Instructions manual

Series LP
Level displacer

The art of measuring

R-MI-LP Rev.: 6 english version

PREFACE

Thank you for choosing a product from Tecfluid S.A.

This instruction manual allows the installation, configuration, programming and maintenance. It is recommended to read it before using the equipment.

WARNINGS

- This document shall not be copied or disclosed in whole or in any part by any means, without the written permission of Tecfluid S.A.
- Tecfluid S.A. reserve the right to make changes as deemed necessary at any time and without notice, in order to improve the quality and safety, with no obligation to update this manual.
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- Keep this manual in a place where you can find it when you need it.
- In case of loss, ask for a new manual or download it directly from our website www.tecfluid.com Downloads section.
- Any deviation from the procedures described in this instruction manual, may cause user safety risks, damage of the unit or cause errors in the equipment performance.
- Do not modify the equipment without permission. Tecfluid S.A. are not responsible for any problems caused by a change not allowed. If you need to modify the equipment for any reason, please contact us in advance.

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1 INTRODUCTION

The series LP are level indicators, transmitters and detectors for liquids.

They are very robust instruments prepared to work in extreme conditions of pressure and temperature.

They have local flow rate indication by means of magnetic coupling, with scales calibrated in % or height.

They can incorporate switches or electronic transmitters that allow to detect a specific level and provide a level signal to a remote device.

In order to operate with very low or high temperature fluids, a version with thermal separator is available.

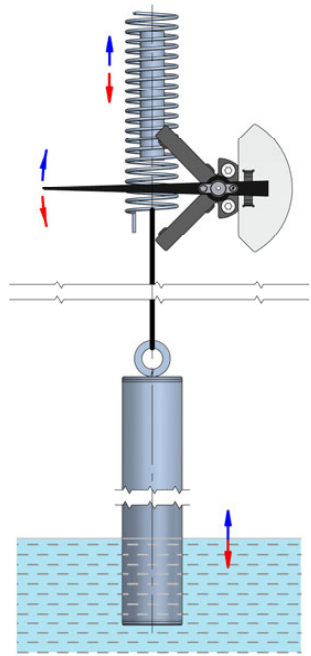
2 WORKING PRINCIPLE

Based on Archimedes principle of a body immersed in a liquid.

A rod with a density similar to the operation liquid is suspended by a spring to maintain an equilibrium with its weight.

Variations in the liquid level causes a change of the weight of the rod (partially immersed), that can be measured by means of the extension or compression of the spring.

Variation on the spring length is transmitted to the indicating needle by means of magnetic coupling.



3 RECEPTION

The series LP level indicators are supplied conveniently packaged for their protection during transportation and storage, together with their instructions manual for installation and operation.

The instruments are supplied tested in our facilities, ready for installation and service.

Before installing the level meter, remove all the blocking elements.

Unpack the instrument carefully, removing any remains of the packing from the inside of the sensor.

It is recommended to check that the measuring system is mechanically correct by means of the following verification:

The indicating needle is initially at 100% of the scale at the top. Pull slowly on the hook under the coupling piece to the tank.

A progressive and even resistance will be noted until the end stop is reached. When pulling on the hook the indicating needle will move towards the beginning of the scale. When the end stop is reached the indicating needle should coincide with the zero of the scale.

Check that the float length coincides with the level difference to be measured.

4 INSTALLATION

4.1 Float

When longer than 3 m, the float is divided into 2 or more parts.

Before mounting, study the installation conditions to decide if it is better to assemble the float before, during or after introducing it into the tank. This will depend on the length of the float, availability of manholes, etc.

The different parts of the float are assembled by means of a stud on the top of the lower piece and a female thread on the upper piece. A split washer (Grower) should be used on all the joints.

The top of the float has a length of chain (except in the case of the minimum length, 115 mm, in which only the hook is supplied). The last link of the chain should be hung on the s-shaped hook which protrudes from the coupling piece to the tank.

Once the float is mounted, its weight will make the indicating needle descend to the zero of the scale. If we lift the float gently, the indicating needle will move towards the 100% of the graduated scale.

4.2 Installation in the tank

Mount the seal on the flange or the coupling thread (seal not supplied).

Introduce with care the float through the mounting hole until the flange or coupling thread couples with the tank.

In the case of a flange, fix it with the appropriate nuts & bolts.

In the case of a screw fitting, turn until tight. Do not apply torques greater than 350 Nm.

If it has been decided to fit the float last, it must be introduced via a manhole and mounted from inside of the tank.

5 INTRODUCTION

The AMD limit switch can be used to generate an alarm or an operation when the flow rate that the instrument is measuring reaches a preset value on the scale plate.

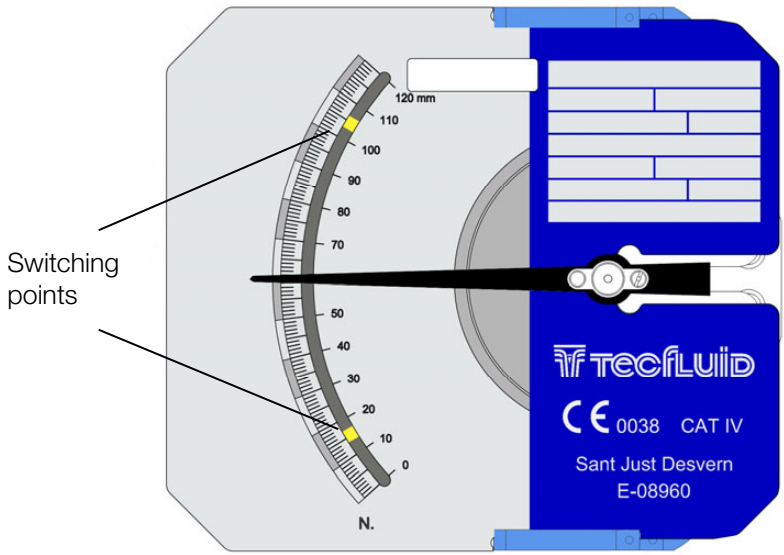
The AMD limit switch consists of a NAMUR slot type inductive sensor, that is actuated by a vane. Given that there is no physical contact in the operation, the limit switch has no influence on the indicator needle movement.

An instrument can be equipped with one or two sensors, depending on the number of points to be detected. A NAMUR amplifier with a relay output can be supplied as an option.

6 OPERATION

The indicator needle moves together with the vane mounted on its shaft. When the vane enters into the slot of the sensor, the limit switch changes its state.

The sensor is mounted on a support which includes a switching point indicator that indicates the switching position. The indicator, that is below the scale plate, can be seen through the scale slot.



7 MOUNTING THE LIMIT SWITCH IN AN EXISTING EQUIPMENT

When the AMD limit switch is to be fitted to an existing device, please follow these steps.

7.1 Kit contents

The kit contains the following elements:

In the kits, the O-rings (5) and the blanking plugs (7) are not provided as loose parts. They are

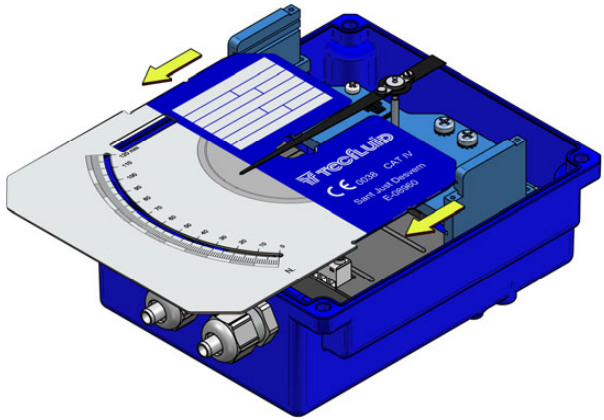
	AMD kit	
Quantity	Material	Position
1	AMD limit switch circuit	1
2	Self tapping screw DIN7982 B-2,2 x 9,5 Nº2 A2	2
1	Screw DIN7985 M3 x 6 A2	3
1	External tooth lock M3 A4	4
2	O-ring Ø 16 x 18,5 x 1,25 mm NBR-70	5
2	Cable gland IP68	6
2	Cable gland blanking plug	7

incorporated in the cable glands (6).

7.2 Preparing the kit

Remove the cover, unscrewing the four screws "Allen" M5 and plastic washers, in the back side of the indicator housing, using a 4 mm Allen key.

Slide the scale plate in the direction indicated in the figure, until it is released from the slot.

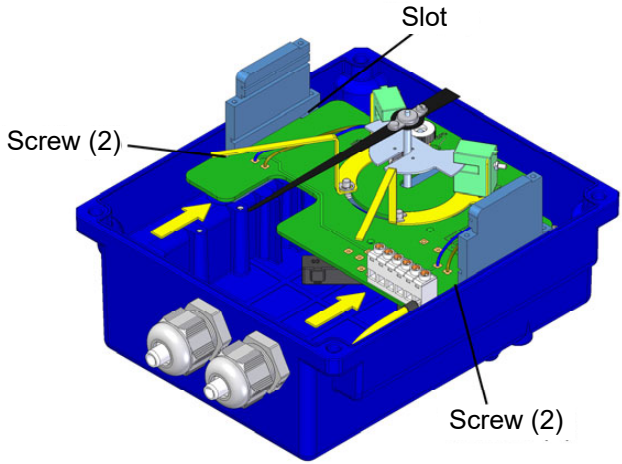


Ensure that the O-rings (5) are placed in the thread of the gland (6). If not, they should be placed. Remove the plugs from the indicator box with a flat screwdriver and replace them by the two cable glands.

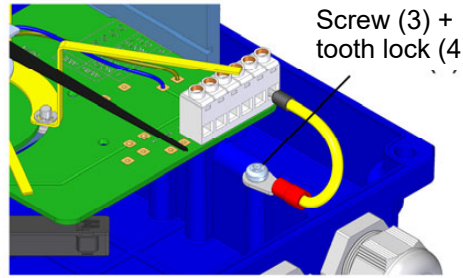
The cable glands that are not expected to be used should be left with the blanking plug (7) placed to preserve watertight.

7.3 Assembling the AMD kit

Slide the circuit into the slot until it stops, and then screw it as shown in the figure.

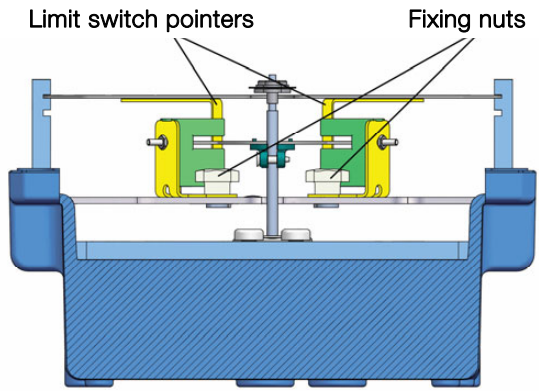


Screw the earth cable terminal with the screw (3) and tooth lock (4).



7.4 Switching point adjustment

The circular fixing nuts of the switching point are in the rear part of the indicator needle.



To move the limit switch needle, the circular fixing nuts have to be slightly loosen by turning them to the left, without removing the scale plate (see the figure on the next page). After that, place the switching point indicator in the required scale value, and fix it again with the screw.

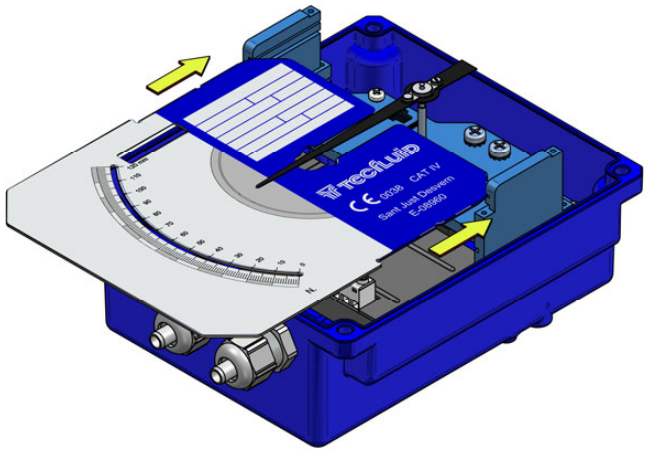
As standard, when the instrument has one AMD, it comes configured as a minimum limit switch.

7.5 Electrical connection

Do it according to section 8.

7.6 Mounting

Slide the scale plate into the slot until it stops as shown in the figure. Mount the cover with the four screws "Allen" M5 and the plastic washers.



8 ELECTRICAL CONNECTION

To gain access to the electrical terminal block, the scale plate must be removed. To do this, slide it to the left by the guide and free it.

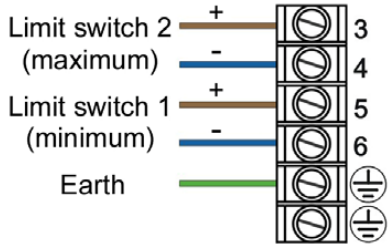
In order to make the electrical connection of the instrument, the limit switch has a screw terminal strip.

For the electrical installation it is recommended to use multiple conductor cables with individual cable sections in the order of 0.25 to 0.5 mm^2 in order to make it easier to connect.

Before starting the installation, check that the cable glands are the right size for the cables to be used, this will guarantee the instrument will stay watertight. The supplied M16 cable glands are for cables with outside diameters between 6 mm and 10 mm.

Peel the outside insulation to free the inner cables. It is recommended to tin the ends of the wires to avoid loose ends. Next, feed the cables through the cable glands, and connect to the corresponding screw terminals. Last, tighten up the cable glands so that they maintain their ingress protection.

The numbering of the terminals is given on the printed circuit board.



	AMM	AMD
1	NC(2)	
2	NO(2)	
3	C(2)	+(2)
4	NC(1)	−(2)
5	NO(1)	+(1)
6	C(1)	−(1)

LIMIT SWITCH AMM

9 INTRODUCTION

The AMM limit switch can be used to generate an alarm or an operation when the flow rate or the instrument is measuring reaches a preset value on the scale plate.

It consists of a micro-switch driven by a cam mounted on the indicating needle.

An instrument can be equipped with one or two micro-switches, depending on the number of points to be detected.

10 MOUNTING THE LIMIT SWITCH IN AN EXISTING EQUIPMENT

In order to add an AMM limit switch to an existing device, follow the steps shown below.

10.1 Kit contents

The kit contains the following elements:

	AMM kit	
Quantity	Material	Position
1	AMM limit switch circuit	1
2	Self tapping screw DIN7982 B-2,2 x 9,5 N°2 A2	2
1	Screw DIN7985 M3 x 6 A2	3
1	External tooth lock M3 A4	4
2	O-ring Ø 16 x 18,5 x 1,25 mm NBR-70	5
2	Cable gland IP68	6
2	Cable gland blanking plug	7

In the kits, the O-rings (5) and the blanking plugs (7) are not provided as loose parts. They are incorporated in the cable glands (6).

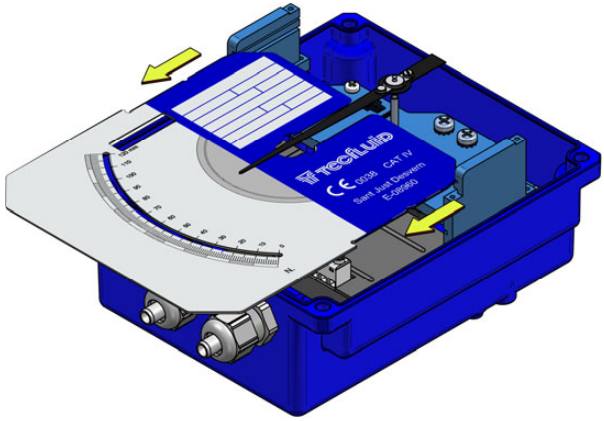
10.2 Preparing the kit

Remove the cover, unscrewing the four screws "Allen" M5 and plastic washers, in the back side of the indicator housing, using a 4 mm Allen key.

Slide the scale plate in the direction indicated in the figure, until it is released from the slot.

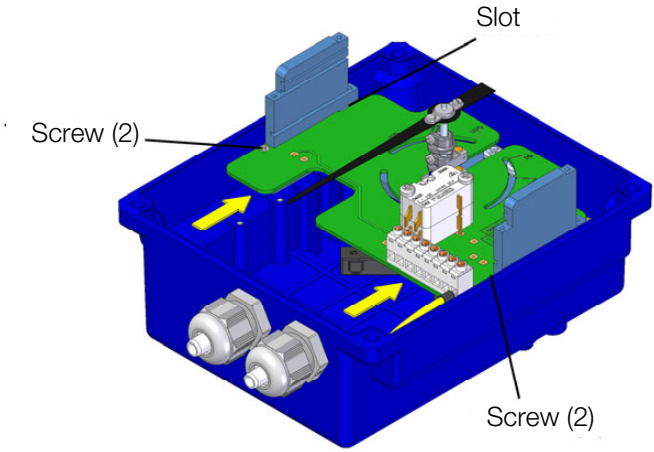
Ensure that the O-rings (5) are placed in the thread of the gland (6). If not, they should be placed. Remove the plugs from the indicator box with a flat screwdriver and replace them by the two cable glands.

The cable glands that are not expected to be used should be left with the blanking plug (7) placed to preserve watertight.

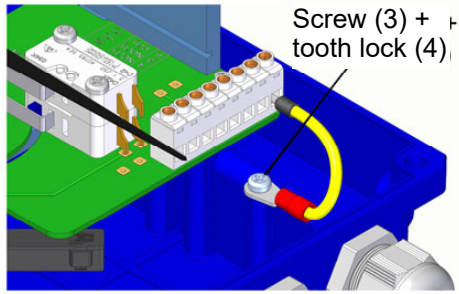


10.3 Assembling the AMM kit

Slide the circuit into the slot until it stops, and then screw it as shown in the figure.

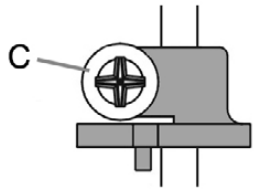


Screw the earth cable terminal with the screw (3) and tooth lock (4).



10.4 Switching point adjustment

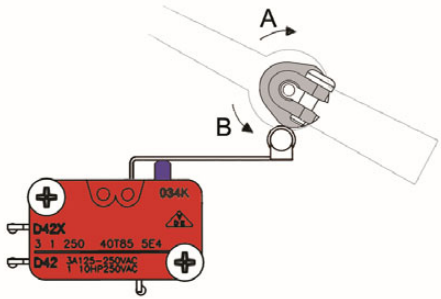
To adjust the switching point, loosen slightly the cam's grub screw (C) and turn the cam on the shaft until the required switching point is achieved.



To turn the cam on the shaft, do not hold the shaft by the indicating needle, as this may move the needle on the shaft. The shaft should be held directly.

If the cam is turned in the "A" direction, the acting point will move away from the zero point of the scale. If the cam is turned in the "B" direction, the acting point will move towards the zero point of the scale.

Once the cam is in its position, making sure that it rests on the follower of the micro-switch lever, and the grub screw (C) has been tightened, the correct working of the limit switch should be verified by turning the indicating needle shaft and checking the switching at the required point.



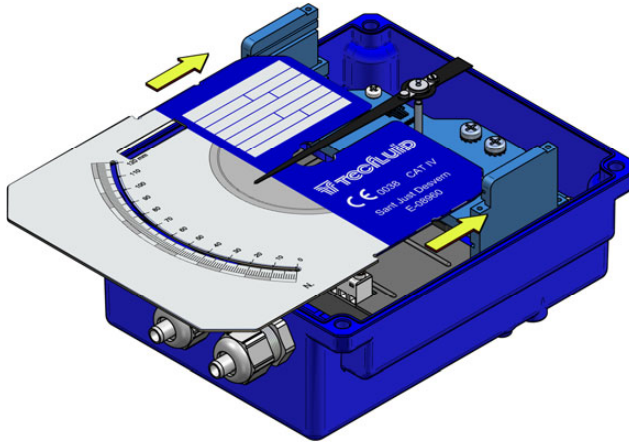
Cam shown acting on the micro-switch lever

10.5 Electrical connection

Do it according to section 11.

10.6 Mounting

Slide the scale plate into the slot until it stops as shown in the figure. Mount the cover with the four screws "Allen" M5 and the plastic washers.



11 ELECTRICAL CONNECTION

In order to make the electrical connection of the instrument, the limit switch has a screw terminal strip.

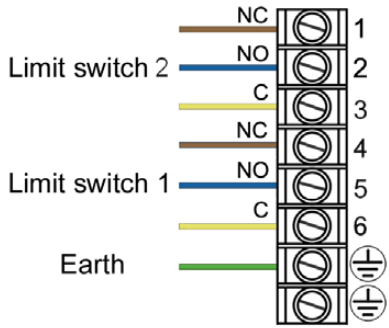
For the electrical installation it is recommended to use multiple conductor cables with individual cable sections in the order of 0.25 to 0.5 mm^2 in order to make it easier to connect. Loose cables should not be used given that they can affect the seal of the cable glands. It is better to maintain the mains cables separated from the cables with low level signals.

Before starting the installation, check that the cable glands are the right size for the cables to be used, this will guarantee the instrument will stay watertight. The M16 cable glands used are for cables with outside diameters between 6 mm and 10 mm.

Peel the outside insulation to free the inner cables. It is recommended to tin the ends of the wires to avoid loose ends. Next, feed the cables through the cable glands, and connect to the corresponding screw terminals. Last, tighten up the cable glands so that they maintain their ingress protection.

The numbering of the terminals is given on the printed circuit board.

Note: The contacts are defined with the cam WHEN NO acting on the micro-switch lever.



	AMM	AMD
1	NC(2)	
2	NO(2)	
3	C(2)	+(2)
4	NC(1)	−(2)
5	NO(1)	+(1)
6	C(1)	−(1)

12 INTRODUCTION

TH7 transmitters are microprocessed electronic position transducers. The instrument uses the Hall effect to capture the field of a magnet. The resulting signal, after the micro-controller processing, is converted into a current signal of 4-20 mA in a 2-wire loop. This signal is proportional to the level.

13 MODELS

13.1 TH7

It is a 4 to 20 mA transmitter proportional to level that incorporates a digital output configurable as alarm output. 4 mA corresponds to beginning of the scale. 20 mA corresponds to full scale.

13.2 TH7H

It is a TH7 transmitter that incorporates HART protocol compatibility. With this protocol the user can change the measuring range of the 4-20 mA loop, and data like the tank liquid level.

14 MOUNTING THE TRANSMITTER IN AN EXISTING EQUIPMENT

When the transmitter is to be fitted to an existing device, please follow these steps.

14.1 Kit contents

The kit contains the following elements:

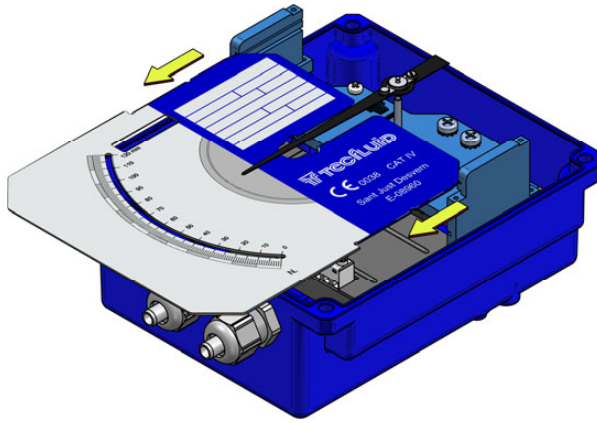
	Kit TH7 or TH7H	
Quantity	Material	Position
1	Transmitter	1
4	Screw DIN7985 M 3 x 4 A2	2
2	O-ring Ø 16 x 18,5 x 1,25 mm NBR-70	3
2	Cable gland IP68	4
2	Cable gland blanking plug	5

In the kits, the O-rings (3) and the blanking plugs (5) are not provided as loose parts. They are incorporated in the cable glands (4).

14.2 Preparing the kit

Remove the cover, unscrewing the four screws "Allen" M5 and plastic washers, in the back side of the indicator housing, using a 4 mm Allen key.

Slide the scale plate in the direction indicated in the figure, until it is released from the slot.

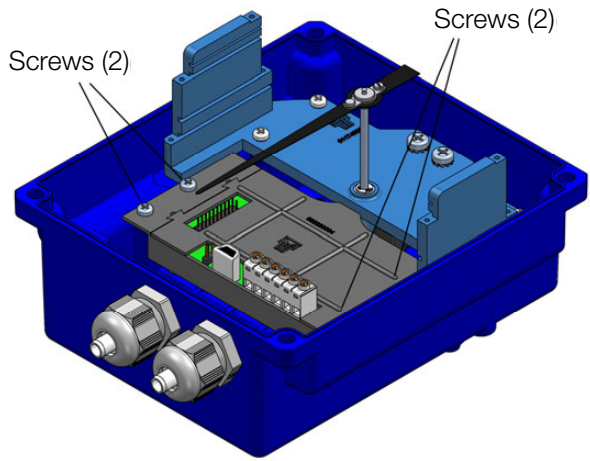


Ensure that the O-rings (3) are placed in the thread of the gland (4). If not, they should be placed. Remove the plugs from the indicator box with a flat screwdriver and replace them by the two cable glands.

The cable glands that are not expected to be used should be left with the blanking plug (5) placed to preserve watertight.

14.3 Assembling the TH7 or TH7H kit

Screw the transmitter as shown in the figure.

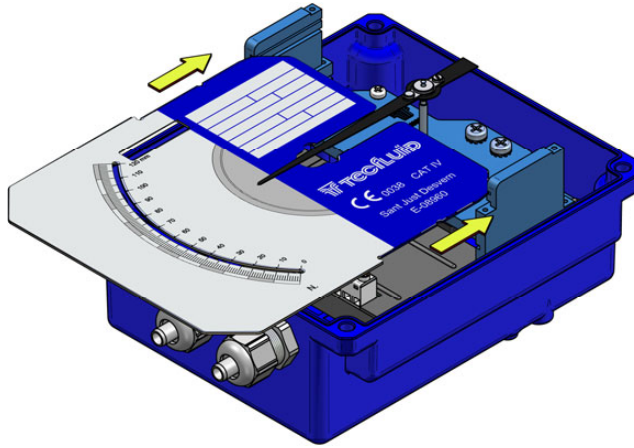


14.4 Electrical connection

Do it according to section 15.

14.5 Mounting

Slide the scale plate into the slot until it stops as shown in the figure. Mount the cover with the four screws "Allen" M5 and the plastic washers.



15 ELECTRICAL CONNECTION

For the electrical connection, the transmitter has a screw terminal strip.

For the electrical installation it is recommended to use multiple conductor cables with individual cable sections in the order of 0.25 to 0.5 mm^2 in order to make it easier to connect.

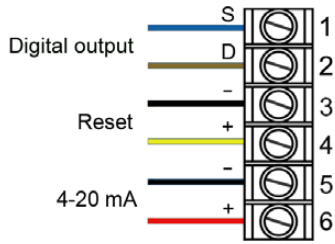
A twisted pair wiring should be used to avoid electrical interferences in the 4-20 mA loop. In some instances, shielded cable may be necessary.

Before starting the installation, check that the cable glands are the right size for the cables to be used, this will guarantee the instrument will stay watertight. The M16 cable glands used are for cables with outside diameters between 6 mm and 10 mm.

Peel the outside insulation to free the inner cables. It is recommended to tin the ends of the wires to avoid loose ends. Pass the cables through the cable glands and screw down in the corresponding positions of the terminal strip. Once the wiring is finished make sure that the cables are well gripped by the cable glands to maintain the ingress protection.

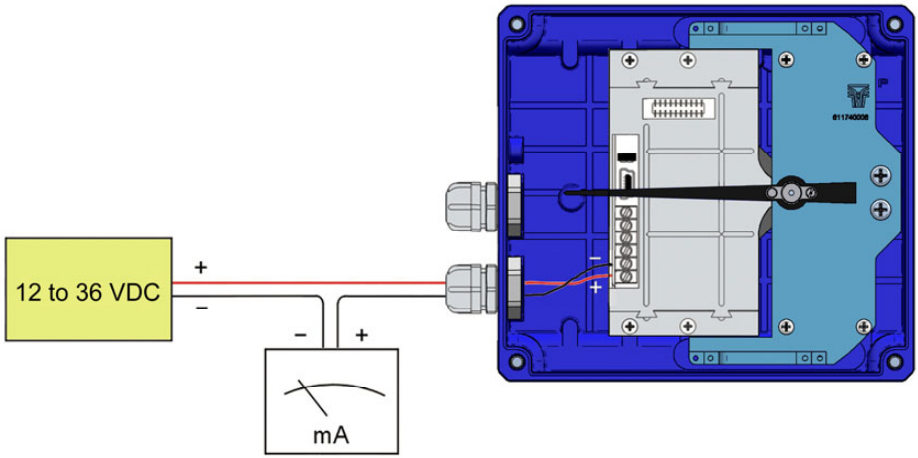
The cable glands must be always closed. Entry of dust or some types of vapours can damage the internal system of bearings and therefore the equipment.

To help in the wiring of the equipment, the description of the terminals is marked on the printed circuit next to the terminal strip.



Before connecting the power supply, you must be sure that the supply voltage is the correct one for the installation. The power supply voltage is indicated on the label of the transmitter.

15.1 Power supply and analog output

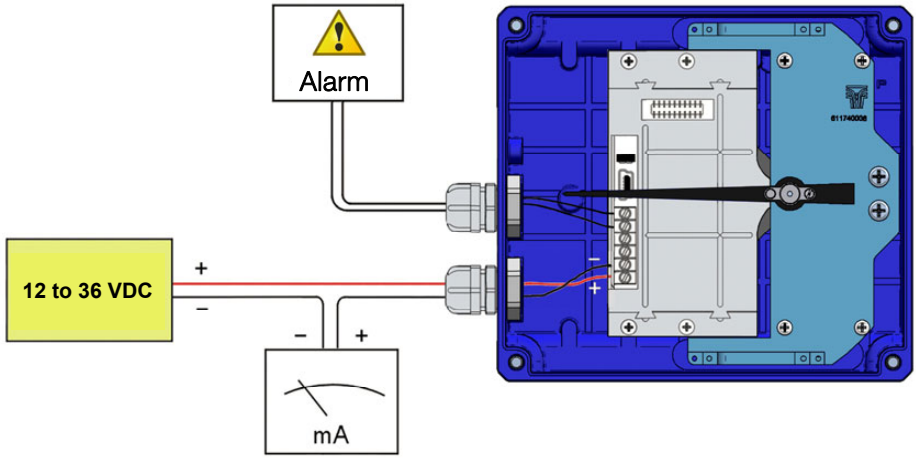


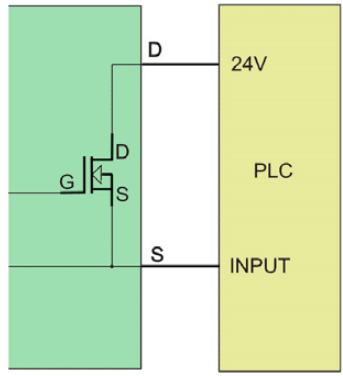
The connection is made in the terminal block. The positive terminal of the power supply is connected to the position + and the positive terminal of the load in the position -. The negative terminals of the power supply and the load are connected together. The instrument works in a 2-wire system, that is, the supply and signal line is the same. It is recommended to use a twisted pair wiring or shielded cable to avoid interferences in the current loop.

15.2 Digital output

The digital output is connected in the positions D and S of the terminal block. The output is an N channel MOSFET transistor isolated from the rest of the circuit and potential free. The S terminal is the source and the D terminal is the drain.

By means of the Winsmeter TH7 software, the parameters of the digital output can be programmed (see section 19.3 in page 27).

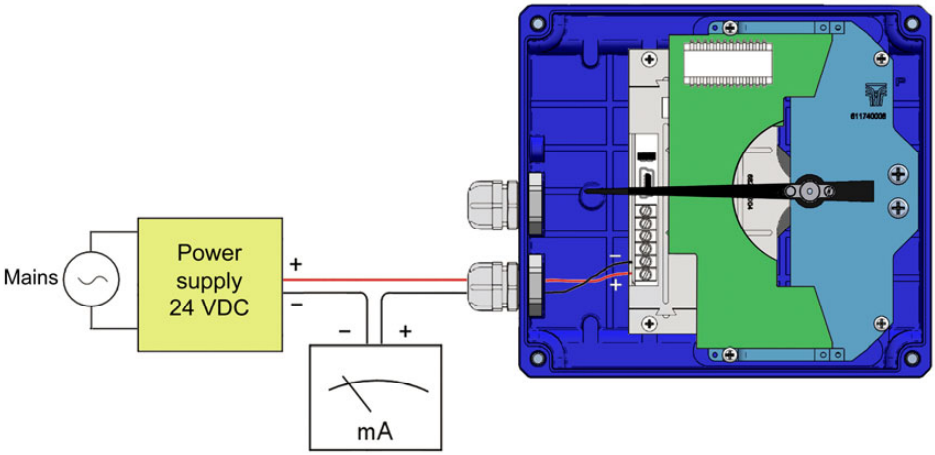




Example of the connection of the pulse output to a PLC

16 4-WIRE CONNECTION

If direct current power supply for the transmitter is not available in the installation, it will be necessary to incorporate an additional power supply as in the following figure.



17 HART TRANSMITTERS

The TH7H and TH7TH transmitters have a modem for HART communication.

TH7H transmitters are fully compatible with the **HART Server** software from HART Communication Foundation.

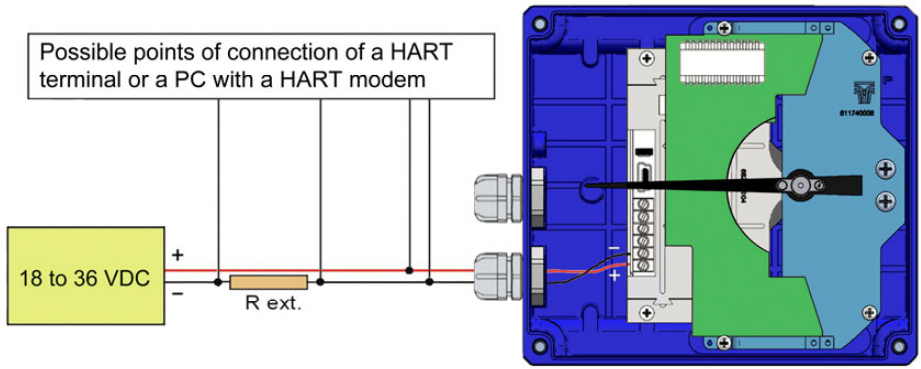
Tecfluid S.A. do not guarantee that the TH7H transmitter is compatible with the different servers on the market.

When connecting the transmitter, an external resistor (R ext.) should be included. Its minimum value needs to be 200 Ω, and the maximum value depends on the power supply as follows:

$$R(Ohm) = \frac{V - 14}{20 \cdot 10^{-3}}$$

In this case the power supply voltage needs to be 18 VDC minimum.

In order to establish HART communication, it is necessary to connect a terminal or PC with a HART modem, in one of the points indicated in the following figure.



17.1 Additional functions with HART communication

By means of the implemented commands, the user can obtain the following information:

- Flow rate value in the scale units.
- Totalizer value (even if the equipment does not have a display).
- Reset or writing of a totalizer value.
- Change of beginning and end of scale of the current loop.
- Possibility of writing tags and messages into the instrument.

17.2 HART communication characteristics

The detail of the characteristics with respect to the HART communication are available in the corresponding “Field Device Specification” document.

Summary of the main communication characteristics:

Manufacturer, Model and Revision	Tecfluid S.A., TH7H, Rev. 0
Device type	Transmitter
HART revision	6.0
Device Description available	No
Number and type of sensors	1
Number and type of actuators	0
Number and type of host side signals	1, 4 – 20 mA analog
Number of Device Variables	2
Number of Dynamic Variables	1
Mappable Dynamic Variables	No
Number of Common Practice Commands	5
Number of Device Specific Commands	0
Bits of Additional Device Status	12
Alternative working modes?	No
Burst mode?	No
Write Protection?	Yes

Electrical characteristics referred to the analog loop and communications:

Reception impedance:

Rx > 3,3 MΩ

Cx < 1000 pF

18 “WRITE PROTECT”

The instrument has a jumper that can be used to avoid changes in the configuration. When the jumper is connected the instrument can be configured via HART. When the jumper is removed, “Write Protect” is activated for HART, thus avoiding any changes in the configuration.

19 ASSOCIATED SOFTWARE WINSMETER TH7

By means of this associated software the transmitter can perform the following functions, working in a comfortable and intuitive way.

- Complete re-calibration of the transmitter according to the scale of the instrument
- Programming of 4 and 20 mA values
- Filter programming
- Configuration of the digital output

Such software can be downloaded from section “Downloads” of the Tecfluid S.A. website.

NOTE: Programming via USB can only be done in non-classified area.

19.1 USB cable connection and drivers installation

Extract the files from the winsmeterTH7.zip to a new system folder.

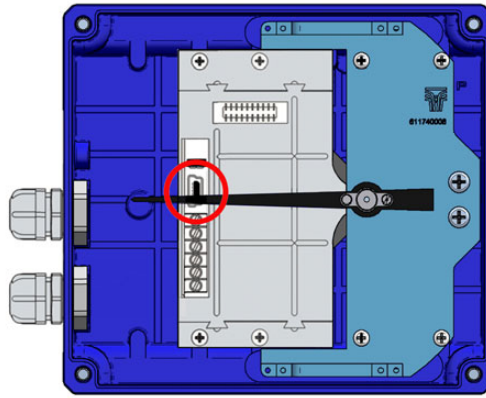
Execute the Setup.exe file and follow the steps for the installation.

In order to connect the converter to a computer an USB cable is required. This cable is type A at one end and mini USB type B at the other (cable not supplied).

The ends of the cables can be seen in the picture.

The first step to make the connection is to open the cover of the indicator housing by removing the four screws "Allen" M5 and plastic washers on the back of the housing.

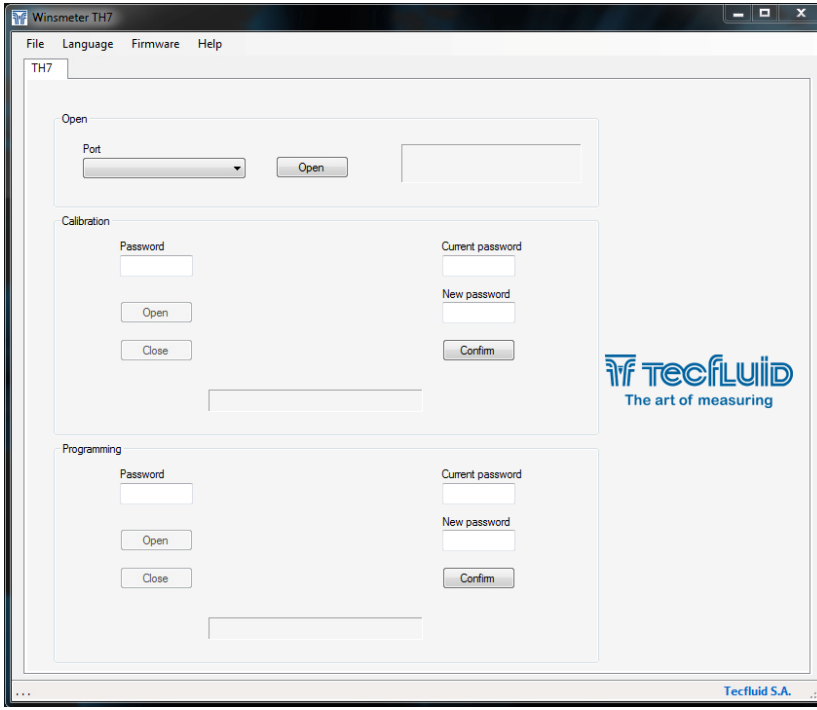
After removing the graduated scale plate sliding it through the slots, the USB connector is visible at the bottom of the housing.



Connect the USB cable at one end to the transmitter and at the other to the computer where the software is installed.

Power on the electronic converter.

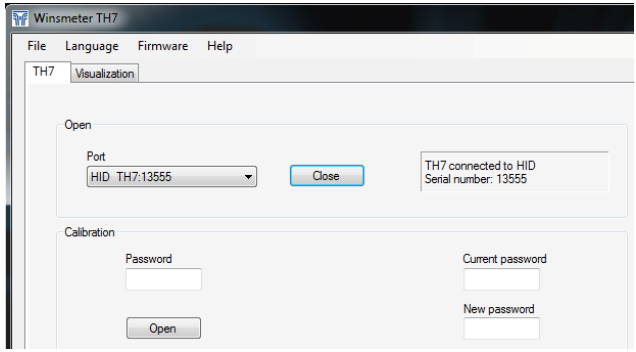
Execute the program WinsmeterTH7 following the sequence Start – Programs – Tecfluid S.A. - WinsmeterTH7.



19.2 Port connection

In the "Port" section, choose the appropriate port for the converter. This will appear with the name of the port followed by TH7 and its serial number. Then click "Open".

Once the port is open, the button "Open" in the "Calibration" and “Programming” sections activates.

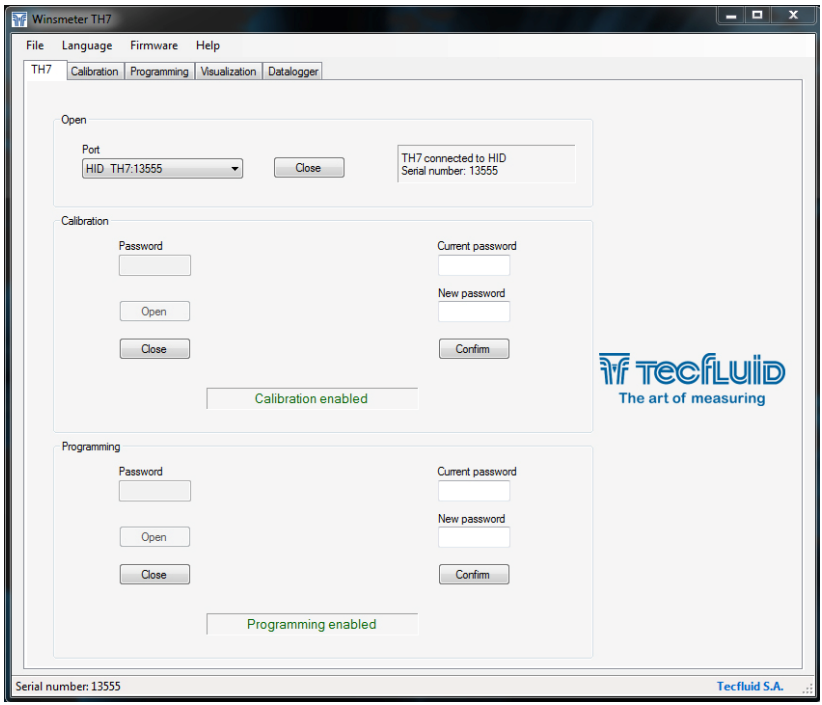


19.3 Access to Calibration and Programming

In order to change data in the tab "Calibration", you must enter a password.

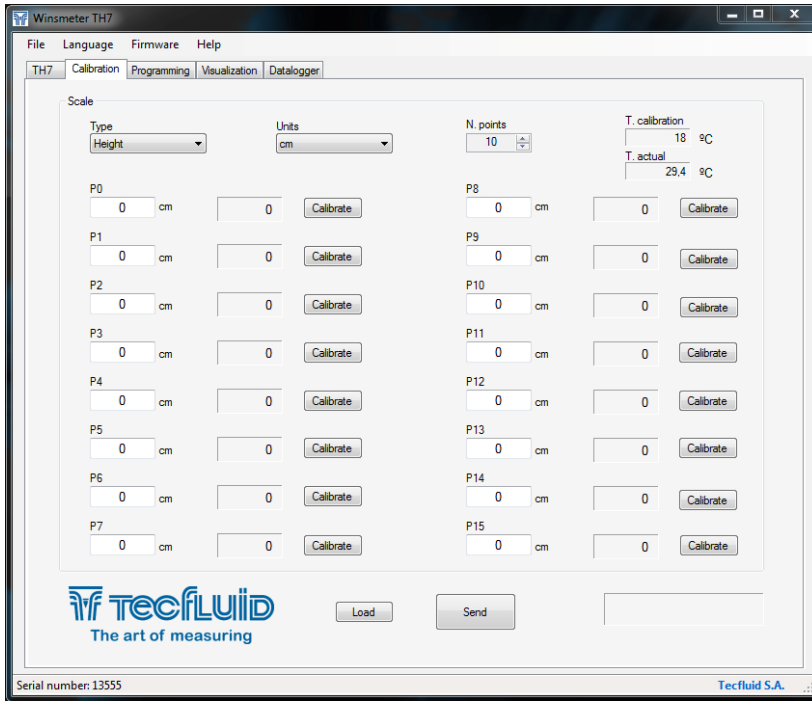
The default password is **calib**, and it can be changed using the boxes on the right of the "Calibration" section.

Likewise, to change data in the tab "Programming" it is necessary to enter the password which by default is **program**. This can be changed using the boxes on the right of the "Programming" section.



Once the password is written, press "Enter" or "Open", and all controls from the Calibration or Programming window will be modifiable. At the bottom of each section the text "Calibration tab enabled" or "Programming tab enabled" will be displayed.

To enter the Installation window, just click the corresponding tab.



In the calibration window a complete re-calibration of the transmitter according to the scale plate can be done.

The first step is to choose the scale units, then the specific units.

In the combo **N. points** the number of points with which the calibration will be performed is selected. The minimum is 10 and the maximum 16.

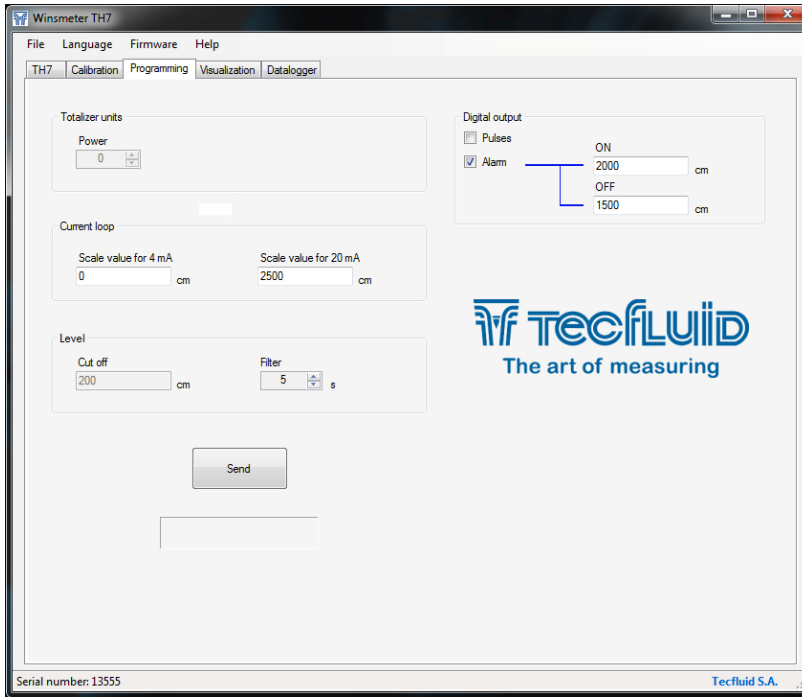
With these data, the boxes P0 ... P10 to P16 are filled with the values of the scale in which the adjustment will be made.

To perform the calibration, the instrument must be in its operating position.

Depending on the instrument in question, move the float or the disc until the needle points each calibration point, and press the "Calibrate" button of the corresponding point.

Once calibrated every point, to send all the data to the transmitter TH7, click the "Send" button. The data is then stored in the transmitter memory.

Likewise, to enter into the programming window, just click the corresponding tab.



Changing the parameters of this screen, (see previous page) you can program the different functions of the equipment.

In the box **Digital output**, the activation and deactivation values for the alarm can be programmed.

In the box **Current loop** the values of flow rate equivalent to 4 and 20 mA can be programmed. These values do not have to be the beginning of scale and end of scale values.

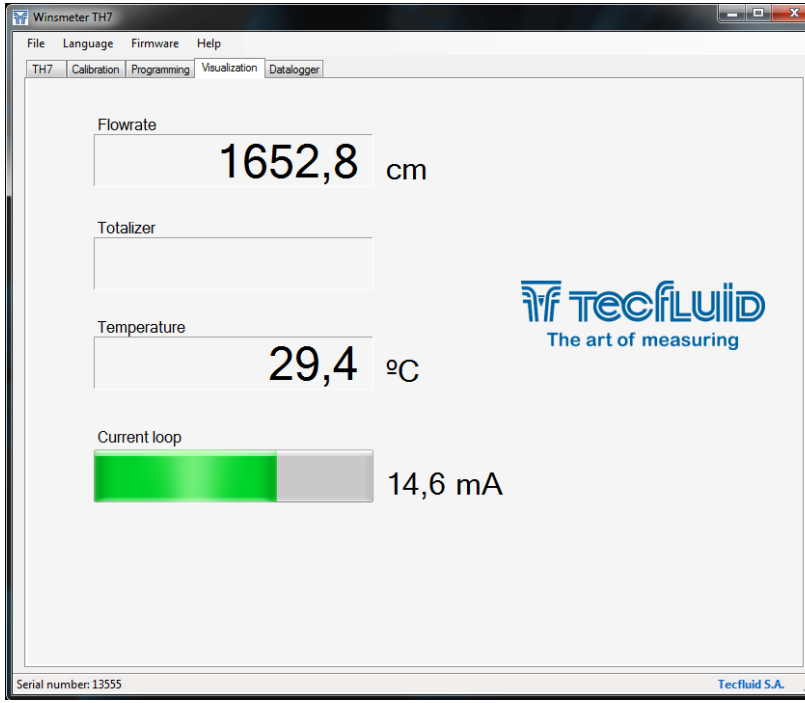
In the box **Level** the filter value can be changed.

To program this data to the transmitter, press the “Send” button. The programming data will be stored in the memory of the transmitter.

19.4 Visualization

When the communication with the computer port is established (see section 19.2), the tab "Visualization" opens. This tab lets you view real-time flow rate, totalizer and velocity values, as well as the current value of the analog output and the status of the digital output if configured as alarm.

It is an intuitive tool to verify that the instrument has been installed and programmed correctly.

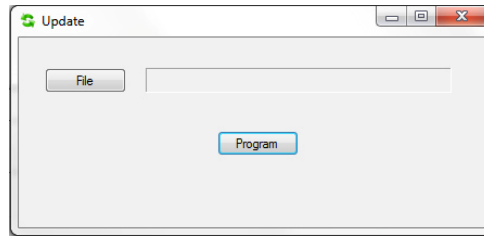


19.5 Firmware updates

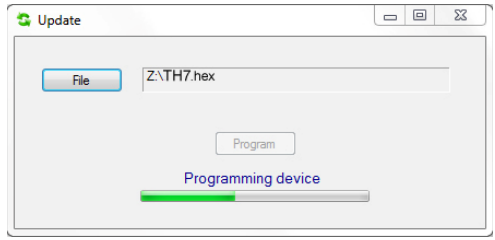
New firmware updates can be published in the website. These updates contain improvements or bug fixes that make the equipment operates at best conditions.

The updates can be downloaded from the section “Downloads” of Tecfluid S.A. website.

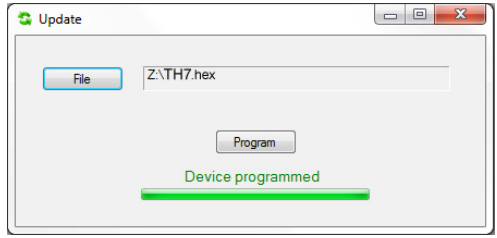
To update the equipment, go to menu “Firmware” - “Update”, and a screen with the button “File” will appear. Pressing this button system can be accessed. The downloaded file has to be searched there.



Once the file is selected, press the “Program” button. A message “Programming device” will appear.



The process takes about 90 seconds, after which the message “Device programmed” will appear.



From this moment, the transmitter already has the new version of Firmware.

20 MAINTENANCE

20.1 Potential problems with the metering body

The following faults can occur:

- Magnetic coupling deterioration
- Variation of the adjustment of the spring

If any of these breakdowns occurs, it is preferable to repair it in TECFLUID S.A. facilities, as a new calibration will be normally necessary.

20.2 Potential problems with the indicator housing

20.2.1 The indicator pointer rubs on the reading scale

To remove the cover, remove the four screws "Allen" M5 and plastic washers, in the back side of the indicator housing, using a 4 mm Allen key.

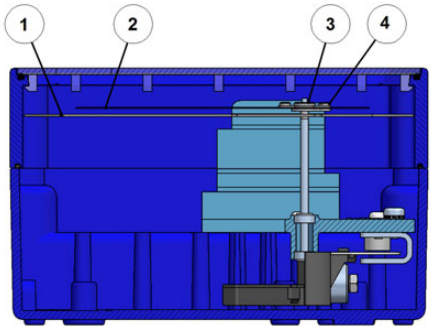
Rubbing normally happens if the meter has been hit or dropped. Simply straighten the pointer (2) by bending it slightly until it is separated between 2-3 mm from the reading scale surface (1)

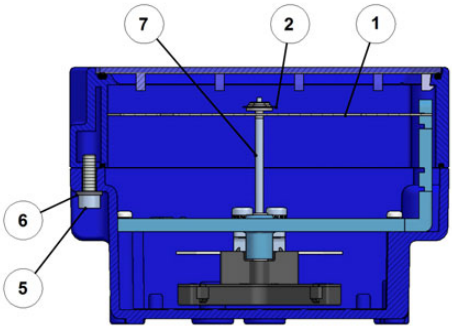
20.2.2 Deviation of the zero on the scale

When the indicator pointer (2) does not point zero in its rest position, place the flowmeter in its real working position on top of a non-magnetic table. If when the float is moved the pointer moves but does not return to 0, check that the pointer hub (3) is firmly attached to the pointer shaft (7). If it isn't, secure the pointer hub (3) onto the conical tip (7) of the shaft by tapping it lightly and carefully.

If the pointer hub is fixed, make the indicator pointer coincide with the 0 on the scale using the frontal adjusting screw (4) on the indicator pointer. Make sure that the shaft (7) is held fast so as not to be bent or damaged

Check that there is no rubbing between the pointer movement system and the cables connected to a limit switch or transmitter.





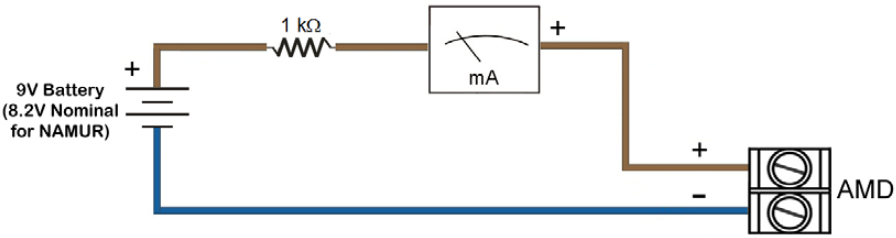
20.3 AMD limit switch maintenance

20.3.1 Electrical verification

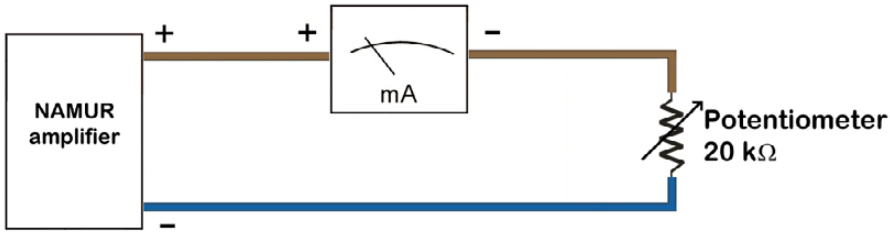
Check that the voltage at the terminals + and - is over 7.5 V when the vane is in the slot. Connect a multimeter with the scale in DC mA, in series with the terminal +.

Verify that the current is less than 1 mA when the vane is in the slot, and more than 3 mA when the vane is out of the slot.

If you do not have the NAMUR amplifier, the current can be checked using the following circuit diagram:



If you do not have the AMD sensor, the operation of the amplifier can be checked using the following circuit diagram:



With the potentiometer the current of the NAMUR amplifier can be modified. The switching point must be between 1.2 mA and 2.1 mA. That is, with the current below 1.2 mA the output relay must have a state and above 2.1 mA the output relay must have the other state.

20.4 AMM limit switch maintenance

No special maintenance is required.

20.5 TH7 transmitter maintenance

No special maintenance is required.

21 TECHNICAL CHARACTERISTICS

21.1 Series LP

Accuracy	± 5 mm measured value
Scale length	~100 mm
Scale	% or height
Liquid density	0.6 ... 2 kg/l
Measuring range	300 mm to 6 m
Working temperature	-60ºC … +150ºC
	on request, -120ºC … +400ºC with thermal separator
Ambient temperature	-10ºC … +80ºC
Working pressure	PN40 (others on request)
Installation	Vertically, on top of the tank or side mounted by means of external chamber
Connections	EN 1092-1 DN40 flange
	Thread connections G1½ or 1½" NPT
	Sanitary connections according to ISO 2852, SMS 1145, DIN 11851, TRI-CLAMP®
	Other connections on request
Housing	IP65 - coated aluminium IP65 - PP (on request) IP67 - EN 1.4404 with glass window, on request

21.2 AMD limit switch

Nominal voltage	8 V
Working voltage	5 ... 25 V
Power supply internal resistance	1 kΩ
Current with the vane into the slot	< 1 mA
Current with the vane out of the slot	≥ 3 mA
Standard:	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25ºC ... +100ºC

21.3 AMM limit switch

Maximum switching voltage	250 VAC
Maximum switching current	3 A
Potential free SPDT contacts	
Ambient temperature	-25ºC ... +100ºC

21.4 TH7 transmitter

21.4.1 Power supply

2-wire

Minimum voltage (TH7 and TH7T):	0.02 Z + 12 (Volt) (Z is the load in the current loop in Ohm) The minimum value is 12 VDC for Z=0 Ohm
Minimum voltage (TH7H and TH7TH):	0.02 (Z+Rext) + 14 (Volt) (Z is the load in the current loop in Ohm) The minimum value is 18 VDC for Z=0 Ohm and Rext=200 Ohm
Maximum voltage:	36 VDC
Consumption:	maximum 20 mA

21.4.2 Outputs

Analog output:	4 - 20 mA, factory calibrated
Maximum load in the 4-20 loop:	1.1 kΩ (at 36 VDC supply voltage)
Digital output:	MOSFET transistor N channel potential free I_{max}: 200 mA

21.4.3 General characteristics

Accuracy (analog output respect the magnetic field):	< 0.6 %
Ambient temperature:	-20ºC … +70ºC
Cable gland:	M16 x 1.5

22 SAFETY INSTRUCTIONS

The series LP of level meters are in conformity with all essential requirements of all EC directives applicable to them:

2014/68/EU Pressure equipment directive (PED)

Limit switches and transmitters:

2014/30/EU Electromagnetic compatibility directive (EMC)

2012/19/EU Waste electric and electronic equipment (WEEE).

Limit switch AMM:

2014/35/EU Low voltage directive (LV)

Equipment for hazardous areas:

2014/34/EU Equipment and protective systems intended for use in potentially explosive atmospheres (ATEX).

In the last sections of this manual the declarations of conformity according to the ATEX directive are attached.

Other declarations of conformity EC can be downloaded from the section “Download” of the Tecfluid S.A. website.

22.1 Pressure equipment directive

Tecfluid S.A. have subjected the series LP of level meters to a conformity assessment method for the pressure equipment directive, specifically according to module H (full quality assurance).

Conformity with the directive is reflected by the CE marking in each pressure equipment and by the written declaration of conformity. The CE marking is accompanied by the identification number of the notified body involved at the production control phase.

The marking of the equipment takes into account the fluid type, the group of fluid and the category, for example: G1 CATII

G Gases and vapours

1 Group of liquids 1

CATII Category II

Devices that, due to their size, are not subject to conformity assessment, are considered outside the scope of the directive and therefore they have not the CE mark according to pressure directive. These devices are subject to applicable sound engineering practice (SEP).

This equipment is considered as being a pressure accessory and **NOT** a safety accessory as defined in the 2014/68/EU directive, Article 2, paragraph 4.

22.2 IECEx certification

This equipment has been certified IECEx. The respective documentation can be downloaded from the IECEx website www.iecex.com.

22.3 Certificate of conformity TR CU (EAC marking)

Tecfluid S.A. have subjected the series LP of level meters to a certification procedure according to the technical regulations of the Customs Union of the Eurasian Economic Union (EEU).

This Certificate is an official document confirming the quality of production with the standards on the territory of the Customs Union, particularly regarding safety requirements and electromagnetic compatibility.

23 ADDITIONAL INSTRUCTIONS FOR THE Ex VERSION

This chapter only applies to equipment intended for use in explosive atmospheres.

These equipment conform with the directive 2014/34/EU (Equipment and protective systems intended for use in potentially explosive atmospheres) as indicated in the EC-type examination certificate and in its marking. They are also compliant with the IECEx scheme.

Given that this instrument is group II, it is intended for use in places likely to become endangered by explosive atmospheres, but not in mines.

For the category 1G, the equipment is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists are present continuously, for long periods or frequently.

For the category 1D, the equipment is intended for use in areas in which explosive atmospheres caused by inflammable dusts are present continuously, for long periods or frequently.

23.1 Surface temperature

Equipment is certificated as Exia IIC T4 or Exia IIC T6.

The maximum possible Surface temperature are the following:

Temperature class	Maximum surface temperature	Ignition temperature of the specific gas involved
T4	135ºC	135ºC
T6	85ºC	85ºC

23.2 Non metallic parts

WARNING: POTENTIAL RISK OF ELECTROSTATIC CHARGE

The front of the housing consists of a transparent plastic window in order to let the user see the position of the pointer on the scale.

Since the danger of ignition by electrostatic discharge when rubbing this window can not be avoided, **the instrument must always be cleaned with a damp cloth**.

WARNING: RISK OF IMPACT

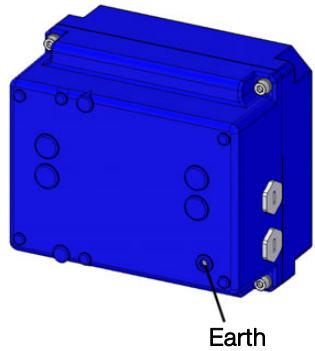
Because the housing base is made of aluminium, **the equipment must be installed and operated always in locations at low risk of impact.**

WARNING: WIRING

The wiring of the variants containing transmitter and inductive sensor must be kept separated.

23.3 Connecting conductive parts to earth

When the instrument is not grounded securely through the connection process, it should be grounded through the housing screw, as shown in the figure.



23.4 AMD limit switch

When the equipment includes an AMD limit switch, it is certified as intrinsic safety with the following parameters:

Marking	Ex ia IIC T4	Ex ia IIC T6
Specific parameters	Ui : 16 V	Ui : 16 V
	Ii : 25 mA	Ii : 76 mA
	Pi : 64 mW	Pi : 242 mW
	Ci : 50 nF	Ci : 50 nF
	Li : 250 uH	Li : 250 uH

23.5 AMM limit switch

When the equipment includes an AMM limit switch, can be certified as intrinsic safety. No specific electric parameters are required for gas. In case of dust, the parameters are the following:

Ii : 250 mA
Pi : According to certificate

23.6 TH7 transmitters

Transmitters TH7 can be supplied with certification to be installed in potentially explosive atmospheres. They are intrinsic safety devices.

Differing from TH7 transmitters for safe zone, they do not have pulse output.

The electrical connection and the information respect the HART protocol is the same as in the TH7 transmitter (see sections 12 to 18).

The technical characteristics that differ from TH7 transmitters are the following:

Maximum voltage:	30 VDC
Maximum load in the 4-20 loop:	900 Ω (at 30 VDC supply voltage)
Pulse output:	Not available in this version.

The rest of characteristics are the same as TH7 transmitter (see section 21.4).

The specific intrinsic safety parameters are the following:

Marking	Ex ia IIC T4	Ex ia IIC T6
Specific parameters	Ui : 30 V	Ui : 30 V
	Pi : According to certificate	Pi : According to certificate
	Ci : 57,3 nF	Ci : 57,3 nF

NOTE: Programming via USB can only be done in non-classified area.

23.7 Maintenance

It is the same as in non-Ex equipment.

Ex-intrinsically safe equipment **can not be repaired**. In case of any incident that requires intervention in the equipment, a new equipment will be supplied.

23.8 Marking

Some examples of marking are sown as follows.

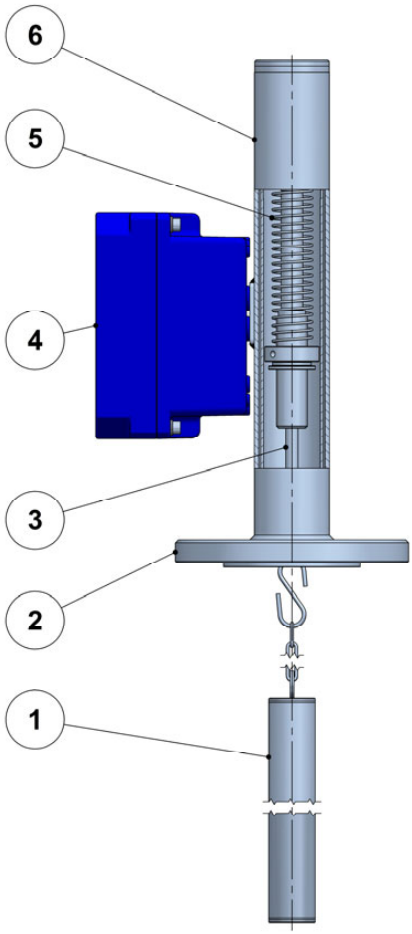
The marking of the equipment shows the following characteristics:

- Manufacturer
- Model
- Serial number
- CE marking
- ATEX and IECEx marking
- Certification number
- Address of the manufacturer

The marking label is located at one side of the housing, always visible

24 LIST OF COMPONENTS

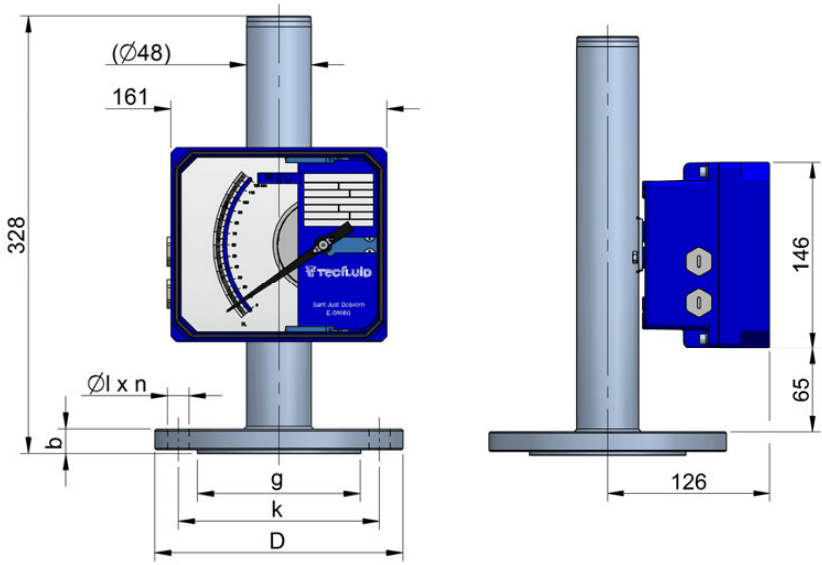
N.	Description	Materials		
		LP / SS	LP / Hastelloy	LP / Titanium
1	Float	EN 1.4404 (AISI 316L) *	Hastelloy C *	Titanium *
2	Connection	EN 1.4404 (AISI 316L)	Hastelloy C	Titanium
3	Float guide			
4	Housing	Coated aluminium **		
5	Spring	EN 1.4401 (AISI 316)	Hastelloy C	Titanium
6	Body	EN 1.4404 (AISI 316L)	Hastelloy C	Titanium



* PVC, PP, PVDF on request

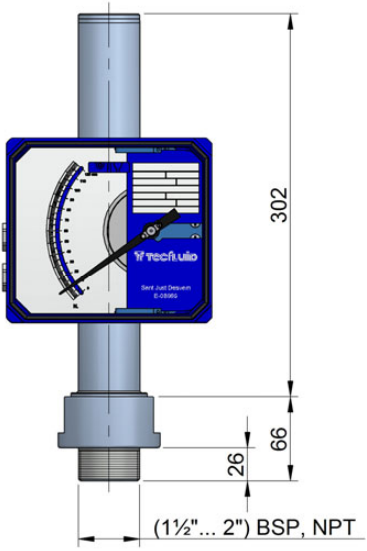
** EN 1.4404 (AISI 316L) & PP on request

25 DIMENSIONS

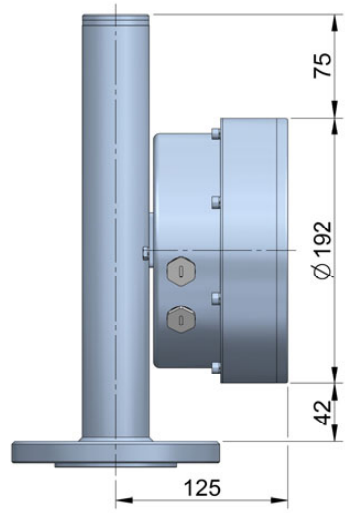


DN	PN	D	k	g	ØI x n	b
40	40	150	110	88	18 x 4	18

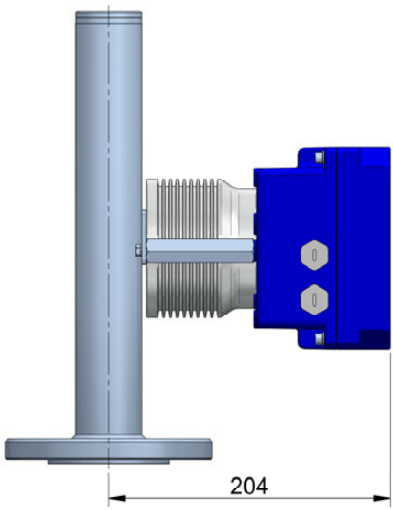
(dimensions in mm)



Dimensions with painted aluminium indicator box

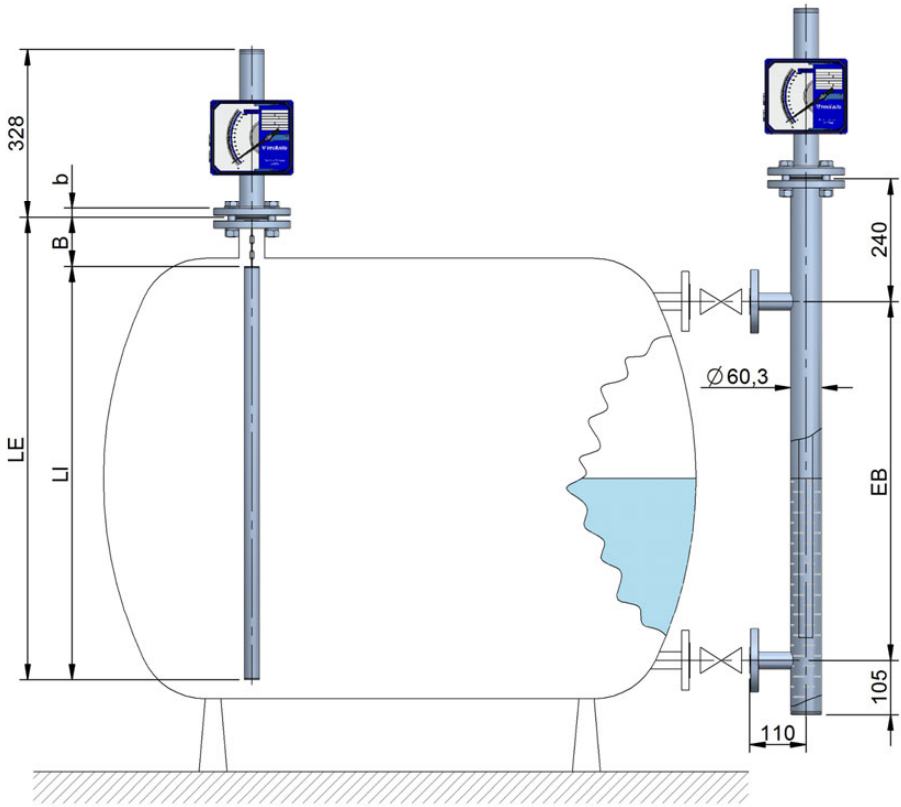


Dimensions with EN 1.4404 (AISI 316L) indicator box



Dimensions with thermal separator

(dimensions in mm)



LP80

LP80 with by-pass chamber 80ME

DN	PN	b	B	EB	LE	LI
40	40	18	to be specified *			

* Dimensions B, EB, LE and LI according to drawing above
Other flange sizes and standards on request

Declaration of Conformity

Manufacturer:	TECFLUID S.A. Narcís Monturiol, 33 E 08960 Sant Just Desvern
Equipment:	Series SC, DP flowmeters and LP level meters
Models:	SC250, SC250H, SC250V, SM250, DP65, DP500, LP80
Switches:	AMD1, AMD2, AMM1, AMM2
Transmitters:	TH7, TH7T, TH7H, TH7TH
Certification:	LOM 09ATEX2087X
Group and category:	II 1G Ex ia IIC T4 Ga II 1D Ex ia IIIC T85ºC Da (transmitter TH7 not encapsulated)
	II 1G Ex ia IIC T6 Ga II 1D Ex ia IIIC T85ºC Da (transmitter TH7 encapsulated)

Standards to which conformity is declared:

Directive ATEX 2014/34/EU

EN60079-0:2009	Equipment. General requirements
EN6009-11:2012	Equipment protection by intrinsic safety "i"
EN60079-26:2007	Equipment with equipment protection level (EPL) Ga

Updates of the standards regarding those referred to the EC-TYPE examination certificate do not affect the scope of this declaration of conformity

For production, Tecfluid S.A. complies with the annex IV of the directive 2014/34/EU, having the notification for production quality assurance n. LOM 02ATEX9033, of the notified body with identification number 0163 (Laboratorio Oficial J.M. Madariaga)

I, the undersigned, declare that the equipment stated above conforms with the essential requirements of the Directives of the European Parliament and the Council on the approximation of the laws of Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres.

In Sant Just Desvern
Date: December 15, 2016

Esteve Cusidó (R&D manager)

Declaration of Conformity

Manufacturer: TECFLUID S.A.
Narcís Monturiol, 33
E 08960 Sant Just Desvern

Equipment: Flowmeters and level meters

Models: Series SC, DP, LP

Declaration:

Having reviewed the essential health and safety requirements related to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, Tecfluid S.A. consider that this device is outside the scope of the Directive 2014/34/EU, given that it does not content any potential ignition sources. Therefore it does not require certification by a notified body or marking in conformity with the ATEX Directive.

Special emphasis has been done in the compliance of EN 13463:2001 standard.

13463-1 5.1

Instructions for use of the equipment include the terms of service.

13463-1 5.2

Ignition hazard assessment.

Potential ignition source		Description of the measure(s) applied
Normal operation	**Expected malfunction**	
Hot surfaces		The equipment itself does not generate any increase of heat, the maximum temperature will depend on the operating conditions (process temperature)
Ingress of dust inside the enclosure		The equipment has an IP65 ingress protection to avoid ingress of dust into the enclosure
Static electricity		A warning label indicating risk of static electricity is placed
Impact of moving parts		Sparks cannot be generated since material is aluminium
Bearings		The bearings cannot generate an ignition
Mechanical resistance		Impact test is performed

13463-1 6.1

Maximum surface temperature. The devices themselves do not generate any heat.

13463-1 7.2

Classification of non-metallic parts.

There is a non-metallic part in the instrument. It is the front window of the cover. It is made of a transparent plastic (polycarbonate resin, whose trademark is LEXAN® 143R) that allows viewing the needle position on the scale.

13463-1 7.3

Thermal endurance.

The temperature index of the equipment is 130 ° C.

13463-1 7.4

When the metal enclosure is made of aluminium, it is coated with an insulating paint whose thickness is always less than 2 mm.

Since the risk of ignition by electrostatic discharge when rubbing the polycarbonate front window cannot be avoided, the instruments include a warning label with the safety measures to be applied in service.

The same case applies to the entire enclosure when it is made of polypropylene.

13463-1.8

Lightweight materials.

The index of the metal magnesium in the equipment of aluminium enclosure is around 0.2%, well below the established limit of 7.5%.

13463-1 11

Connection facilities for earthing conducting parts.

The instruments have a safe earth connection for cases where this earth connection by means of the process connection cannot be ensured.

In Sant Just Desvern
Date: November 5, 2015

Esteve Cusidó (R&D manager)

WARRANTY

Tecfluid S.A. guarantee all the products for a period of 24 months from their sale, against all faulty materials, manufacturing or performance. This warranty does not cover failures which might be imputed to misuse, use in an application different to that specified in the order, the result of service or modification carried out by personnel not authorized by Tecfluid S.A., wrong handling or accident.

This warranty is limited to cover the replacement or repair of the defective parts which have not damaged due to misuse, being excluded all responsibility due to any other damage or the effects of wear caused by the normal use of the devices.

Any consignment of devices for repair must observe a procedure which can be consulted in the website www.tecfluid.com, “After-Sales” section.

All materials sent to our factory must be correctly packaged, clean and completely exempt of any liquid, grease or toxic substances.

The devices sent for repair must enclose the corresponding form, which can be filled in via website from the same “After-Sales” section.

Warranty for repaired or replaced components applies 6 months from repair or replacement date. Anyway, the warranty period will last at least until the initial supply warranty period is over.

TRANSPORTATION

All consignments from the Buyer to the Seller´s installations for their credit, repair or replacement must always be done at freight cost paid unless previous agreement.

The Seller will not accept any responsibility for possible damages caused on the devices during transportation.

The art of measuring

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Quality Management System ISO 9001 certified by

Pressure Equipment Directive certified by

ATEX European Directive certified by

HART is a trademark of FieldComm Group ™

The technical data described in this manual is subject to modification without notification if the technical innovations in the manufacturing processes so require.