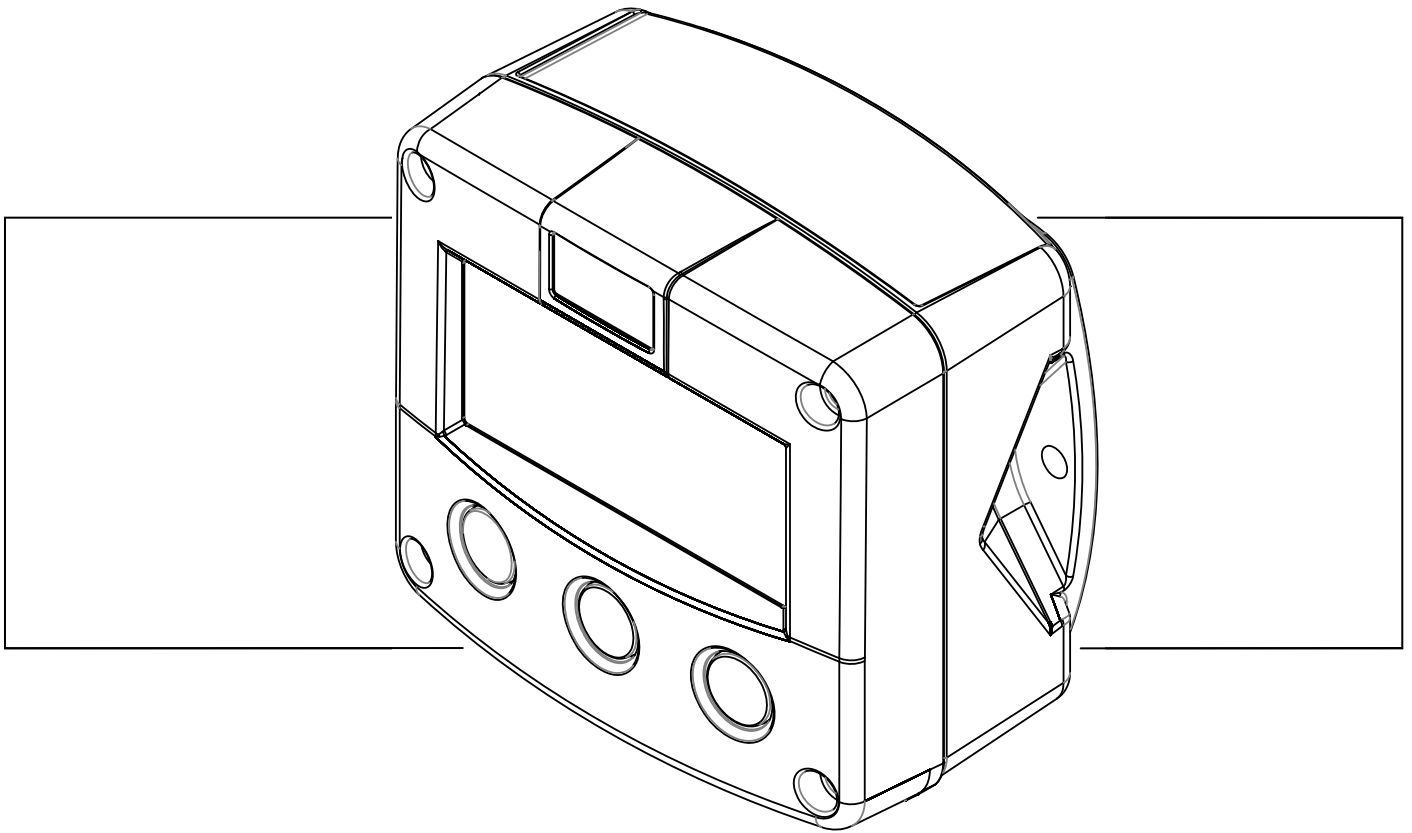


F117-P

TOTALIZER MONITOR

WITH HIGH / LOW TOTALIZER ALARMS



Signal input flowmeter: pulse, Namur and coil

Signal outputs: (0)4-20mA / 0-10V ref. percentage or flowrate

Alarm outputs: two totalizer alarms

Options: Intrinsically Safe, Modbus communication



SAFETY INSTRUCTIONS



- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- LIFE SUPPORT APPLICATIONS: The F117-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 F117-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 F1...-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 F117-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 F117-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 F117-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 F117-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 F117-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.

Hardware version	:	02.01.xx
Software version	:	02.05.xx
Manual	:	HF117PEN_v0501_04
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1. INTRODUCTION

1.1. SYSTEM DESCRIPTION OF THE F117-P

Functions and features

The totalizer monitor model F117-P is a microprocessor driven instrument designed to monitor the total related to a given preset value and two alarm values for high / low alarm. Further an accumulated total as well as the flowrate can be displayed.

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 aluminum or GRP enclosures for harsh industrial surroundings,
- ability to process all types of flowmeter signals,
- transmitting possibilities with analog / alarm and communication (option) outputs.

Flowmeter input

This manual describes the unit with a pulse type input from the flowmeter "-P version".

One flowmeter with two passive or active pulse, Namur or coil signal outputs with a phase difference of 90 or 270 degrees can be connected to the F117-P. These input signals can be used to generate a higher resolution (count up both input signals) or for bi-directional measurement applications.

To power the sensors, several options are available.

Standard outputs

- Two alarm outputs: high and low totalizer alarm. The output is switched till the next "batch".
- Configurable linear (0)4-20mA or 0-10V analog output with 10-bits resolution mirroring the totalised quantity compared to the preset value (related to the displayed percentage) or to transmit the actual (bi-directional) flowrate. Percentage or flowrate levels as well as the minimum and maximum signal output can be tuned.

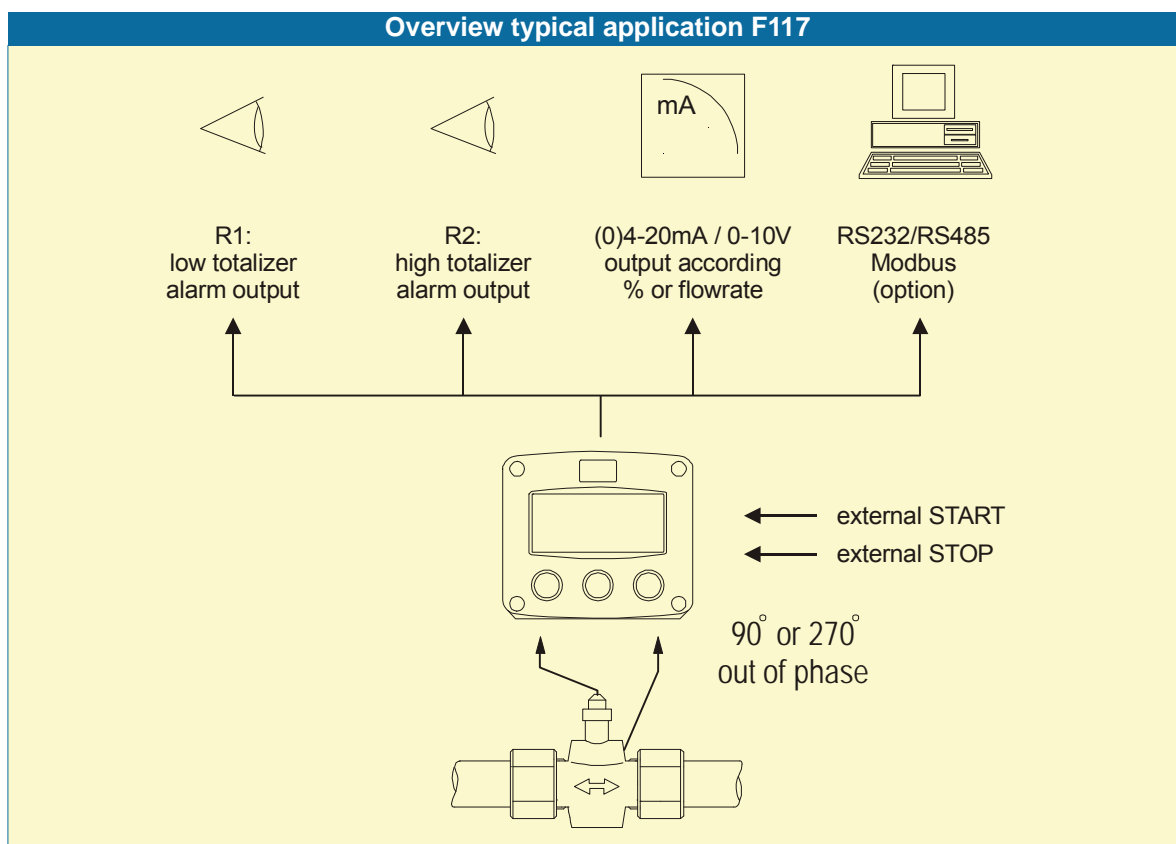


Fig. 1: Typical application for the F117-P.

Configuration of the unit

The F117-P is designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F117-P according to your specific requirements. SETUP includes several important features, such as K-factors, measurement units, signal selection etc. All settings are stored in EEPROM memory and will not be lost in the event of power failure or a drained battery.

To extend the battery-life time (option), please make use of the power-management functions as described in chapter 3.2.3.

Display information

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

The actual totalizer value is displayed with the 17mm digits while the percentage and preset value are displayed with the 8mm digits. When no "batch" is active, the alarm values, flowrate and accumulated total can be displayed.

A backup of the total and accumulated total in EEPROM memory is made every minute.

Options

The following options are available: isolated or active 4-20mA / 0-10V / 0-20mA analog output, full Modbus communication RS232/485 (also battery powered), intrinsic safety, mechanical relay or active outputs, power- and sensor-supply options, panel-mount, wall-mount and weather-proof enclosures, flame proof enclosure.

2. OPERATIONAL

2.1. GENERAL



- *The F117-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 F117-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.



This key is used to START the totalizer monitoring process.
The arrow-key ▲ is used to increase a value after PROG has been pressed or to configure the unit; please read chapter 3.



Press STOP to stop the totalizer monitoring process.
STOP is also used to select Preset value, alarm values, accumulated total and flowrate.
After PROG has been pressed, the arrow-key ► is used to select a value

2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the F117-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 F117-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.

The F117 does monitor a totalised quantity. Therefor, a preset quantity and two alarm values have to be entered first. After a START-command, the flowmeter signal will be totalised while the preset quantity and the percentage totalised is displayed. After a STOP-command or after a pre-defined process time (setup feature) the actual quantity will be compared with the low alarm value. The high alarm value will be compared with the actual quantity continuously, so an overshoot is immediately signaled.

2.3.1. PROGRAMMING THE PRESET AND ALARM VALUES

▪ To enter a Preset quantity



Note: This function might not be accessible due to a configuration setting.

To change the PRESET-value, following procedure must be followed:

- 1) be sure the unit is in steady state: "ready" is displayed.
- 2) press STOP once to select the preset value.
- 3) press PROG: the word "PROGRAM" will be flashing,
- 4) use ▸ to select the digits and ▲ to increase that value,
- 5) set the new PRESET-value by pressing ENTER.



Fig. 3: Example displayed information during programming preset value.

When data is altered but ENTER has not been pressed yet, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER during three seconds: the former value will be reinstated. The PRESET-value can be used time after time till a new value is programmed.



Please note that alterations will only be set after ENTER has been pressed!

▪ Batch maximum

When you program a new value which is too large, the decrease-sign ▼ will be displayed while you are programming; the new value will not be accepted! This is due to a setup feature that limits the preset value.

▪ Programming the totalizer alarm values



Note: This function might not be accessible due to a configuration setting.

When the STOP-key is pressed a few times, the two totalizer alarm values are displayed:

- low totalizer alarm: 95.0% (365.75L) for example,
- high totalizer alarm: 102.5% (394.63L) for example,

The alarm values have to be entered as a percentage (%) of the preset value. However, the unit will calculate the absolute value automatically after ENTER has been pressed.

To change the alarm value, the following procedure must be executed:

- 1) press PROG: the word "PROGRAM" will flash while the percentage value will be displayed.
- 2) use \blacktriangleright to select the digits and \blacktriangle to increase that value,
- 3) confirm the new alarm value by pressing ENTER.

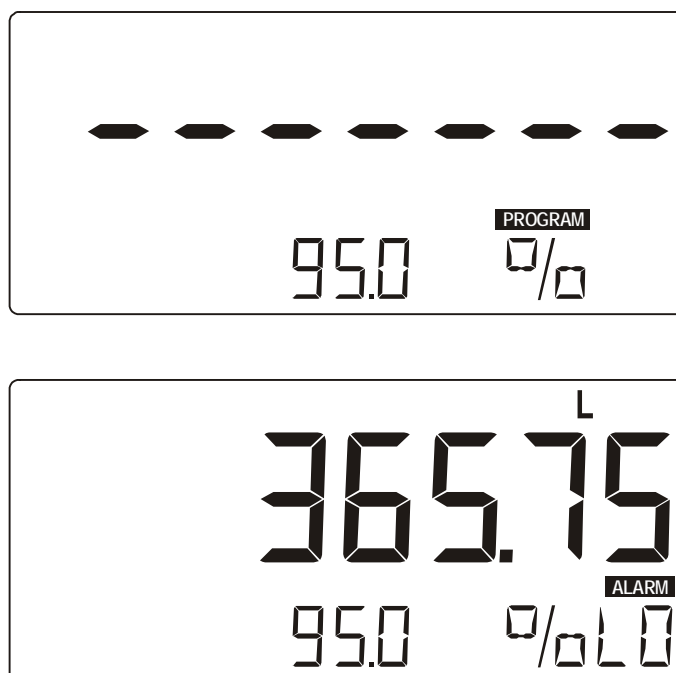


Fig. 4: Display examples of totalizer alarm value's.

▪ Flowrate and accumulated total

When the STOP-key is pressed a few times, the actual flowrate and non-resettable accumulated total are displayed. Both values can not be displayed during normal operation, so if no flow is running, the flowrate will be zero.

If the unit is configured for bi-directional measurement, the flowrate / total can either be displayed as a negative value or being ignored which will result in a flowrate value of zero and no totalization due to configuration settings.

2.3.2. MONITORING PROCESS

- **Starting up the monitoring process**

The totalizer monitoring process can only be started up when "READY" is displayed. This is the main display information of the F117-P. After selecting any other information, it will always return to this main display automatically.

The process is started-up by pressing the START-key or with an external command. From that moment the totalizer will be reset to zero and starts counting. On the bottom line, the percentage and preset value will be displayed after each other.

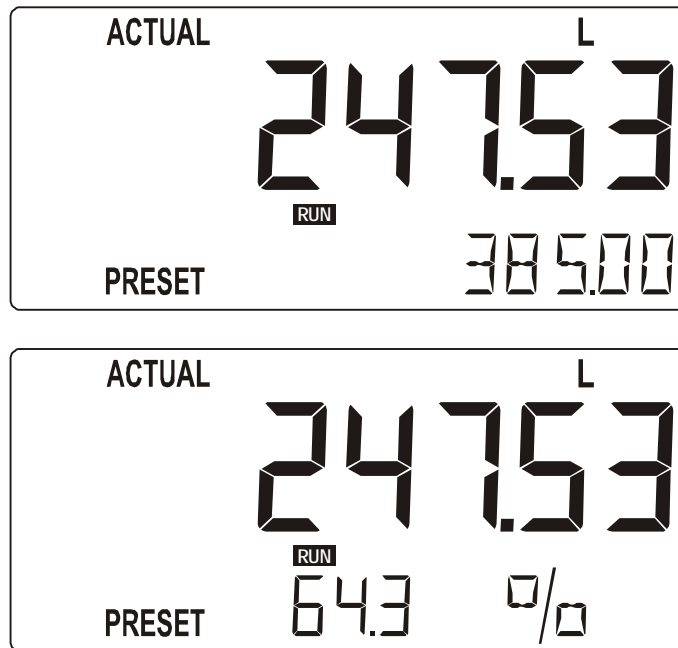


Fig. 5: Examples of displayed information during process.

- **Totalizer alarm**

During the process, the totalised quantity is continuously monitored for the high total alarm value. The low total alarm value will first be monitored after the end of process (due to a STOP command or the process monitoring time feature).

When the actual total is outside the allowed range, an alarm message will be displayed indicating the type of alarm: "LOW TOTAL ALARM" or "HIGH TOTAL ALARM". At the same time the corresponding alarm output will be switched.

The alarm is terminated automatically after a new START-command.

- **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.

- **Alarm 01-03**

When "alarm" is displayed but there is not a low or high total alarm, 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.



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 F117-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

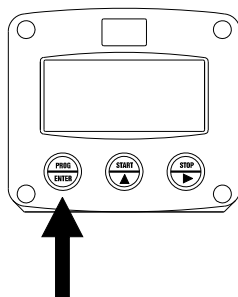
Configuration of the F117-P is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows \blacktriangleleft will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically. SETUP can be reached at all times while the F117-P remains fully operational.



Note !

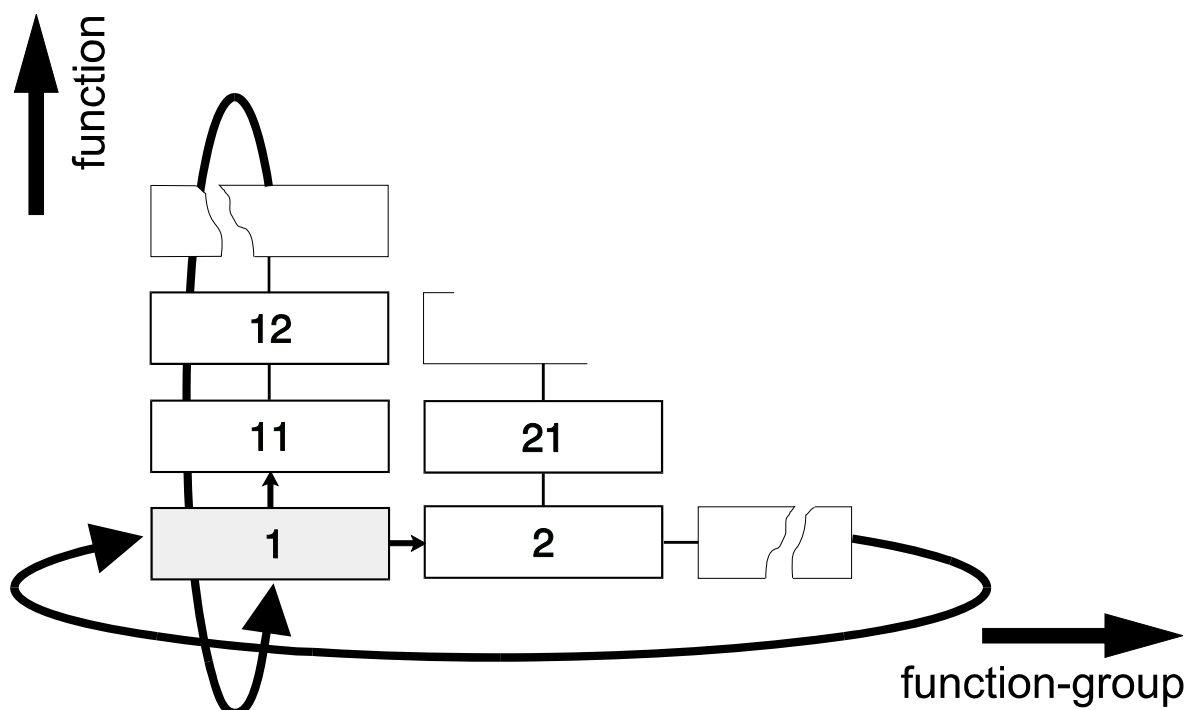
Note: A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.

To enter SETUP-level:



Press  for 7 seconds

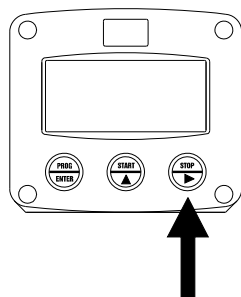
Matrix structure SETUP-level:



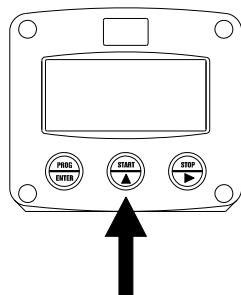
SCROLLING THROUGH SETUP-LEVEL

Selection of function-group and function:

SETUP is divided into several function groups and functions.



Select function-group with

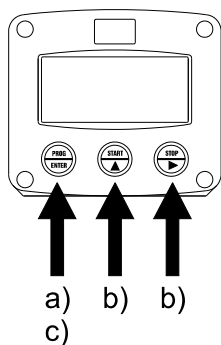






Select function with






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▲, 11▲, 12▲, 13▲, 14▲, 1▶, 2▶, 3▶, 31 etc.).

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.

To select a setting, both  and  can be used.

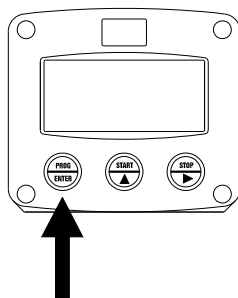
If the new value is invalid, the increase sign  or decrease-sign  will be displayed while you are programming.

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 !

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	TOTAL		
	11	UNIT	L - m3 - kg - lb - GAL - USGAL - bbl - no unit
	12	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	13	K-FACTOR:	0.000010 - 9,999,999
	14	DECIMALS K-FACTOR	0 - 6
2	FLOWRATE		
	21	UNIT	mL - L - m3 - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm3 - NL - P
	22	TIME UNIT	sec - min - hour - day
	23	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	24	K-FACTOR	0.000010 - 9,999,999
	25	DECIMALS K-FACTOR	0 - 6
	26	CALCULATION	per 1 - 255 pulses
	27	CUT-OFF	0.1 - 999.9 seconds
3	PRESET		
	31	SET PRESET	operator - setup
	32	MAXIMUM PRESET	0.000 - 9,999,999 unit
	33	PRESET	0.000 - 9,999,999 unit
	34	OVERRUN TIME	000.0 - 999.9 seconds
	35	PROCESS TIME	000.0 - 999.9 seconds
4	ALARM		
	41	SET ALARM	operator - setup
	42	ALARM LOW	000.0 - 999,9 %
	42	ALARM HIGH	000.0 - 999,9 %
5	POWER MANAGEMENT		
	51	LCD UPDATE	fast - 1 sec - 3 sec - 15 sec - 30 sec - off
	52	BATTERY MODE	operational - shelf
6	INPUT		
	61	INPUT B	disable - start - direction - counter
	62	INPUT C	disable - start - stop - positive slope - negative slope
7	FLOWMETER		
	71	SIGNAL A	npn - npn_lp - reed - reed_lp - pnp - pnp_lp - namur - coil_hi - coil_lo - act_8.1 - act_12 - act_24
	72	SIGNAL B	npn - npn_lp - reed - reed_lp - pnp - pnp_lp - namur - coil_hi - coil_lo - act_8.1 - act_12 - act_24
	73	PHASE	90° - 270°
	74	COUNT NEGATIVE	disable - enable
8	ANALOG		
	81	OUTPUT	disable - enable
	82	OUTPUT FUNCTION	percentage - flowrate
	83	4mA / 0V	0000.000 - 9,999,999
	84	20mA / 10V	0000.000 - 9,999,999
	85	CUT-OFF	0.0 - 9.9%
	86	TUNE MIN - (0)4mA / 0V	0 - 9,999
	87	TUNE MAX- 20mA / 10V	0 - 9,999
9	COMMUNICATION		
	91	SPEED / BAUDRATE	1200 - 2400 - 4800 - 9600
	92	ADDRESS	1 - 255
	93	MODE	rtu - off
A	OTHERS		
	A1	TYPE / MODEL	F117-P
	A2	SOFTWARE VERSION	02.04.01
	A3	SERIAL NO.	xxxxxxx
	A4	PASS CODE	0000 - 9999
	A5	TAGNUMBER	0000000 - 9999999

3.2.3. EXPLANATION OF SETUP-FUNCTIONS

1 - TOTAL	
MEASUREMENT UNIT 11	<p>SETUP - 11 determines the measurement unit for total, preset and accumulated total. The following units can be selected:</p> <p style="text-align: center;">L - m3 - kg - lb. - GAL - USGAL - bbl - _ (no unit).</p> <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.</p>
DECIMALS 12	<p>The decimal point determines for total, preset and accumulated total the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">0000000 - 111111.1 - 22222.22 - 3333.333</p>
K-FACTOR 13	<p>With the K-factor, the flowmeter pulse signals are converted to a quantity. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 11), for example per cubic meter. The more accurate the K-factor, the more accurate the functioning of the system will be.</p> <p>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 - 13: "2481300" and for SETUP - 14 - decimals K-factor "3".</i></p> <p>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 - 13: "6523100" and for SETUP - 14 decimals K-factor "6".</i></p> <p><i>Please note: if two sensors are used with a sum function (setup 61 - setting counter) do enter a K-factor which is twice the usual value !</i></p>
DECIMALS K-FACTOR 14	<p>This setting determines the number of decimals for the K-factor entered. (SETUP 13). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>Please note that this setting influences the accuracy of the K-factor indirectly. (i.e. the position of the decimal point and thus the value given) This setting has NO influence on the displayed number of digits for total (SETUP 12)!</p>



Note !

2 - FLOWRATE

The settings for total and flowrate are entirely separate. In this way, different units of measurement can be used for each e.g. cubic meters for total and liters for flowrate.
The display update time for flowrate is one second or more.

Note: these settings also influence the analog output ref. flowrate.

MEASUREMENT UNIT 21	<p>SETUP - 21 determines the measurement unit for flowrate. The following units can be selected:</p> <p style="text-align: center;">mL - L - m3 - mg - gr - kg - ton - GAL - bbl - lb - cf - rev (revolutions for RPM) - _ (no unit).</p> <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.</p>
TIME UNIT 22	The flowrate can be calculated per second (SEC), minute (MIN), hour (HR) or day (DAY).
DECIMALS 23	<p>This setting determines for flowrate the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">00000 - 1111.1 - 2222.22 - 3333.333</p>
K-FACTOR 24	<p>With the K-factor, the flowmeter pulse signals are converted to a flowrate. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 21), for example per liter. The more accurate the K-factor, the more accurate the functioning of the system will be. For examples read SETUP 13.</p> <p><i>Please note: if two sensors are used with a sum function (setup 61 - setting counter) do enter a K-factor which is twice the usual value !</i></p>
DECIMALS K-FACTOR 25	<p>This setting determines the number of decimals for the K-factor (SETUP 24). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>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 23)!</p>
CALCULATION 26	<p>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.</p> <p>Note: this setting does influence the update time for the analog output directly (maximum update 10 times a second). If the output response is too slow, decrease the number of pulses.</p> <p>Note: the lower the number of pulses, the higher the power consumption of the unit will be (important for battery powered applications).</p> <p>Note: for low frequency applications (below 10Hz): do not program more than 10 pulses else the update time will be very slow.</p> <p>Note: for high frequency application (above 1kHz) do program a value of 50 or more pulses.</p>
CUT-OFF TIME 27	<p>With this setting, you determine a minimum flow requirement thresh-hold, if during this time less than XXX-pulses (SETUP 26) are generated, the flowrate will be displayed as zero.</p> <p>The cut-off time has to be entered in seconds - maximum time is 999 seconds (about 15 minutes).</p>



Note !



Note !

3 - PRESET

The preset value is the totalizer quantity to be monitored. Related to this preset value, the low and high totalizer alarm values are set as well.

SET PRESET VALUE 31	This function determines if the preset value can be set at both Operator level and SETUP-level or SETUP-level only. If SETUP has been selected, the preset value is still visible for the Operator but can not be changed.
MAXIMUM PRESET 32	This function limits the operator to enter a new preset-value which is more as the entered batch maximum.
PRESET VALUE 33	Enter here the totalizer quantity to be monitored. This is the same function as available at Operator level.
OVERRUN TIME 34	For some applications it might be that a certain time after the STOP-command is required before the low totalizer alarm value may be monitored (low total only, as the high total will be monitored continuously). Enter here the time in seconds.
PROCESS TIME 35	This setting allows you to stop the process automatically X-seconds after a START-command. The monitoring will be executed as usual.

4 - ALARM

SET ALARM VALUE 41	This function determines if the totalizer alarm values can be set at both Operator level and SETUP-level or SETUP-level only. If SETUP has been selected, the alarm values are still visible for the operator but can not be changed.
ALARM VALUE LOW 42	The low alarm is set with this setting. The alarm value has to be entered as a percentage (%) of the preset value. The value has to be in a range of 0.1% - 999,9%. With value 0.0 the alarm is disabled. (Only on Operator level the unit will display the absolute value automatically).
ALARM VALUE HIGH 43	The high alarm is set with this setting. The alarm value has to be entered as a percentage (%) of the preset value. The value has to be in a range of 0.1% - 999,9%. With value 0.0 the alarm is disabled. (Only on Operator level the unit will display the absolute value automatically).

5 - POWER MANAGEMENT

When used with the internal battery option, the user can expect reliable measurement over a long period of time. The F117-P has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:

LCD NEW 51

The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display update, it is **strongly advised** to select a slow refresh rate. Please understand that NO information will be lost; every pulse will be counted and the output signals will be generated in the normal way. The following can be selected:

Fast - 1 sec - 3 sec - 15 sec - 30 sec - off.

Example 3: Battery life-time

battery life-time with a coil pick-up, 1KHz. pulses and FAST update: about 2 years.

battery life-time with a coil pick-up, 1KHz. pulses and 1 sec update: about 5 years.

Note: 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.

BATTERY-MODE 52

The unit has two modes: operational or shelf. After "shelf" has been selected, the unit can be stored for several years; it will not count pulses, the display is switched off but all settings and totals are stored. In this mode, power consumption is extremely low. To wake up the unit again, press the SELECT-key twice.



Note !

6 - INPUT

The functions below do configure the inputs for bi-directional or sum function and to configure the external START / STOP input(s).

INPUT B 61

This function determines the function of input B. The following can be selected:

disable - start - direction - counter

start: a reed switch input is available to generate a start command. This setting will change setup 72 automatically to setting "reed-switch LP")

direction: with this setting a bi-directional flowmeter signal can be used. Also setup 72 - 74 will be enabled.

counter: with this setting a second flowmeter input signal will be added to signal input B (sum function). Applications are a bi-directional flowmeter where the second signal is used to generate a higher resolution. *Please note: the K-factors (setting 13 and 24) have to be changed as well!*

INPUT C 62

This function determines the function of input C. The following can be selected:

disable - start - stop - positive slope - negative slope

start: a reed switch input is available to generate a start command.

stop: a reed switch input is available to generate a stop command.

positive slope: this setting offers an external start / stop with one input. Open input means STOP and a closed input means START.

negative slope: this setting offers an external start / stop with one input. Open input means START and a closed input means STOP.



Note !

7 - FLOWMETER

SIGNAL A 71	<p>The F117-P is able to handle several types of input signal. The type of flowmeter pickup / signal is selected with SETUP 71. If two sensors are used, the second input is set with SETUP 72. Note: The selections "active pulse" offer a detection level of 50% of the supply voltage. Read also par. 4.4.3. Flowmeter input terminals 09-11 / 12-14.</p>			
TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ. / MV	REMARK
NPN	NPN input	100K pull-up	6 kHz.	(open collector)
NPN - LP	NPN input with low pass filter	100K pull-up	2.2 kHz.	(open collector) less sensitive
REED	Reed-switch input	1M pull-up	1.2 kHz.	
REED - LP	Reed-switch input with low pass filter	1M pull-up	120 Hz.	Less sensitive
PNP	PNP input	100K pull-down	6 kHz.	
PNP - LP	PNP input with low pass filter	100K pull-down	700 Hz.	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
ACT_8.1	Active pulse input 8.1 VDC	3K9	10KHz.	External power required
ACT_12	Active pulse input 12 VDC	4K	10KHz.	External power required
ACT_24	Active pulse input 24 VDC	3K	10KHz.	External power required
SIGNAL B 72	<p><i>Please note: the settings below are directly influenced by SETUP 61. If "START" has been selected, this input is fixed to the setting "REED LP".</i></p> <p>The secondary signal is used to detect the direction of flow or to create a higher resolution of the input: both signals will be added up. In most applications, the signal type will be as the main signal (setting 71).</p>			
PHASE 73	<p>For applications with bi-directional measurement, the phase difference between flow A and flow B can be set to 90 degrees or 270 degrees. In this way, you can easily swap the input signal to make it count positive in the preferred direction.</p>			
COUNT NEGATIVE 74	<p>For applications with bi-directional measurement, this function determines if a negative (return) flow should result in counting down or if it should be ignored which means that no flow will be counted at all.</p> <ul style="list-style-type: none"> • disable: a reverse flow will result in a flowrate of zero. Total does not count. • enable: a reverse flow will result in a negative flowrate. Total counts down. 			



Note !



Note !

8 - ANALOG OUTPUT

A linear (0)4-20mA or 0-10V output signal is generated according to the percentage or flowrate with a 10 bits resolution. The settings for flowrate (SETUP - 2) directly influence the analog output. The relationship between percentage / rate and analog output is set with the following functions:



Note !

DISABLE / ENABLE 81	The analog output can be disabled. In case of a passive analog output type AP, 3.5mA will be generated if a power supply is available but the output is disabled.			
OUTPUT FUNCTION 82	With this function the analog output signal can be set to follow the percentage displayed or the flowrate.			
MINIMUM FLOWRATE 83	Enter here the flowrate or percentage at which the output should generate a (0)4mA signal (or 0V) - in most applications at value "zero". The number of decimals for flowrate follow SETUP 23. The time and measuring units (L/min for example) are according SETUP 21 and 22 but can not displayed.			
MAXIMUM FLOWRATE 84	Enter here the flowrate or percentage at which the output should generate a 20mA (or 10V) - in most applications at maximum flow or 100%.			
CUT-OFF 85	To ignore leakage of the flow for example, a low flow cut-off can be set as a percentage of the full range of 16mA (or 20mA / 10V). When the flow is less than the required rate, the current will be 4mA. Examples:			
4mA (SETUP 83)	20mA (SETUP 84)	CUT-OFF (SETUP 85)	REQUIRED RATE	OUTPUT
0 L/min	100 L/min	2%	$(100-0)*2\% = 2.0 \text{ L/min}$	$4+(16*2\%) = 4.32\text{mA}$
20 L/min	800 L/min	3.5%	$(800-20)*3.5\% = 27.3 \text{ L/min}$	$4+(16*3.5\%) = 4.56\text{mA}$
TUNE MIN / (0)4mA / 0V DC 86				
TUNE MAX 20mA / 10V DC 87				

The initial minimum analog output value is (0)4mA or 0V. However, this value might differ slightly due to external influences such as temperature for example. The (0)4mA or 0V value can be tuned precisely with this setting.

- *Before tuning the signal, be sure that the analog signal is not being used for any application!*

After pressing PROG, the current will be about 4mA (or 0mA / 0V). The current can be increased / decreased with the arrow-keys and is directly active. Press ENTER to store the new value.
Remark: the analog output value can be programmed "up-side-down" if desired, so 20mA at minimum flowrate or 0% for example!

The initial maximum analog output value is 20mA (or 10V). However, this value might differ slightly due to external influences such as temperature for example. The 20mA value (or 10V) can be tuned precisely with this setting.

- *Before tuning the signal, be sure that the analog signal is not being used for any application!*

After pressing PROG, the current will be about 20mA. The current can be increased / decreased with the arrow-keys and is directly active. Press ENTER to store the new value.
Remark: the analog output value can be programmed "up-side-down" if desired, so 4mA at maximum flowrate or 100% for example!



9 - COMMUNICATION (OPTIONAL)

The functions described below deal with hardware that is not part of the standard delivery. Programming of these functions does not have any effect if this hardware has not been installed. Consult Appendix C and the Modbus communication protocol description for a detailed explanation.

BAUDRATE 91	For external control, the following communication speeds can be selected: 1200 - 2400 - 4800 - 9600 baud
BUS ADDRESS 92	For communication purposes, a unique identity can be attributed to every F117-P. This address can vary from 1-255.
MODE 93	The communication protocol is Modbus RTU mode. Select OFF, to disable this communication function.

A - OTHERS

TYPE OF MODEL A1	For support and maintenance it is important to have information about the characteristics of the F117-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 A2	For support and maintenance it is important to have information about the characteristics of the F117-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 A3	For support and maintenance it is important to have information about the characteristics of the F117-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 A4	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 A5	For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.

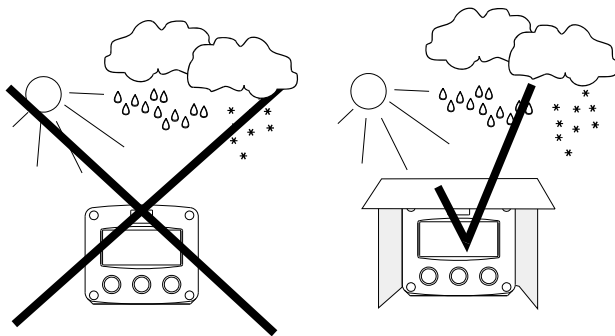
4. INSTALLATION

4.1. GENERAL DIRECTIONS



- 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 F117-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.

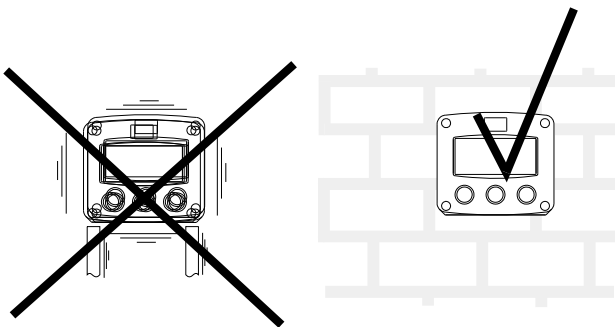
4.2. INSTALLATION / SURROUNDING CONDITIONS



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 4X)!

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 F117-P on a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE
Aluminum enclosures:

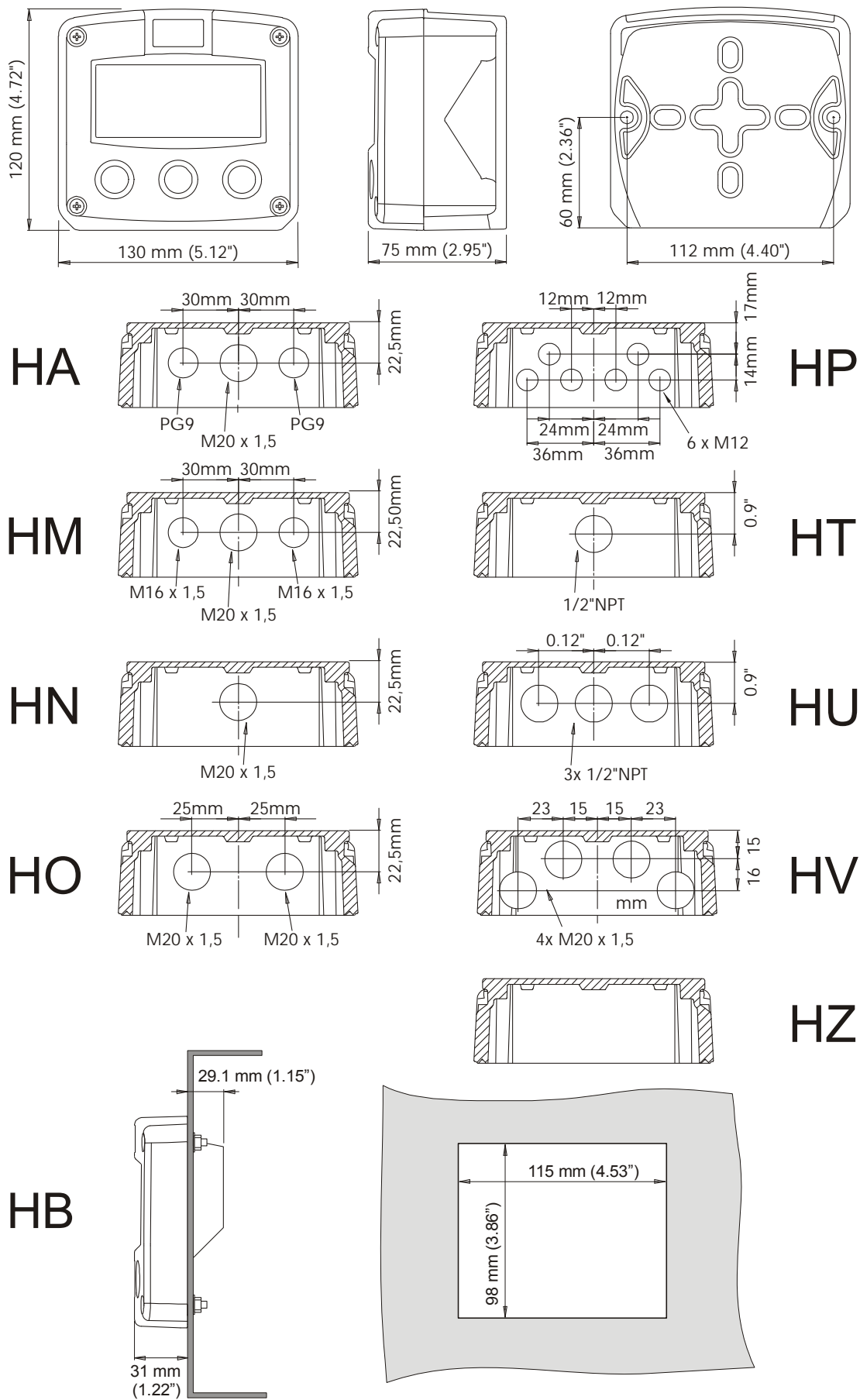
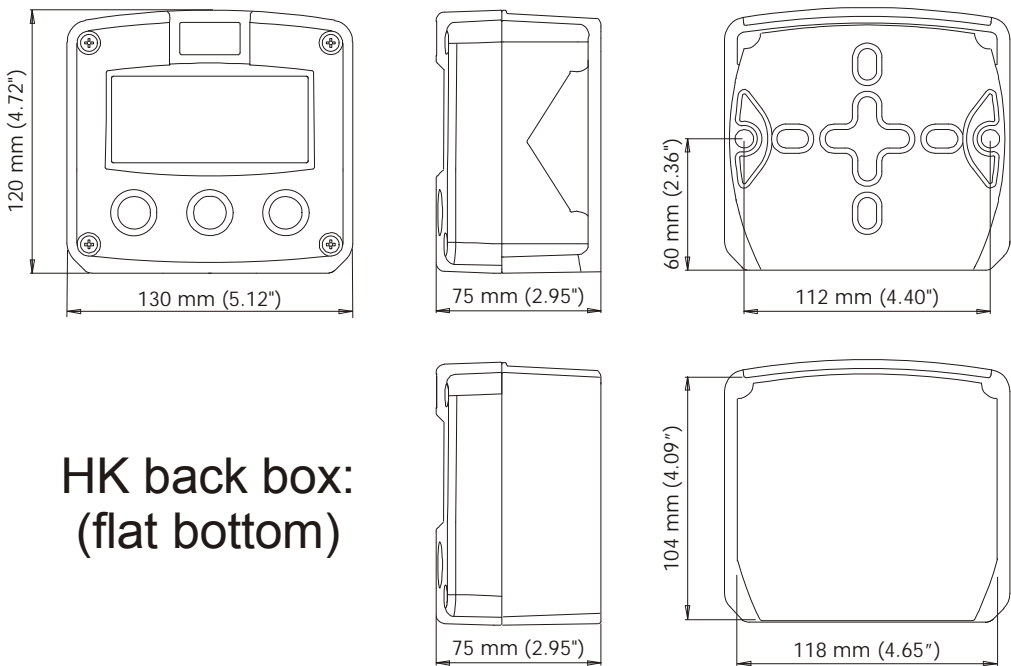


Fig. 5: Dimensions aluminum enclosures.

GRP enclosures:



HK back box:
(flat bottom)

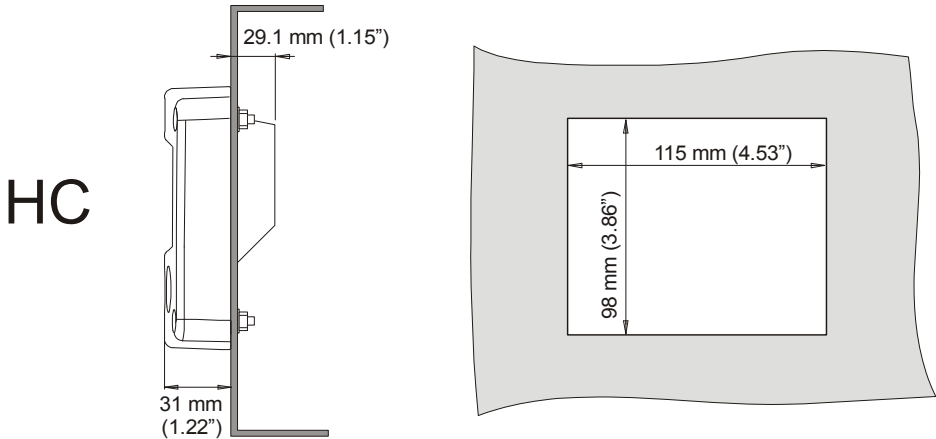
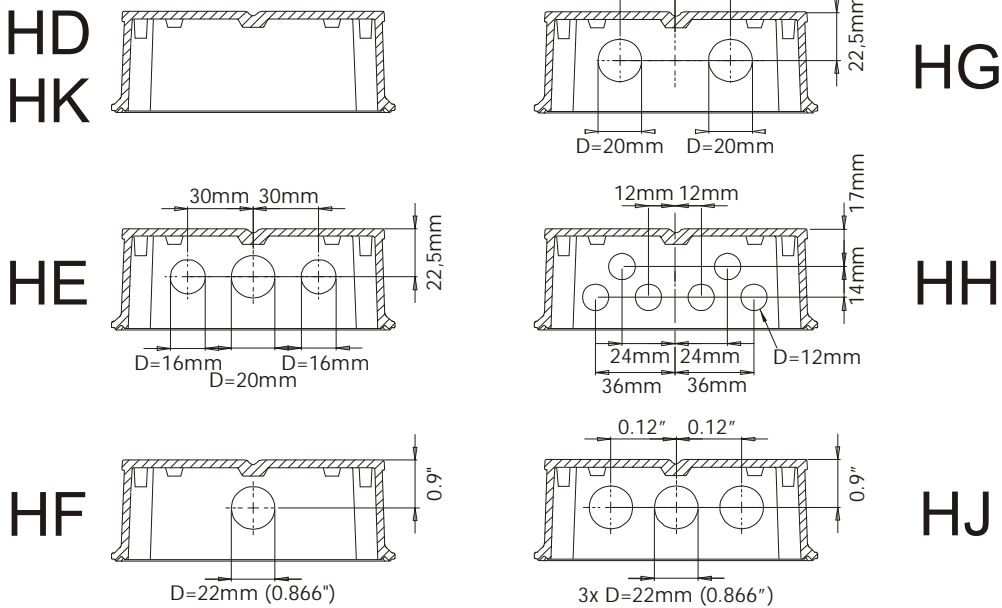


Fig. 6: Dimensions GRP enclosures.

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).



Aluminum enclosures

- When installed in an aluminum enclosure and a potentially explosive atmosphere requiring apparatus of equipment protection level Ga and Da, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.
- Do ground the aluminum enclosure properly as indicated, if the F117-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.

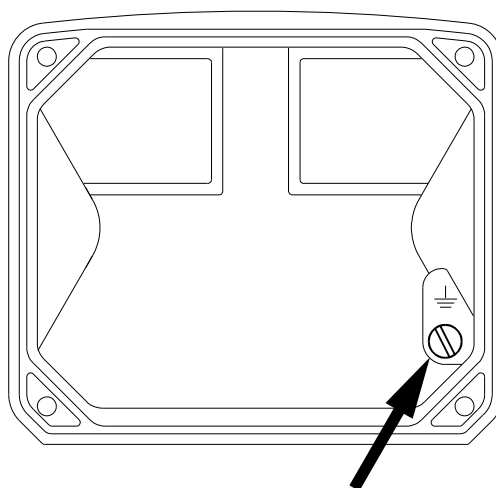


Fig. 7: Grounding aluminum enclosure with type PM 115-230V AC.

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.
- An effective screened cable for the input signal, and grounding of its screen to terminal 9 (GND) or at the sensor itself, whichever is appropriate to the application.

4.4.2. VOLTAGE SELECTION SENSOR SUPPLY

For Intrinsically Safe applications: read chapter 5.

Type PB / PC / PX (AP) - battery powered and output loop-powered applications:

Terminal 11 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. 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 / PF / PM: Sensor supply: 1.2 - 3.2V - 8.2V - 12V or 24 V DC:

With this option, a real power supply for the sensor is available. The flowmeter can be powered with 8.2 - 12 or 24 V DC.

Total power consumption PD: max. 50mA@24V and PF / PM: 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 in the top left corner (type PD) or on the right hand (type PF / PM) as indicated:

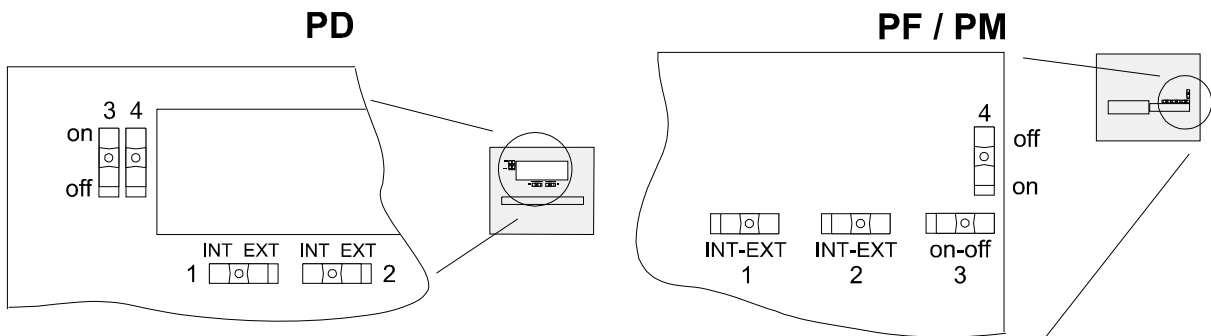


Fig. 9: Switch setting sensor supply voltage.

Switch positions

SENSOR A		SENSOR B		VOLTAGE SELECTION		
SWITCH 1	VOLTAGE	SWITCH 2	VOLTAGE	SWITCH 3	SWITCH 4	VOLTAGE
internal	3.2 V DC	internal	3.2 V DC	on	on	8.2 V DC
external	switch 3+4	external	switch 3+4	on	off	12 V DC
				off	off	23 V DC

- Function switch 1:** voltage selection sensor A - terminal 11.
Function switch 2: voltage selection sensor B - terminal 14.
Function switch 3+4: the combination of these switches determine the voltage as indicated. Do move switch 1 and / or switch 2 to the OFF position to enable the selected voltage with switch 3+4.

4.4.3. TERMINAL CONNECTORS

For Intrinsically Safe applications: read chapter 5.

The following terminal connectors are available:

POWER SUPPLY TYPE PD / PF / PM			HIGH TOTALIZER ALARM OUTPUT TYPE OT / OA / OR		LOW TOTALIZER ALARM OUTPUT TYPE OT / OA / OR		ANALOG OUTPUT TYPE AA / AB / AI / AP / AU POWER SUPPLY TYPE PX		INPUT A SENSOR SIGNAL PULSE INPUT TYPE P			INPUT B SENSOR SIGNAL PULSE INPUT TYPE P OR EXTERNAL START			INPUT C START / STOP / SLOPE INPUT	
GND	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
⊥	N	L1	R2	⊥	R2	R1	⊥	R1	⊥	SIGNAL	+ ⊥	⊥	SIGNAL	+ ⊥	⊥	SIGNAL

Fig. 10: Overview of terminal connectors standard configuration F117-P and options.

REMARKS: TERMINAL CONNECTORS:

Terminal GND- 01- 02: Power Supply - only available with type PD / PF or PM:

TYPE	SENSOR SUPPLY	Terminal			backlight	Type AA	Type AU	Type OA	Type OR
		GND	01	02					
PD 8-24V AC	8.2, 12, 24V max. 50mA		AC	AC	◇	◇	◇	◇	
PD 8-30V DC	8.2, 12, 24V max. 50mA	L-	L+		◇	◇	◇	◇	
PF 24V AC ± 15%	8.2, 12, 24V max. 50mA		AC	AC	◇	◇	◇		◇
PF 24V DC ± 15%	8.2, 12, 24V max. 50mA	L-	L+		◇	◇	◇		◇
PM 115-230V AC ± 15%	8.2, 12, 24V max. 50mA	EARTH	AC	AC	◇	◇	◇	◇	◇
Note PD	do not use a AC autotransformer (Spartrafo) without a galvanic isolation.								
Note PF / PM	The total consumption of the sensors and outputs may not exceed 400mA@24V								

◇=option



Note !

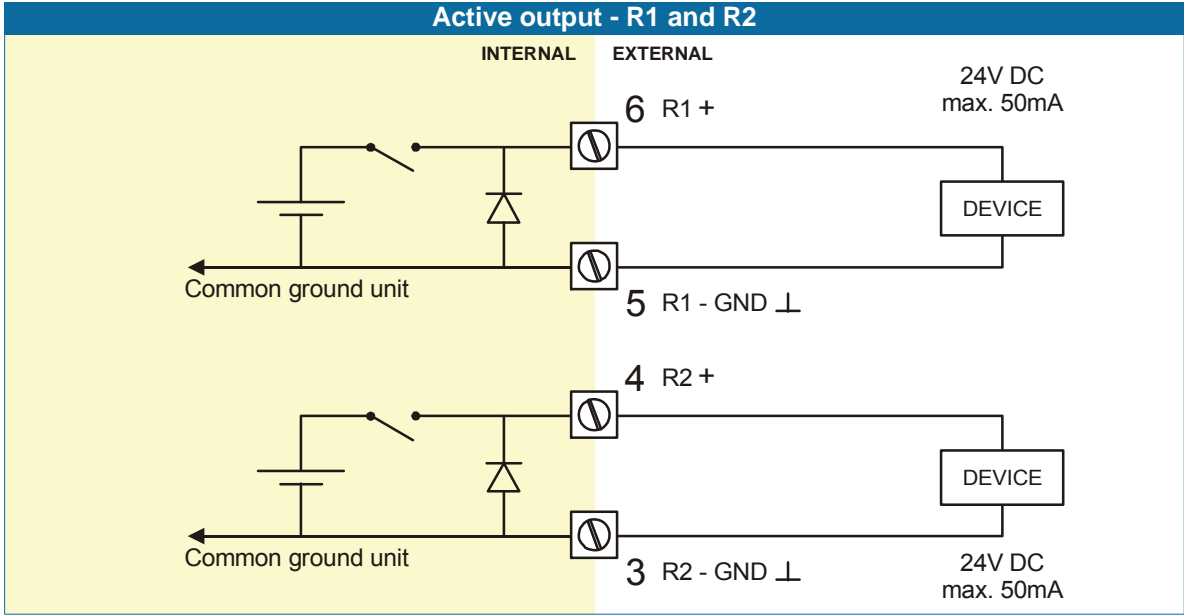
Note: for power supply type PX: please read Terminal 07-08 !

For Intrinsically Safe applications: read chapter 5.

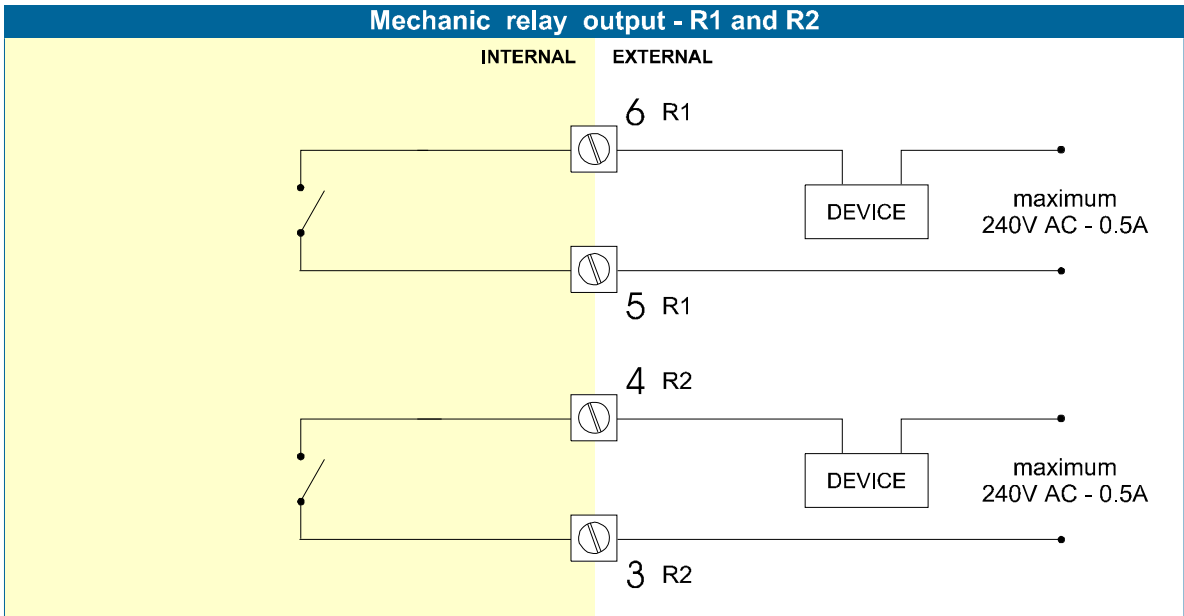
Terminal 03-04; low alarm output R2:
This output is the low totalizer alarm output.

Terminal 05-06; high alarm output R1:
This output the high totalizer alarm output.

Type OA:
An active 24V DC signal totalizer alarm output is available with this option.
Max. driving capacity 50mA@24V per output. (Requires power supply type PD / PF / PM).

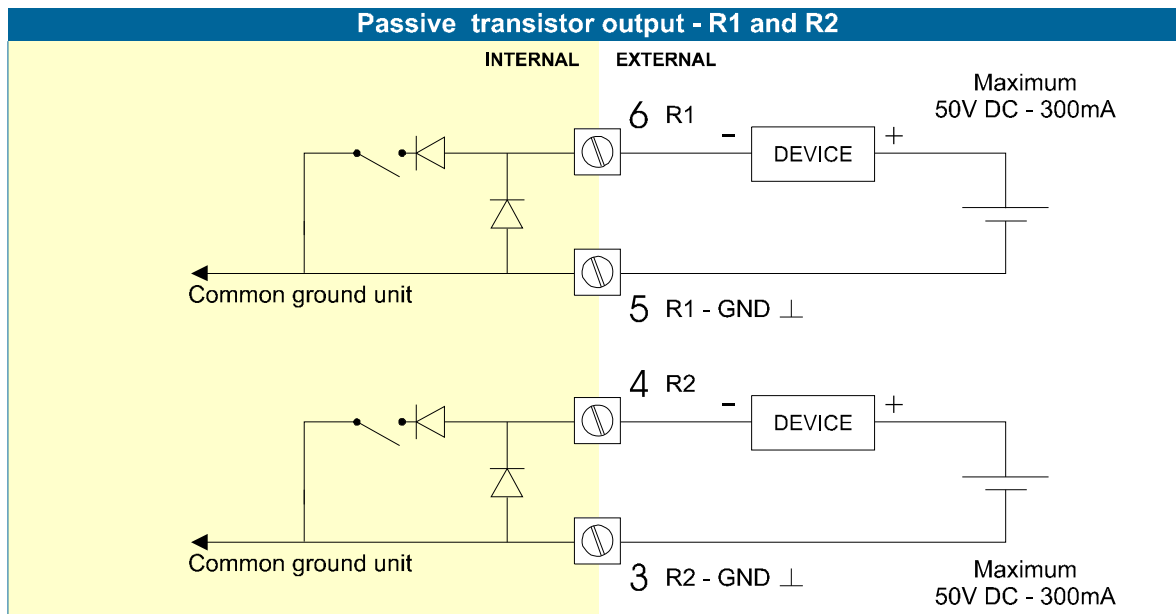


Type OR:
A mechanical relay output totalizer alarm output is available with this option.
Max. switch power 240V 0,5A per output. (Requires power supply type PF / PM).



Type OT:

A passive transistor output is available with this option. Max. driving capacity 300mA@50V DC.

**Terminal 07-08; basic POWER SUPPLY - type PX - output loop powered:**

Connect an external power supply of 8-30VDC to these terminals or a 4-20mA loop.

Do connect the "-" to terminal 7 and the "+" to terminal 8. When power is applied to these terminals, the (optional) internal battery will be disabled / enabled automatically to extend the battery life time.



Caution ! Only valid for standard passive output type AP!

Terminal 07-08 analog output (SETUP 8) :

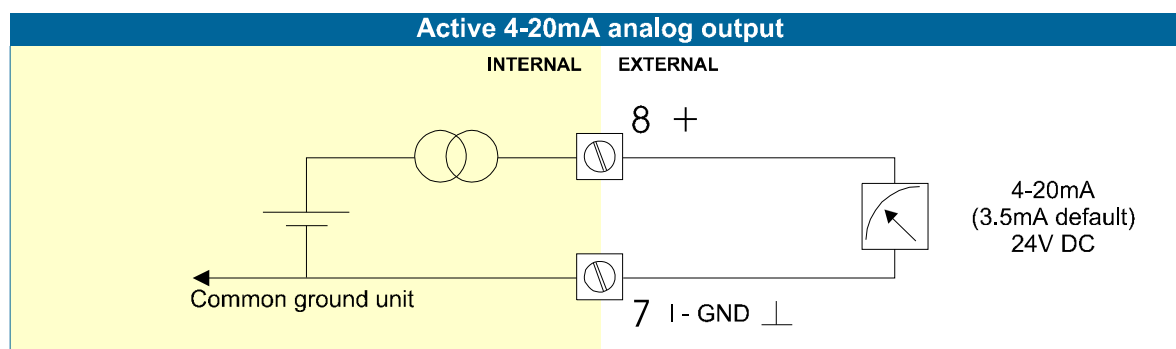
An analog output signal proportional to the flowrate or percentage is available as standard.

Type AA:

An active 4-20mA signal proportional to the flowrate or percentage is available with this option.

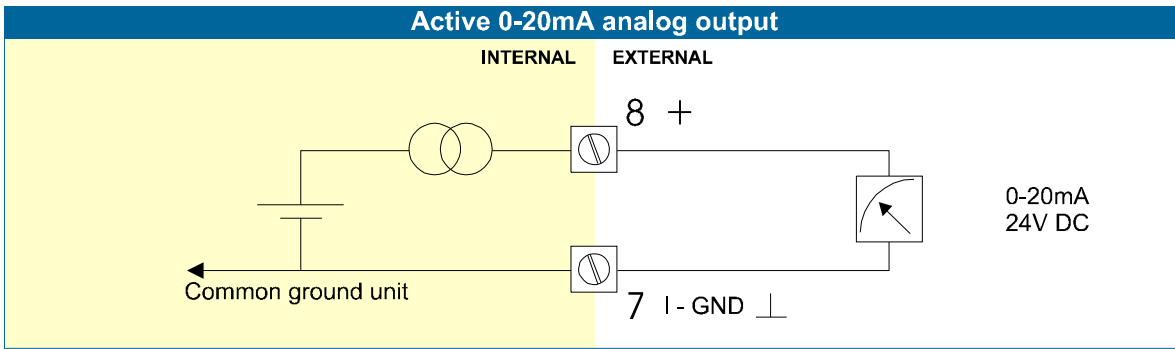
When the output is disabled, a 3.5mA signal will be generated on these terminals.

Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD / PF / PM).



Type AB:

An active 0-20mA signal proportional to the flowrate or percentage is available with this option.
Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD / PF / PM).

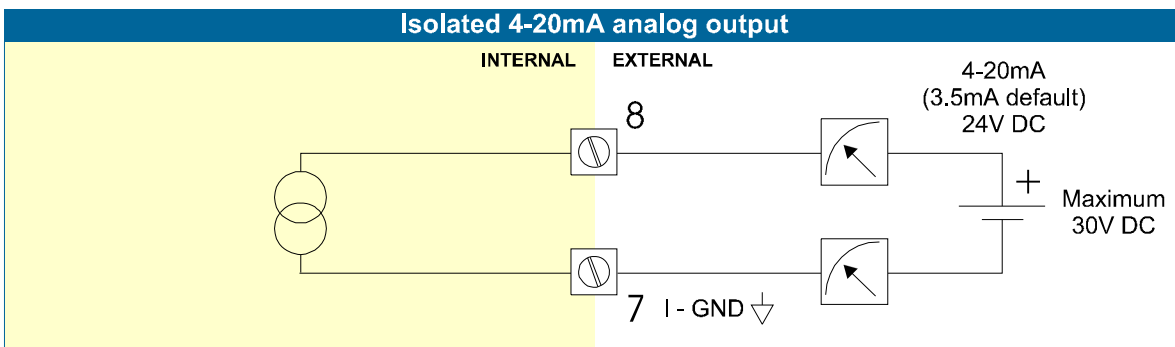


Type AF:

For the Intrinsically Safe floating 4-20mA signal: please read Chapter 5.

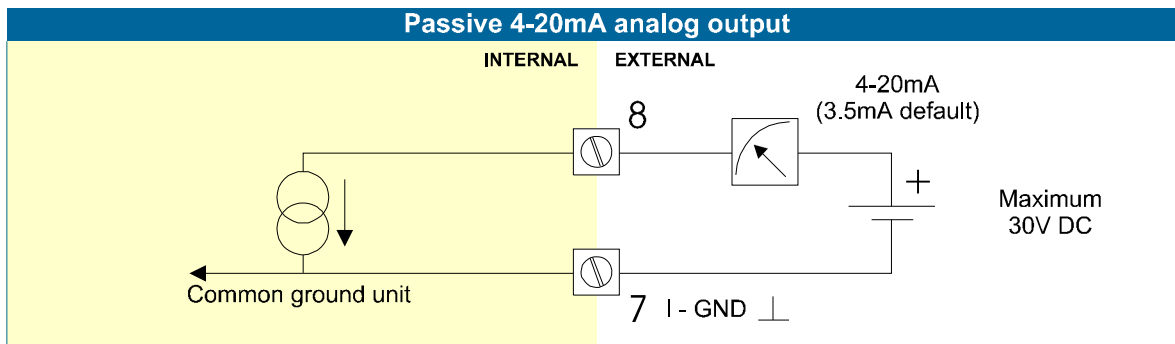
Type AI:

An isolated 4-20mA signal proportional to the flowrate or percentage is available with this option.
When the output is disabled, a 3.5mA signal will be generated on these terminals.
Max. driving capacity 1000 Ohm @ 30VDC.
This option can be battery powered but the life time of the battery is about 2 -3 years.



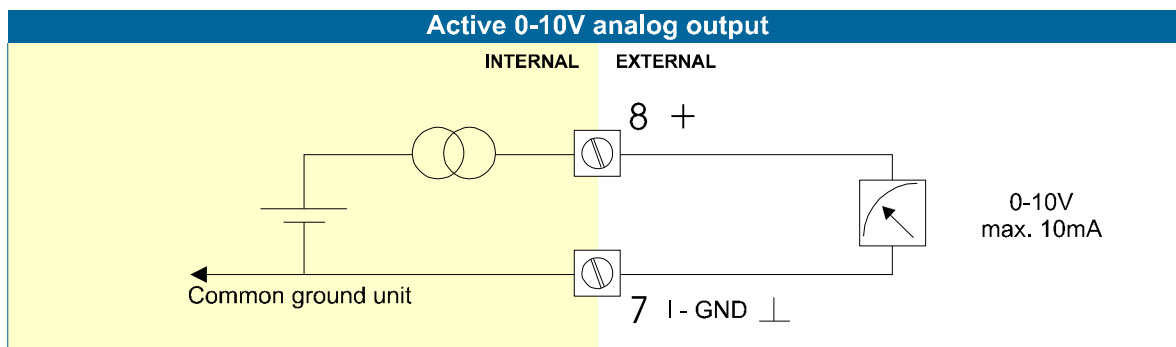
Type AP - passive analog output:

A DC power supply should be connected to terminal 07 and 08, the current is then regulated by unit.
This DC supply is also used to power the unit (output loop-powered). When a power supply is connected but the output is disabled, a 3.5mA signal will be generated.
Max. driving capacity 1000 Ohm.



Type AU:

A 0-10VDC signal proportional to the flowrate or percentage is available with this option.
Max. load 10mA @ 10VDC. (Requires power supply type PD / PF / PM).

**Terminal 09-11; Flowmeter input:**

Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or sine-wave (coil). The screen of the signal wire must be connected to the common ground terminal 09 (unless earthed at the sensor itself).

The maximum input frequency is approximately 10 kHz (depending on the type of signal). The input signal type has to be selected with the correct SETUP-function (read par. 3.2.3.)

Sine-wave signal (Coil):

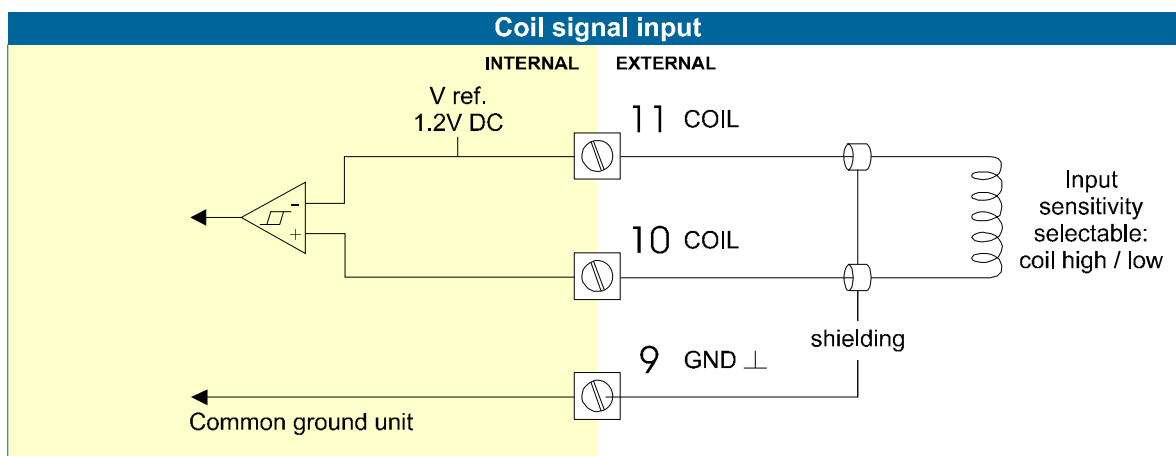
The F117-P is suitable for use with flowmeters which have a coil output signal. Two sensitivity levels can be selected with the SETUP-function:

COIL LO: sensitivity from about 120mVp-p.

COIL HI: sensitivity from about 20mVp-p.

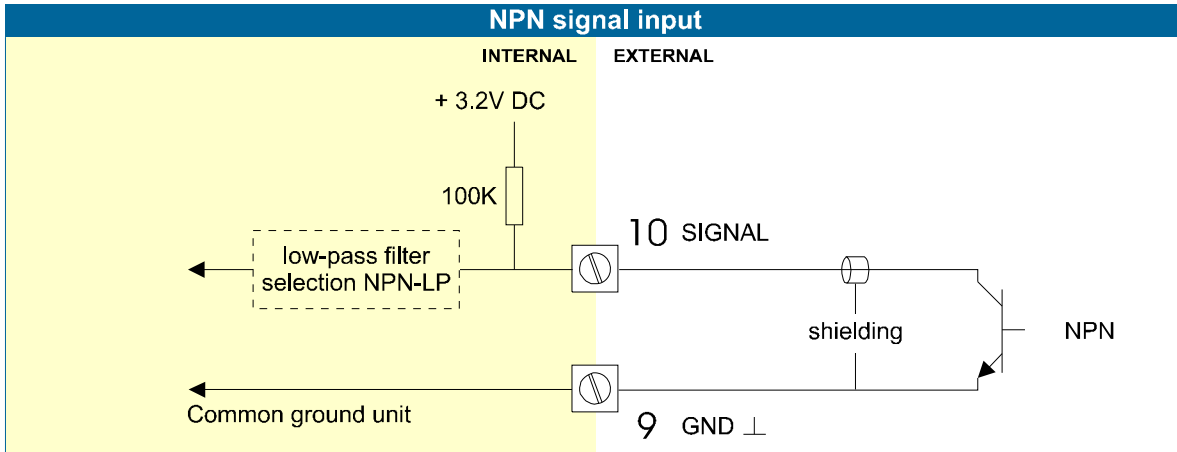
Type ZF offers for setting COIL HI : sensitivity from about 10mVp-p.

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



Pulse-signal NPN / NPN-LP:

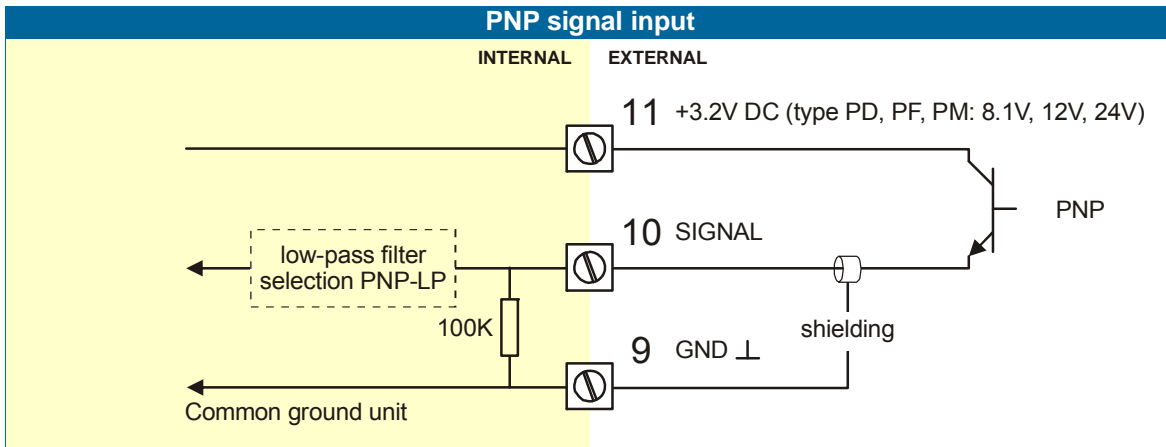
The F117-P is suitable for use with flowmeters which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.



Pulse-signal PNP / PNP-LP:

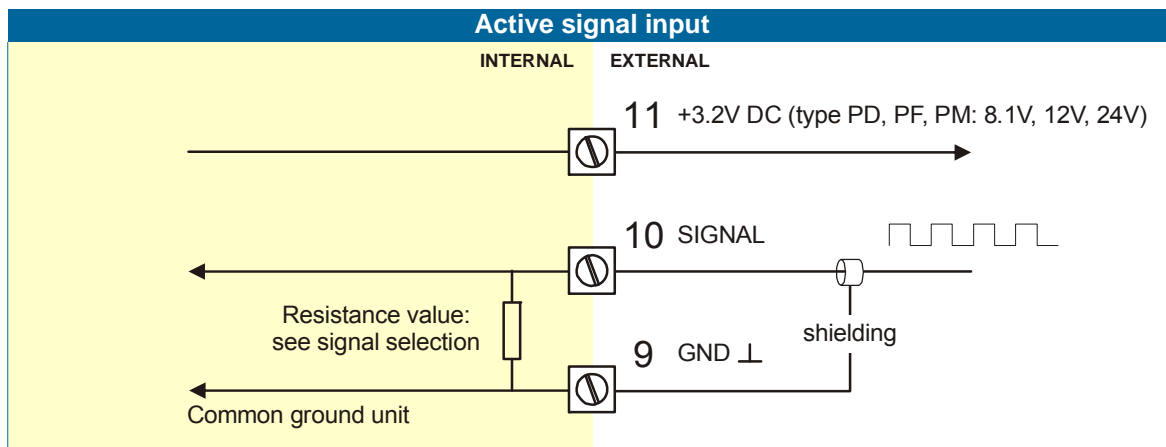
The F117-P is suitable for use with flowmeters which have a PNP output signal. 3.2V is offered on terminal 11 which has to be switched by the sensor to terminal 10 (SIGNAL). For a reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.

A sensor supply voltage of 8.1, 12 or 24V DC can be provided with power supply type PD, PF, PM. For a signal detection level of 50% of the supply voltage: please refer to "active signals".

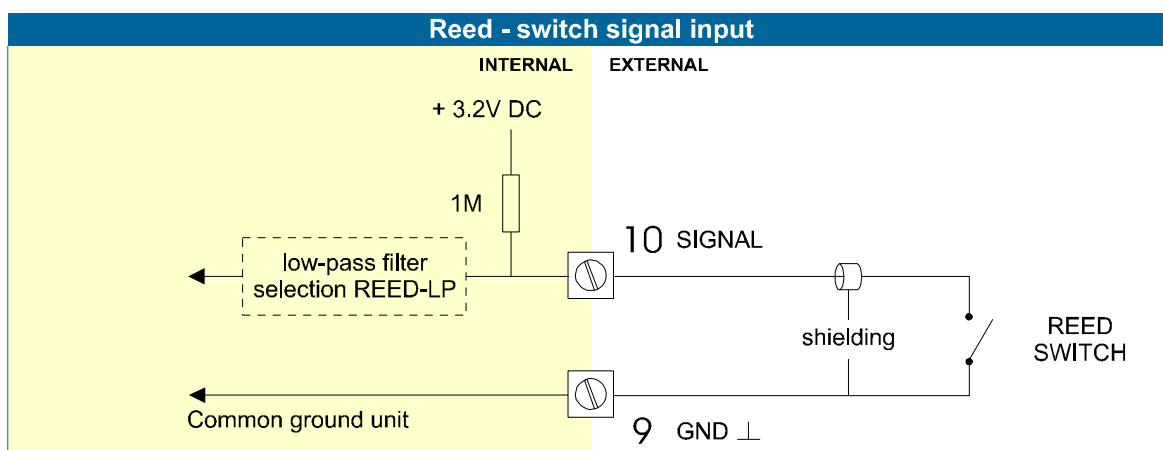


Active signals 8.1V - 12V and 24V:

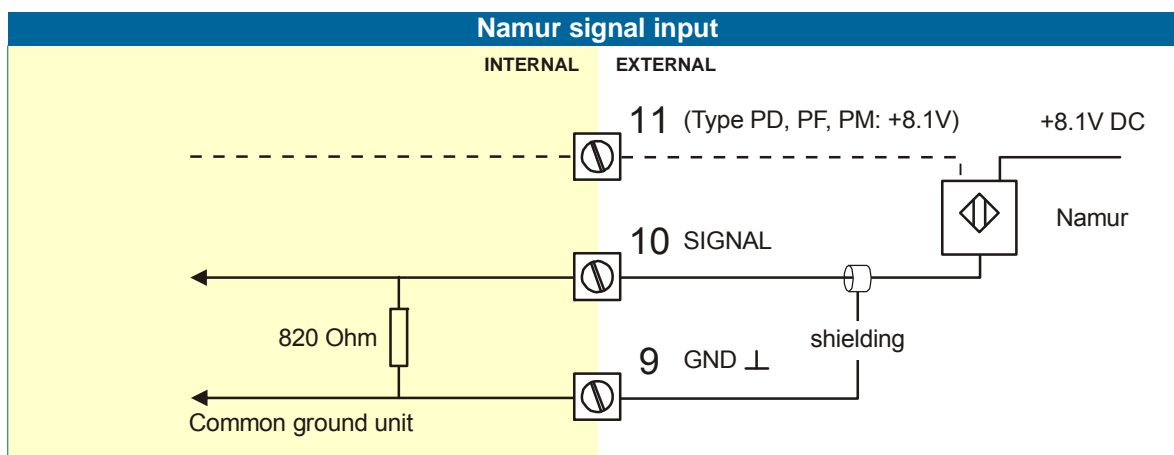
If a sensor gives an active signal, please read par. 3.2.3. The detection levels are 50% of the selected supply voltage; approximately 4V (ACT_8.1) or 6V (ACT_12) or 12V (ACT_24). Active signal selection may well be desired in the case of power supply type PD, PF, PM being supplied for sensor supply.

**Reed-switch:**

The F117-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 F117-P is suitable for flowmeters with an Namur signal. The standard F117-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 11) can be provided with power supply type PD, PF, PM.



Terminal 12-14; input B - flowmeter or external START:

Exactly as described for the flowmeter A, several flowmeter signal types can be selected for flowmeter input B. Please refer to the descriptions per flowmeter type as describer for flowmeter A. The 9-10-11 do correspond with the terminals 12-13-14.
In case the input is set to START input (setting 61) the signal is set automatically to a reed-switch input with low-pass filter.

Terminal 26-31: type CB / CH / CI / CT - communication RS232 / RS485 / TTL (option)

- Full serial communications and computer control in accordance with RS232 (length of cable max. 15 meters) or RS485 (length of cable max. 1200 meters) is possible.
- Read the Modbus communication protocol and Appendix C.

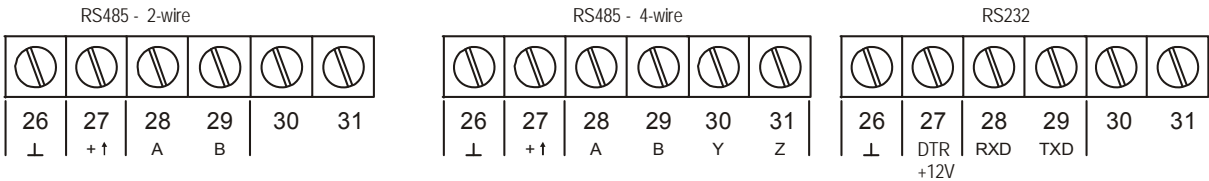


Fig. 11: Overview terminal connectors communication option.

When using the RS232 communication option, terminal 27 is used for supplying the interface. Please connect the DTR (or the RTS) signal of the interface to this terminal and set it active (+12V). If no active signal is available it is possible to connect a separate supply between terminals 26 and 27 with a voltage between 8V and 24V.

Terminal 26-31: backlight - type ZB (option):

***Note:** if the unit is supplied with a power supply type PD, PF or PM, the backlight supply is integrated, so the text following is not applicable.*

To power the backlight, provide a 12-24V DC to terminal 26 (-) and 27 (+). An external trimmer 1kOhm can be used to tune the brightness of the backlight, or if not desired, a short-cut between these terminals have to be made which will result in the maximum brightness.

***Note:** Intrinsically Safe as well as 4-wire RS485 communication is not possible in combination with type ZB, except if a PD, PF or PM power supply is being used.*

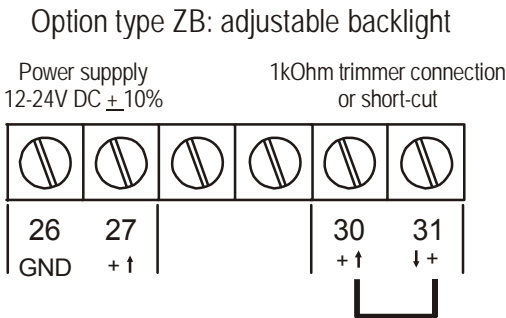


Fig. 12: Overview terminal connectors backlight option.

5. INTRINSICALLY SAFE APPLICATIONS

5.1. GENERAL INFORMATION AND INSTRUCTIONS



Cautions

- 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.
- To maintain the degree of protection of at least IP65 in accordance with IEC 60529, certified cable entries in accordance with IEC 61241-0 must be used and correctly installed. Unused openings must be closed with suitable blanking elements.
- When the enclosure of the Indicator is made of aluminum alloy, when used in a potentially explosive atmosphere requiring apparatus of equipment protection level Ga and Da, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.
- Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.



Safety Instructions

- When two or more active intrinsically safe circuits are connected to the indicator, in order to prevent voltage and/or current addition, applicable to the external circuits, precautions must be taken to separate the intrinsically safe circuits in accordance with IEC 60079-11.
- For the combined connection of the different supply, input and output circuits, the instructions in this manual must be observed.
- From the safety point of view the circuits shall be considered to be connected to earth.
- 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 03ATEX1074 X.
- For installation under IECEx scheme: this intrinsically safe device must be installed in accordance with the product certificate IECEx DEK 11.0042X.
- Exchange of Intrinsically Safe battery FWLiBAT-0xx with certificate number KEMA 03ATEX1071 U or IECEx KEM 08.0005U is allowed in Hazardous Area. See paragraph 5.4. for detailed battery replacement instructions.



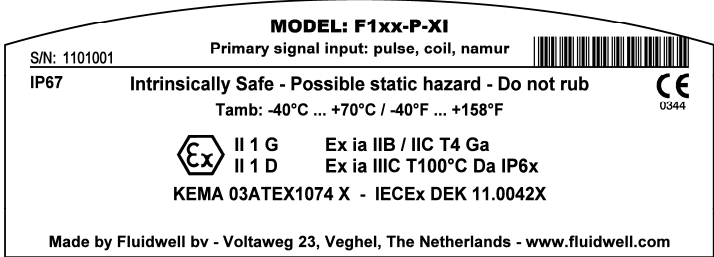
Please Note

- Certificates, safety values and declaration of compliance can be found in the document named: "Fluidwell F1...-XI - Documentation for Intrinsic Safety".
- 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.

Label information (inside and outside the enclosure)

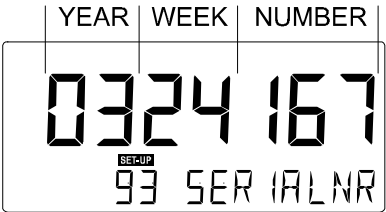
Indicated labels on the back cover (below) and on the inside cover (right) show the type labels for intrinsically safe certified units.

For details on usage see the separate “Fluidwell F1...-IX Documentation for Intrinsic Safety”.



Serial number and year of production

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



5.2. TERMINAL CONNECTORS INTRINSICALLY SAFE APPLICATIONS

The unit is classified as group IIB/IIIC by default.

Classification of the unit as group IIC is only possible under the following conditions:

- The indicator is either supplied by
 - the internal supply (option -PC); or
 - the external supply connected to terminals 0 and 1 (option -PD); or
 - the circuit supply connected to terminals 7 and 8 (option -AP);The maximum values for any of those circuits are those as defined for group IIB/IIIC;
- No other active external intrinsically safe circuits may be connected to the indicator, with exception of circuits connected to terminals 3 and 4 and/or terminals 5 and 6; the maximum values for any of those circuits are those as defined for group IIB/IIIC

Terminal connectors F117-P-XI:

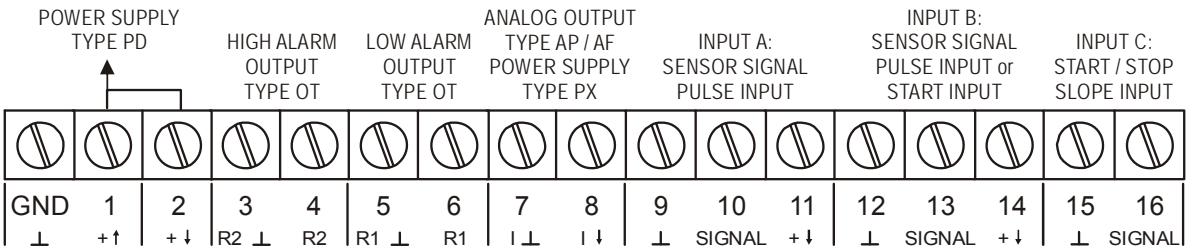
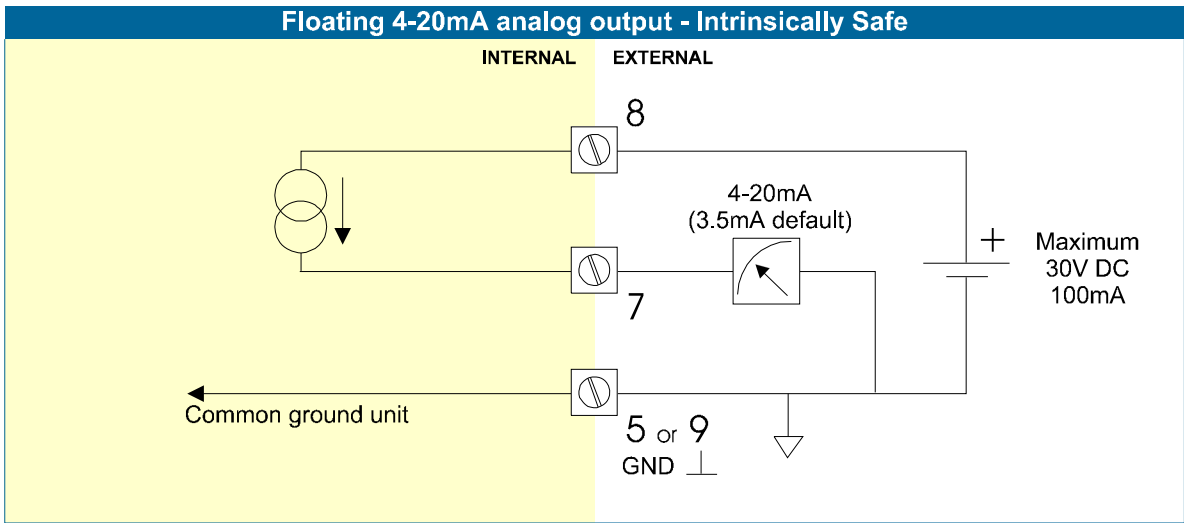


Fig. 13: Overview terminal connectors XI - Intrinsically Safe applications.

Explanation Intrinsically Safe options:

Type AF - Intrinsically Safe floating 4-20mA analog output:

A floating 4-20mA signal proportional to the flowrate or percentage is available with this option. When the output is disabled, a 3.5mA signal will be generated. Max. driving capacity 1000 Ohm @ 30V DC.



Type PD - Intrinsically Safe power supply and sensor supply - Terminal GND- 01 and 11.

TYPE	SENSOR SUPPLY	Terminal		
		GND	01	02
PD	Input voltage: 8-30V DC	3,2 - 8,1V	L-	L+
		output voltage is according the input voltage; internally linked with terminal 01.		

Terminal 02: this terminal offers the same voltage as connected to terminal 01.
Terminal 11: this terminal offers a 3.2V or 8.1V to power the sensor.
This voltage is selected with the switch(es) inside the enclosure. First, remove the terminals after which the internal plastic cover can be removed.

Switch position terminal 11		Switch position no function	
SWITCH 1	VOLTAGE	SWITCH 2	
on	8.1 V DC	not available	
off	3.2 V DC		

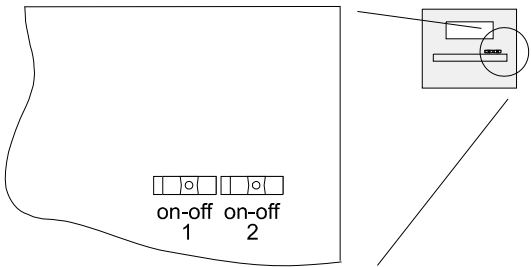


Fig. 14: Switch position voltage selection type PD-XI.

5.3. CONFIGURATION EXAMPLES INTRINSICALLY SAFE APPLICATIONS

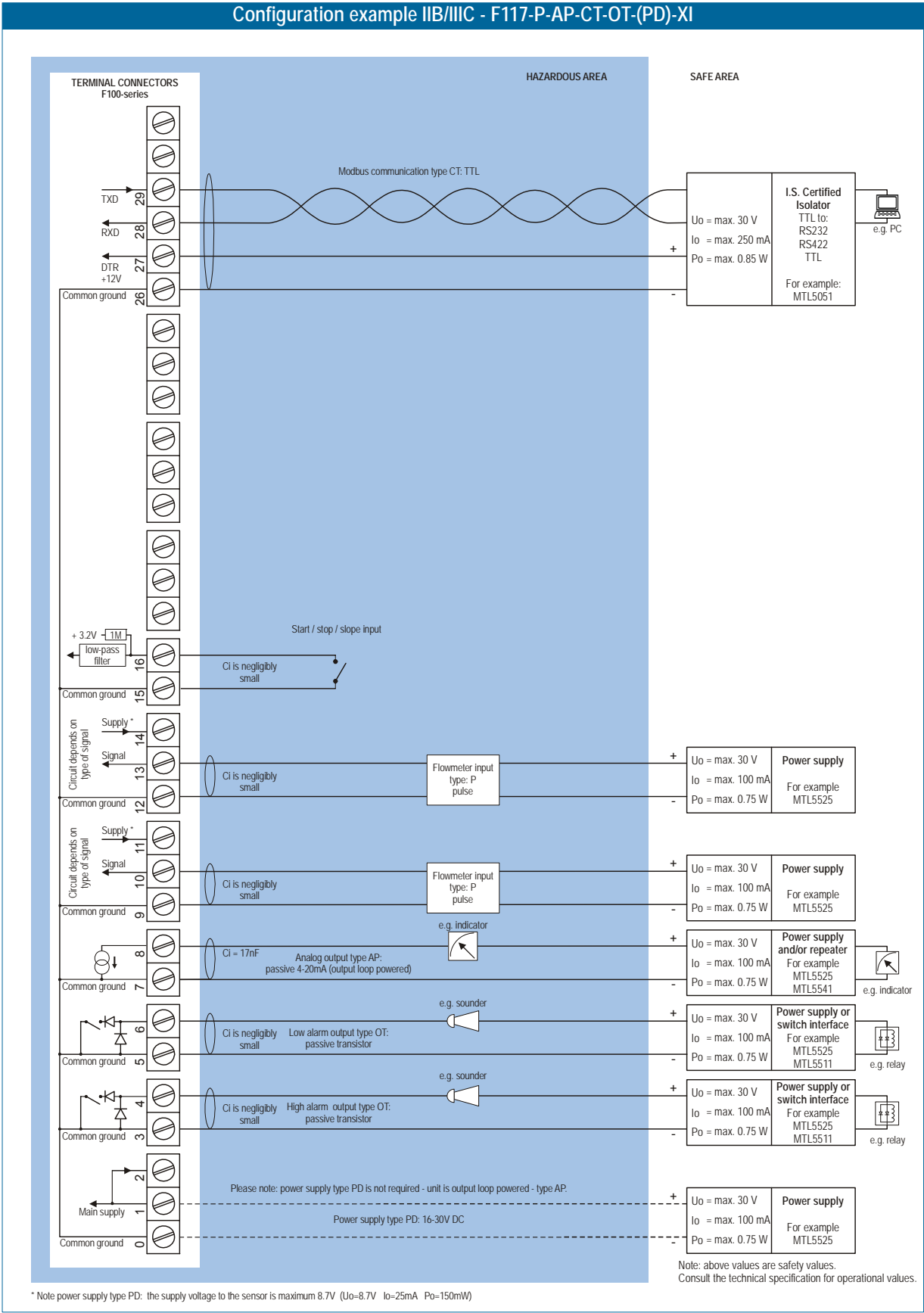


Fig. 14: Configuration example 1 Intrinsically Safe.



5.4 BATTERY REPLACEMENT INSTRUCTIONS



Safety Instructions

- **Fire, explosion or severe burns may result if mistreated.** Do not recharge, crush, disassemble, incinerate, heat above 100°C (212°F) or expose contents to water.
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained personnel authorized by the plant operator. Personnel must read and understand this instruction before carrying out the replacement procedure.
- Always follow the instructions listed in the supplied Battery Replacement Instruction Sheet.
- Batteries pose an environmental hazard. Return used batteries to a recycling point.



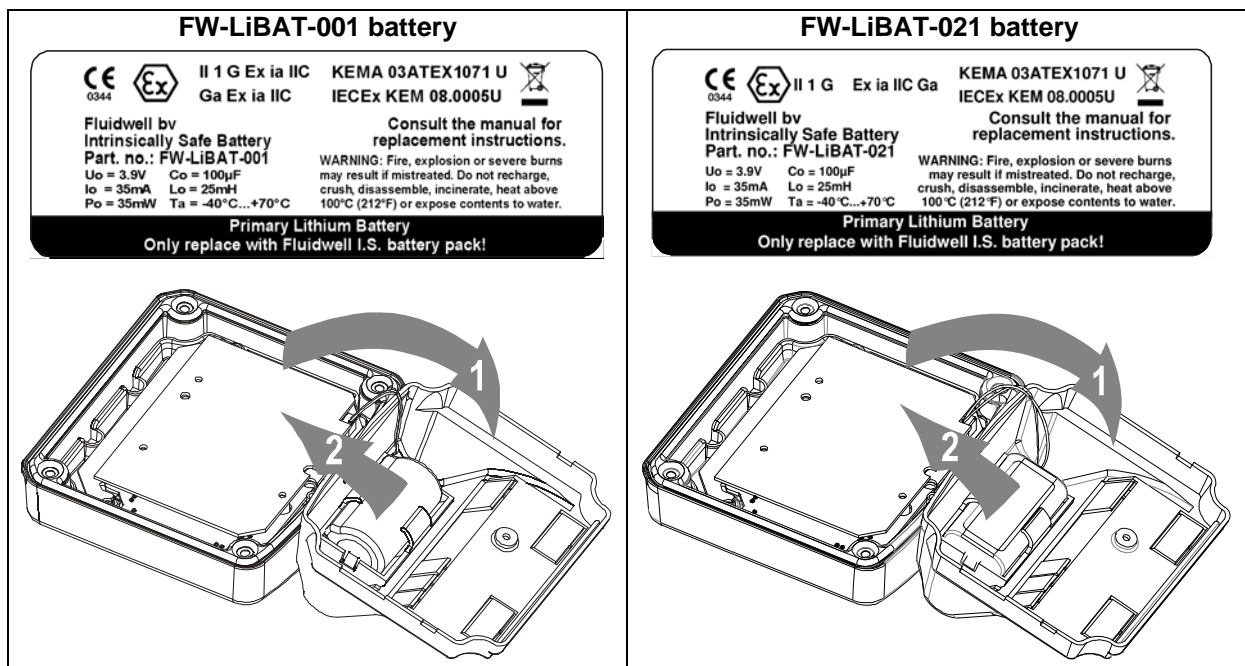
Safety instructions for hazardous areas

- Verify the correct battery is supplied: **Only batteries with indicated Ex label are certified for replacement and use in hazardous areas.** Batteries for use in safe areas have no Ex label. **DO NOT EXCHANGE:** Using the wrong type of battery can pose a SERIOUS RISK.
- **For use in hazardous areas Fluidwell recommends FW-LiBAT batteries (manufactured by Fluidwell bv) only.**

Battery replacement procedure



Depending on the production batch, one of two visualized Intrinsically Safe certified battery types may have been installed in the unit. They are interchangeable.



1. To replace the battery, open the unit to gain access to the back inside cover of the unit.
2. Unplug the field connectors from the back inside of the unit.
3. Remove the screw that holds the plastic inside cover.
4. Open the cover and unplug the battery connector.
5. Remove the battery from the inside of the plastic cover. *Do not remove the battery clip!*
6. Install the new battery and re-assemble the unit in reverse order.
7. Start-up the unit

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 F117-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 F117-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 F117-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 :

- Type of sensor: read chapter 3.2.3. NPN and PNP inputs consume more energy than coil inputs.
- Input frequency: the higher the frequency, the shorter the battery life-time.
- Flowrate calculation: the lower number of pulses (SETUP 26) the shorter the battery life-time.
- Analog output signal; be sure that an external power supply is connected or that the function is disabled if not in use; or else it will have a major influence on the battery life-time (SETUP 81).
- Display update: fast display update uses significantly more power; SETUP 51.
- Communications .
- Low temperatures; the available power will be less due to battery chemistry.



Note !

Note: *It is strongly advised to disable unused 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 K-factor alterations.
- The indication for low-battery.
- Clean the casing with soapy-water. Do not use any aggressive solvents as these might damage the coating.

APPENDIX A: TECHNICAL SPECIFICATION

GENERAL

Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Digits	Seven 17mm (0.67") and eleven 8mm (0.31"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec - 30 secs.
Type ZB	Transflective LCD with green LED backlight. Good readings in full sunlight and darkness. Note: only available for safe area applications. Power requirements: 12-24V DC + 10% or type PD, PF, PM. Power consumption max. 1 Watt.

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 / NEMA4X
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 +176°F)
Intrinsically Safe	-40°C to +70°C (-40°F to +158°F)

Power supply	
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	8-24V AC / DC \pm 10%. Power consumption max. 10 Watt. Intrinsically safe: 16-30V DC; power consumption max. 0.75 Watt.
Type PF	24V AC / DC \pm 10%. Power consumption max. 15 Watt.
Type PL	Input loop powered from sensor signal 4-20mA (type A, non IS).
Type PM	115-230V AC \pm 10%. Power consumption max. 15 Watt.
Type PX	Output loop powered: 8-30V DC. Power consumption max. 0.5 Watt.
Note PF / PM	The total consumption of the sensors', backlight and outputs may not exceed 400mA@24V.
Note I.S. applications	For intrinsically safe applications, consult the safety values in the certificate.

Sensor excitation	
Type PB / PC / PX	3.2V DC for pulse signals and 1.2V DC for coil pick-up. Note: This is not a real sensor supply. Only suitable for pulse sensors with a very low power consumption like coils (sine wave) and reed-switches.
Type PD	1.2 / 3.2 / 8.2 / 12 and 24V DC - max. 50mA@24V DC
Type PD-XI	Intrinsically safe: Pulse signals: 1.2 / 3.2 / 8.2 - max. 7mA@8.2V DC. Analog signals: the sensor supply voltage is according to the power supply voltage connected to terminal 1. Also terminal 2 offers the same voltage.
Type PF / PM	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 (Type PM / PF)

Data protection	
Type	EEPROM backup of all setting. Backup of running totals every minute. 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 IIB/IIC T4 Ga II 1 D Ex ia IIIC T100°C Da IP6x IECEx approval: Ex ia IIB/IIC T4 Ga Ex ia IIIC T100°C Da IP6x
Explosion proof Type XD/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 compatibility	Compliant ref: EN 61326 (1997), EN 61010-1 (1993).

INPUTS

Flowmeter	
Type P	Coil/sine wave (minimum 20mVp-p or 80mVp-p - sensitivity selectable), NPN/PNP, open collector, reed-switch, Namur, active pulse signals 8 - 12 and 24V.
Frequency	Minimum 0 Hz - maximum 7 kHz for total and 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	0.000010 - 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.

OUTPUTS

Analog output	
Function	transmitting flowrate or percentage.
Accuracy	10 bit. Error < 0.05% - update 10 times a second. Software function to calibrate the 4.00mA and 20.00mA levels precisely within set-up.
Load	max. 1 kOhm
Type AA	Active 4-20mA output (requires type OA + PD, PF or PM).
Type AB	Active 0-20mA output (requires type OA + PD, PF or PM).
Type AF	Passive floating 4-20mA output for Intrinsically Safe applications (requires PC, PD or PL).
Type AI	Passive galvanically isolated output (requires PB, PD, PF, PL or PM).
Type AP	Passive 4-20mA output - output loop powered (type PX).
Type AU	Active 0-10V output (requires type OA + PD, PF or PM).

Alarm outputs	
Function	two outputs: low and high totalizer alarm.
Type OA	Active 24V DC transistor output; max. 50mA per output (requires type AA + PD, PF or PM).
Type OR	Isolated mechanic relay output; max. switch power 230V AC - 0,5A (requires type PF or PM).
Type OT	Passive transistor output - not isolated. Load max. 50V DC - 300mA.

Communication option	
Functions	reading display information, reading / writing all settings.
Protocol	Modbus ASCII or RTU
Speed	1200 - 2400 - 4800 - 9600 baud
Addressing	maximum 255 addresses.
Type CB	RS232
Type CH	RS485 2-wire
Type CI	RS485 4-wire
Type CT	TTL Intrinsically Safe communication.
Type CX	no communication.

OPERATIONAL

Operator functions	
Functions	<ul style="list-style-type: none"> enter a preset value, enter a high and low totalizer alarm value, start / interrupt and stop the totalizer monitoring process, total can be reset to zero, start / stop the monitoring process.
Displayed information	<ul style="list-style-type: none"> preset value and percentage, running "batch" total, accumulated total (only if no monitored batch is running), flowrate (only if no monitored batch is running).

Total / preset	
Digits	7 digits.
Units	L, m3, GAL, USGAL, KG, lb, bbl, no unit.
Decimals	0 - 1 - 2 or 3.

Accumulated total	
Digits	11 digits.
Units / decimals	according to selection for total / preset.
Note	accumulated total can NOT be reset to zero.

Flowrate	
Digits	7 digits.
Units	mL, L, m3, Gallons, KG, Ton, lb, bl, cf, RND, ft3, scf, Nm3, NI, ical - no units.
Decimals	0 - 1 - 2 or 3.
Time units	/sec - /min - /hr - /day.

Alarm values	
Digits	7 digits.
Units	According to selection for total / preset.
Decimals	According to selection for total / preset.
Type of alarm	low and high totalizer alarm.
Note	the alarm value has to be entered as a percentage of the preset quantity., The unit will calculate and display the absolute value automatically.

Percentage	
Digits	4 digits - 000.1 - 999.9 %.

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F117-P is going to be installed or while it is in operation.

Flowmeter does not generate pulses:

Check:

- Signal selection SETUP - 71 / 72,
- K-factors SETUP 1 and 2 correctly entered?
- Pulse amplitude (par. 4.4.3.),
- Flowmeter, wiring and connection of terminal connectors (par. 4.4.3.),
- Power supply of flowmeter (par. 4.4.2.).

Flowmeter generates "too many pulses":

Check:

- Settings for total and Flowrate: SETUP 11-14 and 21-27,
- Type of signal selected with actual signal generated - SETUP - 71 / 72 and 61,
- Sensitivity of coil input - SETUP - 71 / 72 and par. 4.4.3.
- Proper grounding of the F117-P - par. 4.4.1.
- Use screened wire for flowmeter signals and connect screen to terminal 9. (unless connected at sensor)

Analog output does not function properly:

Check:

- SETUP 81 - is the function enabled?
- SETUP 82 - does it follow the required function?
- SETUP 83 / 84: are the levels programmed correctly?
- connection of the external power-supply according to the specification.

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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LIST OF CONFIGURATION SETTINGS			
SETTING	DEFAULT	DATE :	DATE :
1 - TOTAL	Enter your settings here		
11 unit	L		
12 decimals	0000000		
13 K-factor	0000001		
14 decimals K-factor	0		
2 - FLOWRATE			
21 unit	L		
22 time unit	/min		
23 decimals	0000000		
24 K-factor	0000001		
25 decimals K-factor	0		
26 calculation / pulses	010		
27 cut-off time	30.0 sec.		

SETTING	DEFAULT	DATE :	DATE :
3 - PRESET	Enter your settings here		
31 set preset	operator		
32 maximum preset	0.0 L		
33 preset	0.0 L		
34 overrun time	0.0 sec.		
35 process time	0.0 sec.		
4 - DISPLAY			
41 set alarm	operator		
42 alarm low	0.0 %		
43 alarm high	0.0 %		
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75 count negative	enable		
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84 max. flowrate 20mA	9999999		
85 cut off percentage	0.0%		
86 tune min - 4mA	0208		
87 tune max - 20mA	6656		
9 - COMMUNICATION			
91 baud-rate	2400		
92 address	1		
93 mode	BUS-RTU		
A - OTHERS			
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A5 tagnumber	0000000		

