

# Installation and Operating Instructions



## KMS-2 Exd Magnetostrictive Level Transmitter

Revision J 22/06/2022



Smart in sensing

ATEX  
UKEX



**KMS-2 Ex d Transmitter**  
Installation and Operating Manual



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## Symbols Used

The following symbols are used in these operating instructions:



Warning: If ignored injury or damage to property can occur.  
Danger: If ignored serious injury or damage to property can occur.  
**Caution:** Failing to comply with these instructions can lead to malfunction of or damage to the Level Transmitter.



### **Ex Applications**

Instructions which must be complied with when the unit is used in potentially explosive environments and to meet the requirements of the type examination certificate.



Information  
Facts and information concerning proper operation of the  
KMS-2 Level Transmitters



Instructions for electrical installation  
Information on proper electrical installation.



### **Safety information**

Read these instructions before installation and putting into operation.

Installation commissioning and maintenance should only be carried out by suitably qualified personnel in conjunction with these instructions.

Comply with the relevant safety regulations when using the equipment.

The transmitter must not be modified as this will invalidate the warranty and or the product certification.

Measures must be taken to prevent risks to persons and property in the event of a defect.

Do not operate the Level Transmitters in the immediate vicinity of strong electromagnetic fields (minimum distance: 1 m) as this may give rise to incorrect readings.

Comply with the maximum current and voltage ratings as stated in the technical data section.

For hazardous area applications installation of this unit must be in compliance with the applicable National requirements i.e. IEC60079-14:



## Introduction

The KMS-2 transmitter is a 4 to 20 mA loop powered transmitter for measuring the level of liquid in a vessel either directly (immersion application) using an annular float, or indirectly by mounting on a magnetic level gauge.

The Ex db Gb explosion proof version is suitable for Zones 1 and 2 (ATEX category 2 & 3) applications. This transmitter is NOT intended to interface directly with Zone 0 areas. When used with Zone 0 tanks (EPL Ga), the probe must be installed in accordance with IEC 60079-26 (i.e. in a separate ventilated pocket and/or fed from an intrinsic safety supply)

The transducer consists of a stainless steel tube, containing the Magnetostrictive measuring element, and an aluminium or stainless housing containing the electronic circuit board.

The unit operates by sending an electrical pulse down the sensing element; the resulting magnetic field reacts with the field from the magnetic float to produce a return signal. The time taken for the return signal to be detected enables a level measurement to be made since the precise velocity of the return signal along the sensing element is known.

## Outputs

LCD Indicator: When fitted the display provides local indication dependent on the display mode as shown in Table 1

Mode	Function	Display Mode* <sup>1</sup>		
		% Range	mA	PV (mm)
Normal	Measuring	0.00/100.00	4.00-20.00	Actual distance in mm from reference point
Fixed Output	Zero	0.00	4.00	Distance to Zero point
	Span	100.00	20.00	Distance to Span point
Calibration	Start	CAL	12.00	CAL
	Zero set	CAL	12.00	CAL
	Span set	CAL	12.00	CAL
Fault signalling	Downscale set	AL.LO* <sup>2</sup>	3.58* <sup>2</sup>	AL.LO* <sup>2</sup>
	Upscale set	AL.HI* <sup>2</sup>	22.00* <sup>2</sup>	AL.HI* <sup>2</sup>
current setting Alarm	Low Level* <sup>3</sup>	ERR.L* <sup>3</sup>	3.8* <sup>3</sup>	ERR.L* <sup>3</sup>
	Downscale* <sup>4</sup>	AL.LO	3.58	AL.LO
	Upscale* <sup>4</sup>	AL.HI	22.00	AL.HI

Table 1  
Instrument output status indication

\*<sup>1</sup> The standard display mode is % range, alternate modes available on request

\*<sup>2</sup> Analogue output remains at last measurement value during setting (Rev 5 Onwards)

\*<sup>3</sup> When enabled by front panel switch, else will remain at zero point until float no longer sensed.

\*<sup>4</sup> Alarm action, set as required (Default upscale).

**Analogue Output:** The process variable and error status are transmitted over the current loop with values as shown in table 1.

**LED,s:** Provide local indication during calibration when the optional LCD is not fitted.

Mode	Function	Outputs		
		ANALOGUE	Zero LED	Span LED
Normal	Measuring	4-20mA	Off	Off
Fixed Output	Zero	4mA	On	Off
	Span	20mA	Off	On
Fault signalling Current setting	Downscale	4-20mA	Flash	Off
	Upscale		Off	Flash
Calibration	Start	12mA	Flash	Flash
	Zero set	12mA	On	Off
	Span set	12mA	Off	On
Alarm	Low level	3.8mA	Off	Off
	Downscale	3.58mA	Off	Off
	Upscale	22mA	Off	Off

Table 2  
Instrument output status indication



The Low Level alarm must be enabled as shown in the configuration section. When set the output signal will change to 3.8mA if the float drops more than 13mm below Zero point.



## Installation General

### Magnetic Level Gauge Applications

The unit should be fitted to the level gauge with reference to Fig1 using the mounting clips and insulation (if required) supplied. The unit should be positioned such that the XXXX marks around the circumference align with the upper and lower vessel connection points.

Ensure that the sensing tube is not distorted or strained during installation

The fixing clips should be spaced evenly along the length of the tube with a maximum centre distance 1000mm



If it is required to remove the transmitter for maintenance work ensure that any insulation is correctly fitted during reassembly to ensure operating temperatures are maintained within the range specified on the EC type approval certificate.

### Immersion or in tank installation

The transmitter should be fitted to the tank with reference to Fig.2. The distance between the tank connection and electronic housing will vary dependent on temperature and for a weld on connection be factory set. For Exd applications, the probe assembly is inserted into a vented sleeve configuration.



#### Caution

When using an adjustable sealing gland ensure that the maximum ambient temperature for the electronic housing is not exceeded. (See technical data section).

Dependent on the length of the sensor tube an anchor point may be required at the bottom of the tank.



Where the transmitter is supplied with an adjustable gland care must be taken to ensure that the electronic housing temperature is maintained within that is specified in the hazardous area certificate. Please consult the sales office.

Use caution when handling the transmitter to ensure the probe is not bent during installation. A bend in the probe could prevent the float from travelling freely up and down and it could damage the magnetostrictive wire fitted inside.

Immersion applications are calibrated prior to installation by positioning the float at the desired 4 mA & 20 mA points.

Verify that the float will pass through the vessel opening. Note: the float is held on the probe by a C-clip inserted into a groove machined into the tip of the probe. The float can be attached or removed by removing and reinserting the C-clip. Ensure that the floats orientation is correct.

For Exd applications, the probe assembly is inserted into a vented sleeve assembly.

### Coatings and painting.

All coated Exd units must be earthed accordingly, an external earth post is provided.

The maximum non-conductive coating thickness allowed for the transmitter is, 200 microns for gas group IIC and a maximum of 2mm for groups IIB and IIA.

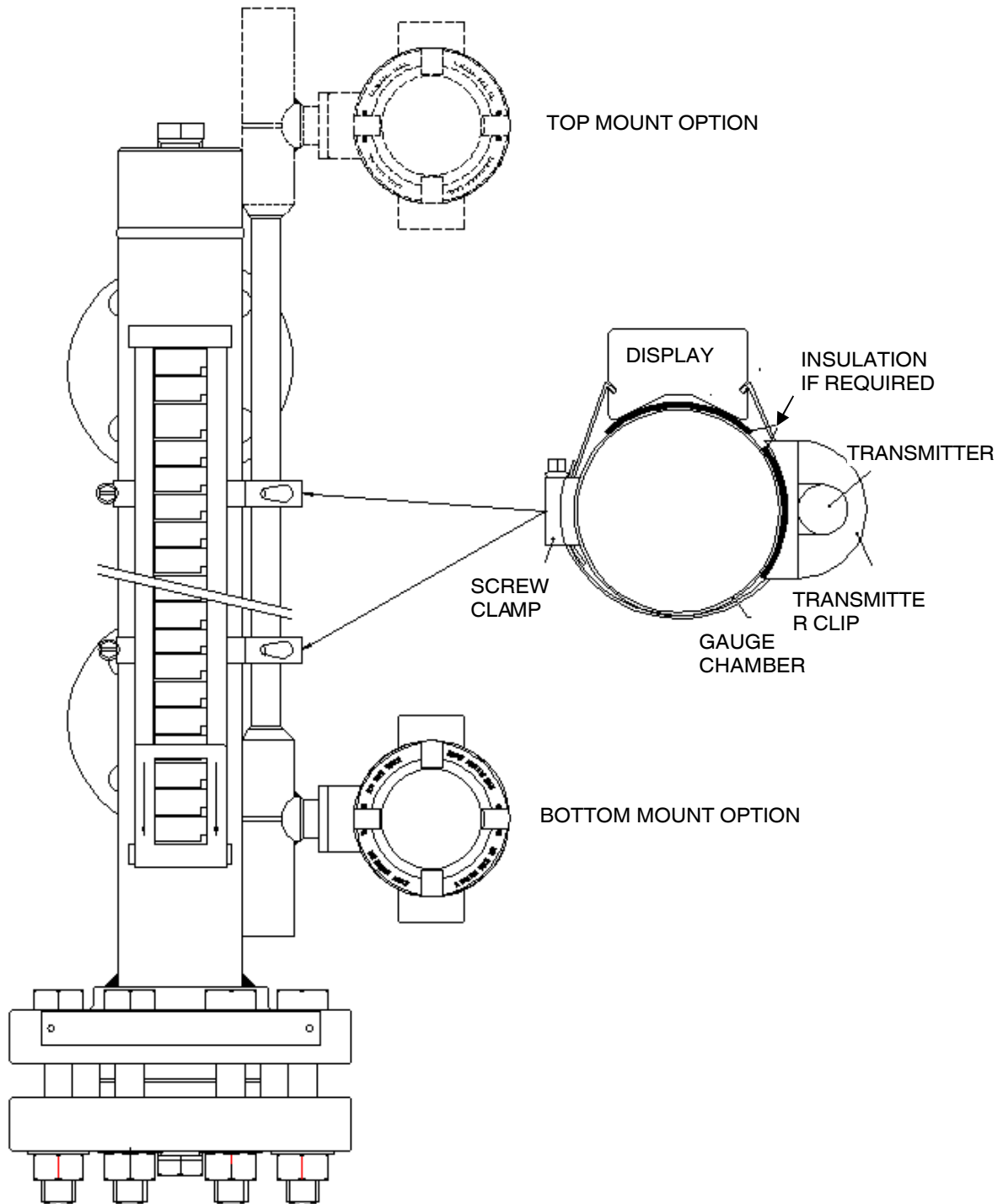


Fig 1  
 Typical Installation When Fitted to Magnetic Level Gauge

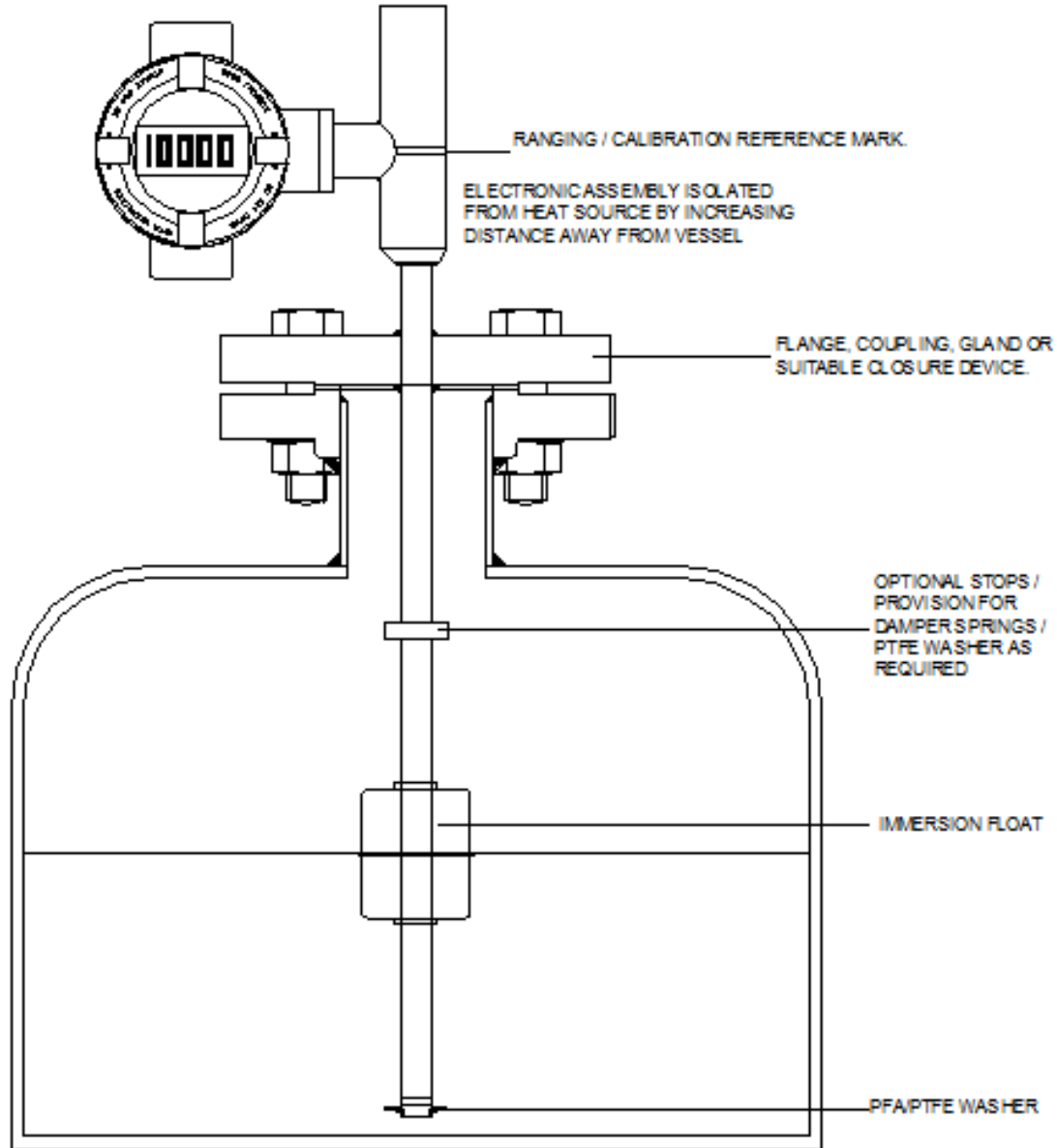
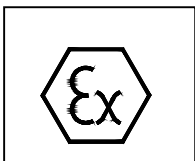


Fig 2  
Immersion Application



Ensure that the PFA/PTFE washer is correctly fitted to prevent the risk of sparking if the float was to hit the stop.  
Ensure that the electronic assembly is maintained within the certified ambient temperature range consult sales office to determine correct offset.  
For Zone 0 areas, refer to the section covering 'Special Conditions For Safe Use' under Certification.

## Electrical Connection

Unscrew the lid to gain access to the rear terminal enclosure; the terminal block can then be removed to facilitate connections.

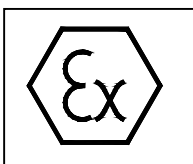
Select the correct cable entry point dependent on the orientation of the sensor. The connection cable should be bought in through an Ex equipment certified M20 gland suitable to maintain the required IP rating, and then connected to the + and – terminals.

To prevent the risk of moisture ingress ensures that the connection cable is led downward in front of the cable gland.

Do not rotate the electronic housing relative to the orientation of the probe assembly as this would invalidate the warranty and could cause damage to the sensor cables.

## Cable Selection

The connection cable should be a twisted pair type suitable for the expected ambient conditions. When a screened cable is used, the screen should be connected to the internal earth connection provided. An external Earth is also provided.



### Hazardous area Installation

The installation of this unit must be in compliance with the applicable national requirements i.e. IEC60079-14.

### Exd Area Installation.

**WARNING – Do not open when an explosive atmosphere may be present.**

Exd cable entry devices shall be an Ex equipment certified cable gland, any unused cable entry holes to be closed using an Ex equipment certified stopping device. Standard cable entries are M20 x 1.5 mm (6H, 6g) with a minimum IP rating of 54.

Note: In an explosive environment, the cover lid must remain fitted and locked into position while energised. Exd lid covers are required to be locked into position using the grub screws provided.

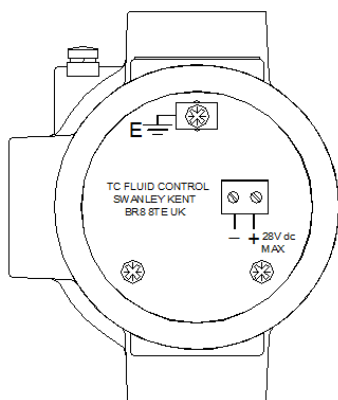


Fig 3 Cable entry via M20 Gland

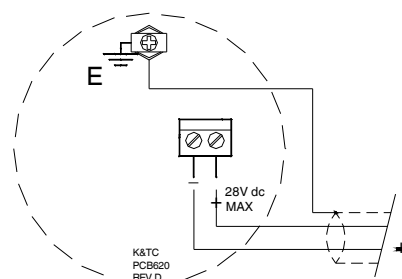


Fig 4 Connection Details

## Adjustment and Configuration

(See also Flowchart Page 10)

The unit is normally set at the factory to the required specification

- Range adjustment and output inversion (To customer requirements)
- Low Level Alarm Select (off)
- Fault Current Output (22mA)

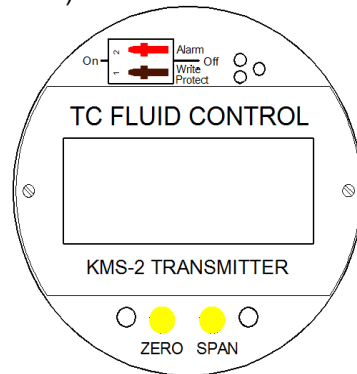


Fig 5

Internal layout of case showing  
Local Display and calibration switches

### Range Adjustment

The measuring range of the unit is set at the factory.

If the default range is unsuitable or adjustment is required the following procedure should be followed. With reference to Fig. 5

1. Set the float to the minimum level
2. Press the 'Span' and 'Zero' buttons until both LED,s flash alternatively (output 12mA)
3. Release buttons
4. Press the 'Zero' button until the 'Zero' LED stays on
5. Wait until the 'Zero' LED extinguishes. (output 4mA)
6. Set the float to the maximum level.
7. Press the 'Span' and 'Zero' buttons until both LED's flash alternatively (output 12mA)
8. Release buttons
9. Press the 'Span' button until the 'Span' LED stays on
10. Wait until the 'Span' LED extinguishes. (output 20mA)



If the optional LCD is fitted the display will read 'CAL' during the setting process. The measuring range can be set within the factory limits with a maximum turndown of 50%. If an error is detected during the ranging process the unit will default to the previously saved values the Relevant LED will flash if ranging failed.

### Inverse output

The output is normally set so that the 20mA point is at the Head shell end. If it is required to mount the head shell at the bottom the output can be inverted by following procedure.

1. Move the float to approximately 50% of range
2. Set the 'Zero' level as 2-5 above
3. Move the float to the required maximum level
4. Set the 'Span level as 7-9 above,
5. Move the float to the required minimum level zero level.
6. Set the 'Zero level as 2-5 above.

The unit will then automatically invert the output.



**Caution**

The float failure and write protect switches should be set to the 'OFF' position before adjustment to the ranging are made, and reinstated as necessary afterwards. It is important that the float is kept stationary for approximately 10 seconds before and after operation of the calibration buttons to ensure that the output signal has stabilised to the correct value.

**Fault signalling Current (Rev 5 Onwards)**

When the magnetic field from the float is not detected the default output level is set Upscale (22mA).

To change to Downscale (3.5mA)

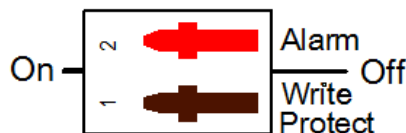
1. Press and release the span & zero buttons
2. Setting is indicated on LCD display and or respective LED
3. To change, press and release respective button
  - a) Zero button (Downscale 3.5mA)\*
  - b) Span button (Upscale 22mA)\*
4. Relevant LED will flash to signify save to memory
5. When complete display will revert to normal measurement mode.

\*If change not required wait 20 Seconds unit will return to "Measurement Mode"

**Low level alarm**

The Low Level alarm output signal will change the output to 3.8mA if the float drops more than 13mm below Zero point. When off the output will remain at 4mA below the zero point until the return signal is lost i.e. the sensor is no longer sensing the magnetic field then output will change to 22mA.

**Configuration Switches**



- 1) Write Protect  
On: Range setting inhibited  
Off

- 2) Alarm Function  
On: Low Level (3.8mA)  
Off: No Alarm Output Remains at 4mA

Fig. 6  
Configuration switches



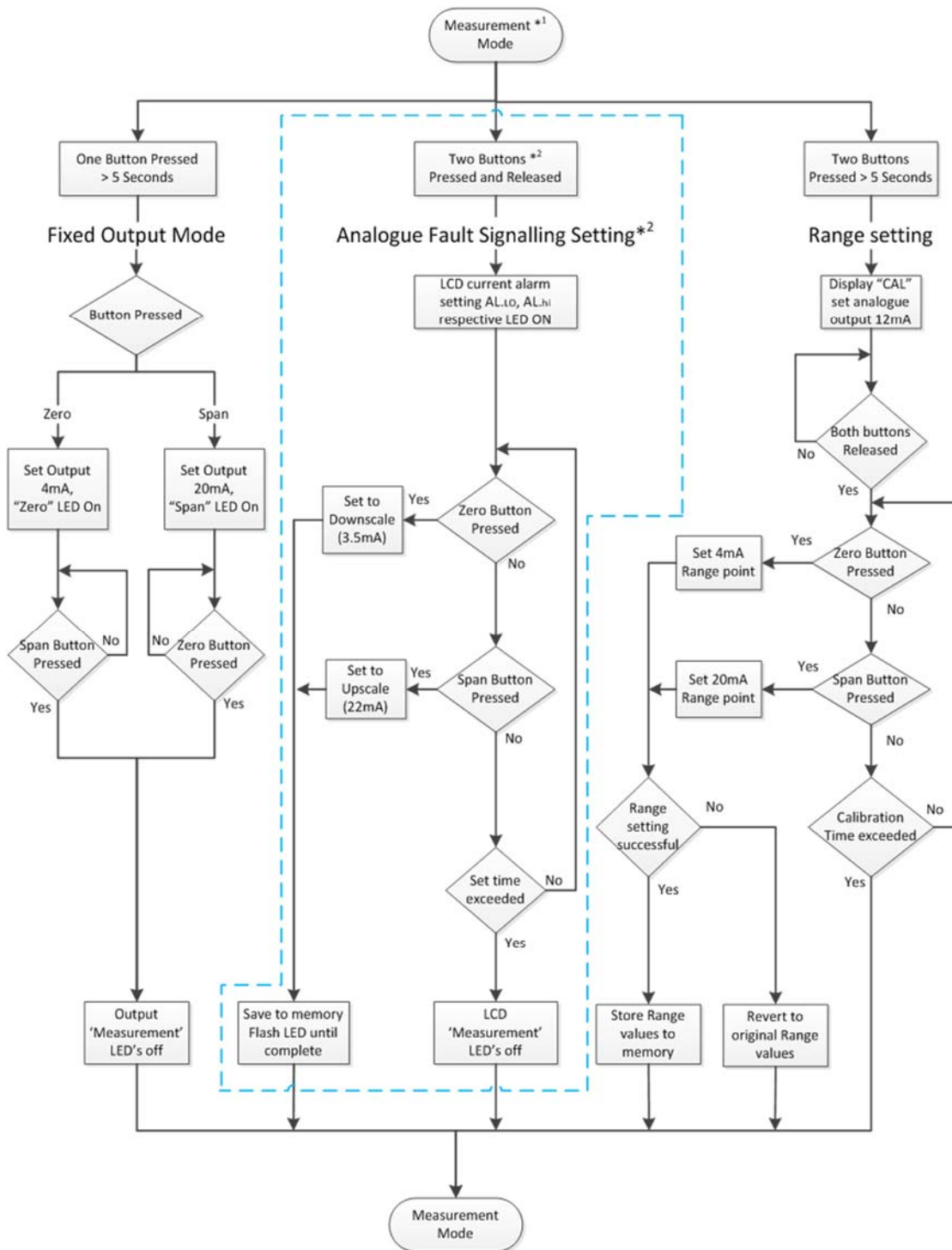
**Caution**

Turn power off before changing alarm switch settings to prevent unexpected changes in loop current. Ensure that the write protect is set to 'ON' after changes to range adjustments.

**Fixed Output**

To allow for loop calibration the transducer output can be fixed to either 4 or 20mA. The zero or span button should be depressed until the respective LED lights; the output will then remain static. To reset to normal operation either depress the opposite button or cycle the power.

**Transmitter Front Panel Settings Flowchart**



\*1 Transmitter must be detecting float before settings can be changed

\*2 Analogue fault signalling setting Rev 5 Onwards (Displayed during start up **Init 5**)

## EMC

In accordance to EC council directive 89/336/EEC

Emissions EN 61326:2004 (Class B)

STANDARD	DESCRIPTION	PORT	RESULT
EN 61326	Radiated Emissions	Enclosure	Pass
EN 61326	Conducted Emissions	Not applicable	Not Tested

Immunity tests to EN 61326: 2004 A1, A2, and A3

STANDARD	DESCRIPTION	PORT	RESULT
61000-4-2	Electrostatic Discharge En	closure	Pass
61000-4-3	RF Electromagnetic Field	Enclosure	Pass
61000-4-4	EFT/ Burst	DC Port	Pass
61000-4-5	Surge	DC Port	Pass
61000-4-6	Conducted RF	DC Port	Pass
61000-4-8	Magnetic Field	Enclosure	Not Tested
61000-4-11	Voltage Dip/ interruptions	Not applicable	Not Tested

## Certification



Certificate No's. Baseefa 09 ATEX 0085X IECEx BAS09.0027X BAS22UK0067X

Explosion protection Type: Ex db

Gas Group: IIB or IIC dependent on coating options (refer to page 4)

Approval Type:  II 2G Ex db IIC T2-T6 or II 2G Ex db IIB T2-T6

Notified Body (ATEX) No. CE 0598  
Approved Body (UKEX) No. UKCA 1180

## Special Conditions for Safe Use:

- The integral probes may be used with process vessels at elevated temperatures up to 250°C, however the connection/transmitter head shall be 'stood-off' and the Temperature Class adjusted as follows :-

Temperature Class	Ambient Temperature	Maximum Probe Temperature	Minimum Stand-off Distance
T6	-50°C to +60°C	40°C	0
T6	-50°C to +40°C	60°C	75mm
T5	-50°C to +60°C	80°C	125mm
T4	-50°C to +60°C	120°C	175mm
T3	-50°C to +60°C	180°C	250mm
T2	-50°C to +60°C	250°C	325mm

- The probes are not intended to interface directly with Zone 0 areas. When used with Zone 0 tanks etc. (EPL Ga), the probe shall be installed in accordance with IEC 60079-26, [i.e. in a separate ventilated pocket and/or fed from an I.S. supply].



## Fault Analysis Sheet

Problem	Possible Fault	Action
Zero reading i.e. 0mA	Supply Voltage to low	Check voltage and adjust accordingly
	Supply Connections reversed	Swap supply cables
	Cables/Connecting circuit faulty	Rectify as required
	Faulty Unit	Consult Technical Sales
Reading Greater than 22mA	Supply voltage to high	Adjust voltage to less than 28V
Continual Reading of 3.8mA (alarm)	Float damaged (sunk)	Fit new float
	Chamber empty	Open check valves
Continual reading of 22mA(Alarm)	Float magnetic field not being sensed	Check gap distance between chamber and transmitter
	Unit incorrectly calibrated	Carry out calibration procedure
	Float Under magnetised	Check with spare float if available
Output static at a particular level	Float stuck or damaged	Check against visual display if fitted. Check float condition
	External magnetic interference	Check for external magnetic devices in vicinity
4-20mA not proportional to liquid level	“XXXX” marks not in line with vessel connections	Realign transmitter marks correctly
	S.G range of float incorrect for media type	Check S.G etched on float against media S.G

Table 3 Fault Analysis

## Maintenance

The unit contains no user serviceable parts; therefore no routine maintenance is required.

- Where the case of the device may be subjected to impact or friction, periodic examination is required to ensure that the integrity of the stove enamelled finish is maintained.
- When used in immersion applications the sensor tube must be kept clean to prevent the float “sticking”.

## Technical Data

### Materials

Measuring probe: - 316L  
Housing: - 316L Stainless steel

### Cable entry

Thread Size: - M20x1.5mm  
Connection conductor size: - 0.5mm<sup>2</sup> - 2.5mm<sup>2</sup>

### Supply voltage (Nominal 24VDC)

Minimum 12V  
Maximum 28V

### Current Output

Measured Current range: - 4-20mA ± 0.1%

Alarm Current: - 3.8mA... 22mA  
Upscale 22mA (Fault)  
Downscale 3.8mA (Low level)  
Fixed Output 4 or 20mA ± 0.1%  
(For loop calibration)

### Operating Temperatures

(See certification section for details when used in a potentially explosive atmosphere)

Ambient range: - -50 °C / + 60 °C (-30 °C / +60 °C When LCD Fitted)  
Process range: - -50 °C / +250 °C

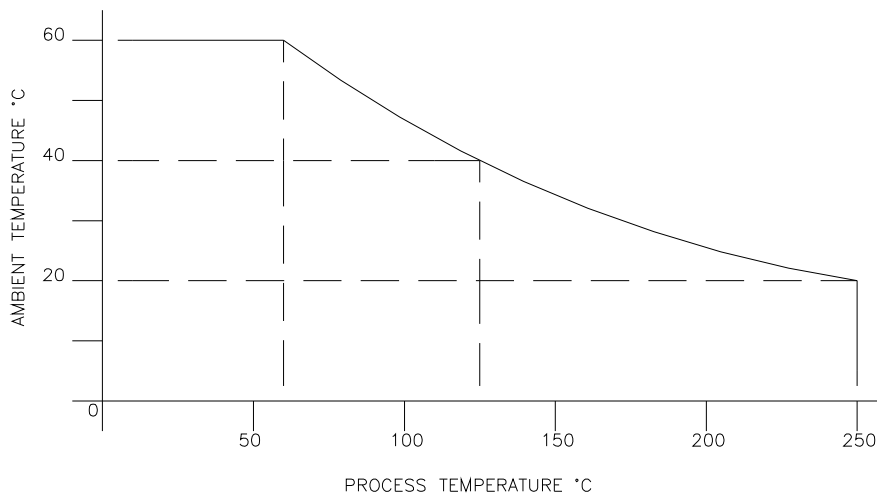


Fig 7  
Ambient verses process temperature for standard transmitter

Where ambient conditions are outside this range additional insulation or shielding will be required please consult sales office

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