



F010-P

FLOWRATE INDICATOR



Signal input flowmeter: pulse, Namur and coil.

Options: Intrinsically Safe.



F-Series - Field mounted indicators for safe and hazardous areas. More info: www.fluidwell.com/fseries



SAFETY INSTRUCTIONS

- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- **LIFE SUPPORT APPLICATIONS:** The F010-P is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.
- **Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.**
- This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).
- Do connect a proper grounding to the aluminum casing as indicated if the F010-P has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-casing and removable terminal-block may never be removed.
- **Intrinsically Safe applications:** follow the instructions as mentioned in Chapter 5 and consult "Fluidwell F0...-XI - Documentation for Intrinsic Safety".



DISPOSAL

- At the end of its life this product should be disposed of according to local regulations regarding waste electronic equipment. If a battery is present in this product it should be disposed of separately. The separate collection and recycling of your waste equipment will help to conserve natural resources and ensure that it is recycled in a manner that protects the environment.

SAFETY RULES AND PRECAUTIONARY MEASURES

- The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and the procedures as described in this manual are not followed.
- Modifications of the F010-P implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Installation, use, maintenance and servicing of this equipment must be carried out by authorized technicians.
- Check the mains voltage and information on the manufacturer's plate before installing the unit.
- Check all connections, settings and technical specifications of the various peripheral devices with the F010-P supplied.
- Open the casing only if all leads are free of potential.
- Never touch the electronic components (ESD sensitivity).
- Never expose the system to heavier conditions than allowed according to the casing classification (see manufacture's plate and chapter 4.2.).
- If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
- The local labor and safety laws and regulations must be adhered to.

ABOUT THE OPERATION MANUAL

This operation manual is divided into two main sections:

- The daily use of the unit is described in chapter 2 "Operation". These instructions are meant for users.
- The following chapters and appendices are exclusively meant for electricians/technicians. These provide a detailed description of all software settings and hardware installation guidance.

This operation manual describes the standard unit as well as most of the options available. For additional information, please contact your supplier.

A hazardous situation may occur if the F010-P is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this operating manual indicated by the pictograms:



A "**warning**" indicates actions or procedures which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the F010-P or connected instruments.



A "**caution**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the F010-P or connected instruments.



A "**note**" indicates actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

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Software version	:	03.02.xx
Manual	:	HF010PEN_v0403_03 Atex_IECEEx_CSA_FM
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1. INTRODUCTION

1.1. SYSTEM DESCRIPTION OF THE F010-P

Functions and features

The flowrate indicator model F010-P is a microprocessor driven instrument designed to display the actual flowrate.

This product has been designed with a focus on:

- ultra-low power consumption to allow long-life battery powered applications (type PB / PC),
- intrinsic safety for use in hazardous applications (type XI),
- several mounting possibilities with GRP or aluminum enclosures for industrial surroundings,
- ability to process all types of flowmeter signals,

Flowmeter input

This manual describes the unit with a pulse type input from the flowmeter "-P version". Other versions are available to process (0)4-20mA or 0-10V flowmeter signals.

One flowmeter with a passive or active pulse, Namur or coil signal output can be connected to the F010-P. To power the sensor, several options are available.

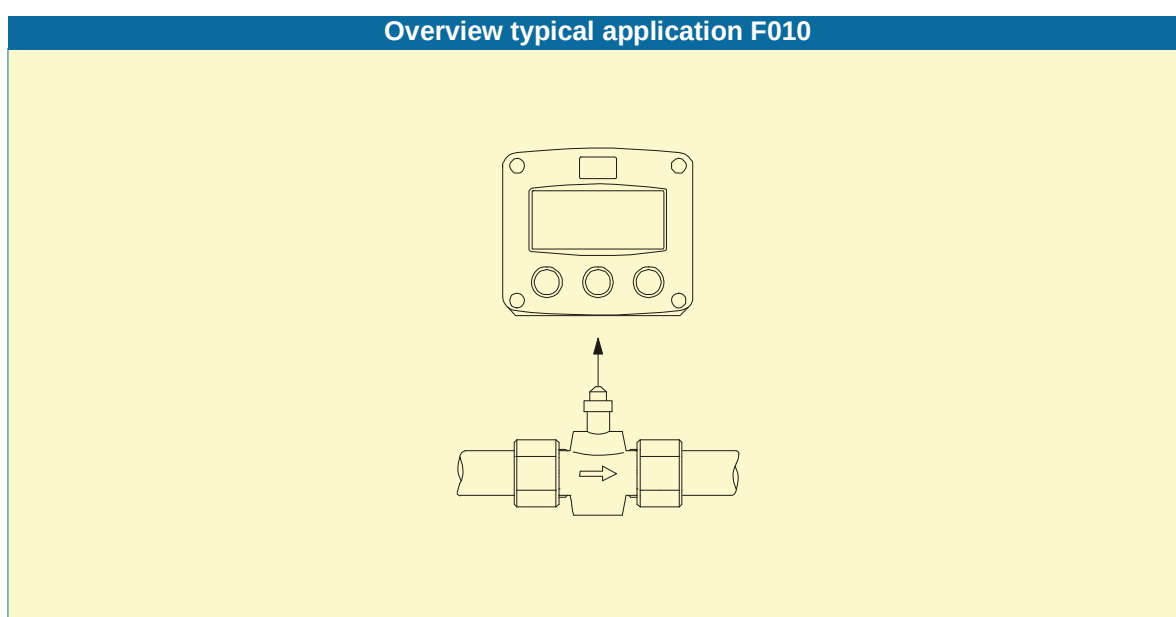


Fig. 1: Typical application for the F010-P.

Configuration of the unit

The F010-P has been designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F010-P according to your specific requirements.

It includes several important features, such as K-Factor, measurement units, signal selection etc. All settings are stored in EEPROM memory and will not be lost in the event of power failure. To extend the battery-life time, please use of the power-management functions as described in chapter 3.2.3.

Display information

The unit has a very large transfective LCD with all kinds of symbols and digits to display measuring units, status information and key-word messages.

Flowrate values are displayed with the large 26mm (1") digits while the smaller 8mm (0.31") digits will display the measuring and time unit.

The Piegraph is percentage-wise related to the span.

Options

The following options are available: intrinsic safety, power- and sensor-supply options, panel-mount, wall-mount and weather-proof enclosures, flame proof enclosure and LED backlight.

2. OPERATIONAL

2.1. GENERAL



- The F010-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.

This chapter describes the daily use of the F010-P. This instruction is meant for users / operators.

2.2. CONTROL PANEL

The following keys are available:

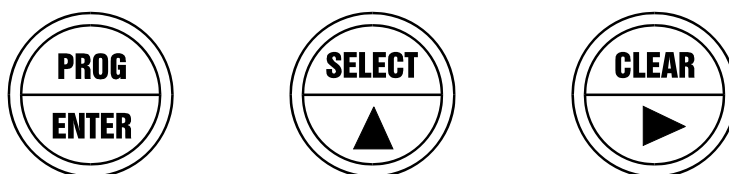


Fig. 2: Control Panel.

Functions of the keys



This key is used to program and save new values or settings.
It is also used to gain access to SETUP-level; please read chapter 3.



The arrow-key ▲ is used to increase a value at SETUP level
after PROG has been pressed
or to configure the unit; please read chapter 3.



The arrow-key ► is used to select a digit at SETUP level after PROG has been
pressed or to configure the unit; please read chapter 3.

2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the F010-P will always function at Operator level. The information displayed is dependant upon the SETUP-settings. All pulses generated by the connected flowmeter are measured by the F010-P in the background, whichever screen refresh rate setting is chosen. After pressing a key, the display will be updated very quickly during a 30 second period, after which it will slow-down again.



Fig. 3: Example of display information during process.

For the Operator, the following functions are available:

- **Display flowrate**

This is the main display information of the F010-P. After selecting any other information, it will always return to this main display automatically.

When "-----" is shown, then the flowrate value is too high to be displayed.

- **Piegraph indication**

This 10 segment Piegraph gives a quick impression about the actual value in relation to its measuring range in a scale of 0-100%.

As soon as the input value is 5% above the calibrated measurement range, the piegraph starts flashing.

- **Low-battery alarm**

When the battery voltage drops, it must be replaced. At first "low-battery" will flash, but as soon as it is displayed continuously, the battery **MUST** be replaced shortly after!

Only original batteries supplied by the manufacturer may be used, else the guarantee and liability will be terminated. The remaining lifetime after the first moment of indication is generally several days up to some weeks.



Fig. 4: Example of low-battery alarm.

- **Range error**

As soon as the input value is 5% outside the calibrated measurement range, the piegraph starts flashing. Meanwhile, LO RANGE or HI RANGE will be displayed.

- **Alarm 01-03**

When "alarm" is displayed, please consult Appendix B: problem solving.

3. CONFIGURATION

3.1. INTRODUCTION

This and the following chapters are exclusively meant for electricians and non-operators. In these, an extensive description of all software settings and hardware connections are provided.



- Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- The F010-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. The housing may only be opened by trained personnel.
- Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.

3.2. PROGRAMMING SETUP-LEVEL

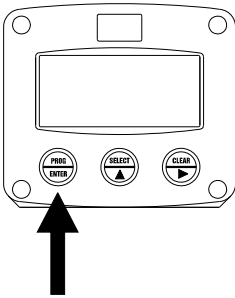
3.2.1. GENERAL

Configuration of the F010-P is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows ⇄ will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically. SETUP can be reached at all times while the F010-P remains fully operational.



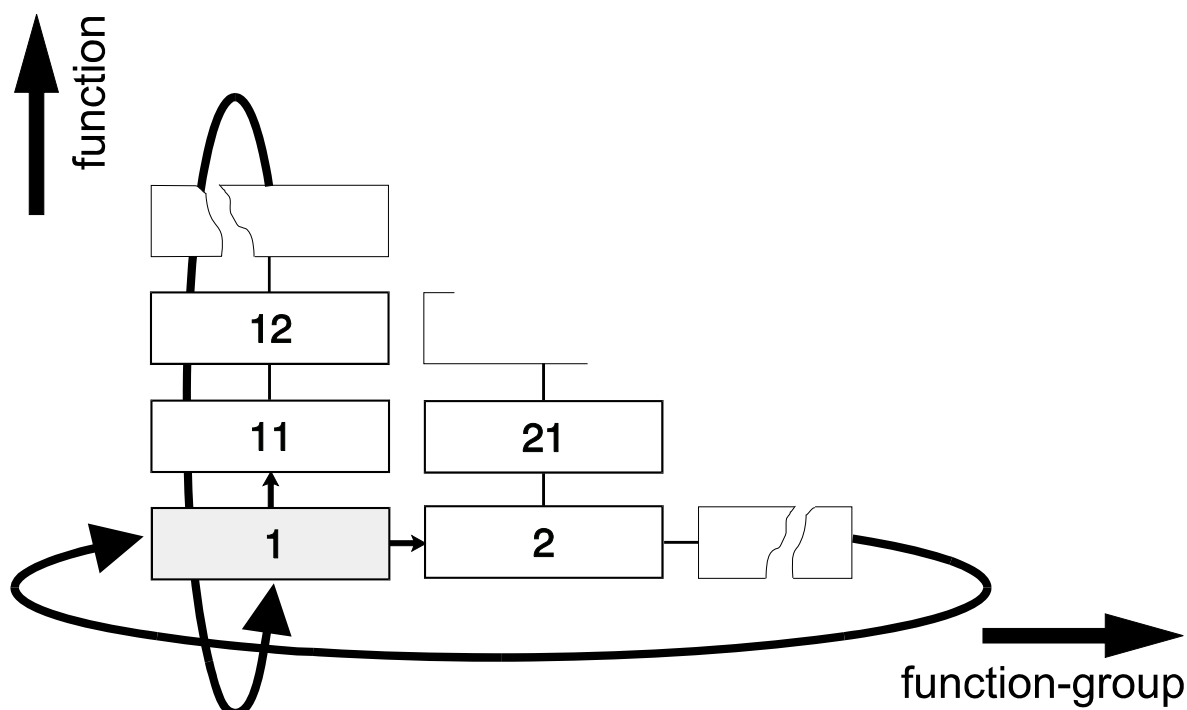
Note: A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.

To enter SETUP-level:



Press  for 7 seconds

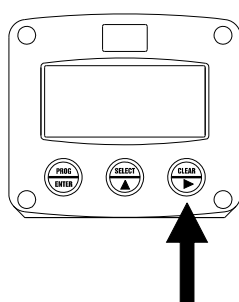
Matrix structure SETUP-level:



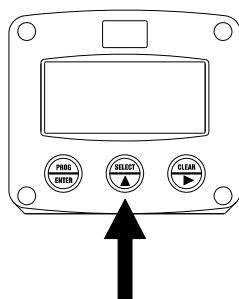
SCROLLING THROUGH SETUP-LEVEL

Selection of function-group and function:

SETUP is divided into several function groups and functions.



Select function-group with



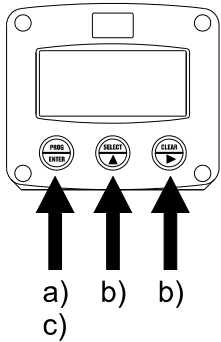
Select function with



Each function has a unique number, which is displayed below the word "SETUP" at the bottom of the display. The number is a combination of two figures. The first figure indicates the function-group and the second figure the sub-function. Additionally, each function is expressed with a keyword.

After selecting a sub-function, the next main function is selected by scrolling through all "active" sub-functions (e.g. 1 $\uparrow$, 11 $\uparrow$, 12 $\uparrow$, 13 $\uparrow$, 14 $\uparrow$, 1 $\rightarrow$, 2 $\rightarrow$, 3 $\uparrow$, 31 etc.). The "CLEAR" button can be used to jump a step back if you missed the desired function.

To change or select a value:



- a) press  briefly; **PROGRAM** will start flash
- b) select or enter value with  and / or 
- c) press  to confirm the value / selection.

To change a value, use  to select the digits and  to increase that value.

If the new value is invalid, the increase sign  or decrease-sign  will be displayed while you are programming.

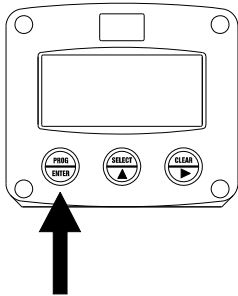
To select a setting,  is used to select in one direction and  can be used to select in the other direction.

When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for three seconds: the PROG-procedure will be left automatically and the former value reinstated.



Note: alterations will only be set after ENTER has been pressed!

To return to OPERATOR-level:



Press  for 3 seconds

In order to return to the operator level, PROG will have to be pressed for three seconds. Also, when no keys are pressed for 2 minutes, SETUP will be left automatically.

3.2.2. OVERVIEW FUNCTIONS SETUP LEVEL

SETUP FUNCTIONS AND VARIABLES			
1	FLOWRATE		
	11	UNIT	mL - L - m3 - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm3 - NL - P
	12	TIME UNIT	sec - min - hour - day
	13	DECIMALS	0 - 1 - 2 - 3 - 4 - 5 (Ref: displayed value)
	14	K-FACTOR	0.00001 - 199,999
	15	DECIMALS K-FACTOR	0 - 5
	16	CALCULATION	per 1 - 255 pulses
	17	CUT-OFF	0.1 - 999.9 seconds
	18	GRAPH MAX	0.00000 - 199,999 unit/time unit
2	DISPLAY		
	21	BARGRAPH	off - on
	22	BACKLIGHT (optional)	off - green - amber
	23	BL. BRIGHTNESS	1 - 5
3	POWER MANAGEMENT		
	31	LCD UPDATE	fast - 1 sec - 3 sec - 15 sec - off
	32	BATTERY MODE	operational - shelf
4	FLOWMETER		
	41	SIGNAL	npn - npn_lp - reed - reed_lp - pnp - pnp_lp - namur - coil_hi - coil_lo - active
5	OTHERS		
	51	TYPE / MODEL	F010-P
	52	SOFTWARE VERSION	03.xx.xx
	53	SERIAL NO.	xxxxxxx
	54	PASS CODE	0000 - 9999
	55	TAGNUMBER	0000000 - 9999999

3.2.3. EXPLANATION OF SETUP-FUNCTIONS

1 - FLOWRATE	
MEASUREMENT UNIT 11	SETUP - 11 determines the measurement unit for flowrate. The following units can be selected: mL - L - m3 - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm3 - NL - P. Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the K-Factor has to be adapted as well; the calculation is not done automatically.
TIME UNIT 12	The flowrate can be calculated per second (SEC), minute (MIN), hour (HR) or day (DAY).
DECIMALS 13	This setting determines for flowrate the number of digits following the decimal point. The following can be selected: 00000 - 1111.1 - 222.22 - 333.333 - 4.4444 - .55555
K-FACTOR 14	With the K-factor, the flowmeter pulse signal is converted to a flowrate. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 11), for example per liter. The more accurate the K-factor, the more accurate the functioning of the system will be. Example 1: Calculating the K-factor. <i>Let us assume that the flowmeter generates 2.4813 pulses per liter and the selected unit is "cubic meters / m3". A cubic meter consists of 1000 parts of one liter which implies 2,481.3 pulses per m3. So, the K-factor is 2,481.3. Enter for SETUP - 14: "24813" and for SETUP - 15 - decimals K-factor "1".</i> Example 2: Calculating the K-factor. <i>Let us assume that the flowmeter generates 6.5231 pulses per gallon and the selected measurement unit is gallons. So, the K-Factor is 6.5231. Enter for SETUP - 14: "65231" and for SETUP - 15 decimals K-factor "4".</i>
DECIMALS K-FACTOR 15	This setting determines the number of decimals for the K-factor (SETUP 14). The following can be selected: 0 - 1 - 2 - 3 - 4 - 5 Please note that this SETUP - influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for "flowrate" (SETUP 13)!
CALCULATION 16	The flowrate is calculated by measuring the time between a number of pulses, for example 10 pulses. The more pulses the more accurate the flowrate will be. The maximum value is 255 pulses. Note: <i>the lower the number of pulses, the higher the power consumption of the unit will be (important for battery powered applications).</i> Note: <i>for low frequency applications (below 10Hz): do not program more than 10 pulses else the update time will be very slow.</i> Note: <i>for high frequency application (above 1kHz) do program a value of 100 or more pulses.</i>
CUT-OFF TIME 17	With this setting, you determine a minimum flow requirement threshold, if during this time less than XXX-pulses (SETUP 26) are generated, the flowrate will be displayed as zero. The cut-off time has to be entered in seconds - maximum time is 999.9 seconds.
GRAPH. MAX. 18	The piegraph gives the Operator an indication of the flowmeter output value in relation to its measuring range. Enter with this setting, the maximum flowrate at which value the piegraph will indicate 100%.



Note !

2 - DISPLAY	
BARGRAPH 21	The bargraph (piegraph) displayed at operator level is percentage-wise related to the input signal: minimum signal is 0% and maximum signal is 100% (setup 18). With this function, the bargraph can be enabled / disabled. Following selections are available: OFF - ON
The functions below will only effect the optional LED-backlight.	
BACKLIGHT (OPTION) 22	If a LED backlight has been supplied, the color can be selected. Following selections are available: OFF - GREEN - AMBER
BRIGHTNESS (OPTION) 23	The density of the backlight can be set in following range: 1 - 5 One is minimum and five is maximum brightness.

3 - POWER MANAGEMENT	
When used with the internal battery option, the user can expect reliable measurement over a long period of time. The F010-P has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:	
LCD NEW 31	The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display update, it is <u>strongly advised</u> to select a slow refresh rate. Please understand that NO information will be lost; the input signal will be processed and the output signal will be generated in the normal way. The following can be selected: Fast - 1 sec - 3 sec - 15 sec - off. Example battery life-time: <i>life-time with a coil pick-up, 1kHz. pulses and FAST update: about 2 years.</i> <i>life-time with a coil pick-up, 1kHz. pulses and 1 sec update: about 5 years.</i> Note: <i>after a button has been pressed by the operator - the display refresh rate will always switch to FAST for 30 seconds. When "OFF" is selected, the display will be switched off after 30 seconds and will be switched on as soon as a button has been pressed.</i>
BATTERY-MODE 32	The unit has two modes: operational or shelf. After "shelf" has been selected, the unit can be stored for several years; it will not process the sensor signal; the display is switched off but all settings are stored. In this mode, power consumption is extremely low. To wake up the unit again, press the SELECT-key twice.



Note !

4 - FLOWMETER

SIGNAL 41	The F010-P is able to handle several types of input signal. The type of flowmeter pickup / signal is selected with SETUP 41. Read also par. 4.4.2. or 4.4.3 - flowmeter input terminals.			
TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ. / MV	REMARK
NPN	NPN input	100kOhm pull-up	6 kHz.	(open collector)
NPN - LP	NPN input with low pass filter	100kOhm pull-up	1.2 kHz.	(open collector) less sensitive
REED	Reed-switch input	1mOhm pull-up	600 Hz.	
REED - LP	Reed-switch input with low pass filter	1mOhm pull-up	120 Hz.	Less sensitive
PNP	PNP input	47kOhm pull-down	6 kHz.	
PNP - LP	PNP input with low pass filter	100kOhm pull-down	1.2 kHz.	Less sensitive
NAMUR	Namur input	820 Ohm pull-down	4 kHz.	External power required
COIL HI	High sensitive coil input	-	20mV p.t.p.	Sensitive for disturbance!
COIL LO	Low sensitive coil input	-	90mV p.t.p.	Normal sensitivity
ACTIVE	Active pulse input detection level 1.2V DC	47kOhm	10KHz.	External power required

5 - OTHERS

TYPE OF MODEL 51	For support and maintenance it is important to have information about the characteristics of the F010-P. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
VERSION SOFTWARE 52	For support and maintenance it is important to have information about the characteristics of the F010-P. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
SERIAL NUMBER 53	For support and maintenance it is important to have information about the characteristics of the F010-P. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
PASS CODE 54	All SETUP-values can be pass code protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
TAGNUMBER 55	For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.

4. INSTALLATION

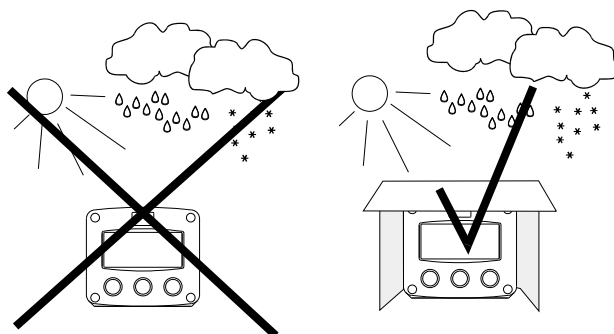
4.1. GENERAL DIRECTIONS



Caution !

- Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- The F010-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.
- Take careful notice of the " Safety rules, instructions and precautionary measures " at the front of this manual.

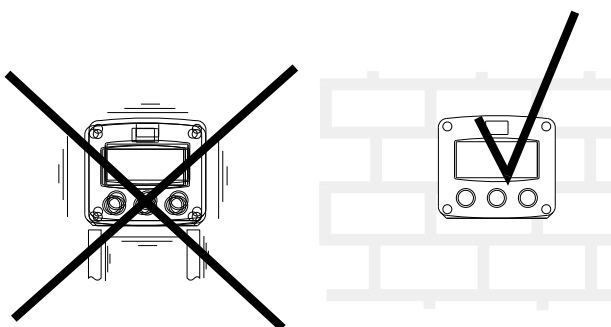
4.2. INSTALLATION / SURROUNDING CONDITIONS



Take the relevant IP classification of the casing into account (see manufactures plate). Even an IP67 (NEMA 4X) casing should NEVER be exposed to strongly varying (weather) conditions.

When panel-mounted, the unit is IP65 (NEMA 4)!

When used in very cold surroundings or varying climatic conditions, take the necessary precautions against moisture by placing a dry sachet of silica gel, for example, inside the instrument case.



Mount the F010-P on a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE

Aluminum enclosures:

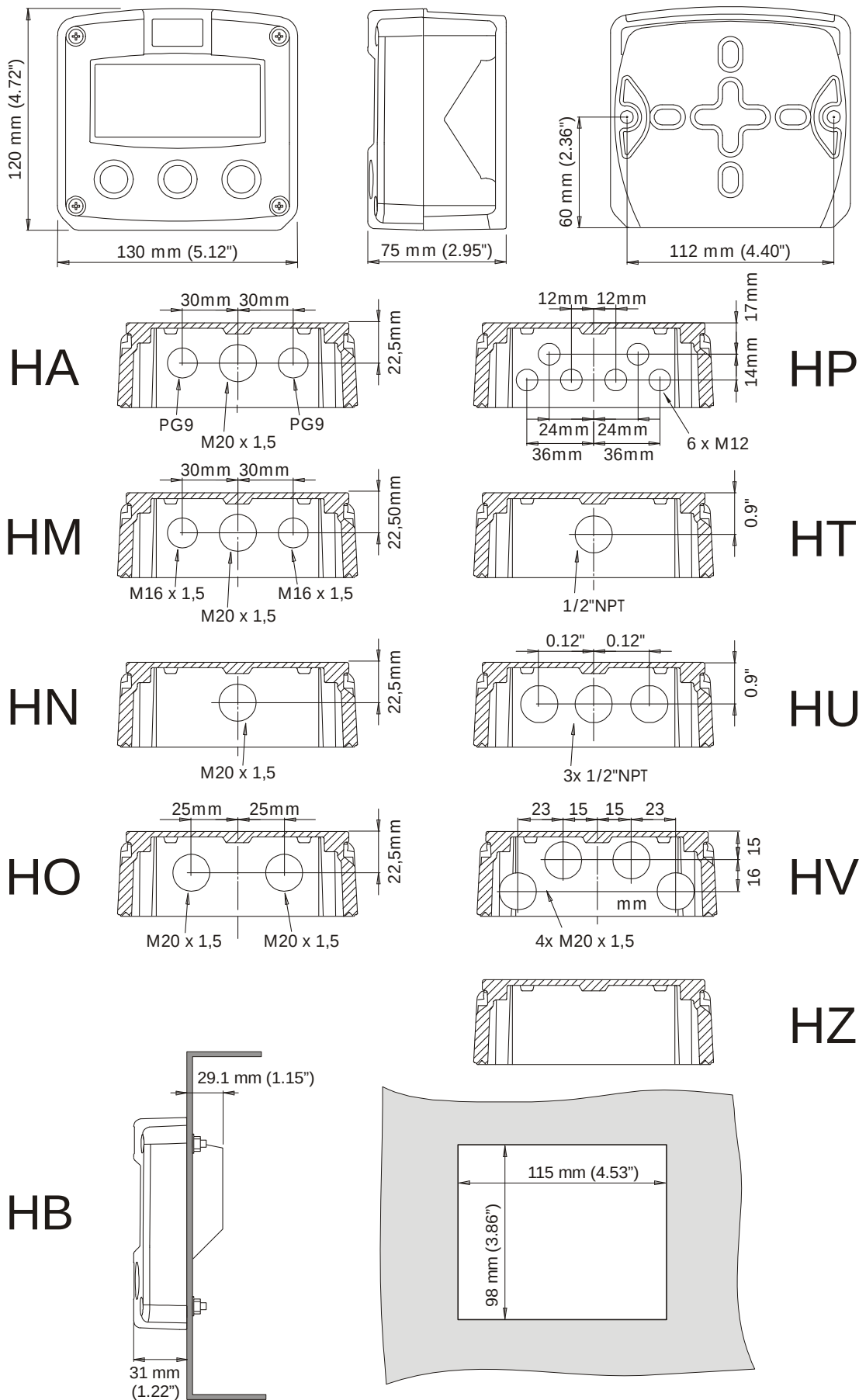
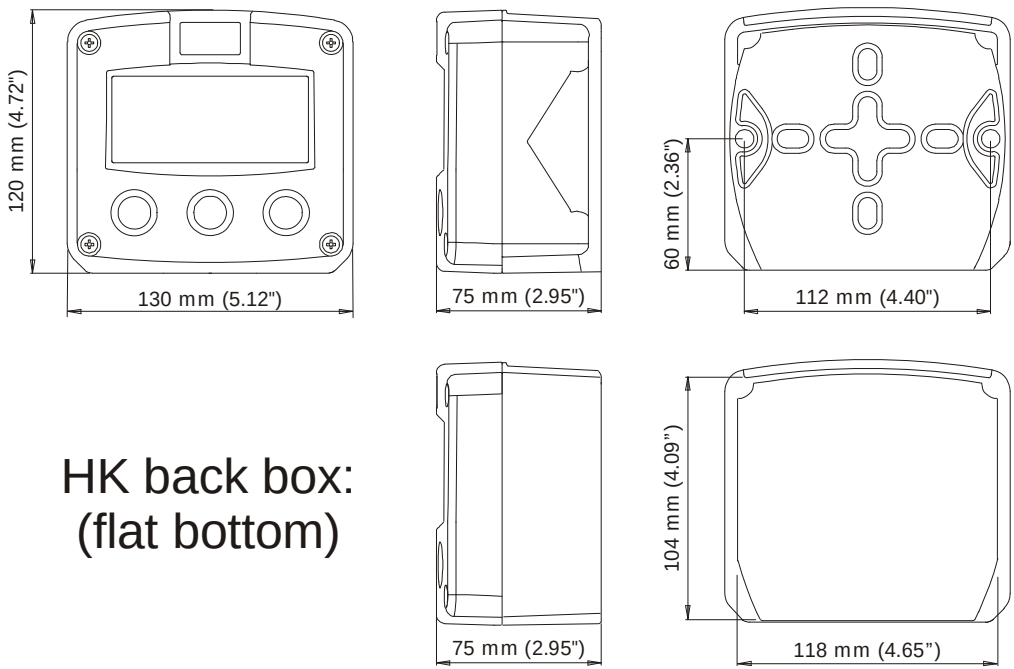


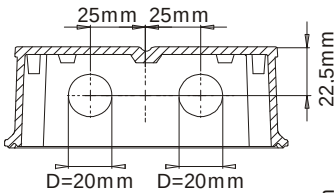
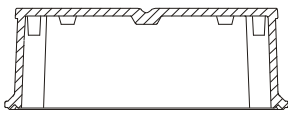
Fig. 5: Dimensions Aluminum enclosures.
HF010PEN_v0403_03 Atex_IECEX_CSA_FM

GRP enclosures:



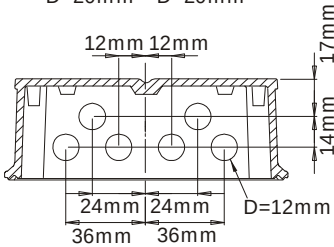
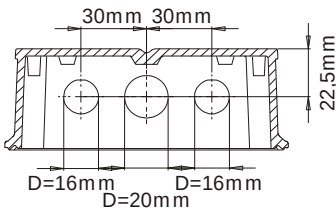
HK back box:
(flat bottom)

HD
HK



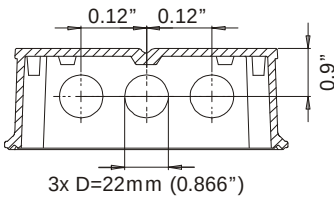
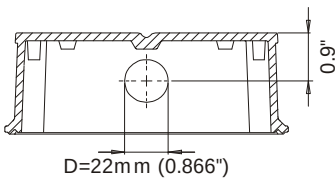
HG

HE



HH

HF



HJ

HC

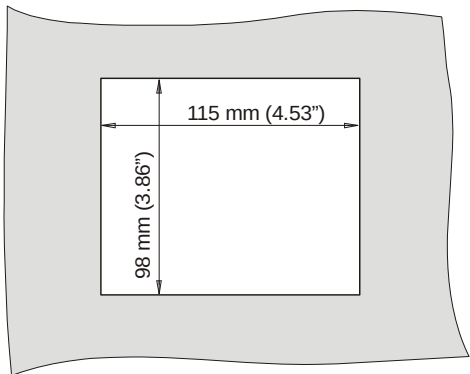
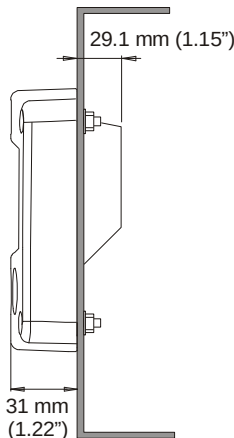


Fig. 6: Dimensions GRP enclosures.

4.4. INSTALLING THE HARDWARE

4.4.1. INTRODUCTION



- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.
- This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).
- Do ground the aluminum casing properly as indicated, if the F010-P has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-casing and removable terminal-block may never be removed.

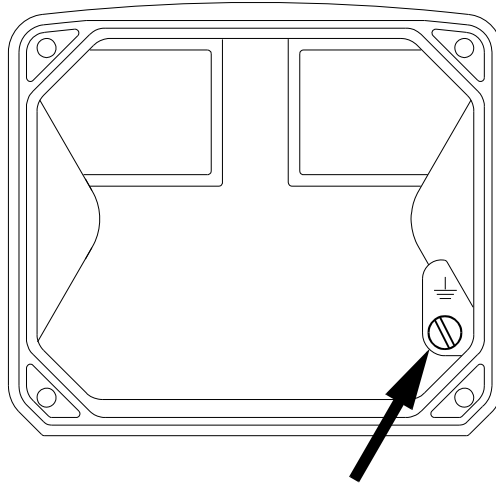


Fig. 7: Grounding aluminum enclosure with option PM 115-230V AC.

FOR INSTALLATION, PAY EMPHATIC ATTENTION TO:

- Separate cable glands with effective IP67 (NEMA4X) seals for all wires.
- Unused cable entries: ensure that you fit IP67 (NEMA4X) plugs to maintain rating.
- A reliable ground connection for both the sensor, and if applicable, for the metal casing. (above)
- An effective screened cable for the input signal, and grounding of it's screen to the "⊥" terminal or at the sensor itself, whichever is appropriate to the application.

4.4.2. TERMINAL CONNECTORS WITH POWER SUPPLY - TYPE : PB / PD / PL / PX

For Intrinsically Safe applications: read chapter 5.

The following terminal connectors are available:

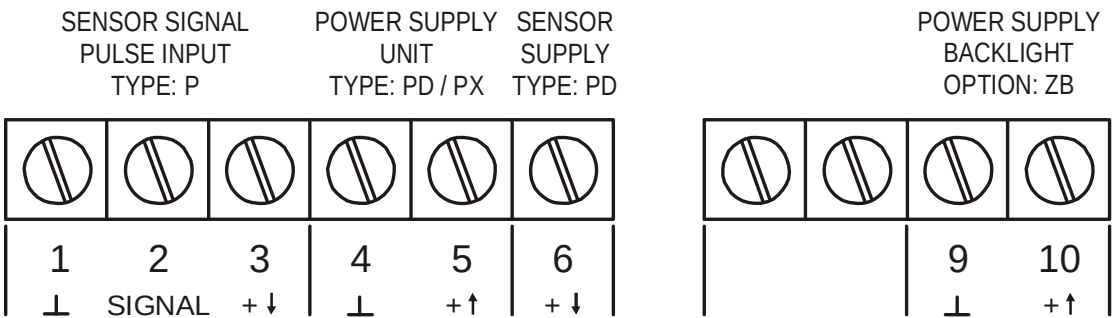


Fig. 8: Overview of terminal connectors F010-P-(PB / PD / PX) and options.

SENSOR SUPPLY

Type PB / PD / PX - terminal 3: sensor supply 1.2V, 3.2V:

Terminal 3 provides a limited supply voltage of 3.2 V DC (coil signals 1.2V) for the signal output of the flowmeter.



Note: This voltage MAY NOT be used to power the flowmeters electronics, converters etc, as it will not provide adequate sustained power ! All energy used by the flowmeters pick-up will directly influence the battery life-time (type PB). It is strongly advised to use a "zero power" pickup such as a coil or reed-switch when operating without external power. It is possible to use some low power NPN or PNP output signals, but the battery life time will be significantly reduced (consult your distributor).

Type PD - terminal 6: sensor supply 8.2V:

With this option, a basic but real sensor supply of max. 5mA@8.2V is available to power e.g. a Namur sensor.

REMARKS: TERMINAL CONNECTORS:

Terminals 1-3; Flowmeter input:

Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or coil. The screen of the signal wire must be connected to the common ground terminal
The input signal type has to be selected with the correct SETUP-function (read par. 3.2.3.)

Coil-signal:

The F010-P is suitable for use with flowmeters which have a coil output signal.

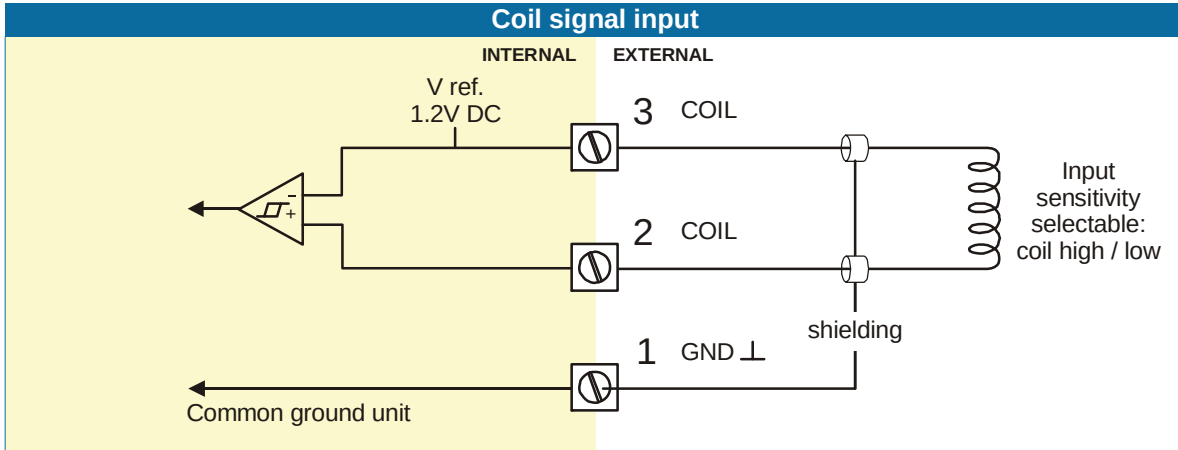
Two sensitivity levels can be selected with the SETUP-function:

COIL LO: sensitivity from about 90mVp-p.

COIL HI: sensitivity from about 20mVp-p.

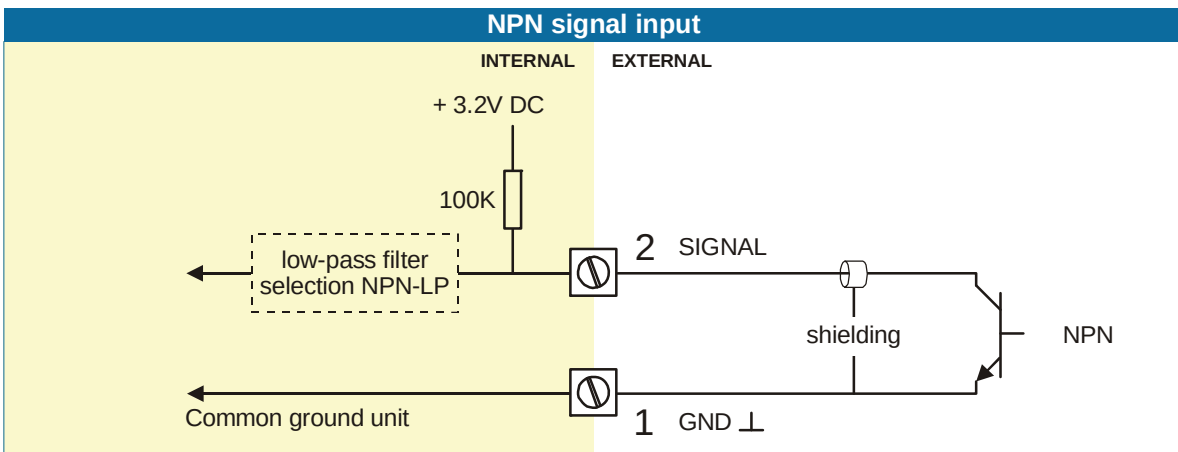
Type ZF (option): offers for setting COIL HI : sensitivity from about 10mVp-p.

Type ZG (option): offers for setting COIL HI : sensitivity from about 5mVp-p.



Pulse-signal NPN / NPN-LP:

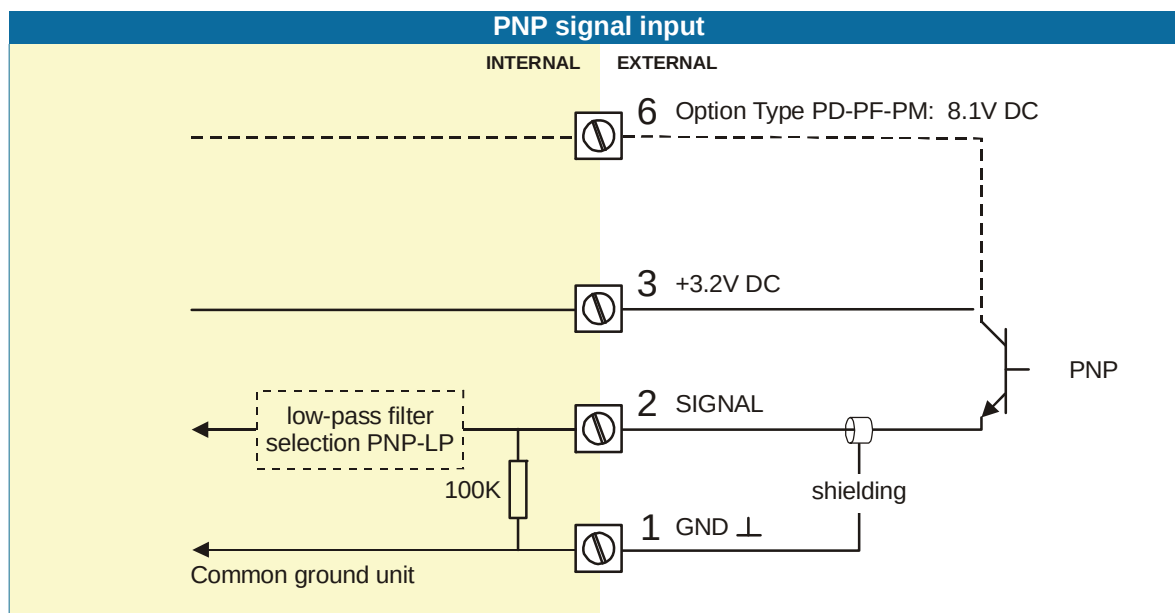
The F010-P is suitable for use with flowmeters which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.



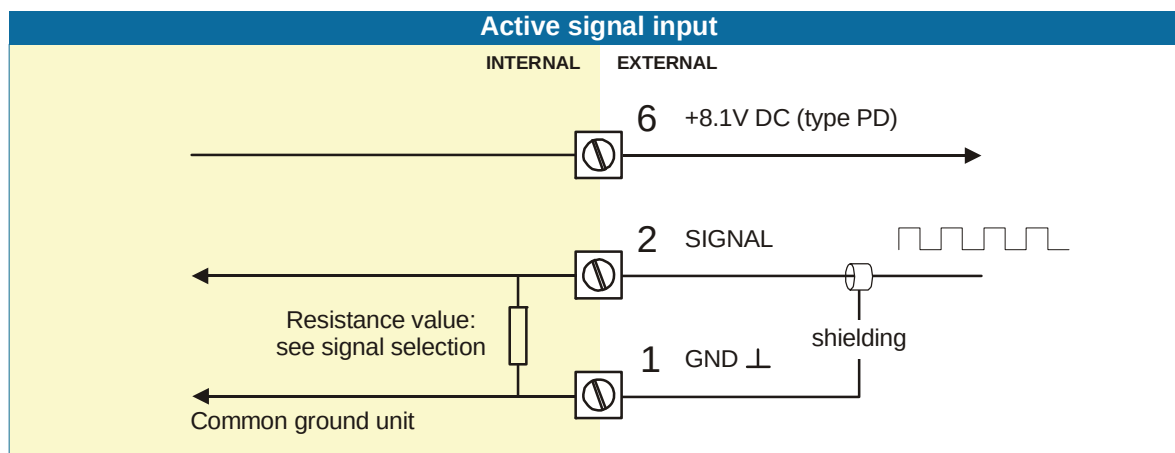
Pulse-signal PNP / PNP-LP:

The F010-P is suitable for use with flowmeters which have a PNP output signal. Terminal 3 offers 3.2V which has to be switched by the sensor to terminal 2 (SIGNAL). For a reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.

A sensor supply voltage of 8.1V DC can be provided with option PD on terminal 6.

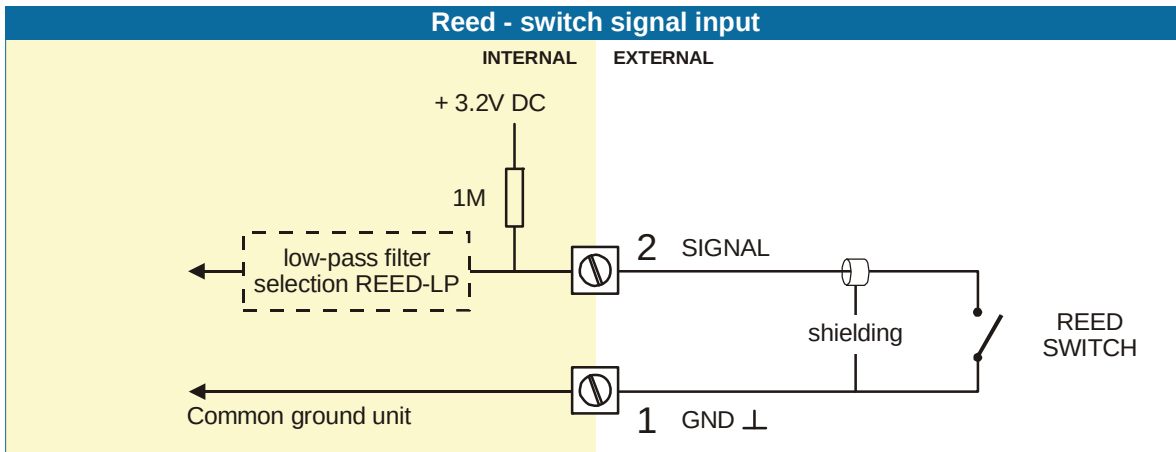
**Active signal:**

Active signal selection may well be desired in the case of option PD being supplied for sensor supply.



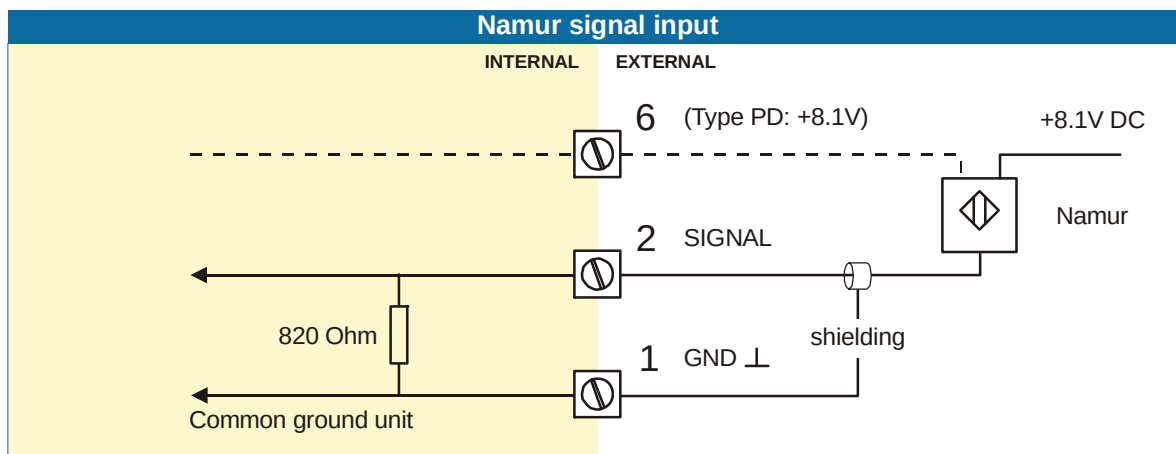
Reed-switch:

The F010-P is suitable for use with flowmeters which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass filter (read par. 3.2.3.)



NAMUR-signal:

The F010-P is suitable for flowmeters with an Namur signal. The standard F010-P is not able to power the Namur sensor, as an external power supply for the sensor is required. However, a 8.2V sensor supply voltage (terminal 6) can be provided with type PD.



Terminal 4-5: POWER SUPPLY UNIT - TYPE PD / PX:

To power the unit an internal battery can be used (type PB) and / or an external DC power supply of 8-30V DC (type PX) or 16-30V DC (type PD).

Connect the "-" to terminal 4 and the "+" to terminal 5. When power is applied to these terminals, the optional internal battery will be disabled / enabled automatically to extend the battery life time.

Terminal 6: Power supply type PD: 8.2V sensor supply.

With this option, a limited power supply for the sensor is available, for example to power a Namur sensor. It offers 8.2V DC (max. 5mA).

Remark: this terminal is only available if option PD has been ordered.

Terminal 9-10: power supply backlight - type ZB (option):

To power the backlight, a voltage in the range 20-30V DC has to be connected.

Maximum current 30mA. Connect the "-" to terminal 9 and the "+" to terminal 10.

4.4.3. TERMINAL CONNECTORS WITH POWER SUPPLY - TYPE : PF / PM

For Intrinsically Safe applications: read chapter 5.

The following terminal connectors are available:

POWER SUPPLY TYPE: PF / PM			SENSOR SIGNAL TYPE: P: PULSE INPUT		
GND ⊥	1 N	2 L1		5 ⊥	6 SIGNAL 7 + ↓

Fig. 9: Overview of terminal connectors F010-P-(PF / PM) and options.

SENSOR SUPPLY

Type PF-PM: Sensor supply: 1.2, 3.2V, 8.2V, 12V or 24 V:

With this option, a real power supply for the sensor is available. The flowmeter can be powered with 1.2, 3.2, 8.2, 12 or 24 V DC (max. 400mA@24V). The voltage is selected with the three switches inside the enclosure.



- Warning: be sure that all the leads to the terminals are disconnected from the unit when the internal plastic protection cover has been removed !
- HIGH VOLTAGE 400V !! NEVER connect the mains power supply to the unit when the plastic protection cover has been removed !!!

First, remove the terminal strip(s) after which the internal plastic cover can be removed. The switches are located on the right hand side as indicated:

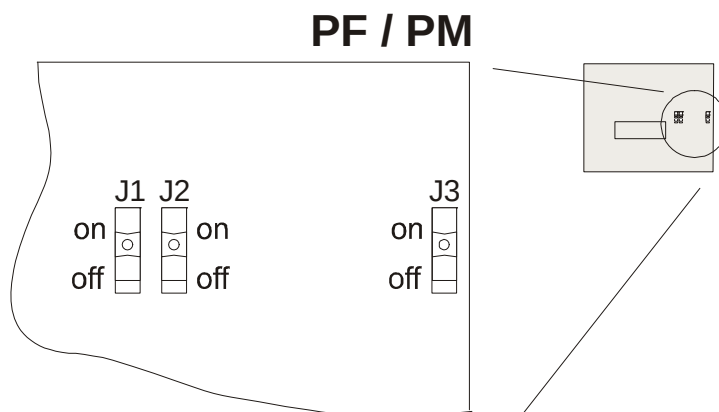


Fig. 10: switch position voltage selection (type PF and PM).

Switch positions / sensor supply voltage:

VOLTAGE SELECTION				
SWITCH	1.2 / 3.2V DC	8.2V DC	12V DC	24V DC
J1	on	off	off	off
J2	on or off	on	on	off
J3	on or off	on	off	on or off

REMARKS: TERMINAL CONNECTORS:

Terminal GND- 01- 02 POWER SUPPLY only available with type PF / PM:

OPTION	SENSOR SUPPLY	Terminal		
		GND	01	02
PF 24V AC $\pm 10\%$	1.2, 3.2, 8.2, 12, 24V max. 400mA@24V DC		AC	AC
PF 24V DC $\pm 10\%$	1.2, 3.2, 8.2, 12, 24V max. 400mA@24V DC	L-	L+	
PM 115-230V AC $\pm 10\%$	1.2, 3.2, 8.2, 12, 24V max. 400mA@24V DC	EARTH	AC	AC
Note PF / PM	The total consumption of the sensor and backlight type ZB may not exceed 400mA@24V DC.			

Terminals 5-7; Flowmeter input:

Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or coil. The screen of the signal wire must be connected to the common ground terminal

The input signal type has to be selected with the correct SETUP-function (read par. 3.2.3.)

Coil-signal:

The F010-P is suitable for use with flowmeters which have a coil output signal.

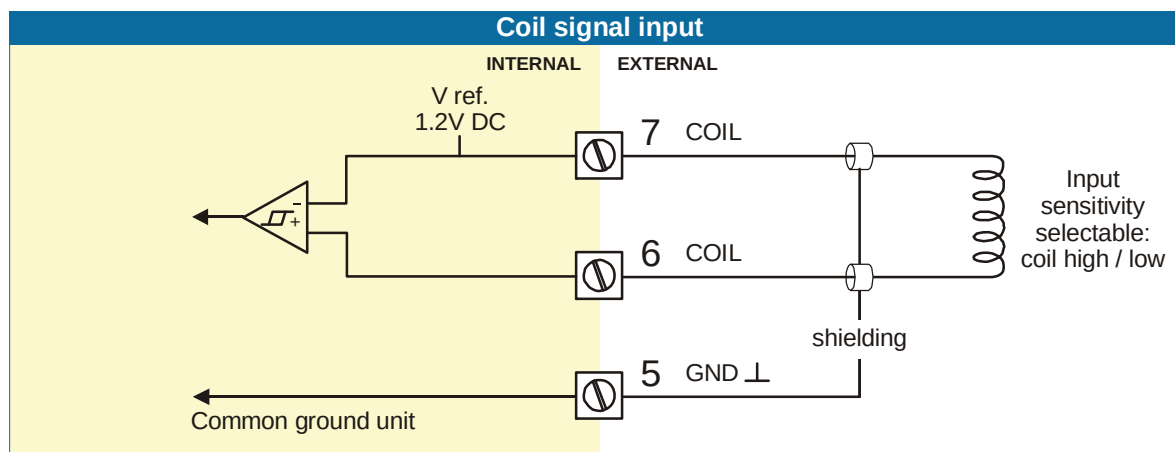
Two sensitivity levels can be selected with the SETUP-function:

COIL LO: sensitivity from about 90mVp-p.

COIL HI: sensitivity from about 20mVp-p.

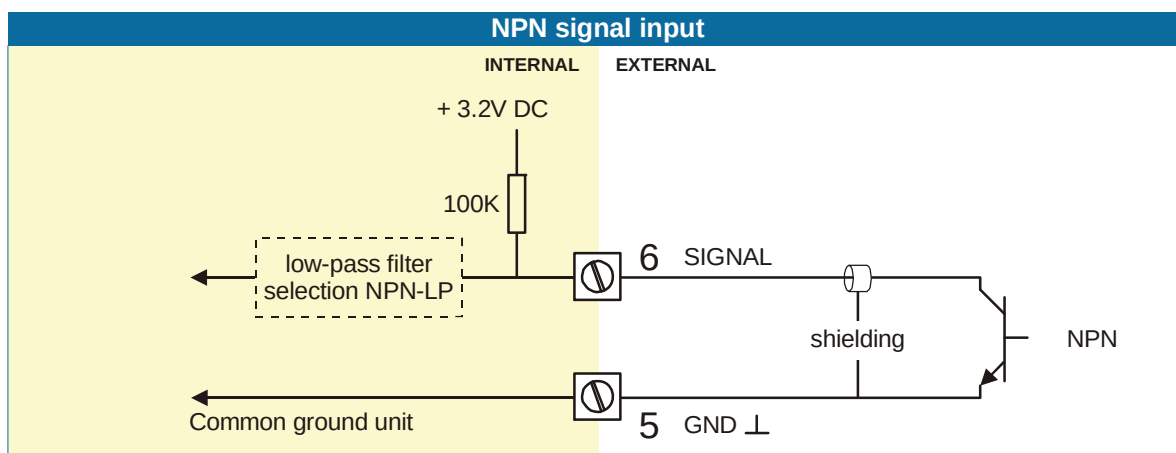
Type ZF (option): offers for setting COIL HI : sensitivity from about 10mVp-p.

Type ZG (option): offers for setting COIL HI : sensitivity from about 5mVp-p.

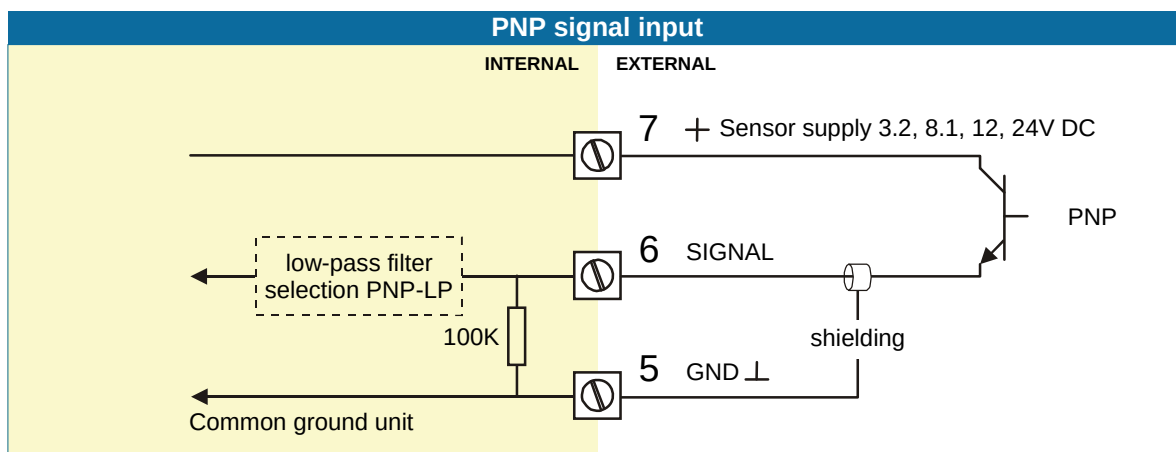


Pulse-signal NPN / NPN-LP:

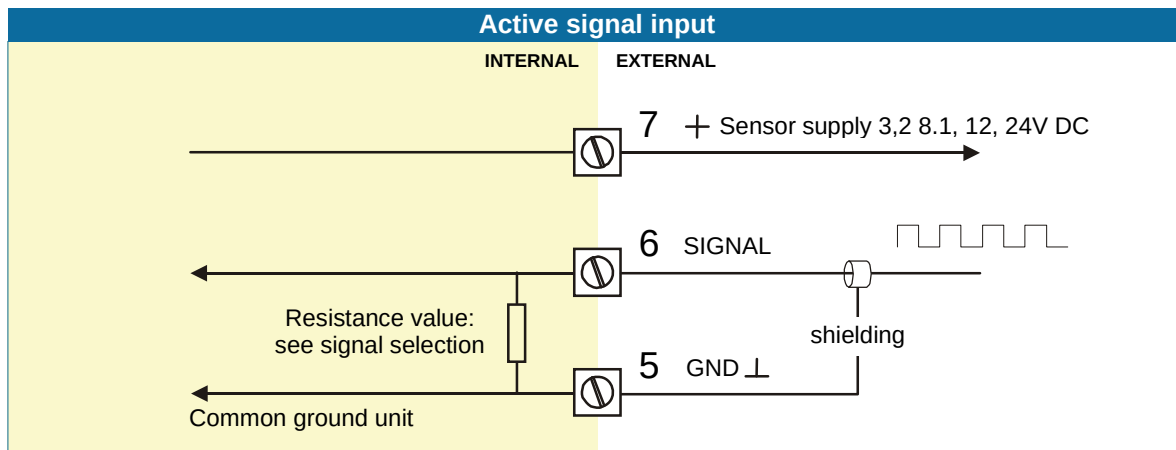
The F010-P is suitable for use with flowmeters which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.

**Pulse-signal PNP / PNP-LP:**

The F010-P is suitable for use with flowmeters which have a PNP output signal. For a reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3. A sensor supply voltage is offered with terminal 7.

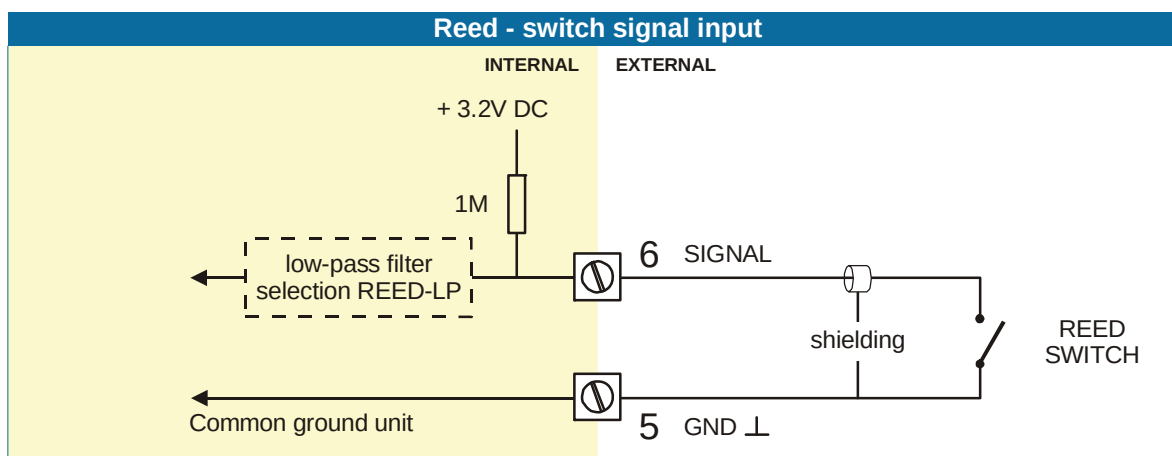
**Active signals:**

Active signal selection may well be desired if an active signal is offered from the sensor.



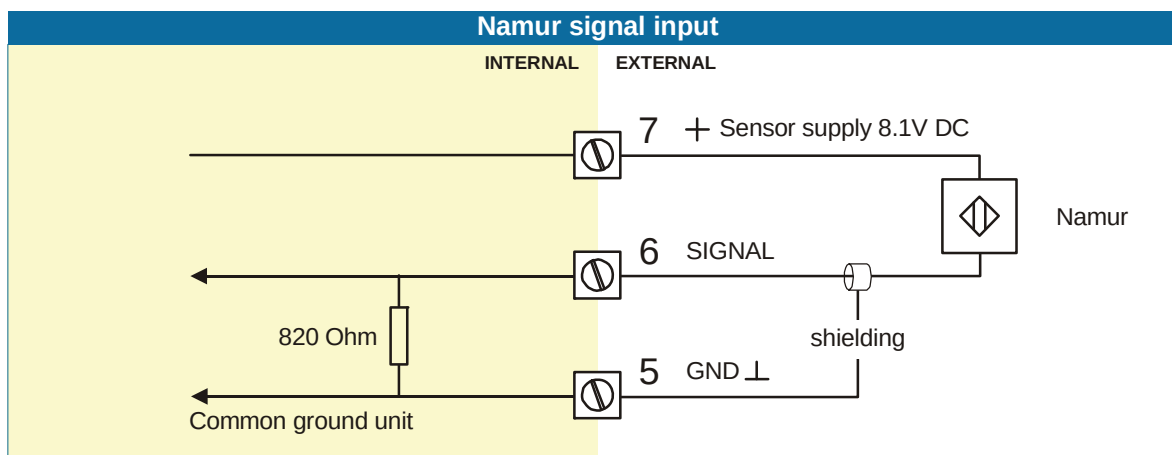
Reed-switch:

The F010-P is suitable for use with flowmeters which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass filter (read par. 3.2.3.)

**NAMUR-signal:**

The F010-P is suitable for flowmeters with an Namur signal.

Terminal 7 can provide a 8.2V sensor supply voltage (please read section "sensor supply").



5. INTRINSICALLY SAFE APPLICATIONS

5.1. GENERAL INFORMATION AND INSTRUCTIONS:



- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- This device may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the cabinet has been opened (danger of electric shock). The housing may only be opened by trained personnel.
- Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.



- Safety Instructions
- Certificates, safety values, control drawing and declaration of compliance can be found in the document named: "Fluidwell F0..-P-XI - Documentation for Intrinsic Safety".
- For installation under ATEX directive: this intrinsically safe device must be installed in accordance with the ATEX directive 94/9/EC and the product certificate KEMA 05ATEX1168 X.
- For installation under IECEx scheme: this intrinsically safe device must be installed in accordance the product certificate IECEx KEM 08.0006X.
- For installation under CSA: this intrinsically safe device must be installed in accordance the product certificate CSA.08.2059461 X.
- For installation under FM: this intrinsically safe device must be installed in accordance with the Certificate / Project ID: 3033306.
- The control drawing number FWCD-0003 can be found in the document named: "Fluidwell F0..-P-XI - Documentation for Intrinsic Safety".
- Exchange of Intrinsically Safe battery FWLiBAT-00x with certificate number KEMA 03ATEX1071 U or IECEx KEM 08.0005U is allowed in Hazardous Area. See paragraph 5.4. for battery replacement instructions.



- Please note
- Special conditions for safe use mentioned in both the certificate and the installation instructions must be observed for the connection of power to both input and / or output circuits.
- When installing this device in hazardous areas, the wiring and installation must comply with the appropriate installation standards for your industry.
- Study the following pages with wiring diagrams per classification.

Serial number and year of production

This information can be looked-up on the display:
setup function (par. 3.2.2.).



Fig. 11: Example serial number.

Label information pulse input type - F0..P-XI (inside and outside the enclosure)

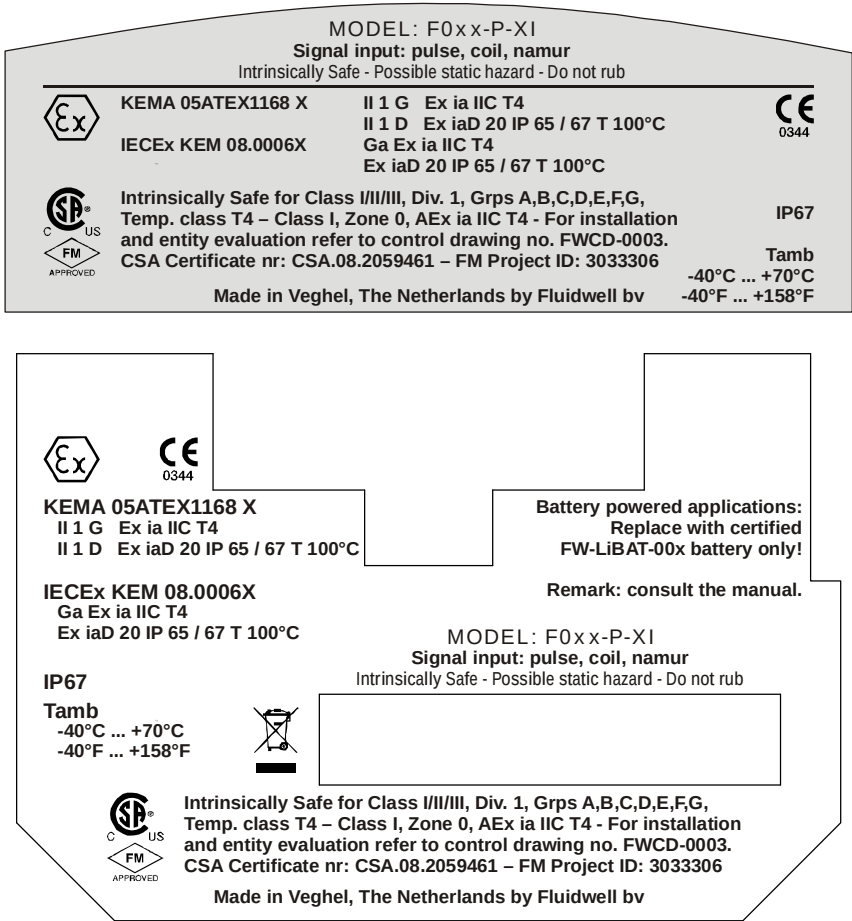


Fig. 12: Label information Intrinsically Safe application.

5.2. TERMINAL CONNECTORS INTRINSICALLY SAFE APPLICATIONS:

Terminal connectors F010-P-(PC / PD / PX)-XI-(ZB):

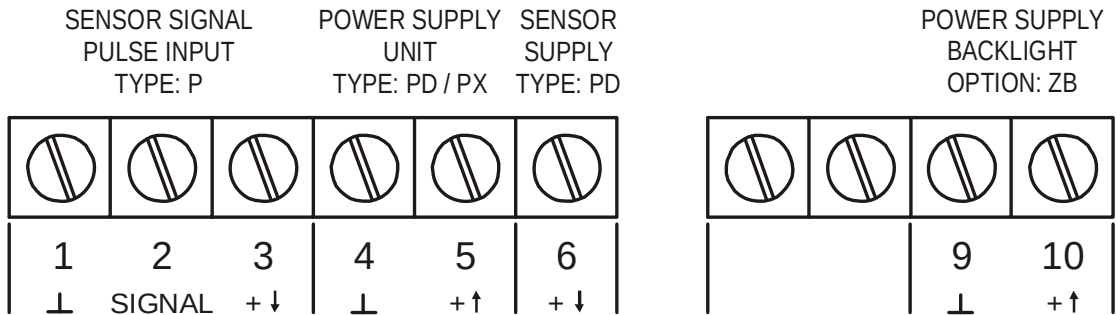


Fig. 13: Overview terminal connectors XI - Intrinsically Safe applications.

Remarks power supply options:

- Type PC:** offers - additional to type PX - an internal Intrinsically Safe lithium battery. This ATEX certified battery (FW-LiBATT-xxx) may be changed in hazardous area.
- Type PD:** offers with terminal 6 - additional to type PX - a real sensor supply of 8.2V DC to power a Namur sensor for example.
- Type PX:** as standard, all intrinsically product are supplied with terminal 4 and 5 to power the product externally.

5.3. CONFIGURATION EXAMPLES INTRINSICALLY SAFE APPLICATIONS:

Configuration example no. 1

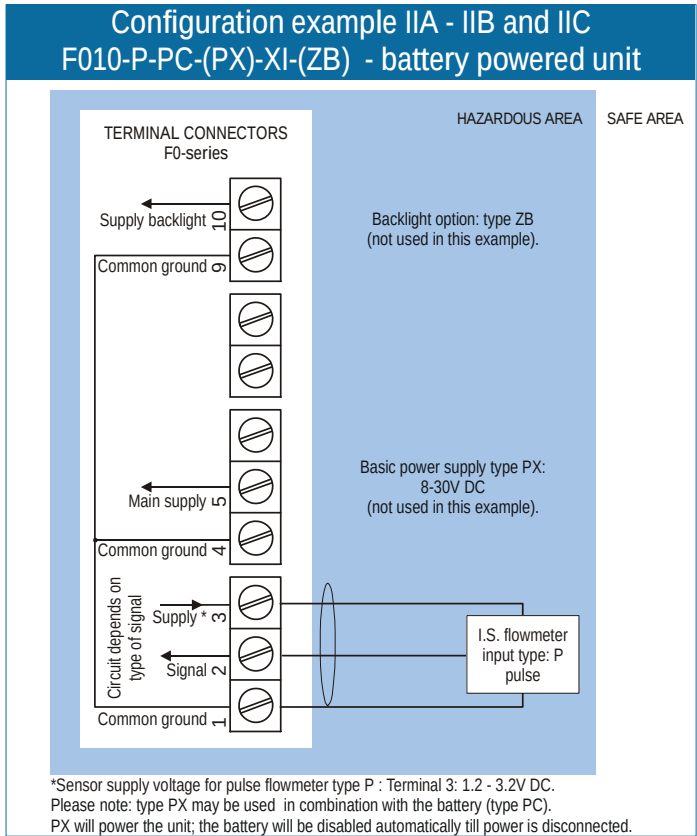


Fig. 14: Configuration example Intrinsically Safe.

Configuration example no. 2

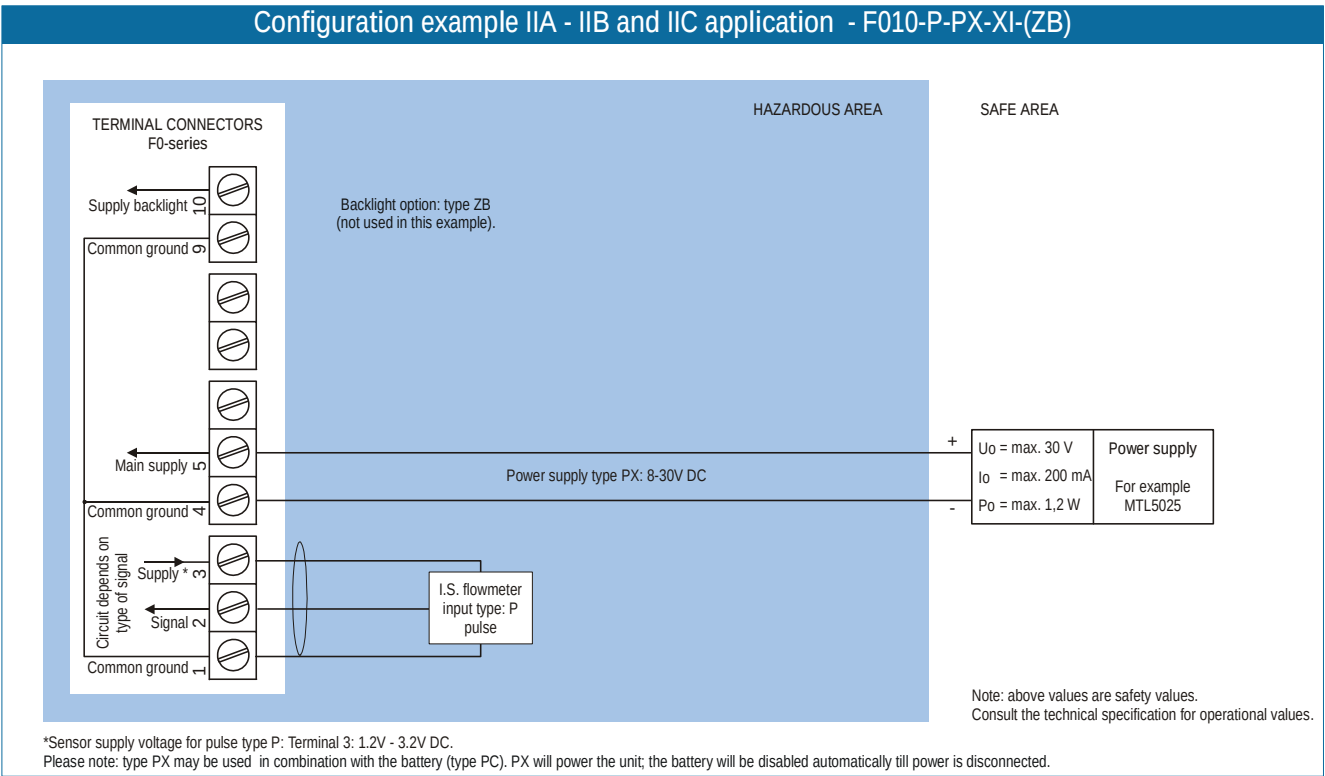


Fig. 15: Configuration example Intrinsically Safe.

Configuration example no. 3

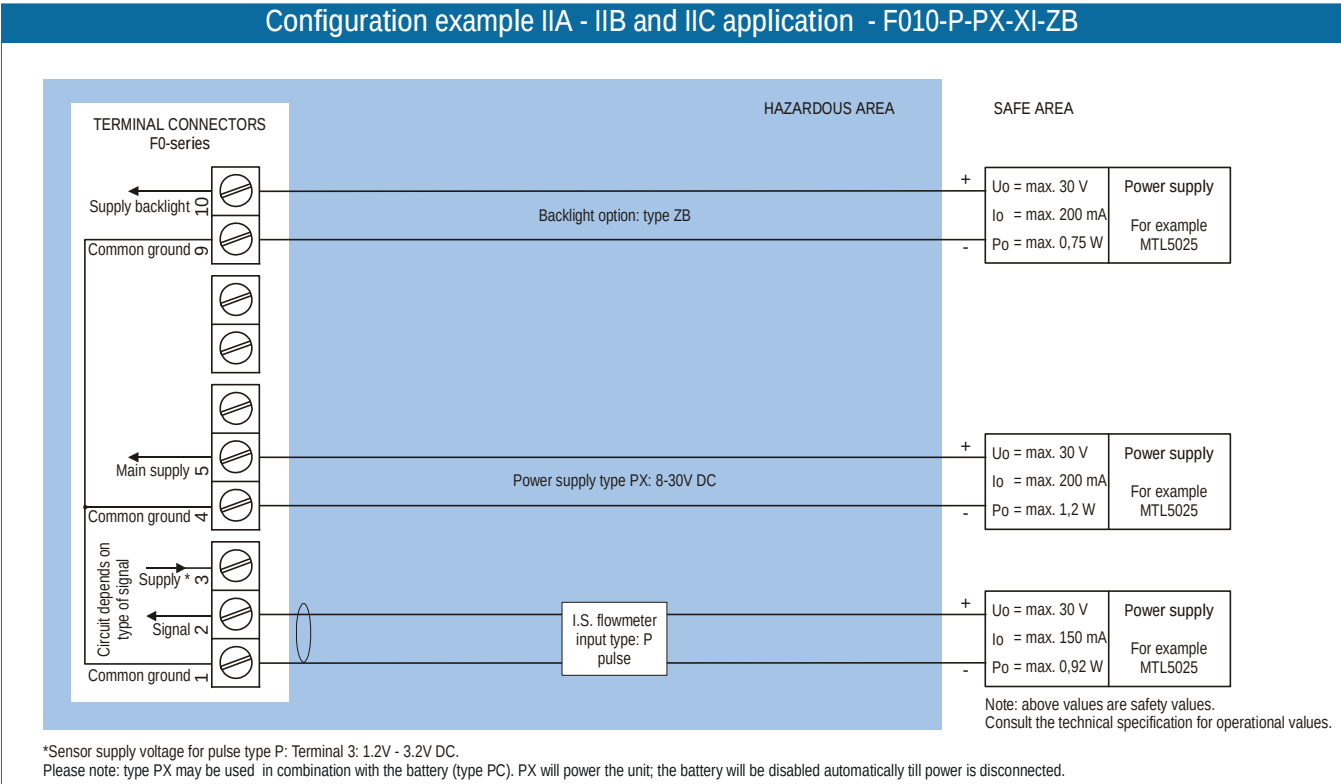


Fig. 16: Configuration example Intrinsically Safe.

Configuration example no. 4

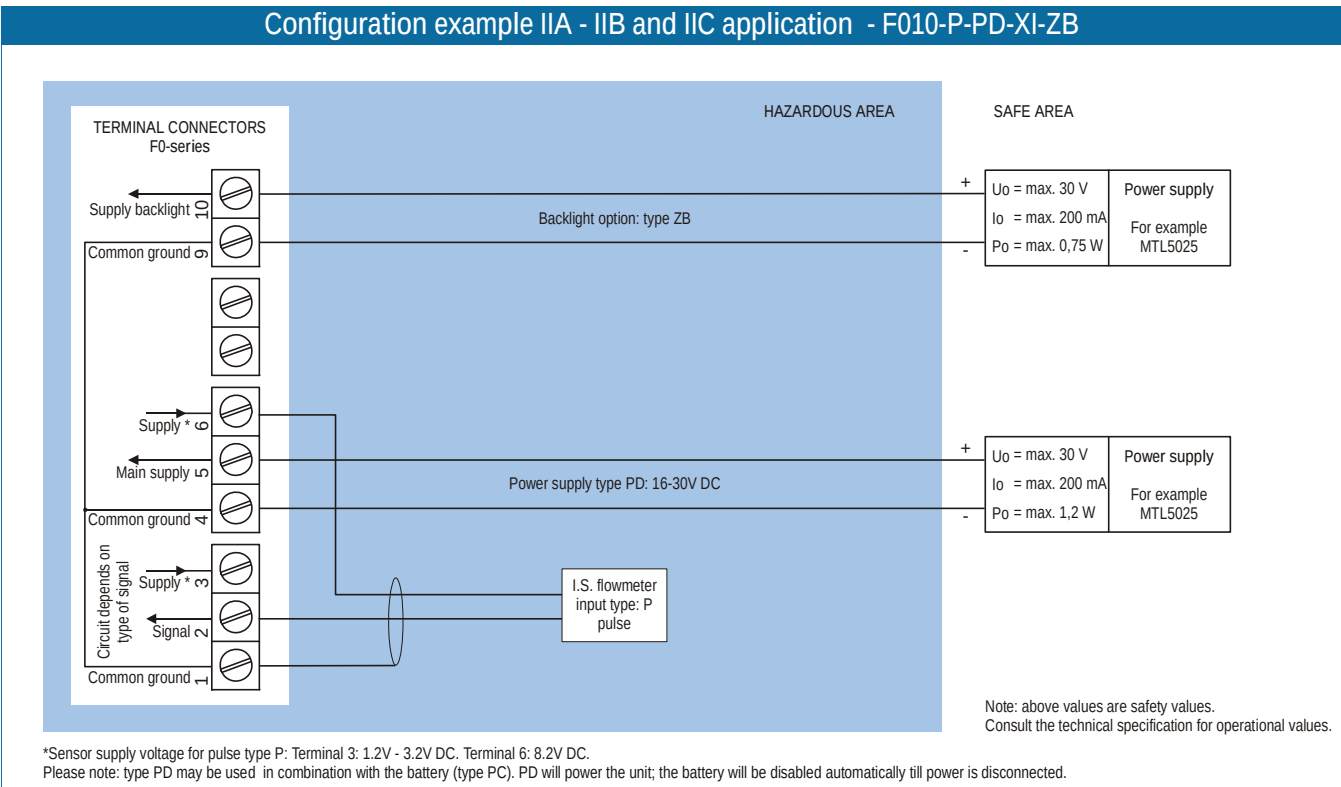


Fig. 17: Configuration example Intrinsically Safe.

6. MAINTENANCE

6.1. GENERAL DIRECTIONS



Caution !

- Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- The F010-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.
- Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.

The F010-P does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the users responsibility to take all precautions to dehumidify the internal atmosphere of the F010-P in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.

Battery life-time:

It is influenced by several issues :

- Display update: fast display update uses significantly more power.
- Low temperatures; the available power will be less due to battery chemistry.



Note !

Note: *It is strongly advised to use only necessary functions.*

Check periodically:

- The condition of the casing, cable glands and front panel.
- The input/output wiring for reliability and aging symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the flowmeter might be necessary. Do not forget to re-enter any subsequent span alterations.
- The indication for low-battery.
- Clean the casing with soapy-water. Do not use any aggressive solvents as these might damage the coating.

6.2. REPAIR

This product cannot be repaired by the user and must be replaced with an equivalent certified product. Repairs should only be carried out by the manufacturer or his authorized agent.

APPENDIX A: TECHNICAL SPECIFICATION

GENERAL

Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Digits	5 ½ 26mm (1") and eleven 8mm (0.31"). Various symbols and measuring units.
Piegraph	10 segment range indication in relation to its measuring range 0-100%
Refresh rate	User definable: 8 times/sec - 15 secs.
Type ZB (option)	Bi-color configurable LED-backlight - green or amber. Intensity adjustable from the keyboard.

Enclosures	
General	Die-cast aluminum or GRP (Glassfibre Reinforced Polyamide) enclosure with Polycarbonate window, silicone and EPDM gaskets. UV stabilized and flame retardant material.
Control Keys	Three industrial micro-switch keys. UV-resistant silicone keypad.
Painting	Aluminum enclosure only: UV-resistant 2-component industrial painting.
Panel-mount enclosures	Dimensions: 130 x 120 x 60mm (5.10" x 4.72" x 2.38") – LxHxD.
Classification	IP65 / NEMA4
Panel cut-out	115 x 98mm (4.53" x 3.86") LxH.
Type HC	GRP panel-mount enclosure
Type HB	Aluminum panel-mount enclosure
Field/wall-mount enclosures	Dimensions: 130 x 120 x 75mm (5.10" x 4.72" x 2.95") – LxHxD.
Classification	IP67 / NEMA4X
Aluminum enclosures	
Type HA	Drilling: 2x PG9 – 1x M20.
Type HM	Drilling: 2x M16 – 1x M20.
Type HN	Drilling: 1x M20.
Type HO	Drilling: 2x M20.
Type HP	Drilling: 6x M12.
Type HT	Drilling: 1x ½"NPT.
Type HU	Drilling: 3x ½"NPT.
Type HV	Drilling: 4x M20
Type HZ	No drilling.
GRP enclosures	
Type HD	No drilling.
Type HE	Drilling: 2x 16mm (0.63") – 1x 20mm (0.78").
Type HF	Drilling: 1x 22mm (0.87").
Type HG	Drilling: 2x 20mm (0.78").
Type HJ	Drilling: 3x 22mm (0.87").
Type HH	Drilling: 6x 12mm (0.47").
Type HK	Flat bottom - no drilling.
ABS enclosure	
Type HS	Silicone free ABS enclosure with EPDM and PE gaskets. UV-resistant polyester keypad. (no drilling)

Operating temperature	
Operational	-40°C to +80°C (-40°F to +178°F).
Intrinsically Safe	-40°C to +70°C (-40°F to +158°F).

Power requirements	
Type PB	Lithium battery - life-time depends upon settings - up to 5 years.
Type PC	Intrinsically Safe lithium battery - life-time depends upon settings - up to 5 years.
Type PD	16-30 V DC. Power consumption max. 1 Watt.
Type PF	24V AC/DC $\pm 10\%$. Power consumption max. 15 Watt.
Type PL	Input loop powered from 4-20mA signal input. Voltage drop max. 2.6V DC
Type PM	115-230V AC $\pm 10\%$. Power consumption max. 15 Watt.
Type PX	8-30 V DC (also available with PB / PC). Power consumption max. 0.3 Watt.
Type ZB	20-30V DC. Power consumption max. 1 Watt. Note: with type PF / PM: internally powered.
Note PF / PM	The total consumption of the sensor and backlight type ZB may not exceed 400mA@24V DC.
Note I.S. application	for intrinsically safe applications, consult the safety values in the certificate.

Sensor excitation	
Type PB / PC / PX	Sensor supply voltage: 3.2V DC for pulse signals and 1.2V DC for coil pick-up. Please note: this is not a real sensor supply. Only suitable for sensors with a very low power consumption like coils (sine wave) and reed-switches. Analog sensors type A / U: sensor supply not available.
Type PD	With pulse input type P: sensor supply 1.2, 3.2, 8.2V DC - max. 5mA@8.2V DC. With analog input type A / U: as connected power supply voltage (internally linked)
Type PF / PM	Analog sensors type A / U: sensor supply 8.2, 12 and 24V DC - max. 400mA@24V DC With pulse input type P: sensor supply 1.2, 3.2, 8.2, 12 and 24V DC - max. 400mA@24V DC

Terminal connections	
Type:	Removable plug-in terminal strip. Wire max. 1.5mm ² and 2.5mm ²

Data protection	
Type	EEPROM backup of all settings. Data retention at least 10 years.
Pass code	Configuration settings can be pass code protected.

Hazardous area (option)	
Intrinsically safe Type XI	ATEX approval: II 1 G Ex ia IIC T4 II 1 D Ex iaD 20 IP 65 / 67 T 100°C IECEX approval: Ga Ex ia IIC T4 Ex iaD 20 IP 65 / 67 T 100°C CSA / FM approval : IS Class I/II/III, Division 1 Groups A to G T4 Class I zone 0 AEx ia IIC T4
Explosion proof Type XF	ATEX approval ref.: <EX> II 2 GD EEx d IIB T5. Weight appr. 15kg. Dimensions of enclosure: 350 x 250 x 200mm (13.7" x 9.9" x 7.9") LxHxD.

Environment	
Electromagnetic comp.	Compliant ref: EN 61326 (1997), EN 61010-1 (1993)
Low voltage directive	Compliant ref: EN60950.

INPUTS

Flowmeter	
Type P	Coil/sine wave (minimum 20mVpp or 80mVpp - sensitivity selectable), NPN/PNP, open collector, reed-switch, Namur, active pulse signals.
Frequency	Minimum 0 Hz - maximum 7 kHz for flowrate. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-Factor	0.00001 - 199,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.
Note	For coil signal input: higher sensitivity is available - type ZF (10mVpp) / type ZG (5mVpp).
Type A	(0)4-20mA - with signal calibration feature.
Type U	0-10 V - with signal calibration feature.
Accuracy	Resolution: 16 bit.. Error < 0.01mA / ±0.05% FS. Low level cut-off programmable.
Span	0.00001 - 199,999 with variable decimal position.
Update time	Four times a second.
Voltage drop	2.6 Volt.
Load impedance	3kOhm
Relationship	Linear and square root calculation.
Note	For signal type A and U: external power to sensor is required; e.g. type PD / PF / PM.

OPERATIONAL

Operator functions	
Displayed functions	• flowrate. • measuring and time unit • piegraph 0-100%
Flowrate	
Digits	5 ½ digits.
Units	mL, L, m3, Gallons, KG, Ton, lb, bl, cf, RND, ft3, scf, Nm3, NI, igal - no units.
Decimals	0 - 1 - 2 - 3 - 4 or 5.
Time units	/sec - /min - /hr - /day.

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F010-P is going to be installed or while it is in operation.

Flowrate displays "0 / zero" while there is flow:

Check:

- SETUP 11 - 14: are the K-Factor and time unit correct?
- Range error: the input value is at least 5% above the calibrated measurement range SETUP 18. Do change the 100% value if desired.

The pass code is unknown:

If the pass code is not 1234, there is only one possibility left: call your supplier.

ALARM

When the alarm flag starts to blink an internal alarm condition has occurred. Press the "select button" several times to display the 5-digit error code. The codes are:

- 0001: irrecoverable display-data error: data on the display might be corrupted.
- 0002: irrecoverable data-storage error: the programming cycle might have gone wrong: check programmed values.
- 0003: error 1 and error 2 occurred simultaneously

The alarm condition will almost certainly be handled internally and if all mentioned values still appear correct, no intervention by the operator is needed. If the alarm occurs more often or stays active for a longer time, please contact your supplier.

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NOTES



LIST OF CONFIGURATION SETTINGS

SETTING	DEFAULT	DATE :	DATE :
1 - FLOWRATE	Enter your settings here		
11 unit	L		
12 time unit	/min		
13 decimals	00000		
14 K-factor	00001		
15 decimals K-factor	0		
16 calculation / pulses	010		
17 cut-off time	30.0 sec.		
18 graph. maximum	01000 L/min		
2 - DISPLAY	Enter your settings here		
21 bargraph	on		
22 backlight	off		
23 brightness	5		
3 - POWER MANAGEMENT	Enter your settings here		
31 LCD-new	1 sec.		
32 mode	operational		
4 - FLOWMETER	Enter your settings here		
41 signal	coil-lo		
5 - OTHERS	Enter your settings here		
51 model	F010-P	F010-P	F010-P
52 software version	03.____.____	03.____.____	03.____.____
53 serial number	-----	-----	-----
54 pass code	0000		
55 tagnumber	0000000		