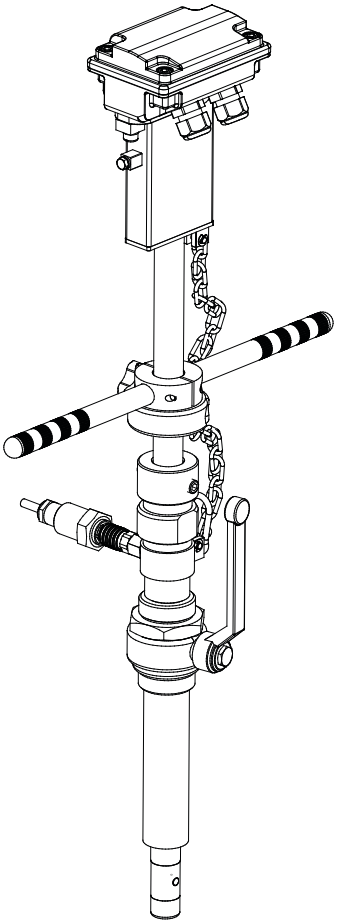
INSTRUCTION MANUAL

MS 3810



CE

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INTRODUCTION

- This manual is integral part of the product. Read carefully the instructions contained since it contains important indications for the safety of use and of maintenance.
- The technical information and the relative products of this manual could be modified without any previous notice.
- The flow meter must be used for the use it has been built for. The improper use, possible tampering of the instrument or parts of it and substitutions of any components not original, makes the warranty to decay automatically.
- The manufacturer is considered responsible only if the instrument is used in its original configuration and setting.
- The flowmeter makes measures of liquids with conductivity greater than 5µS/cm; it consists of a sensor (described in this manual) and a converter, for it see the manual provided.
- If the sensor is supplied in compact version to the converter, consider the operating temperatures more restrictive, otherwise refer to the respective manuals (page 10).
- When transporting, unpacking and handling the flowmeter, be careful and care.
- In the case of prolonged storage and of transport, use and store in the original container in a dry place, do not place more than 3 packs one above the other.
- It is possible pallets storage and transport (in case of wooden crates do not place one above the other).
- For the cleaning of the device use only a damp cloth, and for the maintenance/repairs, contact the customer service.
- For the disposal of the device and of the packaging make strict reference to the regulations.
- It is forbidden the reproduction of the present manual and of possible software supplied with the instrument

START UP AND MAINTENANCE OF THE INSTRUMENTS

- Before starting up the instrument, always make a sure connection to ground

- Verify periodically: the cables integrity, the tightening of the sealing elements (cable glands, covers, etc.), the mechanical fixing of the instrument on the pipe or on the wall stand

GENERAL DESCRIPTION



ATTENTION



DANGER ELECTRIC SHOCK

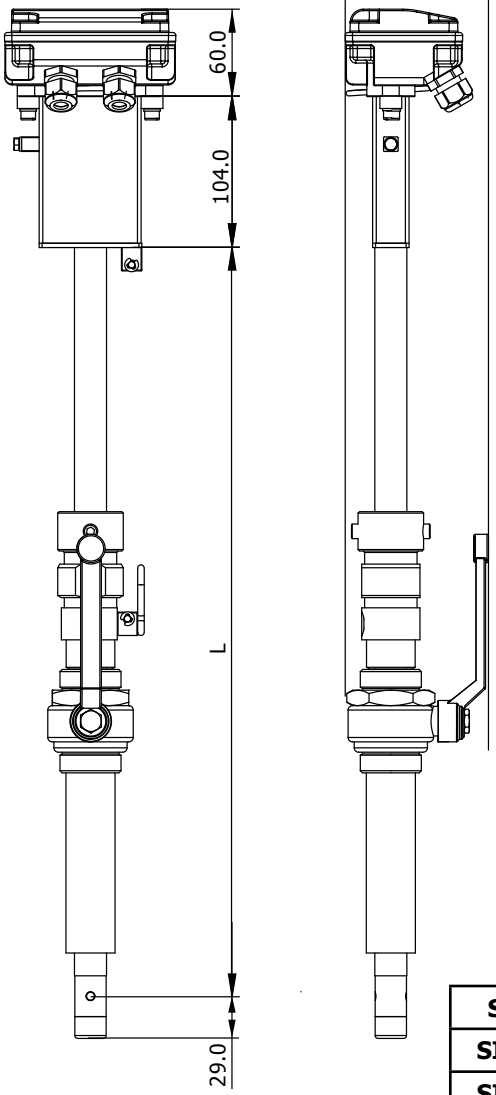


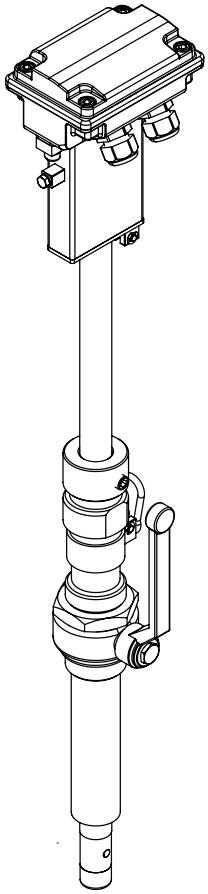
WARNING

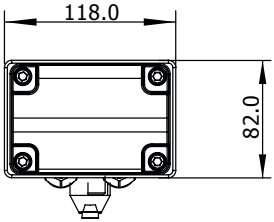


PRECAUTIONS

OVERALL DIMENSIONS







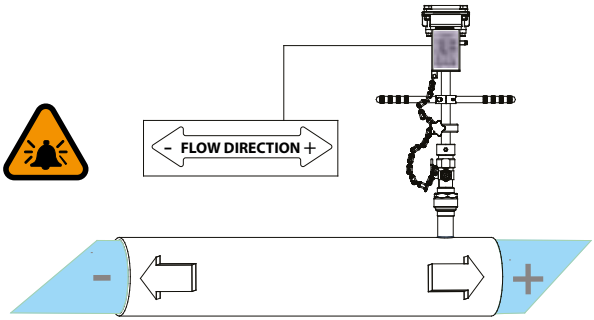
SIZE	MAX. DEPTH	L
SIZE 0	150mm	515
SIZE 1	300mm	665
SIZE 2	500mm	865
SIZE 3	700mm	1065
SIZE 4	1000mm	1365
SIZE 5	2000mm	2365
SIZE 9	80mm	330

OPERATIVE TEMPERATURES

	PEEK LINING			
	LIQUID TEMP.		AMBIENT TEMP.	
	Min.	Max	Min.	Max
°C	0	100	-10	60
°F	32	212	14	140

GENERAL INFORMATIONS FOR THE SENSOR INSTALLATION

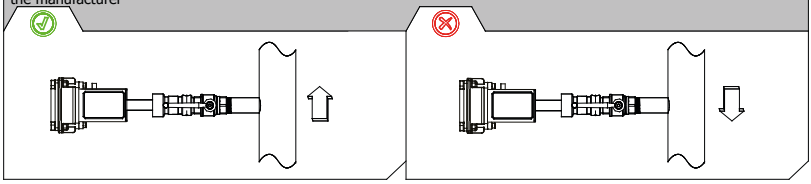
Flow direction



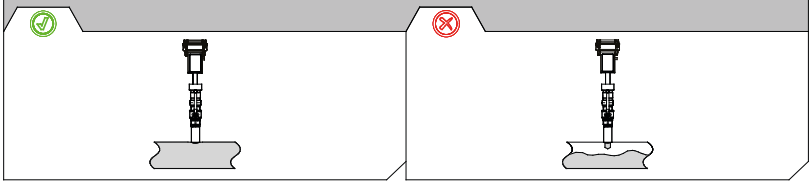
The insertion sensor must be installed correctly in relation to the liquid flow direction in the pipe. Ensure that the flow direction is known. The flow rate will be measured in the positive direction when the liquid in the pipe is flowing from – to the + direction as indicated on the tag plate of the sensor.
If for any reason the flow rate changed after the installation the measured direction can be reversed by changing the sign of the Calibration coefficient (KA factor) in the sensor menu of the converter electronic.

INSTALLATION RECOMMENDATIONS

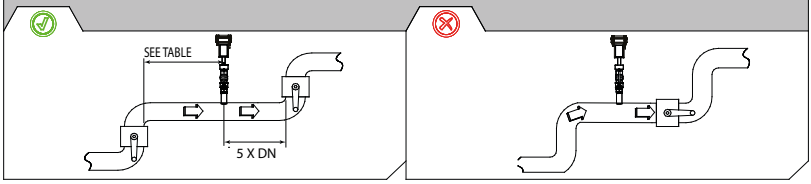
In vertical installations an ascending flow is preferable. For vertical installations with descending flow direction contact the manufacturer



Avoid a partially empty pipe, during operation the pipe must be either completely full of liquid or completely empty



Install the sensor away from bends and hydraulic accessories



Tighten the two fixing screws before opening the ball valve

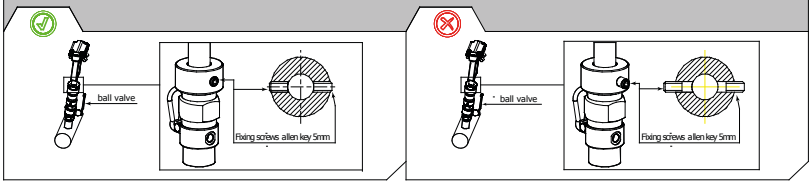


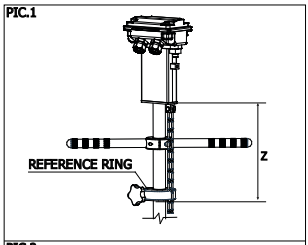
Table according data from **UNI10727_1998** (Fluid flow rate in a circular closed pipeline, speed measuring method at only one point of the section)	Min upstream straight length expressed in multiples of the diameter of the conduit.	
Disturbance upstream from the measuring point	Valid for a measurement at the point of mean axial velocity	Valid for a measurement on the axis of the pipe
90° elbow or t-bend	50	25
Several 90° coplanar bends	50	25
Several 90° non-coplanar bends	80	50
Total angle convergent from 18° to 36°	30	10
Total angle divergent from 14° to 28°	55	25
Fully opened butterfly valve	45	25
Fully opened cap valve	30	15

SENSOR INSTALLATION IN PRESSURIZED PIPE

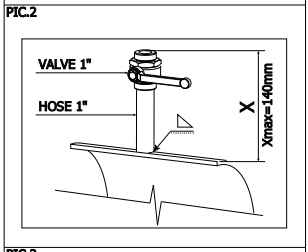
1) Define and block on Z value the reference ring (pic.1)

AVAILABLE INSERTION DEEP	
Insertion	**"Z" VALUE**
1/8D	Z=L-(X+S+1/8D+92)
1/2D	Z=L-(X+S+1/2D+92)
7/8D	Z=L-(X+S+7/8D+92)

N.B.: for other dimensions see complete layout on next page

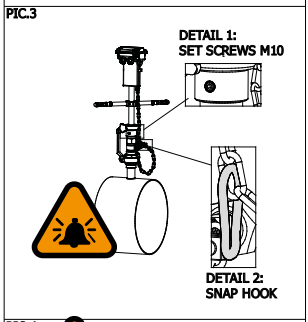


2) Weld to the pipeline the Ø 1" hose-coupling. **WARNING:** "X"dimension max 140 mm with 1" valve (pic.2)



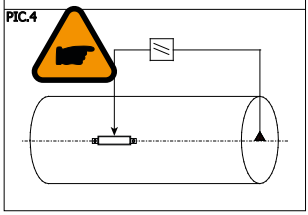
3) Screw the 1" valve to the 1" hose (pic.2)

4) Screw the 1" sensor jacket to the 1" valve



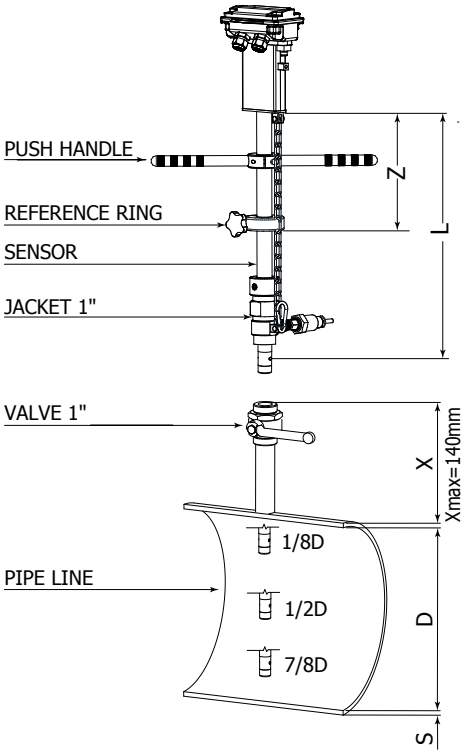
5) Open slowly the valve

6) Push the sensor up to the reference ring touch the sensor jacket ("Z" dimension) (pic.1)



7) clip the excess chain lenght to the snap hook (pic.3)

8) Verify the lineup: the alignment handle MUST be aligned with the pipe axis (pic.4) and tighten the 2 M10 screw bolts (pic.3)



SIZE	L	MAX DEPTH
SIZE 0	515	150 (X<140)
SIZE 1	665	300 (X<140)
SIZE 2	865	500 (X<140)
SIZE 3	1065	700 (X<140)
SIZE 4	1365	1000 (X<140)
SIZE 5	2365	2000 (X<140)
SIZE 9	330	80 (X<140)

CONVERTER SETTING:

Insertion position of Sensor Head [check **CONVERTER MANUAL/MENU SENSOR]**
POSITIONS: 0 (1/8D) - 1(1/2D) - 2 (7/8D) ⇨ the coefficients **Kp** and **Ki** are calculated automatically by the converter.
POSITION: 3 ⇨ **Kp** and **Ki = 1** (default); relevant values of these coefficients must be calculated through the real speed profile on the installation point (use PROFILING software)
NOTE: consult page 13 for further details

tightening the 2 x M10 screw bolts without fixing the chain could cause the sensor's violent ejection from the pipe.

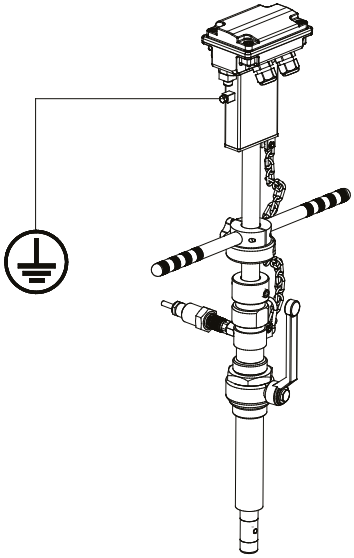
WARNING FOR YOUR SAFETY: do not remove or modify the lock chain.

to determine Z value, the formula considers the jacket sensor screwed up to 3/4 of the thread.

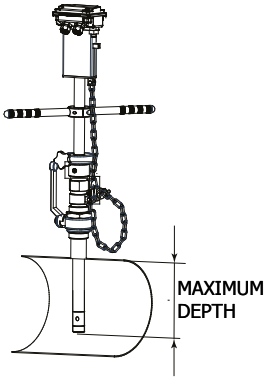
GROUNDING INSTRUCTIONS

For correct meter operation it is NECESSARY that the sensor and the liquid are equipotential, ALWAYS connect the sensor and converter to ground as indicated in the below figure.

For grounding with cathodic protection pipe contact the manufacturer.



MS3810: MAXIMUM INSERTION DEPTH

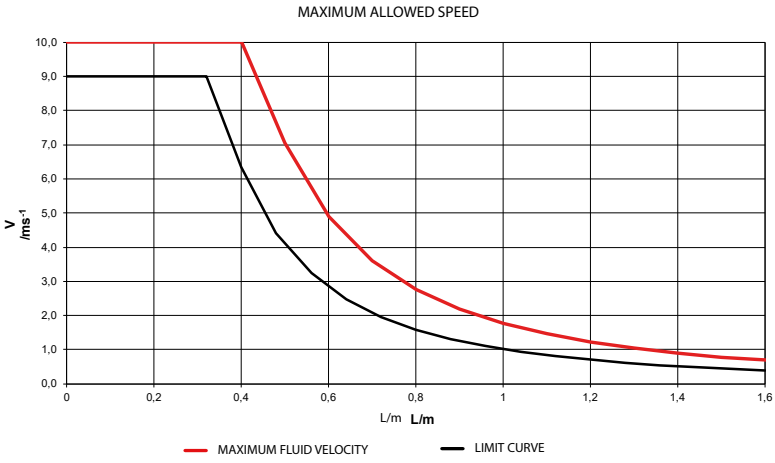


SIZE	MAXIMUM DEPTH
SIZE0	150(X<140)
SIZE1	300(X<140)
SIZE2	500(X<140)
SIZE3	700(X<140)
SIZE4	1000(X<140)
SIZE5	2000(X<140)
SIZE 9	80 (X<140)

MAXIMUM ALLOWED SPEED

WARNING! The insertion and extraction operations of the insertion instruments are operations that can be dangerous when working with the pressure tube.
The pressure inside the tube apply a significant force on the probe that can be ejected violently, creating dangerous situations for the operators. However, the protection chain provided by the instrument does not allow it to completely escape from the cylinder linear. It is recommended to perform the insertion or extraction operations of the insertion instrument in safe conditions, if possible with not in pressure pipe or at least reduced pressure pipe.
The extraction operations can be dangerous as well as for the risk connected to the ejection forces of the probe, also due to the possible leakage of liquid from the piping caused by incorrect operation or defect in the shut-off valve. The following are the indicative values of expulsion force at different pressure values:

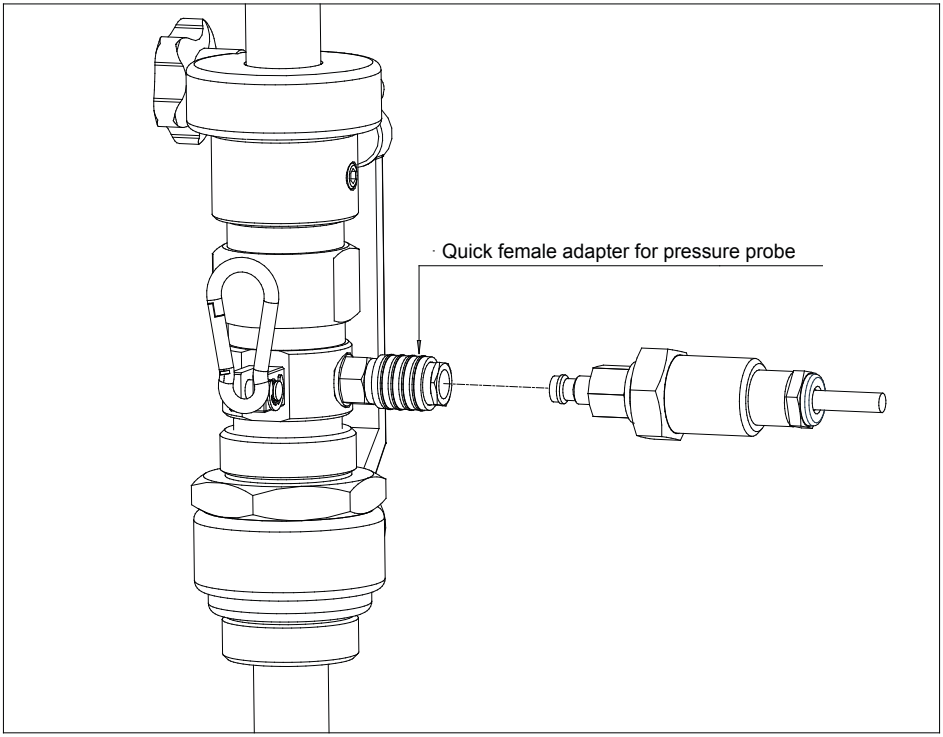
INTERNAL PRESSURE PIPE [bar]	EXPULSION FORCE [kg]
6	30
10	50
16	80
25	125



INSERTION DEPTH	MAXIMUM FLUID VELOCITY
L	V
m	ms-1
0.10	10.0
0.20	10.0
0.30	10.0
0.40	10.0
0.50	7.06
0.60	4.91
0.70	3.60
0.80	2.76
0.90	2.18
1.00	1.77
1.10	1.46
1.20	1.23
1.30	1.04
1.40	0.90
1.50	0.78
1.60	0.69

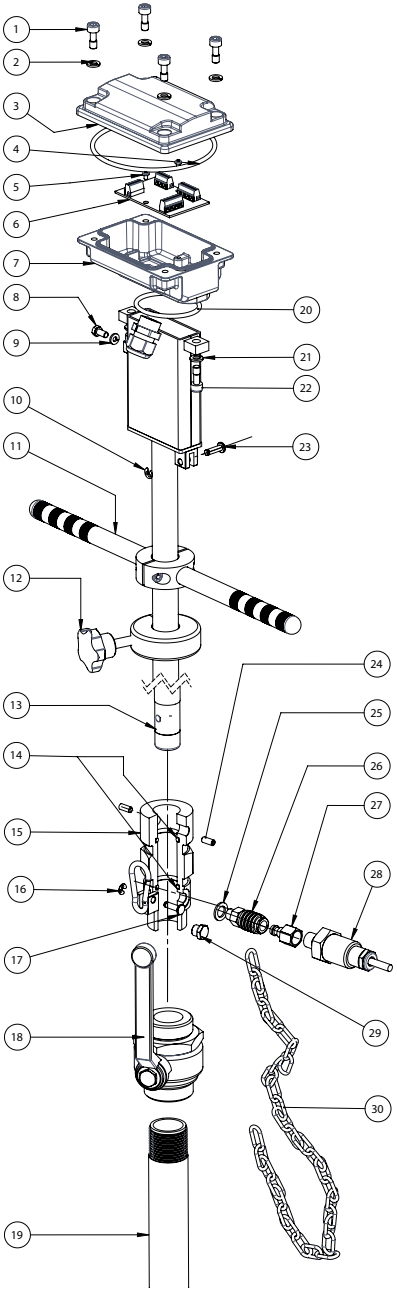
The maximum flow velocity in the pipe strictly regulates the maximum permitted inserted length of the probe inside the same pipe (maximum depth). The flow rate and generation of fluid vortices places stress on the probe. The graph above should be used as a rule when installing the sensor in the pipe to ensure the probe remains within safe operating conditions. The mounting of the probe is important and the probe should be installed following this installation guide and standards set down in UNI 1072700 1998 which seeks to ensure a fully developed stable flow profile at the measurement point.

PRESSURE SENSOR INSTALLATION



LAYOUT

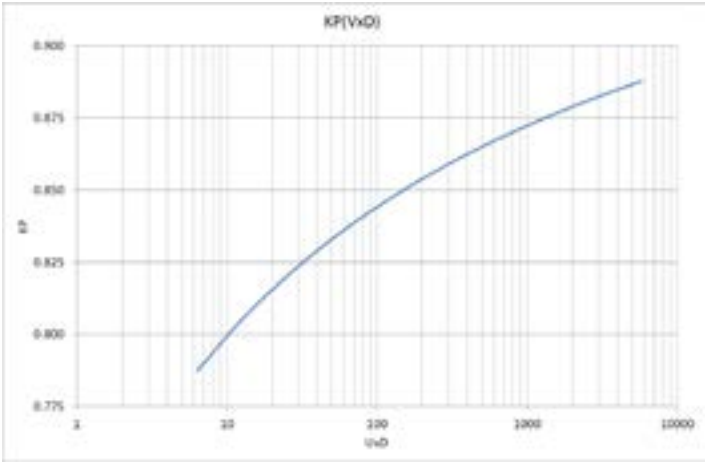
POS.	DESCRIPTION
1	SCREW 6X16
2	GROWER Ø6
3	JUNCTIONS BOX COVER
4	O-RING 4400
5	SCREW M4x6
6	PCB FOR SEPARATE VERSION (NORMAL OR PREAMPLIFIER)
7	JUNCTIONS BOX MAIN HOUSING
8	SCREW M5x10
9	GROWER Ø5
10	SEGGER 4X9 (RING 4 7434-75)
11	HANDLE PUSH
12	FIXING KNOB
13	SENSOR MS3810
14	O-RING 4087
15	CYLINDER LI\NER
16	SEGGER 4X9 (RING 4 7434-75)
17	PIN FOR INSERT
18	BALL VALVE
19	WELDED PIPE 1”
20	O-RING 155
21	GROWER Ø6
22	SCREW 6X16 WORKED
23	PIN FOR INSERT
24	GRUB SCREW M10X12
25	WASHER
26	QUICK FEMALE
27	QUICK MALE
28	PRESSURE SENSOR
29	CUP PRESSURE HOLE
30	SAFETY CHAIN



VELOCITY K-FACTOR SETUP (KP,KI)

Flow rate equation: Q=KA x **KP** x **KI** x V x A , V= Velocity A=inner Area				
CONVERTER OPERATION MODE	SENS. POSITION	INSTALLATION AT	KP	KI
AUTO	0	D/8	1	KI EQUATION
	1	D/2	KP(TABLE)	
	2	7/8D	1	
MANUAL	3	FLOATING	1(EDITABLE)	1(EDITABLE)

KP Profile Factor (KP TABELLA)	
(VxD)	Kp(D/2)
6	0,787
12	0,805
24	0,820
48	0,832
95	0,843
188	0,853
371	0,862
736	0,869
1461	0,876
2902	0,882
5767	0,888
V	ms-1
D	mm



$$Ki(y,D,d) = 1 + \frac{2d}{\pi D} + 0{,}5\left(1 - \frac{2y}{D}\right)\left(\frac{2d}{\pi D}\right)^{0{,}5}$$

Y: insertion depth /mm
D: pipe inside diameter /mm
d: sensor diameter d=23mm

At the end of its lifetime, this product shall be disposed of in full compliance with the environmental regulations of the state in which it is located.

MANUAL REVIEWS

REVIEW	DATE	DESCRIPTION
MS3810_IT_EN_NL_R01	15/09/2016	First edition
MS3810_IT_EN_NL_R02	21/06/2017	Updated the layout
MS3810_IT_EN_NL_R03	09/03/2017	Added revision table
MS3810_IT_EN_NL_R04	30/01/2019	Added maximum speed allowed notes