatures ≤ 125°C
T3 / T200ºC for process temperatures ≤ 190°C

ATEX Certificate: SGS 21ATEX0002X
IECEx Certificate: IECEx BAS 21.0002X

Features Include:

- ATEX & IECEx Intrinsically Safe Approved
- 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.
- Temperature ranges from -200°C to +200°C available.

Deeter Electronics Ltd.
Deeter House, Valley Road
Hughenden Valley
Bucks, HP14 4LW

Tel: +44 (0) 1494 566 046
Fax: +44 (0) 1494 563 961
Email: sales@deeter.co.uk
www.deeterelectronics.com

Company Reg. Number 2580838 | VAT Number GB 578 1549 02

Specifications

ELECTRICAL DATA	
Operating Voltage	15 – 25.2VDC (a minimum of 24V should be applied to the barrier)
Operating Current	< 50mA
Intrinsic Safety Parameters Ui Ii Pi Ci Li	 25.2V DC 155 mA 1.2 W 0 0
Resolution	< 2mm +/- 0.5mm
Operating Temperature (Head)	-40°C to +70°C
Stem Minimum Operating Temperature Standard Version Low Temperature Version	 -40°C -200°C
Stem Maximum Operating Temperature T4/T145°C T3/T200°C	 +125°C +190°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 - 5Vdc
Calibration (Zero, Span)	Stored in NVM
Dielectric Constant of Liquid (- Ɛ -)	> 3.1
Response time (currently)	1000ms
Response time (enhanced)	250ms / 500ms

MECHANICAL DATA	
Weight	1.90Kg
Enclosure Rating	IP66 / IP68
Electrical Connections	Screw Terminals
Head Material	316L
Stem Material	316L Stainless Steel
Other wetted parts	PTFE
Maximum Stem length	Up to 6m
Stem Diameter	12mm
Mounting Orientation	Vertical or horizontal
Cable Entry	M20 x 1.5p or 1/2"NPT
Mounting Thread	1" BSP Parallel (standard, other threads and flange mounting available)
EMC Standards	EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4, EN61000-4-2
UKCA & ATEX Standards	EN IEC 60079-0:2018 EN60079-11:2012
IECEx Standards	IEC 60079-0:2017 Edition 7 IEC 60079-11:2011 Edition 6

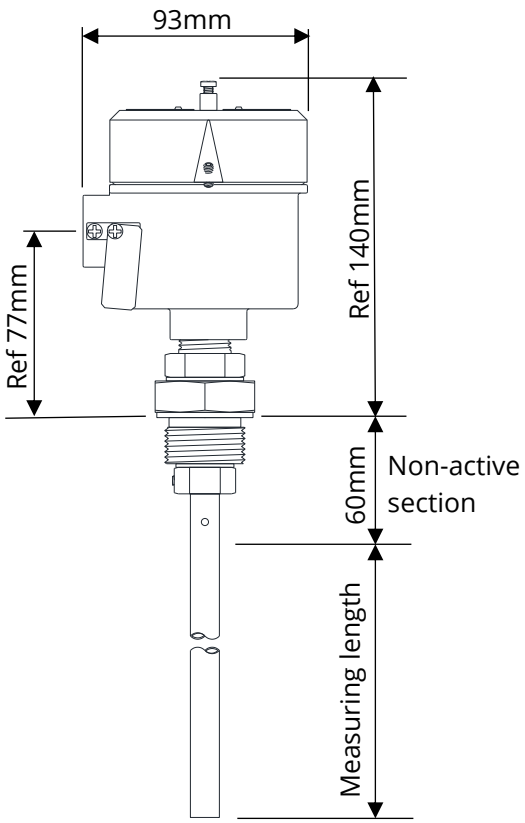
Deeter Electronics Ltd.
Deeter House, Valley Road
Hughenden Valley
Bucks, HP14 4LW

Tel: +44 (0) 1494 566 046
Fax: +44 (0) 1494 563 961
Email: sales@deeter.co.uk
www.deeterelectronics.com

Company Reg. Number 2580838 | VAT Number GB 578 1549 02

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 measuring 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.



Operation

The DCS IS is suitable for measuring non viscous liquids with a dielectric constant (also known as relative permittivity) shown in the tabulated data above. 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 centrally 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.

Ordering Code

Please contact the sales office at sales@deeter.co.uk or +44 (0)1494 566 046 do discuss this product further.

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.

Deeter Electronics Ltd.
Deeter House, Valley Road
Hughenden Valley
Bucks, HP14 4LW

Tel: +44 (0) 1494 566 046
Fax: +44 (0) 1494 563 961
Email: sales@deeter.co.uk
www.deeterelectronics.com

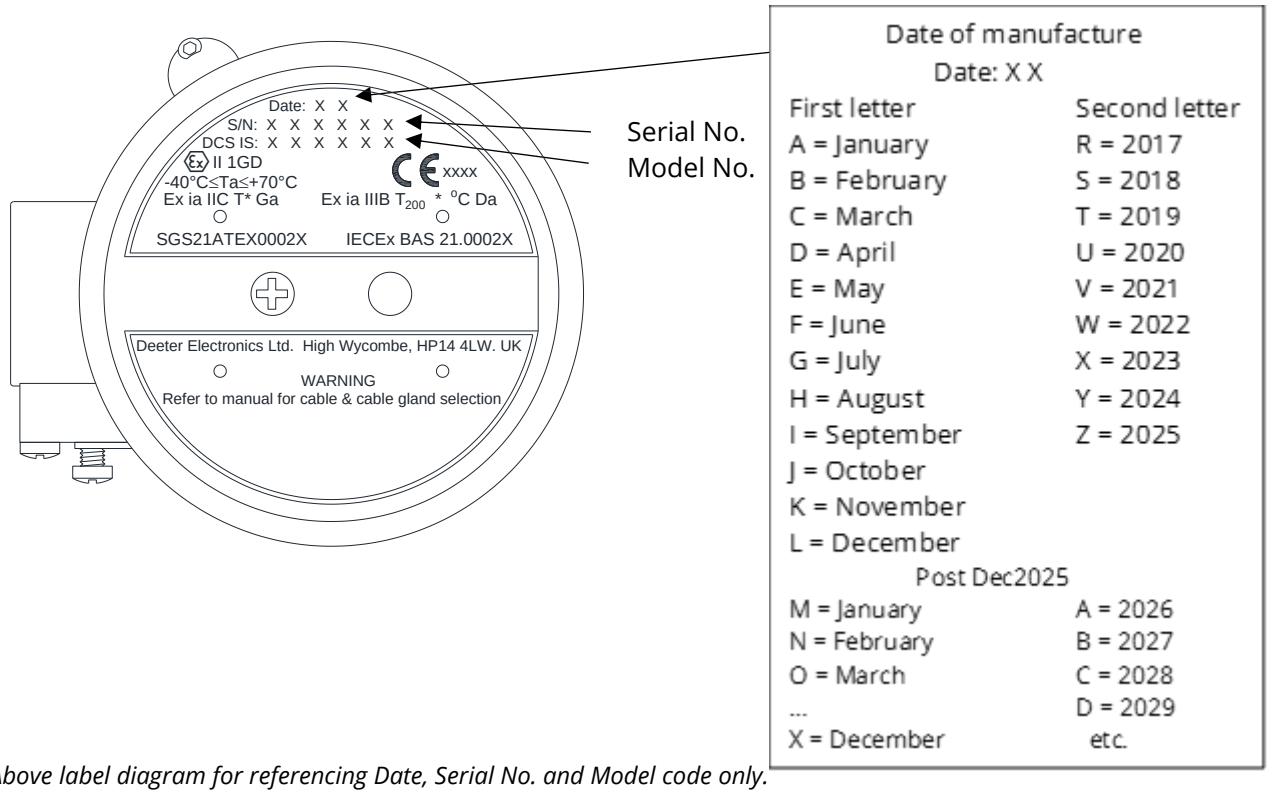
Company Reg. Number 2580838 | VAT Number GB 578 1549 02

Identification

This document details the installation of all versions of Deeter Electronics DCS IS.
The sensors covered by this document can be identified by the label attached to the sensor head which states 'DCS IS' next to the model number. The standard DCS is not ATEX or IECEx rated and does not include ATEX or IECEx markings. Separate documents are available for the standard DCS.

The head label is marked with the date of manufacture in the form of 2 letters.
The S/N:xxxxxx is a unique serial No. given to each piece of equipment.
The DCS IS:xxxxxx is a 6 digit model code.

The model code is also the Deeter reference number of a drawing which identifies the electrical connections and custom mechanical dimensions. A copy of this drawing should be attached to this manual. The temperature class shown here as a * will be either T4/145°C or T3/200°C



Above label diagram for referencing Date, Serial No. and Model code only.
Other markings shown for illustration only

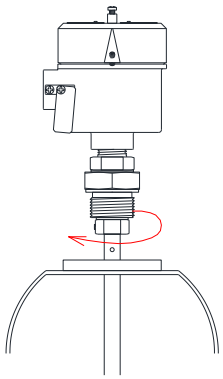
Deeter Electronics Ltd.
Deeter House, Valley Road
Hughenden Valley
Bucks, HP14 4LW

Tel: +44 (0) 1494 566 046
Fax: +44 (0) 1494 563 961
Email: sales@deeter.co.uk
www.deeterelectronics.com

Company Reg. Number 2580838 | VAT Number GB 578 1549 02

Mounting

1) This device must be installed in accordance with IEC/EN60079-14
2) All versions of DCS IS must be mounted where the ambient temperature will allow the sensor head to cool to below 70°C. This is especially significant where the process temperature is above 70°C. 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 -40°C or +70°C
3) The DCS IS 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 just below the terminal head.



4) 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 linear output can be adjusted to compensate for the difference between the perpendicular height and the stem measuring length in calibration and setup procedure below.
5) 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 ends of the stem.
6) The DCS IS 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.
7) Fast moving or frequently changing liquid direction may bend or cause metal fatigue at the top of a long DCS IS stem. Baffles should be installed to shield the stem if required.
8) 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.
9) The DCS IS must not be mounted where the stem will be subject to vibration or shock. The effect of water hammer should also be considered.
10) IECEx/ATEX/UKCA specific conditions of use: when the equipment is installed particular cautions must be taken to ensure, taking into account the effect of process temperature, that the ambient temperature range of the electronics housing of -40°C to + 70°C is not exceeded.
11) Whilst the mounting adapter and electronics housing pass the 500V dielectric strength test of IEC/EN 60079-11 (clause 6.3.13), the probe stem forms part of the intrinsically safe circuit and therefore does not. This should be considered during installation.

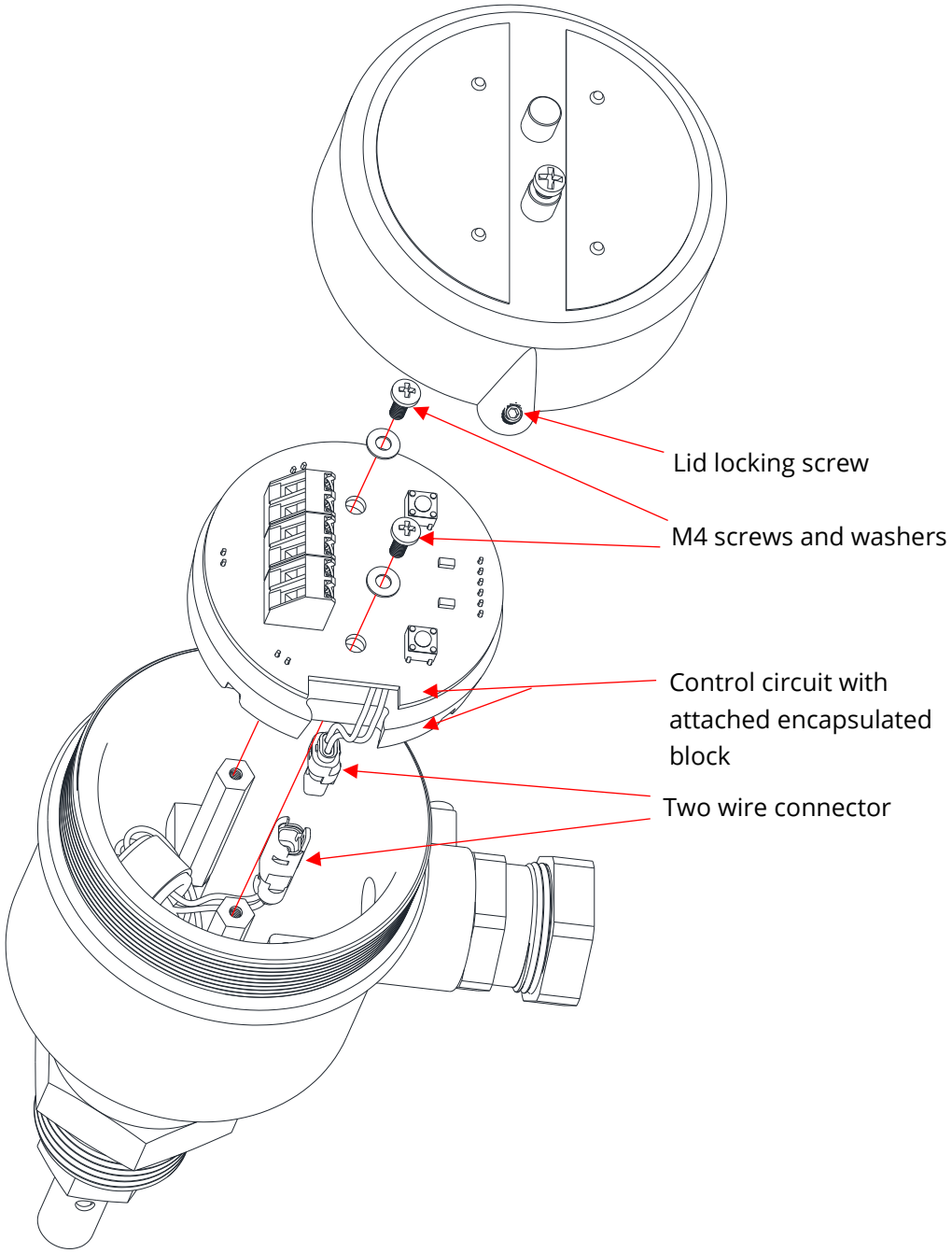
Deeter Electronics Ltd.
Deeter House, Valley Road
Hughenden Valley
Bucks, HP14 4LW

Tel: +44 (0) 1494 566 046
Fax: +44 (0) 1494 563 961
Email: sales@deeter.co.uk
www.deeterelectronics.com

Company Reg. Number 2580838 | VAT Number GB 578 1549 02

Wiring

Loosen the lid locking screw using a 3mm Allen key and unscrew the lid by hand. Unscrew the two M4 screws holding the circuit board. Lift the circuit board and its attached encapsulated block off the two posts. If required completely disconnect the circuit assembly by pulling apart the connector on the attached 2 wires. Anti-static precautions should be taken when handling the control board.



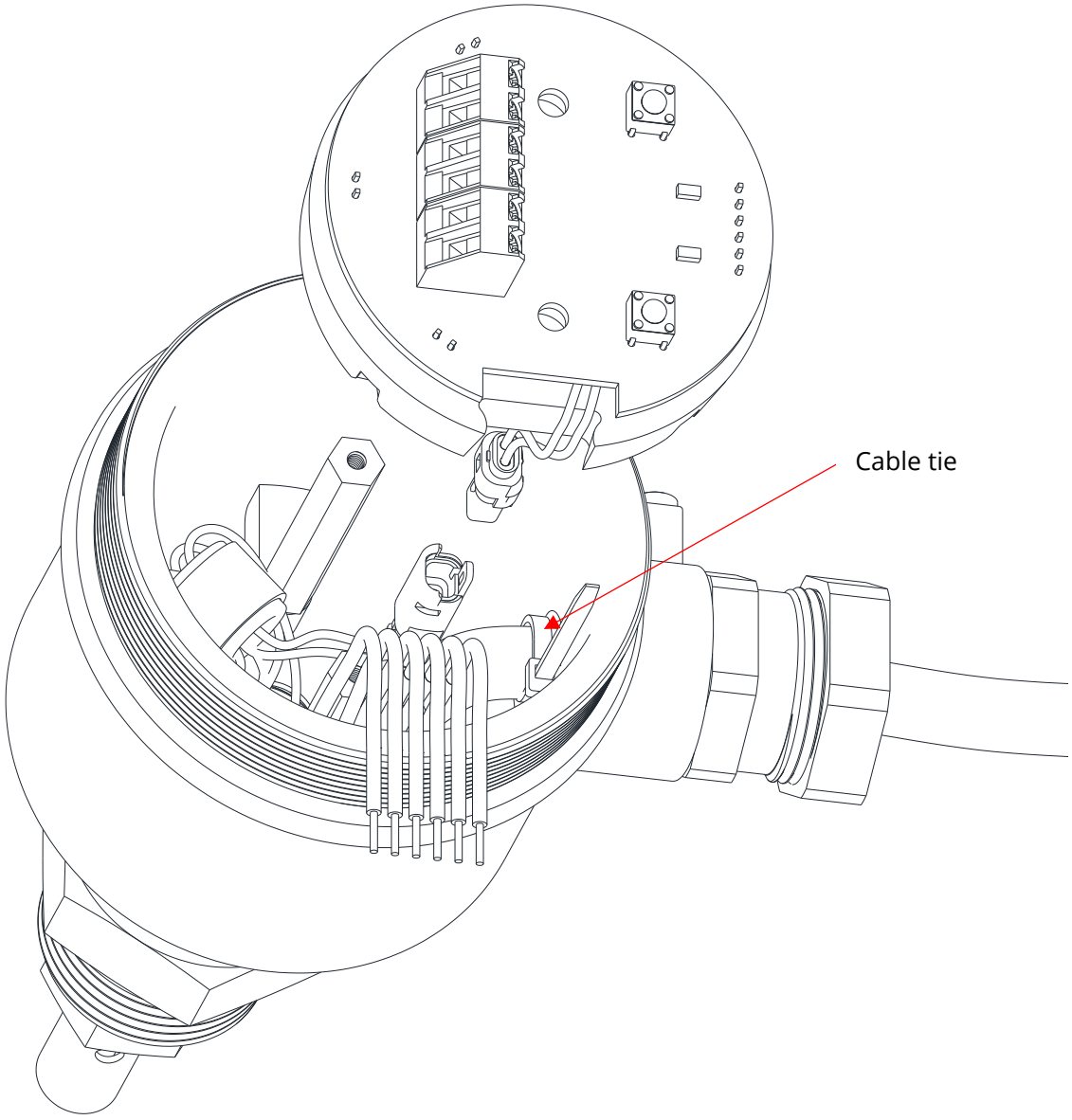
The DCS IS is not normally provided with a cable gland so the installer is free to select an 'Increased safety' cable gland suitable for the temperature and environment around the DCS IS head. The cable entry thread will be either M20x1.5p or 1/2"-14NPT. The product drawing will specify the thread supplied with your model.

Deeter Electronics Ltd.
Deeter House, Valley Road
Hughenden Valley
Bucks, HP14 4LW

Tel: +44 (0) 1494 566 046
Fax: +44 (0) 1494 563 961
Email: sales@deeter.co.uk
www.deeterelectronics.com

Company Reg. Number 2580838 | VAT Number GB 578 1549 02

Depending on the internal diameter of the gland selected, ridged cables with a diameter greater than 10mm may obstruct the repositioning of the circuit assembly.
With the cable gland fitted, feed the connecting cable through the gland allowing approximately 180mm of cable inside the head. Strip away 160mm of the cables outer sheath leaving 20mm protruding into the head where a cable tie can be secured to make a cable restraint.
Form the cable tails along the side of the head to enable the circuit assembly to be fitted back onto the two hexagon posts. Don't forget to re-connect the 2wire plug and socket if disconnected earlier.



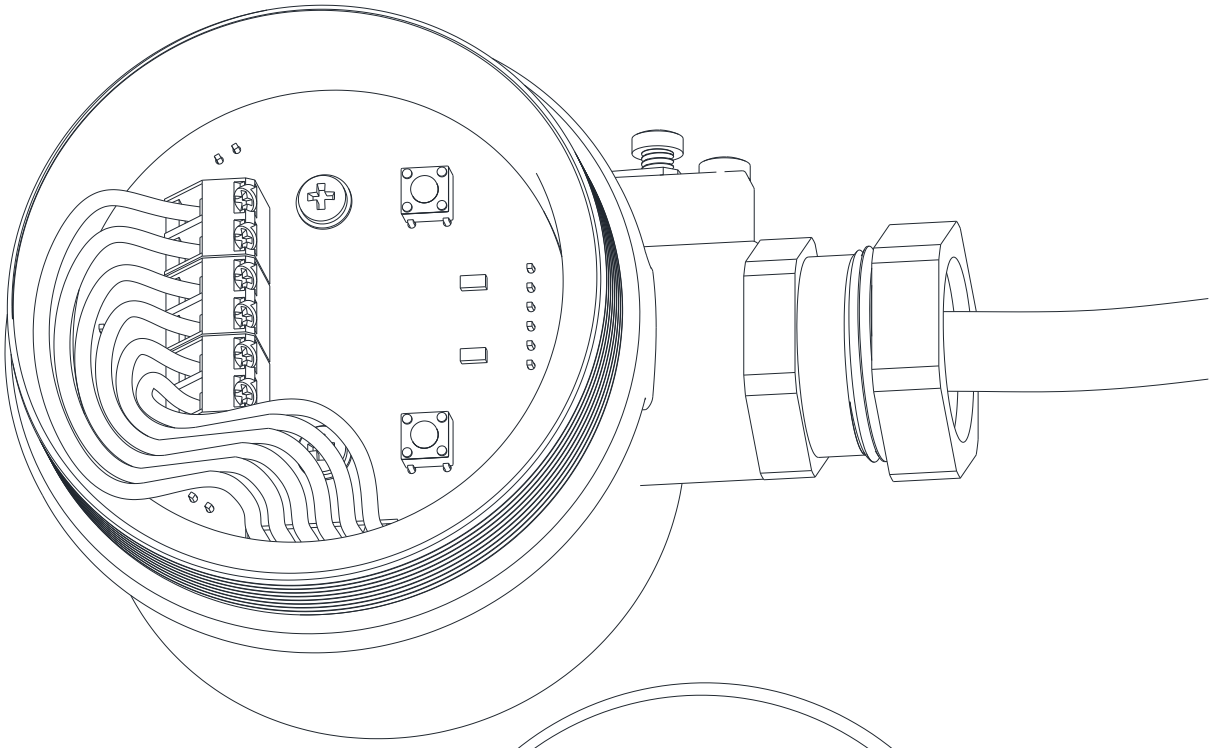
With the circuit board re-fitted back on to the hexagon posts, screw the board down using the M4 screws and washers.

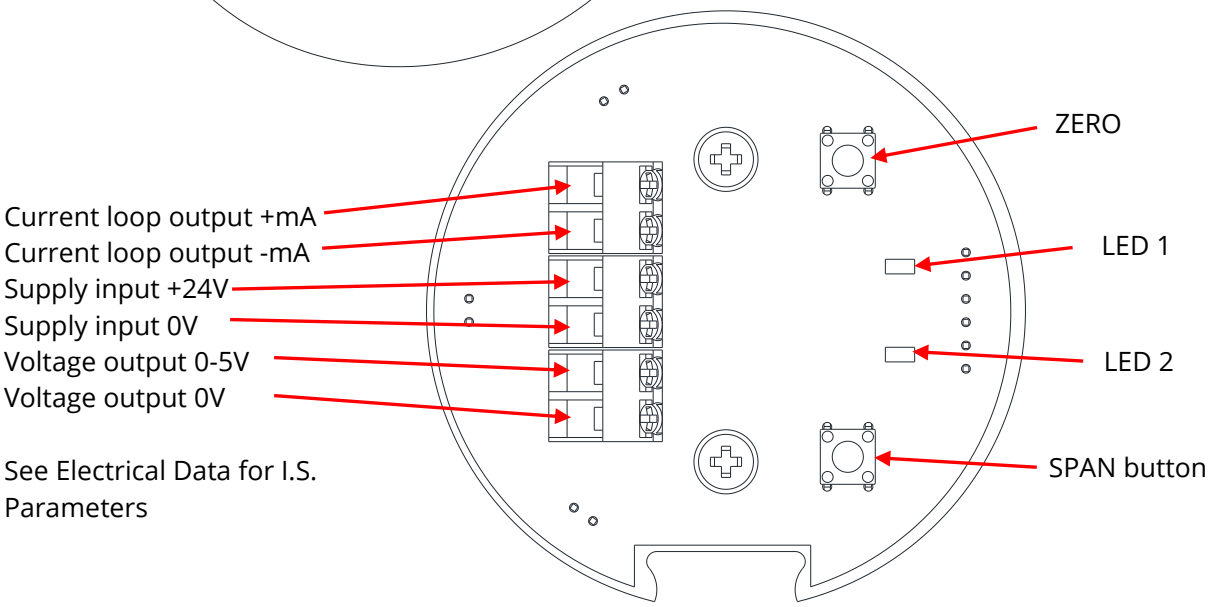
Deeter Electronics Ltd.
Deeter House, Valley Road
Hughenden Valley
Bucks, HP14 4LW

Tel: +44 (0) 1494 566 046
Fax: +44 (0) 1494 563 961
Email: sales@deeter.co.uk
www.deeterelectronics.com

Company Reg. Number 2580838 | VAT Number GB 578 1549 02

Circuit board connections.
The 6 screw terminals can each accept a 22 to 14AWG (0.32 to 2.1mm^2 wire).
Strip 4 to 5mm of insulation from the wire ends before inserting into the terminal opening and tightening the screw.
The sensor outputs the float level as a varying voltage or varying current.
Connection can be made to voltage, current or both voltage and current outputs.





See Electrical Data for I.S. Parameters

Deeter Electronics Ltd.
Deeter House, Valley Road
Hughenden Valley
Bucks, HP14 4LW

Tel: +44 (0) 1494 566 046
Fax: +44 (0) 1494 563 961
Email: sales@deeter.co.uk
www.deeterelectronics.com

Company Reg. Number 2580838 | VAT Number GB 578 1549 02

Setup and calibration

The DCS sensor has been factory set to measure a liquid with a known capacitance. It is unlikely that your process liquid has the same capacitance 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) Caution: Do NOT unscrew to terminal head from the thread adaptor or the thread adaptor from the mounting plug. Unscrewing these parts will break the internal potted seal. This will cause irreparable damage.
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 IP68. 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.

Deeter Electronics Ltd.
Deeter House, Valley Road
Hughenden Valley
Bucks, HP14 4LW

Tel: +44 (0) 1494 566 046
Fax: +44 (0) 1494 563 961
Email: sales@deeter.co.uk
www.deeterelectronics.com

Company Reg. Number 2580838 | VAT Number GB 578 1549 02

1 # EU - TYPE EXAMINATION CERTIFICATE

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 2014/34/EU**

3	EU - Type Examination Certificate Number:	**SGS21ATEX0002X**
4	Product:	**DCS IS Capacitive Liquid Level Sensor**
5	Manufacturer:	**Deeter Electronics Ltd**
6	Address:	**Deeter House, Valley Road, Hughenden Valley, Buckinghamshire HP14 4LW**

7 This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 SGS Fimko Oy, Notified Body number 0598, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential Report No. **GB/BAS/ExTR21.0002/00**

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN IEC 60079-0: 2018 EN 60079-11: 2012

except in respect of those requirements listed at item 18 of the Schedule.

10 If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

11 This EU - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of the product shall include the following :

Ⓔx II 1GD Ex ia IIC T4 Ga or Ex ia IIC T3 Ga
Ex ia IIIB T_{200} 145°C Da or Ex ia IIIB T_{200} 200°C Da
(See Certificate Schedule for Process and Ambient Temperature Information)

SGS Fimko Oy Customer Reference No. **8083** Project File No. **20/0433**

SGS Fimko Oy
Takomotie 8
FI-00380 Helsinki, Finland
Telephone +358 (0)9 696 361
e-mail sgs.fimko@sgs.com
web site www.sgs.fi
Business ID 0978538-5 Member of the SGS Group (SGA SA)

D BREARLEY
Certification Manager

R S SINCLAIR
Authorised Signatory for SGS Fimko Oy

13 # Schedule

14 ## Certificate Number SGS21ATEX0002X

15 Description of Product

The DCS IS Capacitive Liquid Level Sensor is designed to measure the level of liquids with a dielectric constant (also known as relative permittivity) and outputs 4-20mA & 0-5V signals indicating the liquid level.

The equipment comprises a stainless steel electronics housing containing an encapsulated main circuit and un-encapsulated terminal / button board. The electronics housing is mounted on a stainless steel Sensor Probe stem of up to 6 metres in length which is secured to the process liquid vessel via a mounting thread or flange with the probe inside the vessel measuring the liquid level. The electronics housing and mounting adapter is electrically insulated from the intrinsically safe circuit and passes the 500V dielectric strength test. The sensor is configured using Zero and Span buttons located inside the electronics housing.

External connections to the equipment are made via a threaded cable entry to screw terminals mounted on the terminal / button board.

The DCS IS Capacitive Liquid Level Sensor can be marked with the following temperature classifications with associated process temperature ranges. When the equipment is installed particular cautions must be taken to ensure, taking into account the effect of process temperature, that the ambient temperature range of the electronics housing of -40°C to +70°C is not exceeded:

Certification Code		Probe Process Temperature Range
⟨Ex⟩ II 1 GD	Ex ia IIC T4 Ga (-40°C ≤ T_a ≤ +70°C) Ex ia IIIB T_{200} 145°C Da (-40°C ≤ T_a ≤ +70°C)	-200°C to +125°C
⟨Ex⟩ II 1 GD	Ex ia IIC T3 Ga (-40°C ≤ T_a ≤ +70°C) Ex ia IIIB T_{200} 200°C Da (-40°C ≤ T_a ≤ +70°C)	-200°C to +190°C

Input Parameters

U_i = 25.2V C_i = 0

I_i = 155mA L_i = 0

P_i = 1.2W

16 Report Number

GB/BAS/ExTR21.0002/00

17 Specific Conditions of Use

1. When the equipment is installed particular cautions must be taken to ensure, taking into account the effect of process temperature, that the ambient temperature range of the electronics housing of -40°C to +70°C is not exceeded.

2. Due to the insulated stainless steel Sensor Probe stem forming part of the intrinsically safe circuit, this part of the equipment is not capable of passing the 500V dielectric strength test. This must be taken into account when installing the equipment.

3.

18 Essential Health and Safety Requirements

In addition to the Essential Health and Safety Requirements (EHSRs) covered by the standards listed at item 9, the following are considered relevant to this product, and conformity is demonstrated in the report:

Clause	Subject
1.2.7	LVD type requirements
1.2.8	Overloading of equipment (protection relays, etc.)
1.4.1	External effects
1.4.2	Aggressive substances, etc.

19 Drawings and Documents

Number	Sheet	Issue	Date	Description
D 600804	1 of 3	1	4th January 2020	DCS IS all Versions (General Assembly)
D 600804	2 of 3	1	4th January 2020	DCS IS all Versions (General Assembly)
D 600851	1 of 1	2	13/1/21	DCS IS Top & Bottom PCB Track & Component Layout
Sch700497 IssD	1 to 4	D	22/12/2020	DCS Capacitive Sensor PCB (Ex I Version)
LP700497	1 of 1	D.1	22 December 2020	DCS_Ex Capacitive Level Sensor (BOM)

The above drawings are associated, and held with, IECEx BAS 21.0002X Iss. 0.

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification System for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	**IECEx BAS 21.0002X**	Page 1 of 3	Certificate history:
Status:	**Current**	Issue No: 0	
Date of Issue:	2021-02-12		
Applicant:	**Deeter Electronics Limited** Deeter House Valley Road Hughenden Valley High Wycombe Bucks HP14 4LW **United Kingdom**		
Equipment:	**DCS IS Capacitance Liquid Level Sensor**		
Optional accessory:			
Type of Protection:	**Intrinsic Safety**		
Marking:	Ex ia IIC T4 Ga or Ex ia IIC T3 Ga Ex ia IIIB T_{200} 145°C Da or Ex ia IIIB T_{200} 200°C Da See Certificate Schedule for process and ambient temperature Information		

Approved for issue on behalf of the IECEx Certification Body: **Mr R S Sinclair**

Position: **Technical Manager**

Signature: (for printed version)

D BREARLEY
Certification Manager

Date: 12.2.2021

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting www.iecex.com or use of this QR Code.

Certificate issued by:

SGS Baseefa Limited
Rockhead Business Park
Staden Lane
Buxton, Derbyshire, SK17 9RZ
United Kingdom

IECEx Certificate of Conformity

Certificate No.: **IECEx BAS 21.0002X**

Date of issue: 2021-02-12 Issue No: 0

Manufacturer: **Deeter Electronics Limited**
Deeter House
Valley Road
Hughenden Valley
High Wycombe
Bucks HP14 4LW
United Kingdom

Additional manufacturing locations:

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements.This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended

STANDARDS :
The equipment and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards

IEC 60079-0:2017 Explosive atmospheres - Part 0: Equipment - General requirements
Edition:7.0

IEC 60079-11:2011 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
Edition:6.0

This Certificate **does not** indicate compliance with safety and performance requirements other than those expressly included in the Standards listed above.

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in:

Test Report:

GB/BAS/ExTR21.0002/00

Quality Assessment Report:

GB/SIR/QAR12.0004/07

IECEx Certificate of Conformity

EQUIPMENT:
Equipment and systems covered by this Certificate are as follows:

The DCS IS Capacitive Liquid Level Sensor is designed to measure the level of liquids with a dielectric constant (also known as relative permittivity) and outputs 4-20mA & 0-5V signals indicating the liquid level.

The equipment comprises a stainless steel electronics housing containing an encapsulated main circuit and un-encapsulated terminal / button board. The electronics housing is mounted on a stainless steel Sensor Probe stem of up to 6 metres in length which is secured to the process liquid vessel via a mounting thread or flange with the probe inside the vessel measuring the liquid level. The electronics housing and mounting adapter is electrically insulated from the intrinsically safe circuit and passes the 500V dielectric strength test. The sensor is configured using Zero and Span buttons located inside the electronics housing.

External connections to the equipment are made via a threaded cable entry to screw terminals mounted on the terminal / button board.

The DCS IS Capacitive Liquid Level Sensor can be marked with the following temperature classifications with associated process temperature ranges. When the equipment is installed particular cautions must be taken to ensure, taking into account the effect of process temperature, that the ambient temperature range of the electronics housing of -40°C to +70°C is not exceeded:

Certification Code	Probe Process Temperature Range
Ex ia IIC T4 Ga (-40°C ≤ T_a ≤ +70°C) Ex ia IIIB T_{200} 145°C Da (-40°C ≤ T_a ≤ +70°C)	-200°C to +125°C
Ex ia IIC T3 Ga (-40°C ≤ T_a ≤ +70°C) Ex ia IIIB T_{200} 200°C Da (-40°C ≤ T_a ≤ +70°C)	-200°C to +190°C

Input Parameters

U_i = 25.2V C_i = 0

I_i = 155mA L_i = 0

P_i = 1.2W

SPECIFIC CONDITIONS OF USE: YES as shown below:

1. When the equipment is installed, particular cautions must be taken to ensure that, taking into account the effect of process temperature, the ambient temperature range of the electronics housing of -40°C to +70°C is not exceeded.
2. Due to the insulated stainless steel Sensor Probe stem forming part of the intrinsically safe circuit, this part of the equipment is not capable of passing the 500V dielectric strength test. This must be taken into account when installing the equipment.