FLOMEC™

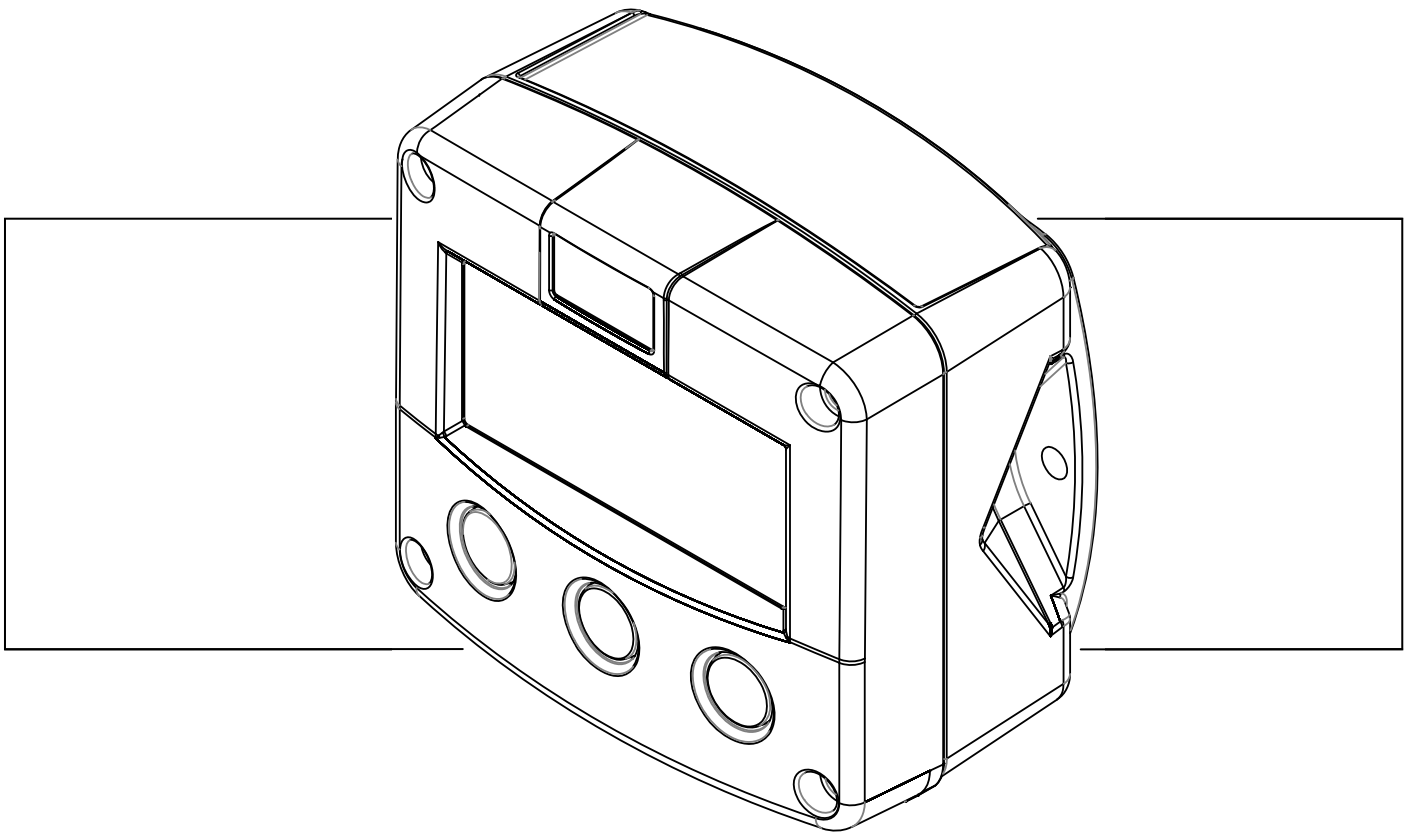# Flowrate Indicator/Totalizer with Linearization and High/Low Alarms

Owner's Manual – Model F118-P

Signal input flowmeter: pulse, Namur and coil

Analog output: (0)4-20mA/ 0-10V ref. flowrate and pulse ref. total

Switch outputs: high / low alarms and / or pulse ref. total

Options: Intrinsically Safe, Modbus communication

C E   〈Ex〉   IEC   IECEx

⚠️ WARNING SAFETY INSTRUCTIONS

- *Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.*

- *LIFE SUPPORT APPLICATIONS: The F118-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 F118-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 F118-P implemented without a preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Installation, use, maintenance and de-mounting 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 F118-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". This instruction is meant for users.
- The following chapters and appendices are exclusively meant for electricians/technicians. These provide an extensive description of all software settings and installing the hardware.

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 F118-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 destruction of the F118-P or connected instruments.

A "**caution**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect function of the F118-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.

CONTENTS MANUAL

1. INTRODUCTION

1.1. SYSTEM DESCRIPTION OF THE F118-P

Functions and features
The flowrate / totalizer model F118-P is a microprocessor driven instrument designed to linearise the flowmeters flowcurve and to display flowrate, total and accumulated total. Moreover, two alarm values can be set to monitor the 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 aluminum or GRP enclosures for harsh industrial surroundings,
▪ ability to process all types of flowmeter signals,
▪ transmitting possibilities with analog / pulse and communication (option) outputs.

Flowmeter input
This manual describes the unit with a <u>pulse type</u> input for 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 sine wave (coil) signal output can be connected to the F118-P. To power the sensor, several options are available.

Standard outputs
▪ Two / three configurable switch outputs: high or low flowrate alarm, all alarms or pulse output.
▪ Configurable pulse output: a scaled pulse mirroring a certain linearized total quantity. Maximum frequency 500Hz.; the pulse length can be set from 1msec up to 10 seconds.
▪ Configurable linear (0)4-20mA or 0-10V analog output with 10-bits resolution mirroring the actual linearised flowrate. Flowrate levels as well as the minimum and maximum signal output can be tuned.
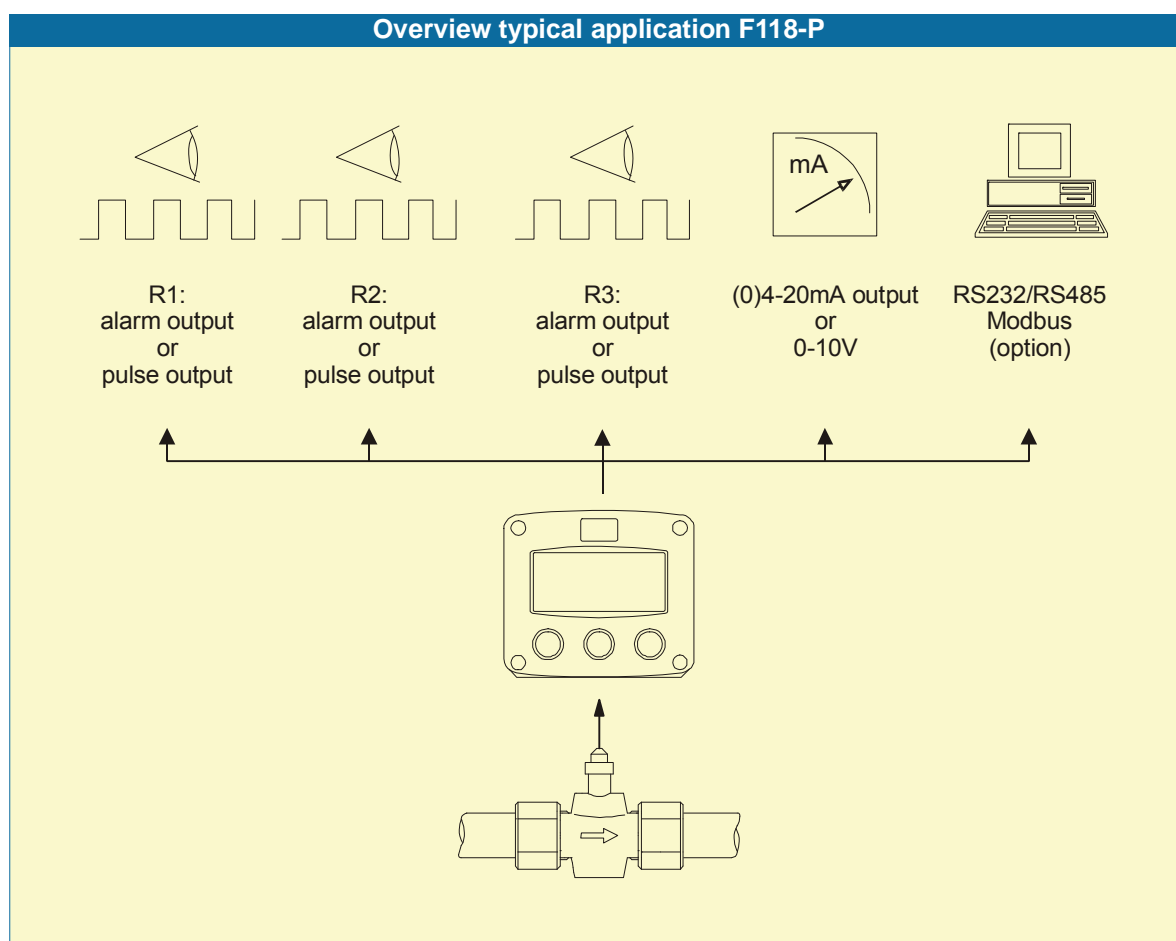
Fig. 1: Typical application for the F118-P
GPI_F118PEN_v0601_01

Configuration of the unit
The F118-P was designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F118-P according to your specific requirements.
SETUP includes several important features, such as K-factors, measurement units, signal selection etc. All setting as are stored in EEPROM memory and will not get lost in case of power break-down or empty 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 transflective LCD with all kinds of symbols and digits to display measuring units, status information, trend-indication and key-word messages.
Flowrate and totals can be displayed either with the small 8mm digits or with the 17mm digits.
A backup of the total and accumulated total in EEPROM memory is made every minute.

Options
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, mechanic 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

Caution !

- *The F118-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 front of this manual.*

This chapter describes the daily use of the F118-P. This instruction is meant for users / operators.

2.2. CONTROL PANEL

The following keys are available:
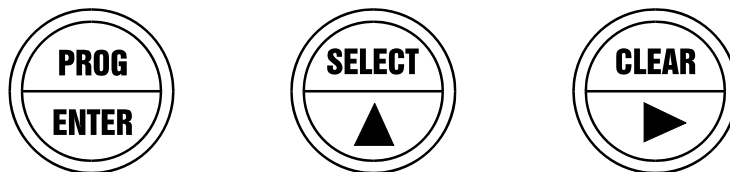
Fig. 2: Control Panel

Functions of the keys

PROG ENTER 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.

SELECT This key is used to SELECT accumulated total and flowrate alarm values.
The arrow-key ▲ is used to increase a value after PROG has been pressed or to configure the unit; please read chapter 3.

CLEAR Press this key twice to CLEAR the value for total.
The arrow-key ▶ is used to select a digit after PROG has been pressed or to configure the unit; please read chapter 3.

2.3.   OPERATOR INFORMATION AND FUNCTIONS

In general, the F118-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 F118-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 / total**
   This is the main display information of the F118-P. After selecting any other information, it will always return to this main display automatically.
   Total is displayed on the upper-line of the display and flowrate on the bottom line.
   When "-------" is shown, then the flowrate value is too high to be displayed. The arrows ♦ indicate the increase/decrease of the flowrate trend.

▪ **Clear total**
   The value for total can be re-initialized. To do so, press CLEAR twice. After pressing CLEAR once, the flashing text "PUSH CLEAR" is displayed. To avoid re-initialization at this stage, press another key than CLEAR or wait for 20 seconds.
   Re-initialization of total DOES NOT influence the accumulated total.

▪ **Display accumulated total**
   When the SELECT-key is pressed, total and accumulated total are displayed. The accumulated total cannot be re-initialized. The value will count up to 99,999,999,999. The unit and number of decimals are displayed according to the configuration settings for total.

▪ **Programming the flowrate alarm values**

Note !

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

When the SELECT-key is pressed a few times, following flowrate alarm values are displayed:
▪ low flowrate alarm: enter here 40 L/min for example,
▪ high flowrate alarm: enter here 200 L/min for example,

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

1) press PROG: the word "PROGRAM" will flash,
2) use ‣ to select the digits and ▲ to increase that value,
3) confirm the new alarm value by pressing ENTER.

Fig. 4: Example of display information during programming minimum flowrate

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.

▪ **Flowrate alarm**
When the actual flowrate is outside the allowed range, an alarm message will be displayed indicating the type of alarm: "LO RATE" or "HI RATE".
The alarm is terminated automatically as soon as the flowrate is within its range again.

▪ **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. 5: Example of low-battery alarm

• **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.

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 F118-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 F118-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 F118-P remains fully operational.

Note !

Note: *A password may be required to enter SETUP. Without this password access to SETUP is denied.*

To enter SETUP-level:
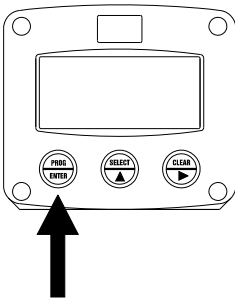
Press (PROG ENTER) for 7 seconds

Matrix structure SETUP-level:
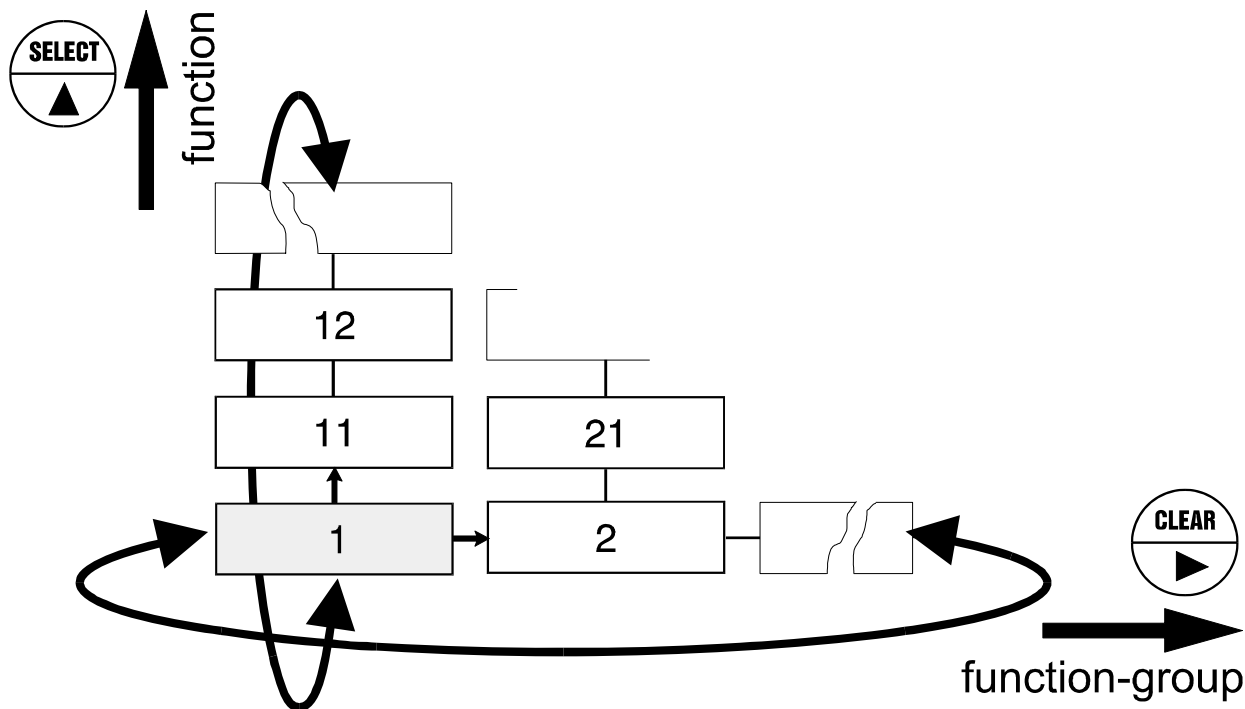
SCROLLING THROUGH SETUP-LEVEL

Selection function-group and function:
SETUP is divided into several function groups and functions.
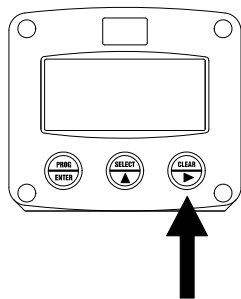
Select function-group with CLEAR ▶
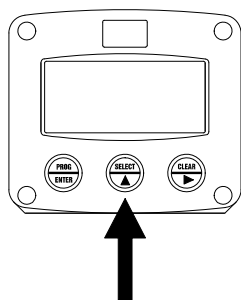
Select function with SELECT ▲

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 function. Additionally, each function is expressed with a keyword.

After selecting a sub-function, the next main function is selected after scrolling through all "active" sub-functions (e.g. 1▲, 11▲, 12▲, 13▲, 14▲, 1▶, 2▶, 3▲, 31 etc.).

To change or a select a value or value:
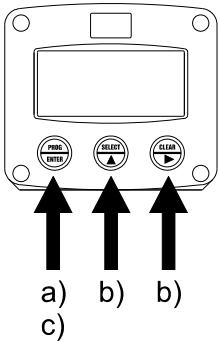
a) press (PROG ENTER) briefly; **PROGRAM** will start flash

b) select or enter value with (SELECT ▲) and / or (CLEAR ▶)

c) press (PROG ENTER) to confirm the value / selection.

a) b) b)
c)

To change a value, use ▶ to select the digits and ▲ to increase that value.
To select a setting, both ▲ and ▶ can be used.
When the new value is not valid, 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:
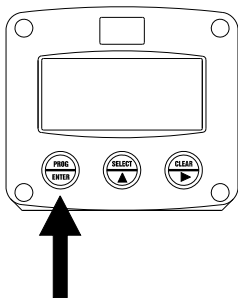
Press (PROG ENTER) for 3 seconds

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.

### 3.3. 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-FACT:	0.000010 - 9,999,999
	14	DECS K-FACT	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	/sec - /min - /hour - /day
	23	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	24	K-FACT	0.000010 - 9,999,999
	25	DECS K-FACT	0 - 6
	26	CALCULAT	per 1 - 255 pulses
	27	CUT-OFF	0.1 - 999.9 seconds
3	**ALARM**		
	31	FLOWZERO	default - no relays - ignore
	32	ALARM LO	0000.000 - 9,999,999
	33	ALARM HI	0000.000 - 9,999,999
	34	DELAY LO	0.1 - 999.9 seconds
	35	DELAY HI	0.1 - 999.9 seconds
4	**DISPLAY**		
	41	FUNCTION	total - flowrate
	42	ALARM SET	operator - setup level - hidden
	43	LIGHT	0% (OFF) - 20% - 40% - 60% - 80% - 100% (FULL BRIGHTNESS)
5	**POWER MAN**		
	51	LCD NEW	fast - 1 sec - 3 sec - 15 sec - 30 sec - off
	52	BATT MODE	operational - shelf
6	**FLOWMETER**		
	61	SIGNAL	npn - npn_lp - reed - reed_lp - pnp - pnp_lp - namur - coil_hi - coil_lo - act_8.1 - act_12 - act_24
7	**LINEARIZE**		
	71	FR (FREQ. / M-FACTOR 1)	0.1 – 9,999.9 Hz / 0.000001 – 9.999999
	72	FR (FREQ. / M-FACTOR 2)	0.1 – 9,999.9 Hz / 0.000001 – 9.999999
	..	..	……..
	7A	FR (FREQ. / M-FACTOR 10)	0.1 – 9,999.9 Hz / 0.000001 – 9.999999
	7B	LINEAR	enable / disable
	7C	DECIMALS	00000 - 1111.1 - 222.22 - 33.333
8	**ANALOG**		
	81	OUTPUT	disable - enable
	82	RATE MIN - (0)4mA / 0V	0000.000 - 9,999,999
	83	RATE MAX - 20mA / 10V	0000.000 - 9,999,999
	84	CUT-OFF	0.0 - 9.9%
	85	TUNE MIN - 4mA / 0V	0 - 9,999
	86	TUNE MAX- 20mA / 10V	0 - 9,999
	87	FILTER	00 - 99
9	**RELAYS**		
	91	RELAY 1	off - high - low - all - pulse
	92	RELAY 2	off - high - low - all - pulse
	93	RELAY 3	off - high - low - all - pulse
	94	WIDTH	0 - 250
	95	DECIMALS	0 – 1 – 2 – 3
	95	AMOUNT	X,XXX,XXX quantity
A	**COMMUNICATION**		
	A1	SPEED (BAUDRATE)	1200 - 2400 - 4800 - 9600
	A2	ADDRESS	1 - 255
	A3	MODE	rtu –asc - off
B	**OTHERS**		
	B1	MODEL	
	B2	S-VERSION	
	B3	SERIAL Nr.	
	B4	PASSWORD	0000 - 9999
	B5	TAGNR	0000000 - 9999999

3.4. EXPLANATION SETUP-FUNCTIONS

1 - TOTAL	
UNIT **11**	SETUP - 11 determines the measurement unit for total, accumulated total and pulse output. The following units can be selected: L - m3 - kg - lb. - GAL - USGAL - bbl - _ (no unit). 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.
DECIMALS **12**	The decimal point determines for total, accumulated total and pulse output the number of digits following the decimal point. The following can be selected: 0000000 - 111111.1 - 22222.22 - 3333.333
K-FACT **13**	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. Do enter here the average flowmeters K-Factor. The linearisation functions is described with SETUP - 6. **Example 1: Calculating the K-factor.** *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".* **Example 2: Calculating the K-factor.** *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".*
DECS K-FACT **14**	This setting determines the number of decimals for the K-factor (SETUP 13). The following can be selected: 0 - 1 - 2 - 3 - 4 - 5 - 6 Please note that this function influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for total (SETUP 12)!

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.*	
UNIT **21**	SETUP - 21 determines the measurement unit for flowrate. The following units can be selected: mL - L - m3 - mg - gr - kg - ton - GAL - bbl - lb - cf - rev (revolutions for RPM) - _ (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 **22**	The flowrate can be calculated per second (/SEC), minute (/MIN), hour (/HR) or day (/DAY).
DECIMALS **23**	This setting determines for flowrate the number of digits following the decimal point. The following can be selected: 00000 - 1111.1 - 2222.22 - 3333.333
K-FACT **24**	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. Do enter here the average flowmeters K-Factor. The linearisation functions is described with SETUP - 6.
DECS K-FACT **25**	This setting determines the number of decimals for the K-factor (SETUP 24). The following can be selected: 0 - 1 - 2 - 3 - 4 - 5 - 6 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)!
CALCULAT **26**	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: 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.* *Note: the lower the number of pulses, the higher the power consumption of the unit will be (important for battery powered applications).* *Note: for low frequency applications (below 10Hz): do not program more than 10 pulses else the update time will be very slow.* *Note: for high frequency application (above 1kHz) do program a value of 50 or more pulses.*
CUT-OFF **27**	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 seconds (about 15 minutes).

Note !

Note !

3 - ALARM	
With these settings, it is determined how the flowrate will be monitored and the functionality of the transistor / relay outputs (terminals 03-04, 05-06 and 15-16) be determined. *Note: for transistor / relay output functions: read SETUP 8 "relays".*	
FLOW ZERO **31**	When the <u>flowrate is zero</u>, then it is possible to ignore or disable the flowrate monitoring. The following settings can be selected: DEFAULT: in case of a low-flowrate alarm and zero flow, it will switch the alarm output and indicate the alarm on the display. NO RELAY: in case of a low-flowrate alarm and zero flow, it won't switch the alarm output but will indicate the alarm on the display only. IGNORE: in case of a low-flowrate alarm and zero flow, it won't switch the alarm output and nothing will be indicated on the display.
ALARM LO **32**	The low alarm is set with this setting. An alarm will be generated as long as the flowrate lower as this. With value 0.0 this function is disabled.
ALARM HI **33**	The high alarm is set with this setting. An alarm will be generated as long as the flowrate higher as this. With value 0.0 this function is disabled.
DELAY LO **34**	An alarm generated by SETUP 33 "low" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.
DELAY HI **35**	An alarm generated by SETUP 34 "high" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.

4 - DISPLAY	
FUNCTION **41**	The large 17mm digits can be set to display total or flowrate. When "total" is selected, both total and flowrate are displayed simultaneously. When "flowrate" is selected, only flowrate will be displayed with it's measuring unit while total will be displayed after pressing SELECT.
SET ALARM **42**	This function determines if the flowrate 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 cannot be changed.
LIGHT (BACKLIGHT BRIGHTNESS) **43**	The density of the backlight can be set in following range: 0% (OFF) – 20% - 40% - 60% - 80% - 100% (FULL BRIGHTNESS)

5 - POWER MAN

When used with the internal battery option, the user may hold the concern of reliable measurement over a long period of time. The F118-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 be FAST during 30 seconds. When "OFF" is selected, the display will be switched-off after 30 seconds and will be switched-on for 30 seconds as soon as a button has been pressed.*
BATT-MODE **52**	The unit has two battery modes: operational or shelf. After "shelf" has been selected, the unit can be stored for several years; it will not process the signals, 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 - FLOWMETER

SIGNAL **61**	The F118-P is able to handle several types of signals. The type of flowmeter pickup / signal is selected with SETUP 61. *Note: The selections "active pulse" offer a detection level of 50% of the supply voltage.* Read also par. 4.4.3. Flowmeter input terminal 09-11.

Note !

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

7 - LINEARIZE

The linearization function is available to approach the real flowcurve for mechanical flowmeters. This to obtain a more accurate flowrate, total and accumulated total as well as the analog and pulse output at any flowmeter frequency.
A maximum of 10 linearization-positions can be entered while the interpolation will calculate any other position in-between.
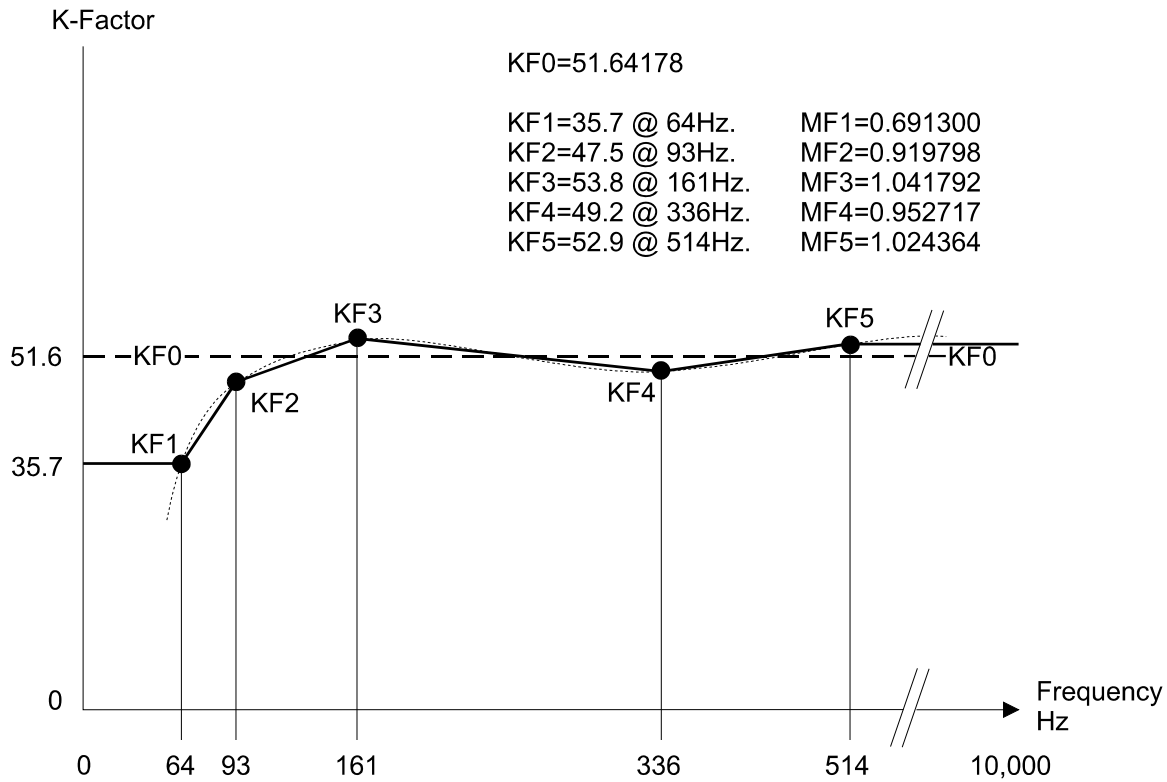
For each linearization position, the frequency and a Meter Factor (MF) must be entered.
The Meter Factor for each frequency is calculated with following formula:

$$\text{Meter-Factor} = \frac{\text{K-Factor at flowrate X}}{\text{KF0}}$$

KF0 is the average K-factor as entered with setup 13 and 24.

The lowest frequency and MF you enter will be valid from 0Hz. The highest frequency and MF will be valid till 10KHz. It is advised to enter the frequencies in increasing order, however it is not necessary. Please have a look at following example to understand the method of linearization:

K-Factor

KF0=51.64178

KF1=35.7 @ 64Hz.	MF1=0.691300
KF2=47.5 @ 93Hz.	MF2=0.919798
KF3=53.8 @ 161Hz.	MF3=1.041792
KF4=49.2 @ 336Hz.	MF4=0.952717
KF5=52.9 @ 514Hz.	MF5=1.024364

FR (FREQUENCY / M-FACTOR) 71 TO 7A	The frequency is displayed at the bottom line of the display. The maximum frequency is 9,999.9 Hz. With value 0.0Hz, the M-Factor is disabled. (Please read SETUP 7C - decimals frequency) The M-Factor is displayed at the top-line of the display. The minimum value to be entered is 0.000001 and the maximum value is 9.999999. *Please note that this value has always six decimals while the "dot" is not displayed.* Most M-factors will be around 1.000000 like 0.945354 or 1.132573.
LINEAR 7B	With this setup function, you can easily enable / disable the linearization function.
DECIMALS 7C	For the frequency, following decimal positions can be selected: 00000 - 1111.1 - 222.22 - 33.333

Note !

8 - ANALOG

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

OUTPUT 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.
RATE MIN 82	Enter here the flowrate at which the output should generate the minimum signal (0/4mA or 0V) - in most applications at flowrate "zero". The number of decimals displayed is according to SETUP 23. The time and measuring units (L/min for example) are according to SETUP 21 and 22 but are not displayed.
RATE MAX 83	Enter here the flowrate at which the output should generate the maximum signal (20mA or 10V) - in most applications at maximum flow. The number of decimals displayed is according to SETUP 23. The time and measuring units (L/min for example) are according to SETUP 21 and 22 but can not be displayed.
CUT-OFF 84	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 or 10V). When the flow is less than the required rate, the current will be the minimum signal (0/4mA or 10V). **Examples:**

4MA (SETUP 82)	20MA (SETUP 83)	CUT-OFF (SETUP 84)	REQUIRED RATE	OUTPUT
0 L/min	100 L/min	2%	(100-0)*2% = 2.0 L/min	4+(16*2%) = 4.32mA
20 L/min	800 L/min	3.5%	(800-20)*3.5%= 27.3 L/min	4+(16*3.5%)=4.56mA

TUNE MIN (4MA) 85	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 <u>directly active</u>. 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 for example!
TUNE MAX (20MA) 86	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 <u>directly active</u>. 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 for example!
Continued next page >>>	

8 - ANALOG (CONTINUED)

FILTER 87	This function is used to stabilize the analog output signal. The output value is updated every 0.1 second. With the help of this digital filter a more stable but less precise reading can be obtained. The filter principal is based on three input values: the filter level (01-99), the last analog output value and the last average value. The higher the filter level, the longer the response time on a value change will be. Below, several filter levels with their response times are indicated:

FILTER VALUE	RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE. TIME IN SECONDS			
	50% INFLUENCE	75% INFLUENCE	90% INFLUENCE	99% INFLUENCE
01	filter disabled	filter disabled	filter disabled	filter disabled
02	0.1 second	0.3 second	0.5 second	0.9 second
03	0.3 second	0.5 second	0.8 second	1.5 seconds
05	0.5 second	0.9 second	1.4 seconds	2.6 seconds
10	0.9 second	1.8 seconds	2.8 seconds	5.5 seconds
20	1.8 seconds	3.5 seconds	5.6 seconds	11 seconds
30	2.6 seconds	5.1 seconds	8.5 seconds	17 seconds
50	4.4 seconds	8.6 seconds	14 seconds	29 seconds
75	6.5 seconds	13 seconds	22 seconds	43 seconds
99	8.6 seconds	17 seconds	28 seconds	57 seconds

9 - RELAYS

With the exception of the Intrinsically Safe version (type XI), three transistor outputs are available or one transistor output plus two electro-mechanical relay outputs.
Note: the alarm settings - SETUP 3 - need to correspond with the selections below.

RELAY 1 91	Assign the output function to R1 - terminal 05-06: high alarm, low alarm, flowrate alarm or pulse output (max 5Hz) *Note: Intrinsically safe applications: this setting has no influence on any output; please read 93: R3.*
RELAY 2 92	Assign the output function to R2 - terminal 03-04: high alarm, low alarm, flowrate alarm or pulse output (max 60Hz)
RELAY 3 93	Assign the output function to R3 - terminal 15-16 - which is always a transistor output: high alarm, low alarm, flowrate alarm or pulse output (max 60Hz) *Note: Intrinsically safe applications: This output is assigned to output R1 and not R3.*
WIDTH	The pulse width determines the time that the output will be switched on; in other words the pulse length. The time between two pulses (when the output is switched off) is at least as long as the pulse width time (50/50 duty cycle). The pulse width is set in milliseconds in the range 0.001 - 9.999 sec. Value "zero" disables the pulse output. *Note: If the frequency should go out of range - when the flowrate increases for example - an internal buffer will be used to "store the missed pulses": As soon as the flowrate slows down, the buffer will be "emptied". It might be that pulses will be missed due to a buffer-overflow, so it is advised to program this setting within its range!*
DECIMALS 95	This setting determines the decimal position for setting 96. *Note: the measuring unit is according to setting 11 (for total)*
AMOUNT 96	According to the measurement unit settings for preset, a scaled pulse will be generated every X-quantity. Enter this quantity here while taking the displayed decimal position and measuring unit into account.

Note !
Note !
Note !
Note !

A - COMMUNIC (OPTIONAL)	
Functions as described below deal with hardware that are 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 **A1**	For external control, following communication speeds can be selected: 1200 - 2400 - 4800 - 9600 baud
BUS ADDRESS **A2**	For communication purposes, a unique identity can be attributed to every F118-P. This address can vary from 1-255.
MODE **A3**	The communication can only be executed according Modbus protocol RTU mode (ASCII is not available for this model). With OFF, the communication is disabled.

| B - OTHERS	
MODEL **B1**	For support and maintenance it is important to have information about the characteristics of the F118-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.
S-VERSION **B2**	For support and maintenance it is important to have information about the characteristics of the F118-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 NR **B3**	For support and maintenance it is important to have information about the characteristics of the F118-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.
PASSWORD **B4**	All SETUP-values can be password protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
TAGNR **B5**	For identification of the unit and communication purposes, a unique tagnumber 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 F118-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
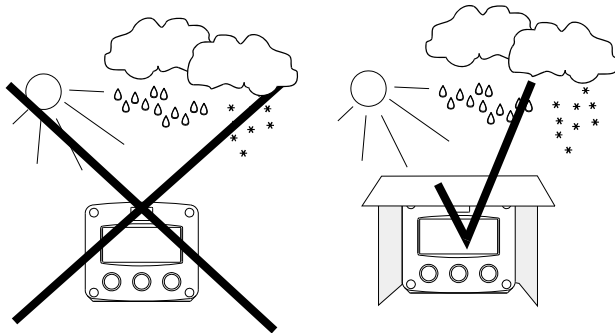
Take the relevant IP classification of the casing into account (see manufactures plate). Even an IP67 (NEMA 4X) casing should NEVER be exposed to strongly varying (weather) conditions.
When panel-mounted, the unit is IP65 (NEMA 4X)!
When used in very cold surroundings or varying climatic conditions, take the necessary precautions against moisture by placing a dry sachet of silica gel, for example, inside the instrument case.
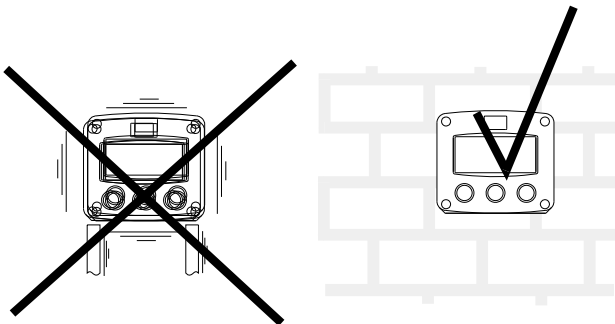
Mount the F118-P on a solid structure to avoid vibrations.

4.3.   DIMENSIONS- ENCLOSURE
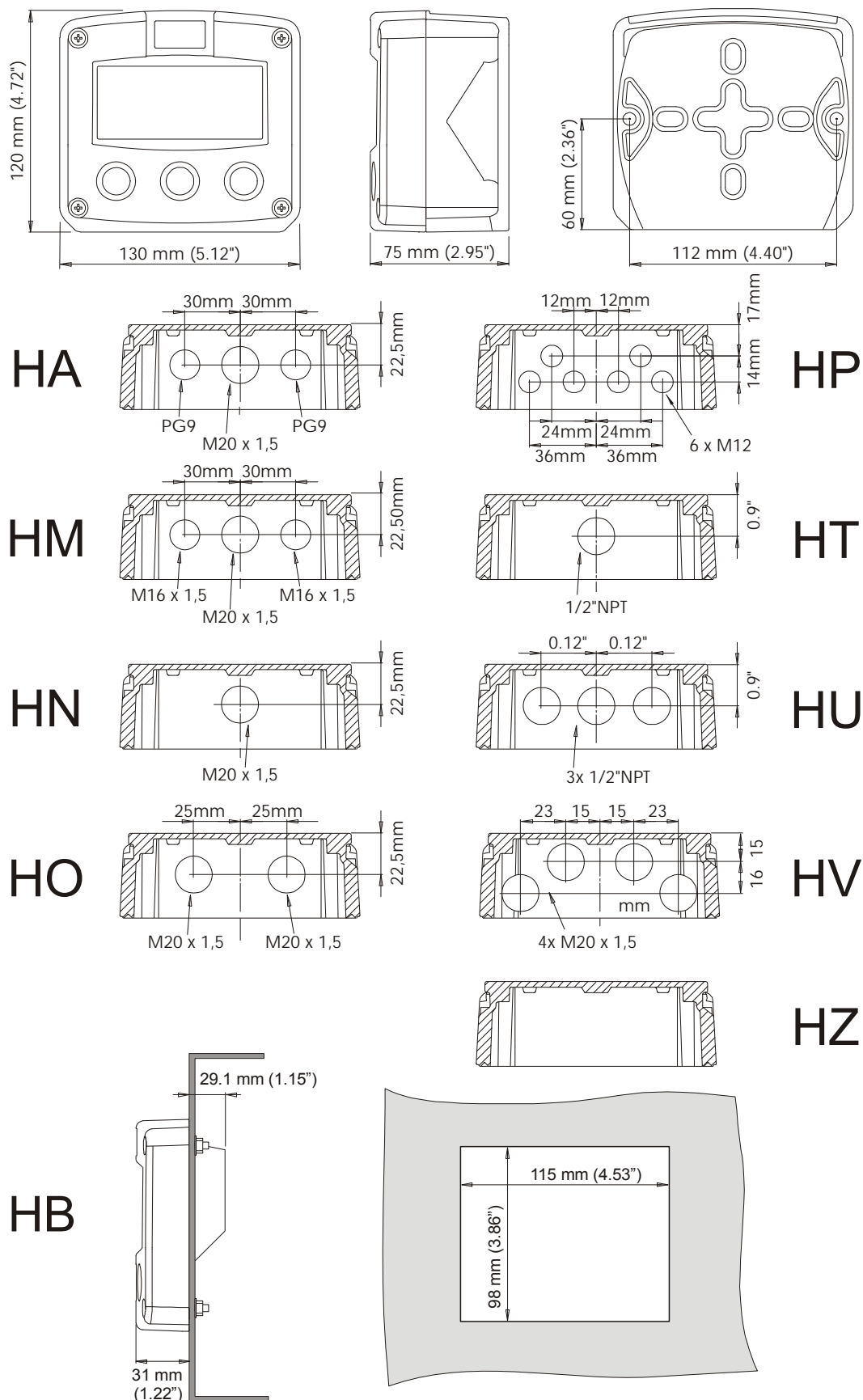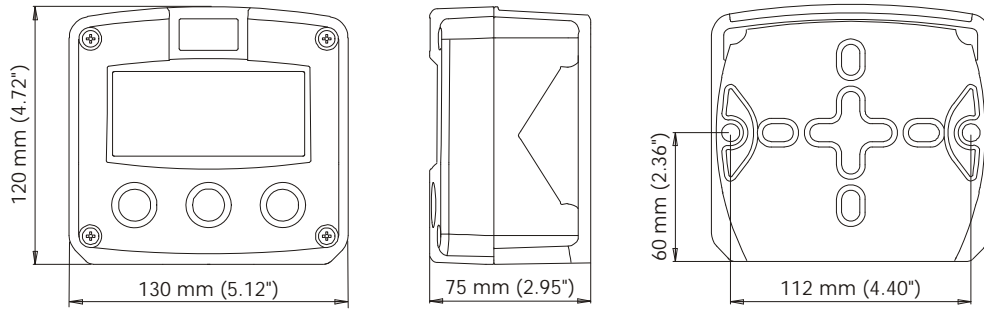
Aluminum enclosures:

Fig. 6: Dimensions aluminum enclosures

GPI_F118PEN_v0601_01

GRP enclosures:

HK back box:
(flat bottom)

HD
HK

HG

HE

HH

HF

HJ

HC
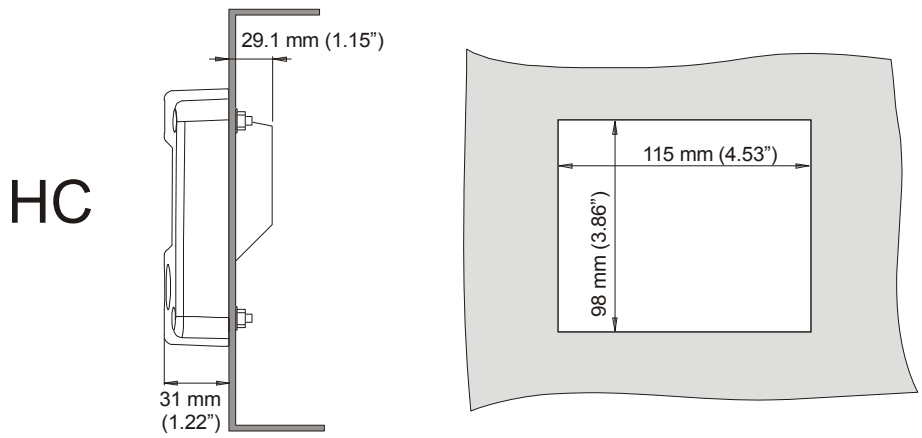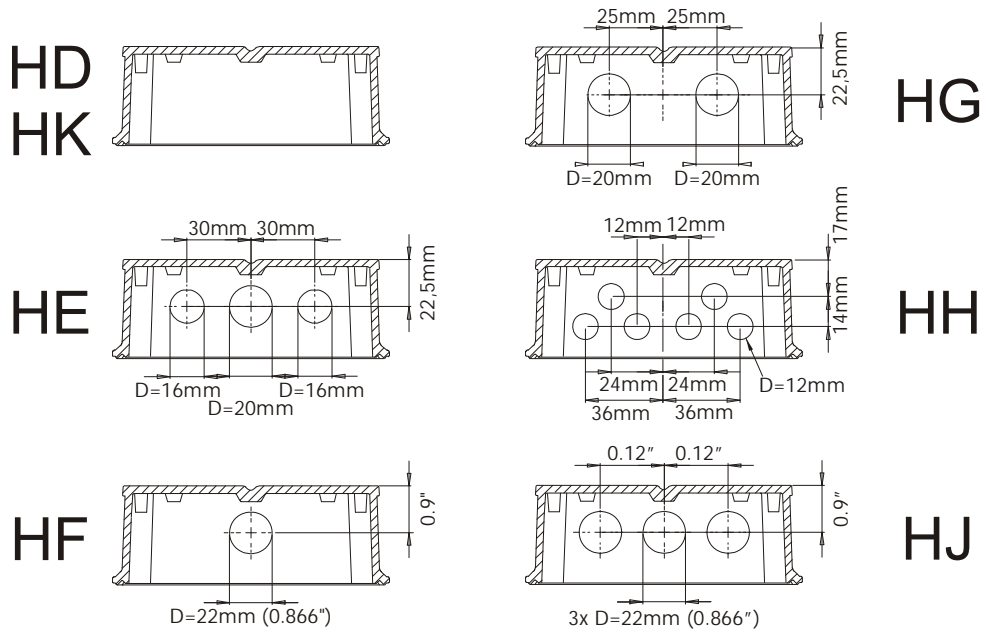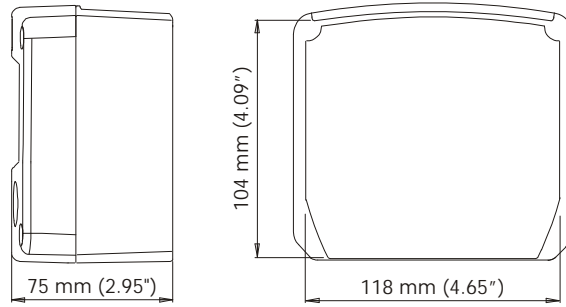
Fig. 7: Dimensions GRP enclosures

GPI_F118PEN_v0601_01

4.4.   INSTALLING THE HARDWARE

4.4.1.   INTRODUCTION

WARNING

- 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).

WARNING

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 F118-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.
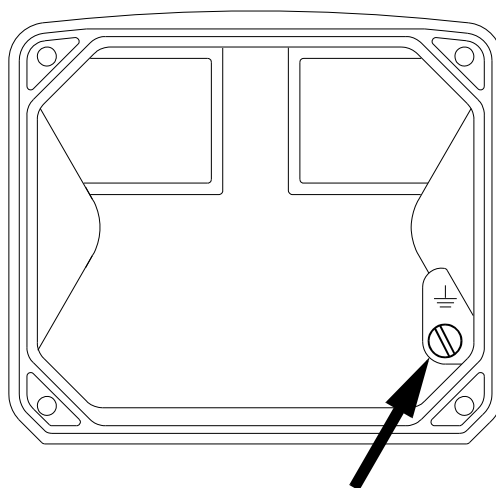
Fig. 8: Grounding aluminum enclosure with type PM 115-230V AC

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 <u>Intrinsically Safe</u> 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).

Note !

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 a real sensor supply 8.2 / 12 or 24 V DC or with a limited sensor supply of 1.2 or 3.2V 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

- *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:
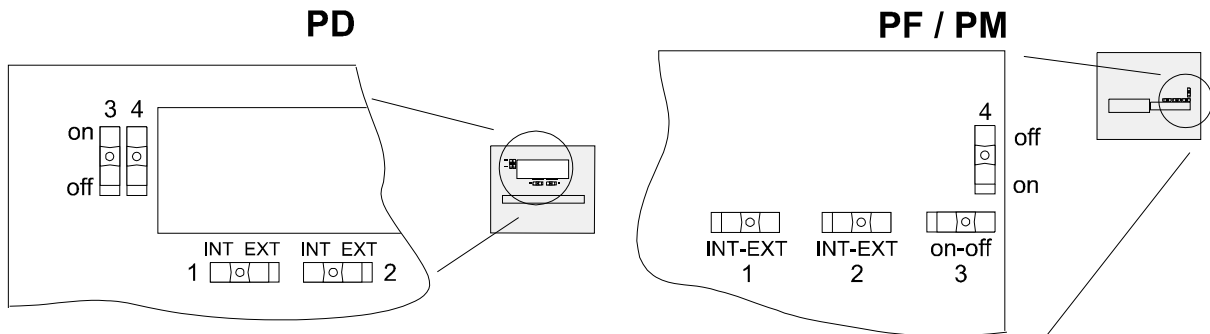
Fig. 9: Switch setting sensor supply voltage

Switch positions

SENSOR A	
SWITCH 1	VOLTAGE
internal	3.2 V DC
external	switch 3+4

SENSOR B	
SWITCH 2	VOLTAGE

VOLTAGE SELECTION		
SWITCH 3	SWITCH 4	VOLTAGE
on	on	8.2 V DC
on	off	12 V DC
off	off	23 V DC

Function switch 1:   voltage selection sensor A - terminal 11.
Function switch 2:   not available for this Model.
Function switch 3+4: the combination of these switches determine the voltage as indicated.
                  Do move switch 1 to the "external" position (off) to enable the selected voltage with switch 3+4.

4.4.3. TERMINAL CONNECTORS

For <u>Intrinsically Safe</u> applications: read chapter 5.

The following terminal connectors are available:

Fig. 10: Overview of terminal connectors standard configuration F118-P and options

REMARKS: TERMINAL CONNECTORS:

For <u>Intrinsically Safe</u> applications: read chapter 5.
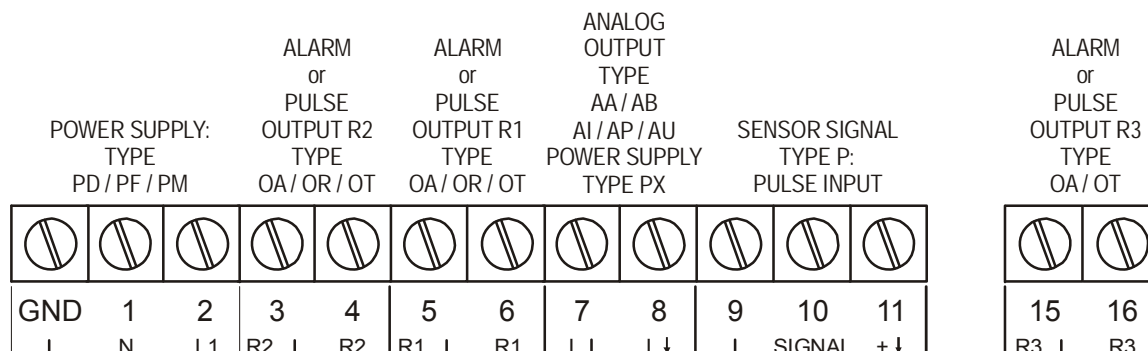
Terminal GND- 01- 02: Power Supply - <u>only available with type PD / PF or PM</u>:

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

Terminal 03-04; transistor or relay output R2:
This output is always a fast output. With SETUP 8, the function of this output is set to a flowrate alarm output or pulse output.
If pulse output function is selected: the maximum pulse frequency of this output is 60Hz. If a relay output option has been supplied, be sure that the output frequency does not exceed 5Hz else the life-time of the relay will be reduced significantly.
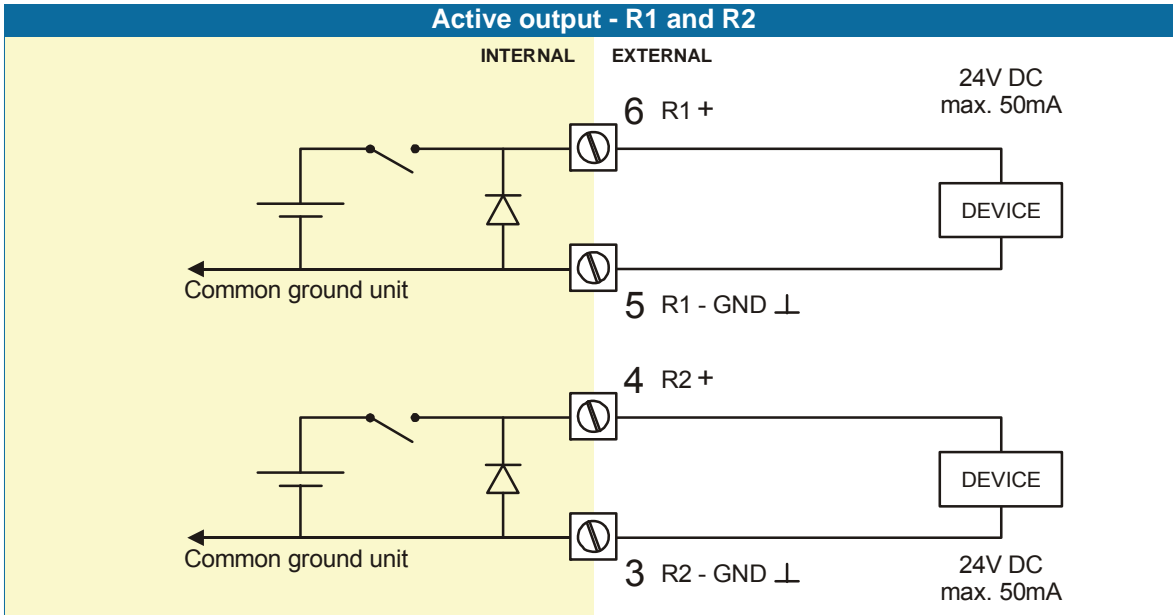
Terminal 05-06; transistor or relay output R1:
This output is always a slow output. With SETUP 8, the function of this output is set to a flowrate alarm output or pulse output.
If pulse output function is selected: the maximum pulse frequency of this output is 5Hz.

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

Active output - R1 and R2

INTERNAL   EXTERNAL

6 R1 +   24V DC
                                 max. 50mA

                                 DEVICE

Common ground unit

5 R1 - GND ⊥

4 R2 +

                                 DEVICE

Common ground unit

3 R2 - GND ⊥   24V DC
                       max. 50mA

Type OR:
A mechanical relay output is available with this option.
Max. switch power 240V-0,5A per output. (Requires power supply type PF / PM).
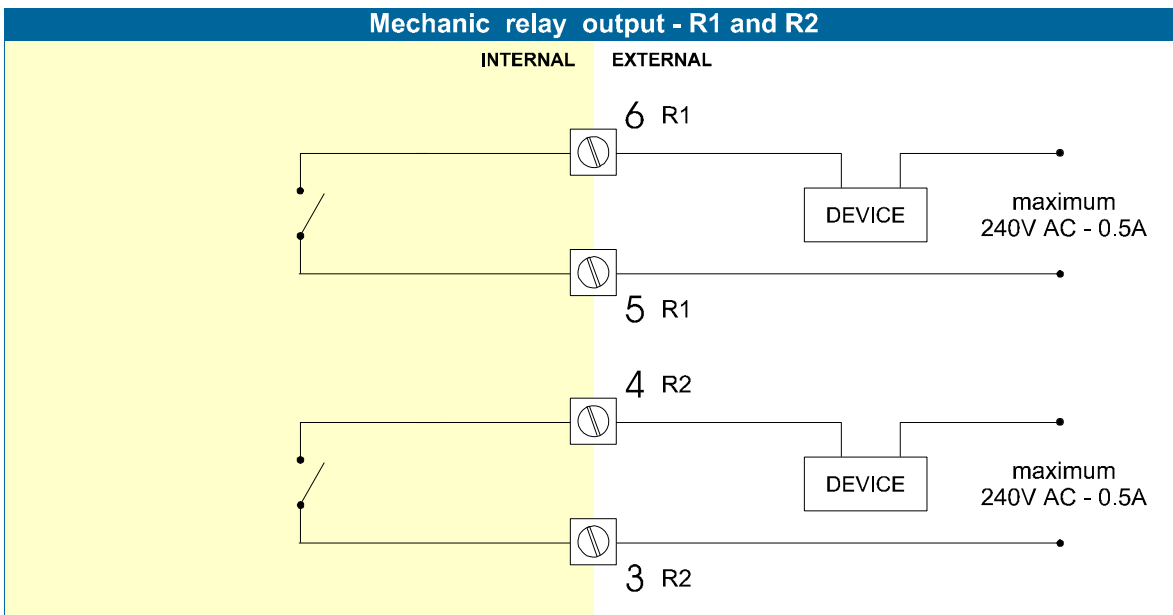
Mechanic relay output - R1 and R2

INTERNAL   EXTERNAL

6 R1

                    DEVICE   maximum
                                    240V AC - 0.5A

5 R1

4 R2

                    DEVICE   maximum
                                    240V AC - 0.5A

3 R2

Type OT:
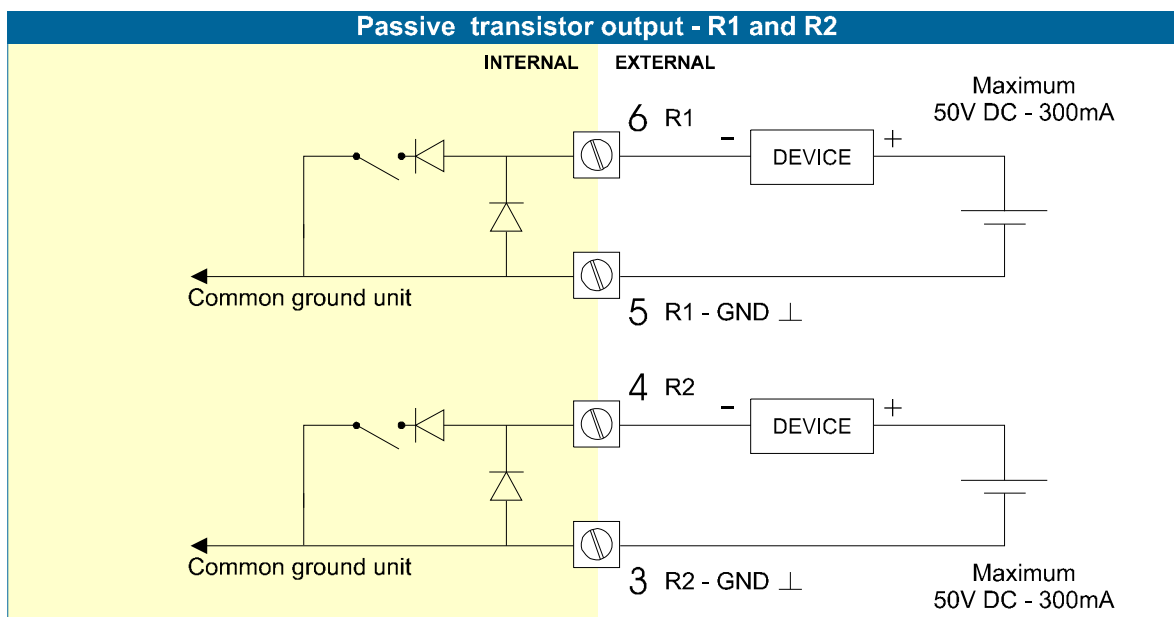A <u>passive</u> transistor output is available with this option. Max. driving capacity 300mA@50V DC.

Passive transistor output - R1 and R2

Terminal 07-08; basic <u>POWER SUPPLY</u> - type PX - output loop powered:
Connect an external power supply of 8-30V DC 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 7) :
An analog output signal proportional to the flowrate is available as standard.

Type AA:
An <u>active 4-20mA signal</u> proportional to the flowrate 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).

Active 4-20mA analog output
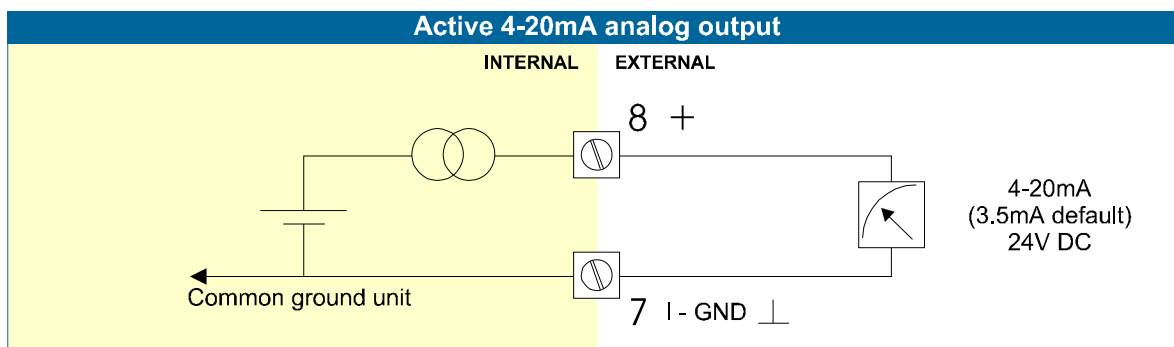
Type AB:
An active 0-20mA signal proportional to the flowrate is available with this option.
Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD / PF / PM).

Active 0-20mA analog output

INTERNAL   EXTERNAL

8 +

0-20mA
24V DC

Common ground unit

7   I - GND ⊥

Type AF:
For the Intrinsically Safe floating 4-20mA signal: please read Chapter 5.
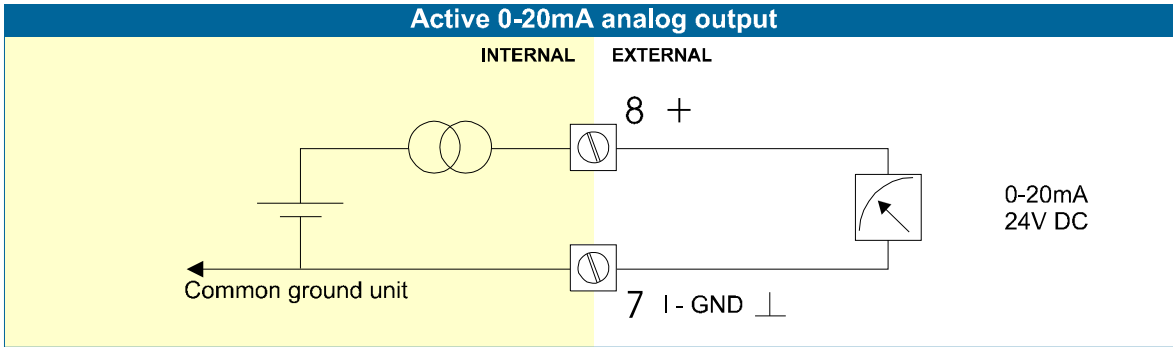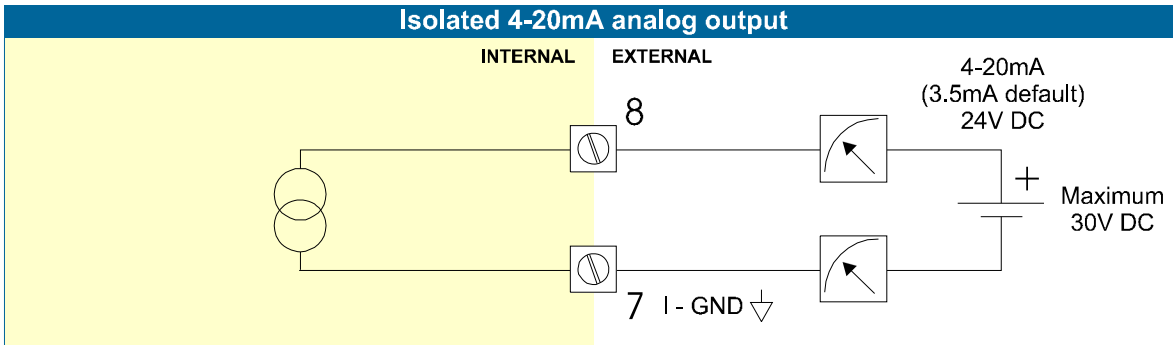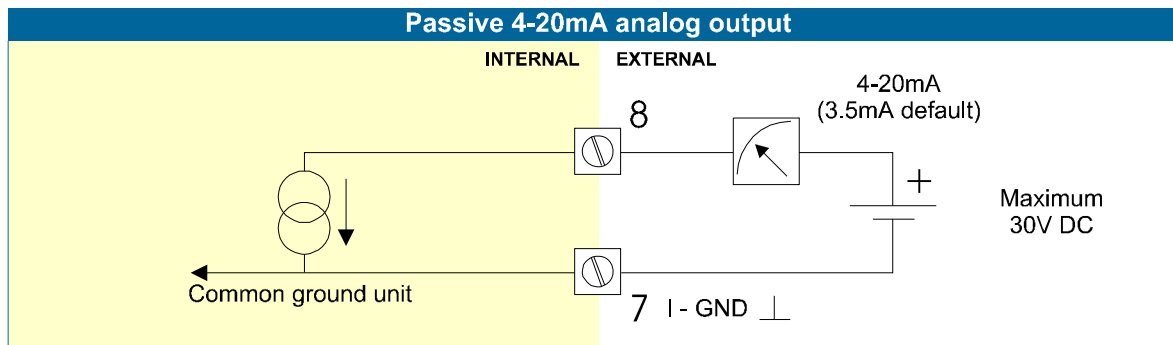
Type AI:
An isolated 4-20mA signal proportional to the flowrate is available with this option.
When the output is disabled, a 3.5mA signal will be generated on these terminals.
Max. driving capacity 1000 Ohm @ 30VDC.
This option can be used with a battery powered unit but the life time of the battery is about 2 -3 years.

Isolated 4-20mA analog output

INTERNAL   EXTERNAL

4-20mA
(3.5mA default)
24V DC

8

+
Maximum
30V DC

7   I - GND ▽

Type AP:
A passive 4-20mA signal proportional to the flowrate is available with this option. When a power supply is connected but the output is disabled, a 3.5mA signal will be generated.
Max. driving capacity 1000 Ohm. This output does loop power the unit as well (type PX).

Passive 4-20mA analog output

INTERNAL   EXTERNAL

4-20mA
(3.5mA default)

8

+
Maximum
30V DC

Common ground unit

7   I - GND ⊥

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

Active 0-10V analog output
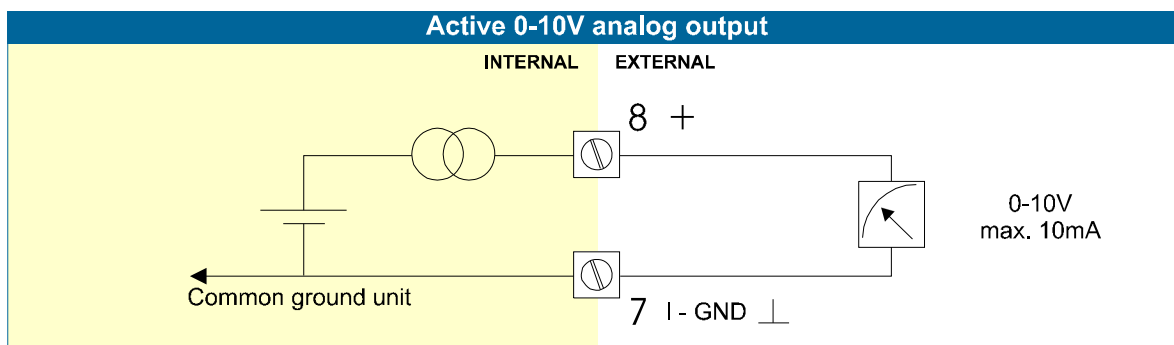
Terminal 09-11; Flowmeter input:
Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or sine-wave (coil). The screen of the signal wire must be connected to the common ground terminal 09 (unless earthed at the sensor itself).
The maximum input frequency is approximately 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):
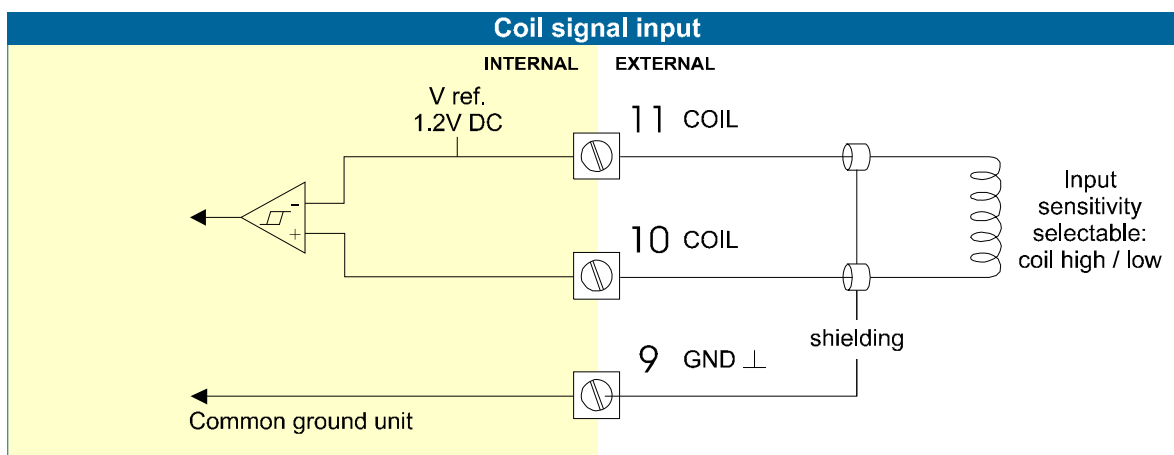The F118-P is suitable for use with flowmeters which have a coil output signal. Two sensitivity levels can be selected with the SETUP-function:
      COIL LO: sensitivity from about 120mVp-p.
   COIL HI: sensitivity from about 20mVp-p.
Type ZF offers for setting COIL HI : sensitivity from about 10mVp-p.
Type ZG offers for setting COIL HI : sensitivity from about 5mVp-p.

Coil signal input

Pulse-signal NPN / NPN-LP:
The F118-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.
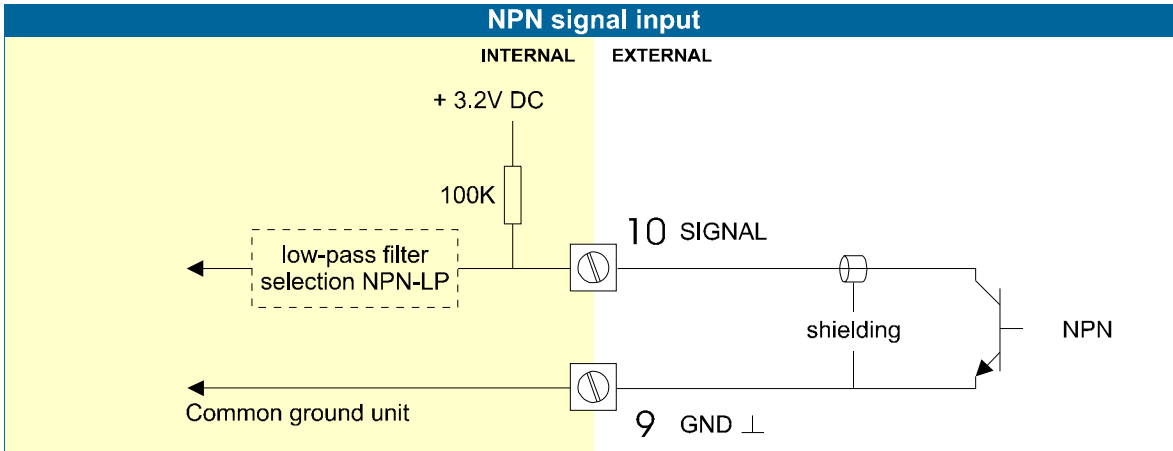
Pulse-signal PNP / PNP-LP:
The F118-P is suitable for use with flowmeters which have a PNP output signal. 3.2V is offered on terminal 11 which has to be switched by the sensor to terminal 10 (SIGNAL). For a reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs 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".
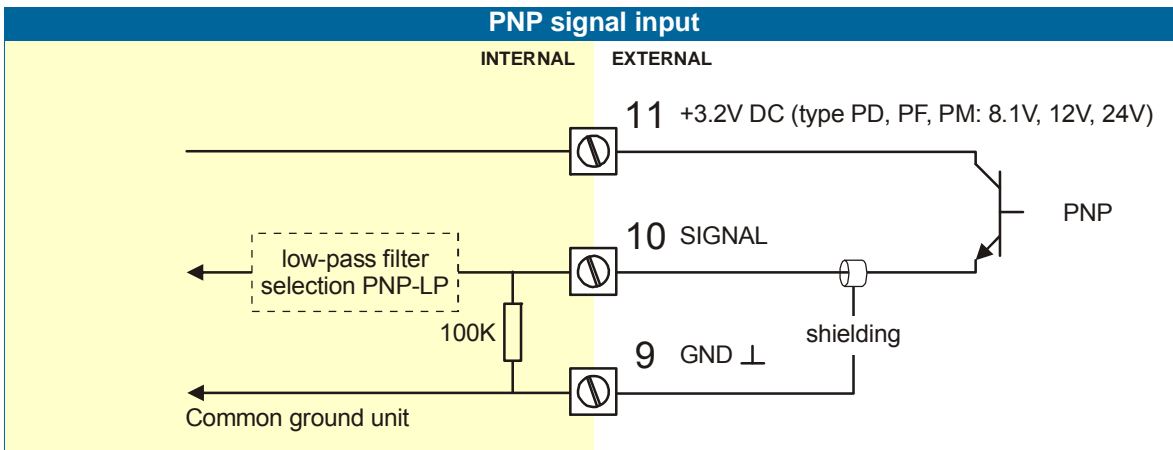
Active signals 8.1V - 12V and 24V:

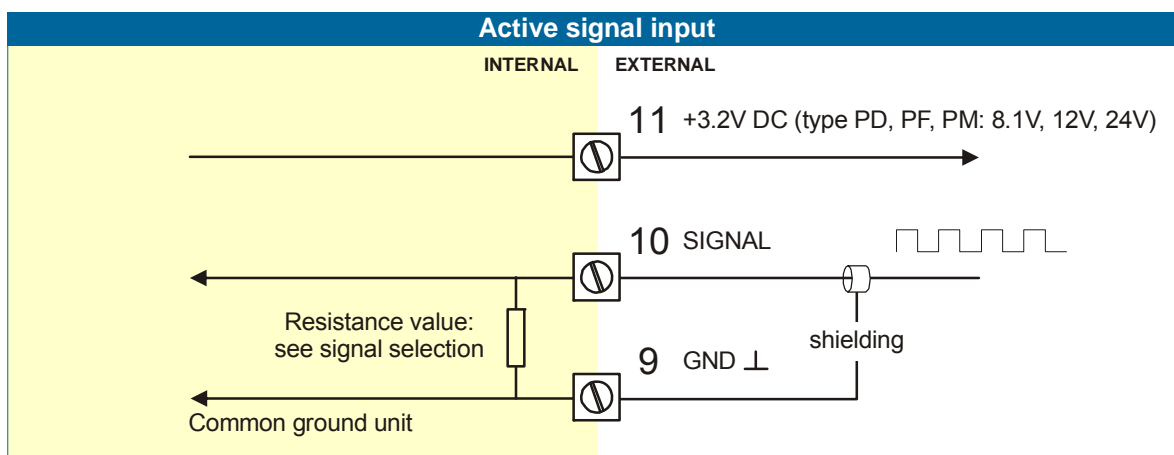If a sensor gives an active signal, please read par. 3.2.3. The detection levels are 50% of the selected supply voltage; approximately 4V (ACT_8.1) or 6V (ACT_12) or 12V (ACT_24).
Active signal selection may well be desired in the case of power supply type PD, PF, PM being supplied for sensor supply.

Reed-switch:

The F118-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.)
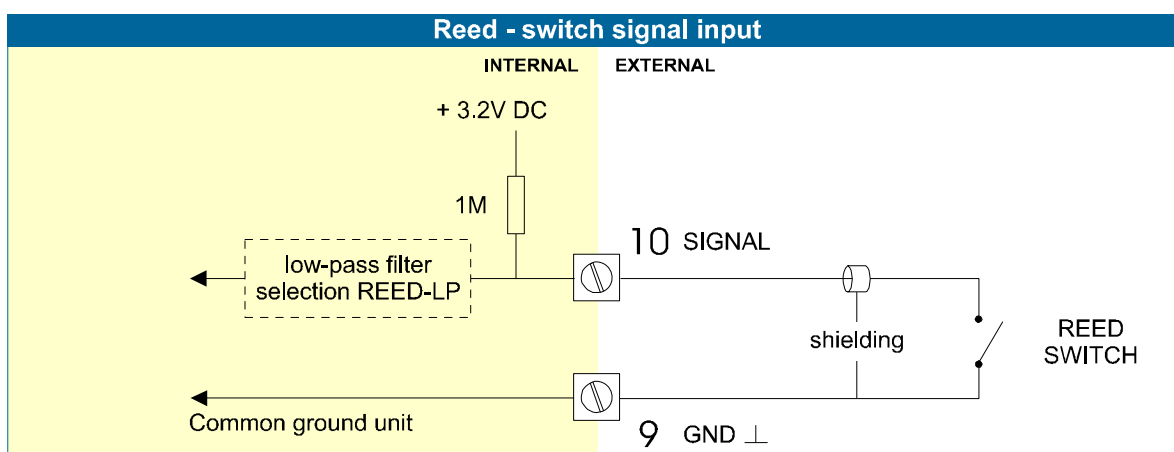
NAMUR-signal:

The F118-P is suitable for flowmeters with an Namur signal. The standard F118-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.
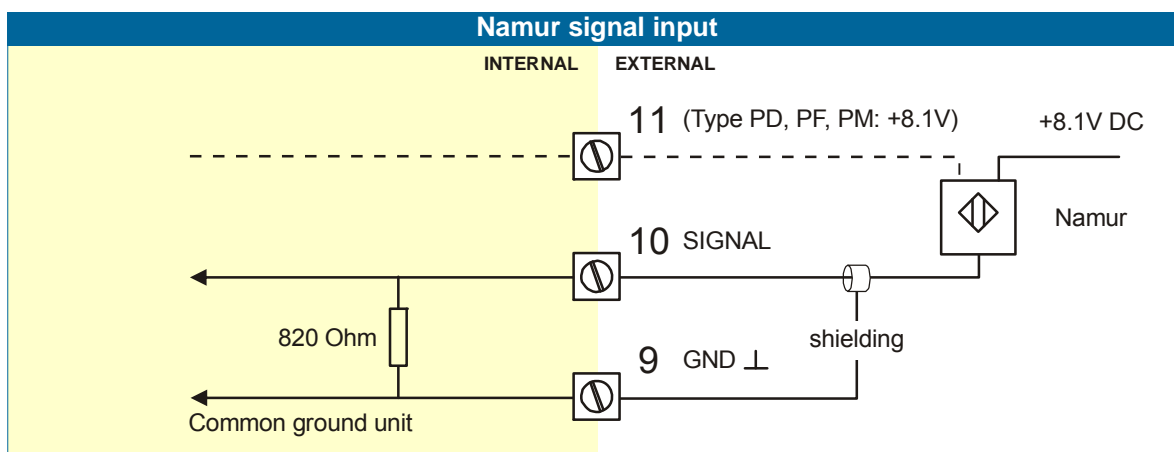
Terminal 15-16; alarm output R3:
This output is always a fast transistor output. With SETUP 8, the function of this output is set to a flowrate alarm output or pulse output.
If used as a pulse output: the maximum frequency of this output is 60Hz.

Type OA:
An active 24V DC level alarm output is available with this option.
Max. driving capacity 50mA@. (Requires power supply type PD / PF / PM).
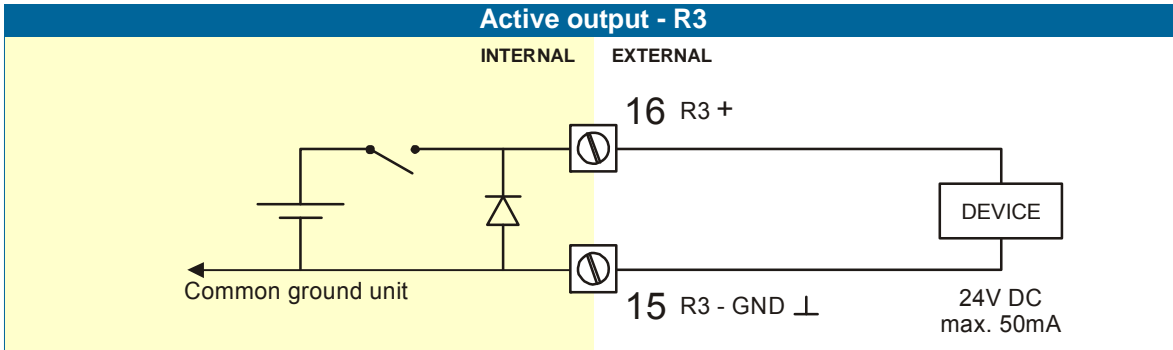
Type OT:
A passive transistor output is available with this option. Max. driving capacity 300mA@50V DC.
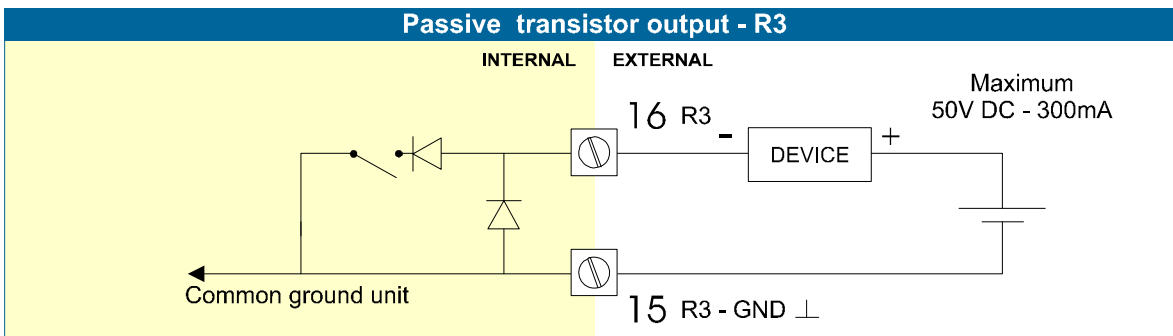
Terminal 26-31: type CB / CH / CI / CT - communication RS232 / RS485 / TTL (option)
- Full serial communications and computer control in accordance with RS232 (length of cable max. 15 meters) or RS485 (length of cable max. 1200 meters) is possible.
- Read the Modbus communication protocol and Appendix C.
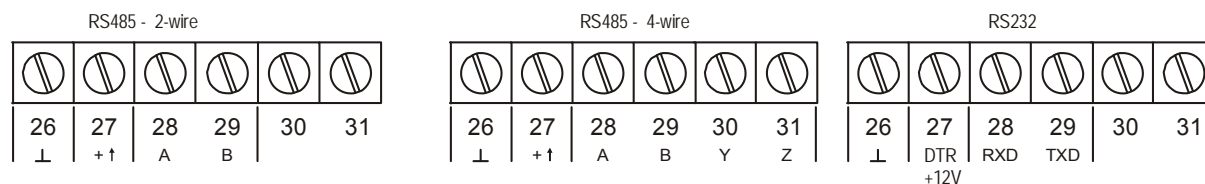
Fig. 11: Overview terminal connectors communication option

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 !

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 trimmer 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 !

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.

Option type ZB: adjustable backlight
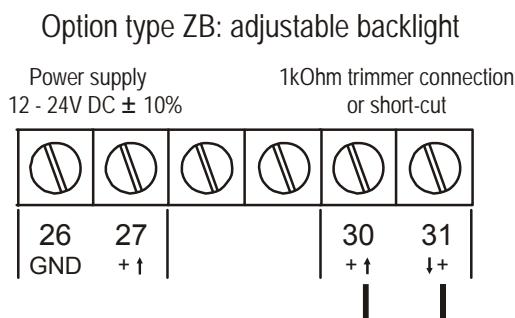
Fig. 12: Overview terminal connectors backlight option

5. INTRINSICALLY SAFE APPLICATIONS

5.1. GENERAL INFORMATION AND INSTRUCTIONS

Caution !

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.

WARNING

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 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.

Note !

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".

MODEL: F1xx-P-XI
Primary signal input: pulse, coil, namur

S/N: 1101001
IP67

Intrinsically Safe - Possible static hazard - Do not rub
Tamb: -40°C ... +70°C / -40°F ... +158°F

$C\,C$
0344

II 1 G   Ex ia IIB / IIC T4 Ga
II 1 D   Ex ia IIIC T100°C Da IP6x
KEMA 03ATEX1074 X - IECEx DEK 11.0042X

Made by Fluidwell bv - Voltaweg 23, Veghel, The Netherlands - www.fluidwell.com
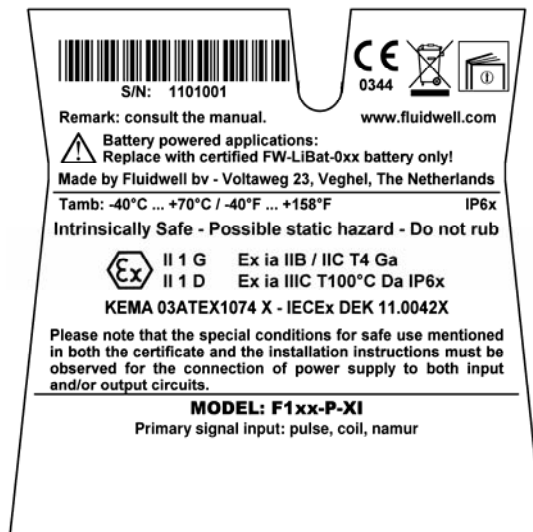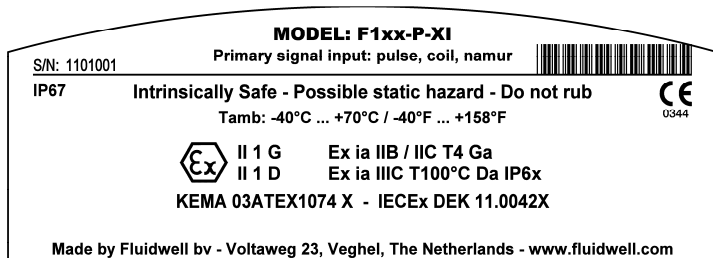
Serial number and year of production

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

Note !

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 F118-P-XI:
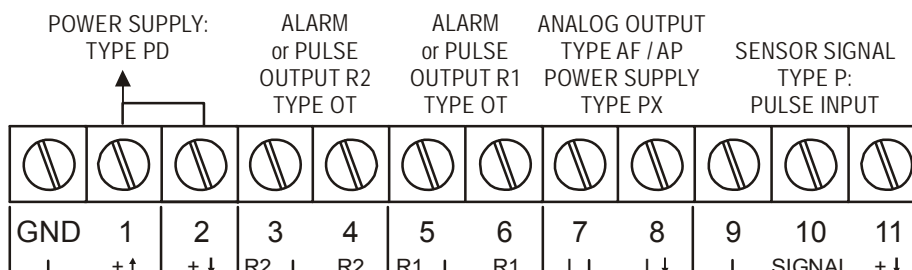
Fig. 13: Overview of terminal connectors intrinsically safe

Explanation Intrinsically Safe options:

Type AF - Intrinsically Safe floating 4-20mA analog output - Terminal 7-8:
A floating 4-20mA signal proportional to the flowrate is available with this option.
When the output is disabled, a 3.5mA signal will be generated.
Max. driving capacity 1000 Ohm @ 30V DC.

Note !

Note! *It is required to link the minus from the analog output - terminal 7 - with a ground terminal of the unit; terminal: GND, 3, 5, 9, 12 or 15.*
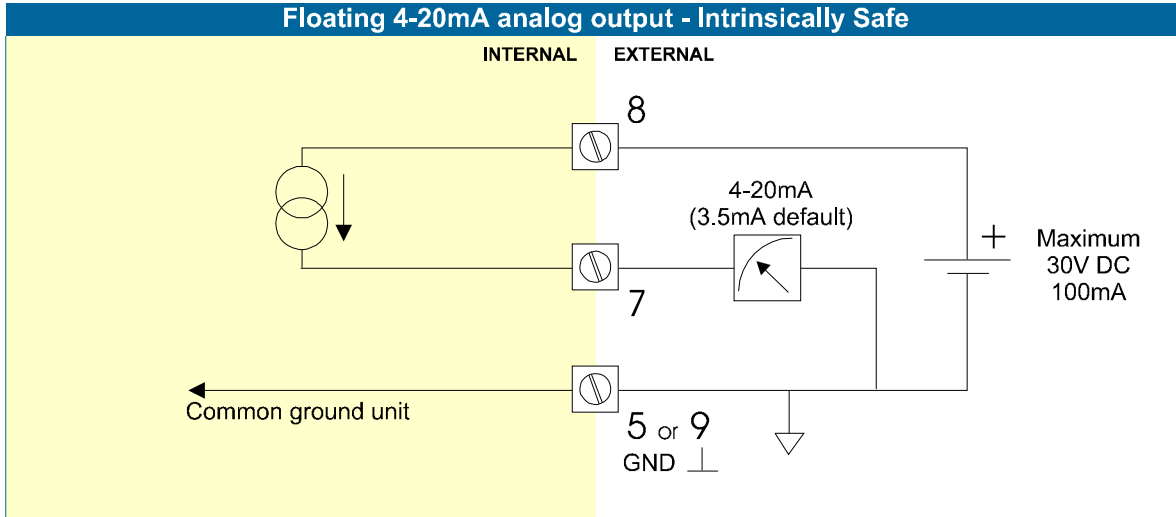
Type PD - Intrinsically Safe power supply and sensor supply - Terminal GND- 01 and 11.

TYPE		SENSOR SUPPLY	Terminal		
			GND	01	02
PD	Input voltage: 8-30V DC	3,2 - 8,1V	L-	L+	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

Fig. 15: Configuration example 1 Intrinsically Safe

Configuration example IIB/IIIC and IIC - F118-P-AP-(CT)-OT-PD-XI

Fig. 16: Configuration example 2 Intrinsically Safe

GPI_F118PEN_v0601_01
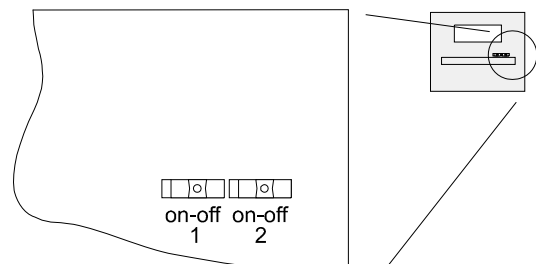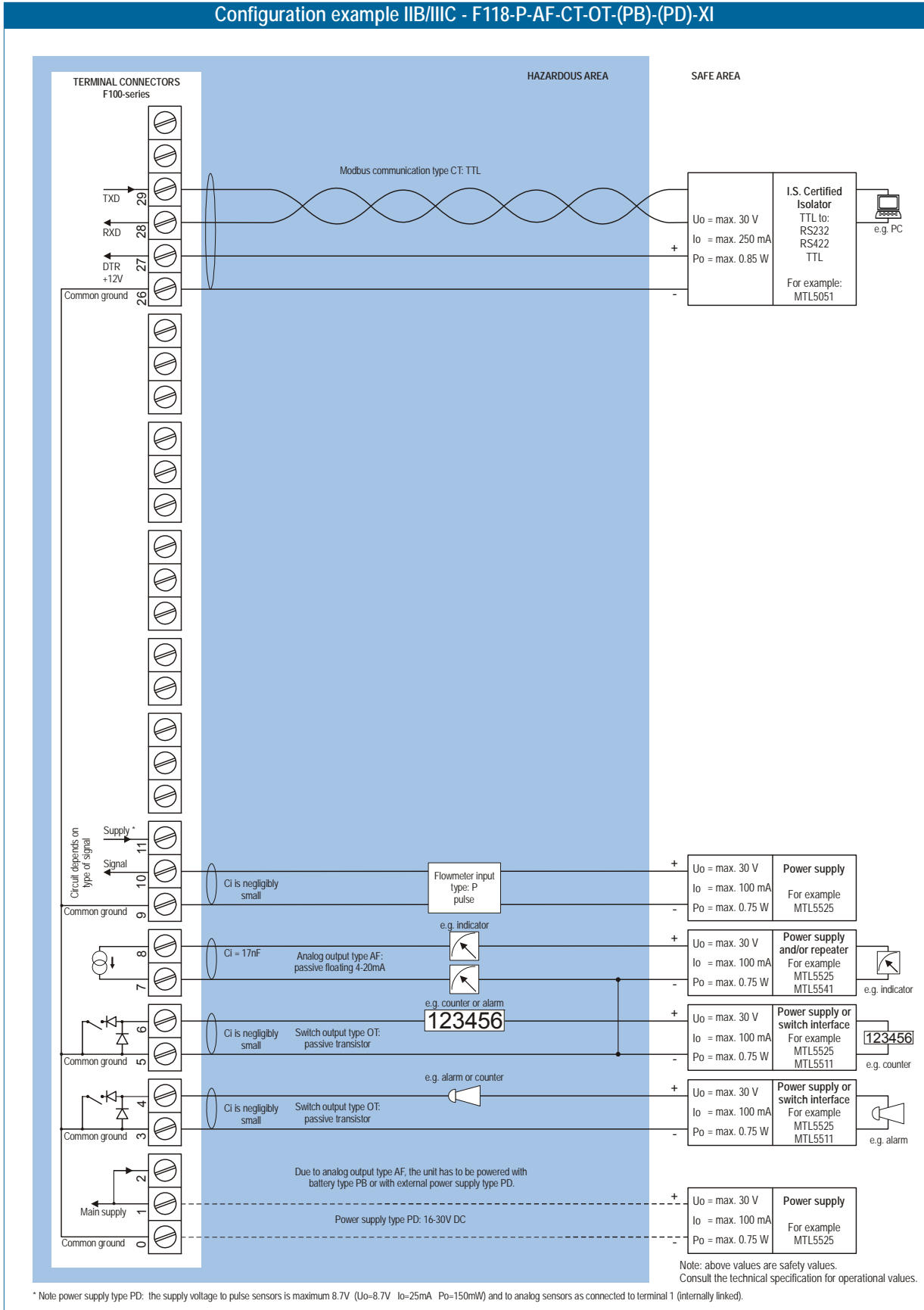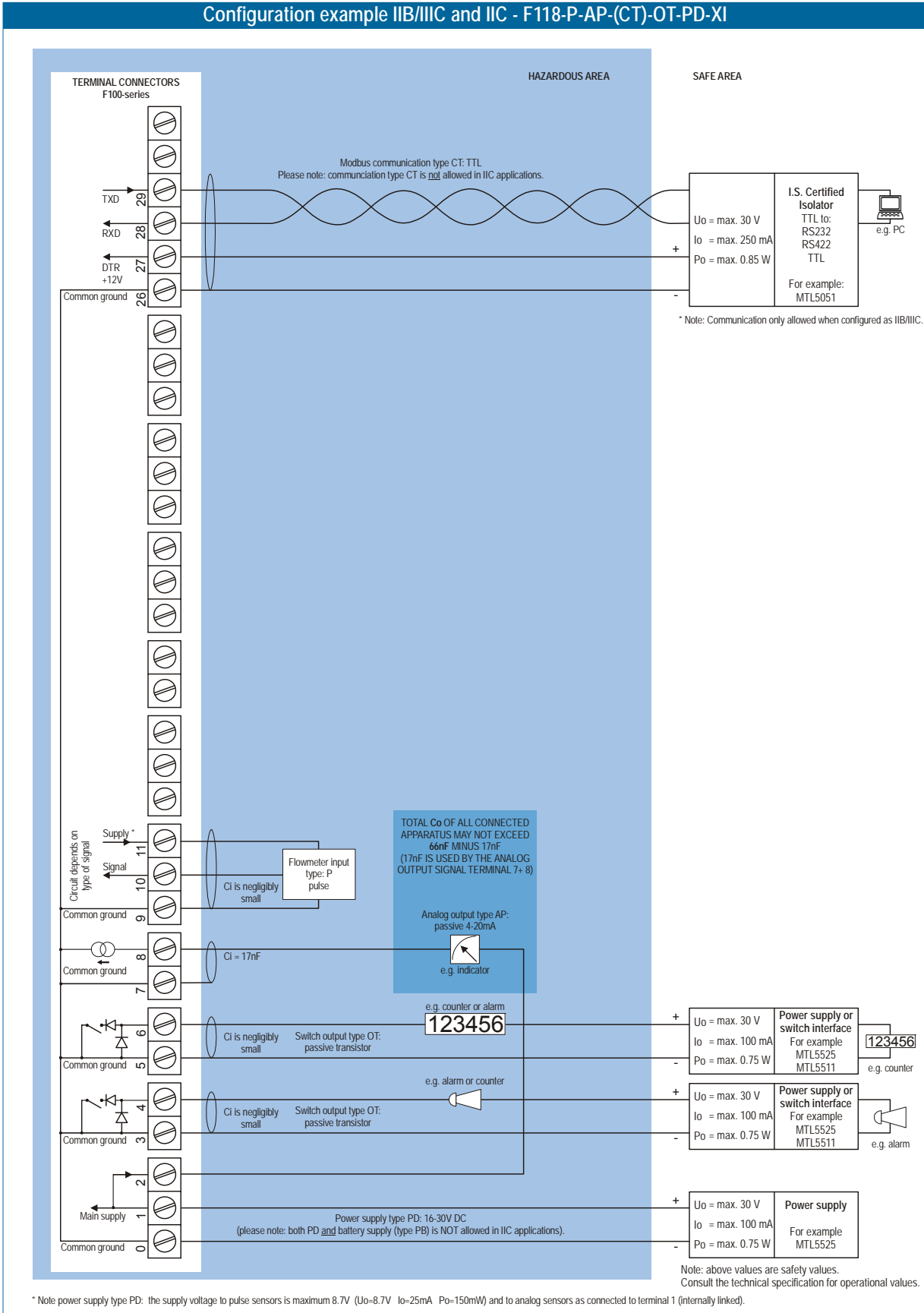
5.4   BATTERY REPLACEMENT INSTRUCTIONS

Safety Instructions

⚠️ **WARNING**

- **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.

Caution !

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

Note !

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

FW-LiBAT-001 battery	**FW-LiBAT-021 battery**
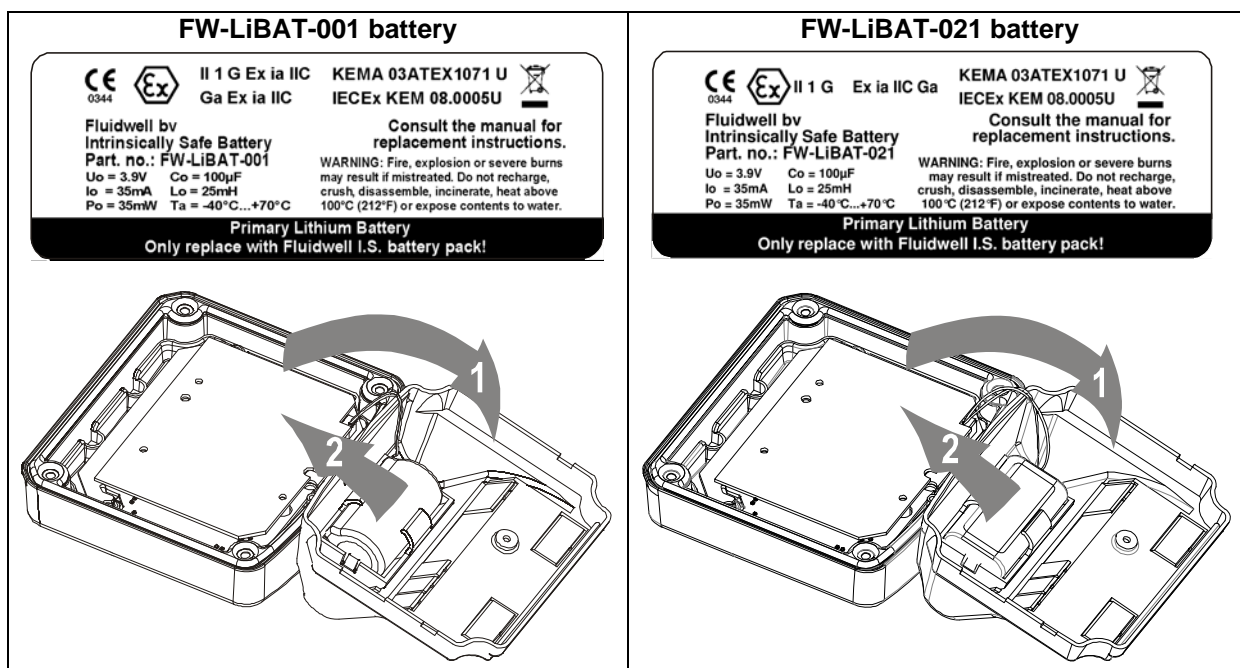
1. To replace the battery, open the unit to gain access to the back inside cover of the unit.
2. Unplug the field connectors from the back inside of the unit.
3. Remove the screw that holds the plastic inside cover.
4. Open the cover and unplug the battery connector.
5. Remove the battery from the inside 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

- *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 F118-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.*

Caution !

The F118-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 customers responsibility to take all precautions to dehumidify the internal atmosphere of the F118-P in such a way that no condensation will occur, for example by placing dry silica-gel in the casing just before closing the enclosure.
Furthermore, is required to replace or dry the silica gel from time to time as advised by the silica gel supplier.

Battery life-time:
It is influenced by several issues as:
- Type of sensor: read chapter 3.2.3. NPN and PNP inputs consume more energy then 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; else it has major influence on the battery life-time (SETUP 71).
- Display update: fast display update has major influence; SETUP 51.
- Pulse output and communication.
- Low temperatures; the available power will be less due to battery chemistry.

Note: It is strongly advised to disable unused functions.

Note !

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 re-enter any subsequent K-factor alterations.
- The indication for low-battery.
- Clean the casing with soapy-water; don't 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 SPECIFICATIONS

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-stabilized 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 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 HH	Drilling: 6x 12mm (0.47″).
ABS enclosure Type HS	Silicone free ABS enclosure with EPDM and PE gaskets. UV-resistant polyester keypad.

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 ± 10%. Power consumption max. 10 Watt. Intrinsically safe: 16-30V DC; power consumption max. 0.75 Watt.
Type PF	24V AC / DC ± 10%. Power consumption max. 15 Watt.
Type PL	Input loop powered from sensor signal 4-20mA (type A).
Type PM	115-230V AC ± 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 / 8.2V DC 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. 1.5mm2 and 2.5mm2 (Type PM / PF)

Data protection	
Type	EEPROM backup of all setting. Backup of running totals every minute. Data retention at least 10 years.
Password	Configuration settings can be password protected.

Hazardous area (option)	
Intrinsically safe Type XI	**ATEX approval:** 〈Ex〉 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.

Directives & Standards	
EMC	Directive 2004/108/EC, FCC 47 CFR part 15
Low voltage	Directive 2006/95/EC
ATEX / IECEx	Directive 94/9/EC, IEC 60079-0, IEC 60079-11, IEC 60079-26
IP & NEMA	EN 60529 & NEMA 250

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.
Linearization	15 positions with interpolation function; Meter-Factor 0.000001 - 9.999999 versus Frequency 0.001 Hz - 9,999 Hz.

OUTPUTS

Analog output	
Function	transmitting flowrate.
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).

Transistor output(s)	
Pulse output	Max. frequency 500Hz. Pulse length user definable between 1msec up to 10 seconds.
Alarm output	low flowrate, high flowrate or flowrate alarm (both).
Type OA	Three active 24V DC transistor output; max. 50mA per output (requires type AA + PD, PF or PM).
Type OR	Two isolated mechanic relay outputs; max. switch power 230V AC - 0,5A and one type OA or OT; (requires type PF or PM).
Type OT	Max. three passive transistor outputs - not isolated. Load max. 50V DC - 300mA. Note: Intrinsically Safe: two outputs only.

Communication option	
Functions	reading display information, reading / writing all settings.
Protocol	Modbus 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	
Displayed functions	- total and/or flowrate. - total and accumulated total. - total can be reset to zero by pressing the CLEAR-key twice. - alarm value's low and high flowrate - alarm value's can be entered (this function can be disabled)

Total	
Digits	7 digits.
Units	L, m3, GAL, USGAL, KG, lb, bbl, no unit.
Decimals	0 - 1 - 2 or 3.
Note	total can be reset to zero.

Accumulated total	
Digits	11 digits.
Units / decimals	according selection for total.

Flowrate	
Digits	7 digits.
Units	mL - L - m3 - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm3 - NL - P
Decimals	0 - 1 - 2 or 3.
Time units	/sec - /min - /hr - /day.

Alarm values	
Digits	7 digits.
Units	According to selection for flowrate.
Decimals	According to selection for flowrate.
Time units	According to selection for flowrate.
Type of alarm	Low and high flowrate alarm. Includes delay time alarm and configurable alarm outputs.

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F118-P is going to be installed or while it is in operation.

Flowmeter does not generate pulses:
Check:
- Signal selection SETUP - 51,
- 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 with actual signal selection - SETUP - 51,
- Sensitivity of coil input - SETUP - 51 and par. 4.4.3.
- Proper grounding of the F118-P - par. 4.4.1.
- Use screened wire for flowmeter signals and connect screen to terminal 9.

Analog output does not function properly:
Check:
- SETUP 71 - is the function enabled?
- SETUP 72 / 73: are the flow-levels programmed correctly?
- connection of the external power-supply according specification.
- SETUP 27 - when 4mA should be generated as soon as the flowrate is zero, it might take this time worst case. To get a quick response, decrease this time according to you desired response time.

Pulse output does not function:
Check:
- SETUP 81 - pulse per X-quantity; is the value programmed reasonable and will the maximum output be under 20Hz?
- SETUP 82 - impulse width; is the external device able to recognize the selected pulse width and frequency?

Flowrate displays "0 / zero" while there is flow (total is counting):
Check:
- SETUP 22 / 25: are the K-factor and time unit correct?
- SETUP 26 / 27: The unit has to count the number of pulses according to SETUP 26 within the time according to SETUP 27. Make sure that 27 is set like 10.0 seconds for example : the result is that the unit has at least 10 seconds time to measure the number of pulses according to SETUP 26.

The password is unknown:
If the password 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

If the alarm occurs more often or stays active for a longer time, please contact your supplier.

APPENDIX C: COMMUNICATION VARIABLES

GENERAL

The tables below show the various variables that can be used for communication.
The F118-P is fitted with the Modbus communication protocol and can be equipped with various physical interfaces like RS485 and RS232 (please see device datasheet for available options).

Currently, the functions supported are function 3 Read Holding Registers (4X references) and function 16 Preset Multiple Registers (4X references). The shown communication variables, indicated by the column VAR, show protocol addressed in decimal representation, followed by its hexadecimal representation (0x0000). When the PLC address range is required (4X references typically used by PLCs), please add a value of 40001 to the protocol address. E.g. reading the serial number with PLC-based addressing means reading 165 + 40001 = register 40166.

Variables spanning multiple registers use 'little-endian' data representation. This means that the lowest register holds the least significant word of the variable. Although most Modbus masters will support variables that span 2 registers, variables spanning more registers sometimes require you to manually calculate the resulting value.

Following example shows how data is represented and how this calculation can be accomplished:
For a total-value of 158928, the following register data has been received by the Modbus master:
    register 566 = 0x6CD0 = 27856
    register 567 = 0x0002 = 2
    register 568 = 0x0000 = 0
If we interpret this as a long integer value, it's value would be: 0x0000.0002.6CD0 = 158928.
If this value needs to be calculated: 0*65536*65536 + 2*65536 + 27856 = 158928.

For additional information regarding using your Fluidwell Modbus device, please read the 'Fluidwell General Modbus Communication Protocol' and 'Modbus troubleshooting guide' that are available through our website or your distributor.

RUNTIME VARIABLES OF THE F118-P

VAR	RUN-TIME VALUES	REGs	R/W	TYPE	VALUE / REMARKS
572 0x23C	flow rate	2	r	uint32	0…9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
566 0x236	total	3	r	uint48	0…9999999999 Representation: unit, decimals depending on variables 32, 33
560 0x230	accumulated total	3	r	uint48	0…99999999999999 Representation: unit, decimals depending on variables 32, 33
37 0x025	error status	1	r	uint16	Bitfield: 0x0001=Display error 0x0002=EEPROM error 0x0004=EEPROM initialization error

<u>Reading flowrate, total or accumulated total:</u> The returned values are given including the decimals and represent the actual value. The given value may differ from the value that is displayed on the display – this is due to the fact that the display is limited in the number of digits and may have a slower update rate set.
For example when two decimals are selected for total and total has a value of 123456,78 the display will show 23456,78 while communication will read a "total" of 12345678 and a "total decimals" of 2.

<u>Clearing total:</u> It is possible to clear the total counter by means of writing a value of 0 to <u>all</u> the 3 registers of total in a single write action. Writing any other value will result in the reply of an error message.

SETUP VARIABLES OF THE F118-P

VAR	TOTAL A	REGs	R/W	TYPE	VALUE / REMARKS		
32 0x020	unit	1	r/w	uint8	0=none 3=kg 6=usgal	1=L 4=lb 7=bbl	2=m3 5=gal
33 0x021	decimals	1	r/w	uint8	0…3		
34 0x022	K-factor	2	r/w	uint32	1...9999999 Representation: 0.000010…9999999 depending on variable 54: decimals K-factor.		
37 0x025	decimals K-factor	1	r/w	uint8	0…6		
VAR	**FLOWRATE A**	**REGs**	**R/W**	**TYPE**	**VALUE / REMARKS**		
48 0x030	unit	1	r/w	uint8	0=mL 3=mg 6=ton 9=lb 12=none 15=NL	1=L 4=g 7=gal 10=cf 13=scf 16=P	2=m^3 5=kg 8=bbl 11=rev 14=NM^3
49 0x031	time unit	1	r/w	uint8	0=sec 3=day	1=min	2=hour
50 0x032	decimals	1	r/w	uint8	0…3		
51 0x033	K-factor	2	r/w	uint32	1...9999999 Representation: 0.000010…9999999 depending on variable 54: decimals K-factor.		
54 0x036	decimals K-factor	1	r/w	uint8	0…6		
55 0x037	number of pulses	1	r/w	uint8	1...255		
56 0x038	cut-off time	1	r/w	uint16	1...9999 Representation: 0.0001 – 9.999 sec		
VAR	**ALARM**	**REGs**	**R/W**	**TYPE**	**VALUE / REMARKS**		
?? 0x0??	flow zero	1	r/w	uint8			
?? 0x0??	alarm value low	1	r/w	uint8			
?? 0x0??	alarm value high	1	r/w	uint8			
?? 0x0??	delay time value low	1	r/w	uint8			
?? 0x0??	delay time value high	1	r/w	uint8			
VAR	**DISPLAY**	**REGs**	**R/W**	**TYPE**	**VALUE / REMARKS**		
64 0x040	display function	1	r/w	uint8	0=total	1=flowrate	
?? 0x0??	alarm set						
67 0x043	backlight brightness	1	r/w	uint8	0=off 3=60%	1=20% 4=80%	2=40% 5=100%

VAR	POWERMAN	REGs	R/W	TYPE	VALUE / REMARKS		
80 0x050	LCD update time	1	r/w	uint8	0=fast 3=15sec	1=1sec 4=30sec	2=3sec 5=off
81 0x051	power mode	1	r/w	uint8	0=operational	1=shelf	
VAR	**FLOWMETER**	**REGs**	**R/W**	**TYPE**	**VALUE / REMARKS**		
96 0x060	flowmeter signal a	1	r/w	uint8	0=npn 3=reed LP 6=namur 9=act.8.1V	1=npn-lp 4=pnp 7=coil hi 10=act. 12V	2=reed 5=pnp-lp 8=coil lo 11=act.24V
VAR	**LINEARIZATION**	**REGs**	**R/W**	**TYPE**	**VALUE / REMARKS**		
1024 0x400	Linearization table entry	3	r/w	struct 2x uint24	The linearization table is an **INDEXED** variable. Reading and writing the entries of the linearization tables is done by first selecting the entry through the index. Valid values for the index are 0…14, which correspond with the linearization table entries 1 through 15. Indexes outside this range will result in an error being sent back. (See the communication-section of this appendix for setting the index and its extended functionality through variable 150 and 149.) The 3 registers represent a structure containing 2 variables of each 3 bytes. The three least significant bytes (register 400 and LSB of register 401) contain the frequency part, the three most significant bytes (MSB of register 401 and register 402) contain the M-factor part. Valid range for the frequency is 0.000 to 9999Hz. Decimal point dependent on variable 1039. A value of 0 for frequency means that entry is disabled. Valid range for the M-factor 0.000000 to 9.999999.		
1038 0x40E	linearization on/off	1	r/w	uint8	0=disable 1=enable		
1039 0x40F	decimals	1	r/w	uint8	0…3 This variable selects the number of decimals used for the frequencies entered in the linearization table.		

VAR	ANALOG OUTPUT	REGs	R/W	TYPE	VALUE / REMARKS
112 0x070	analog output	1	r/w	uint8	0=disable 1=enable
113 0x071	minimum rate	2	r/w	uint32	0…9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
116 0x074	maximum rate	2	r/w	uint32	0…9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
124 0x07C	flowrate negative	1	r/w	uint8	0=ignore 1=absolute
119 0x077	cut off percentage	1	r/w	uint8	0...99 Representation: 0.0 – 9.9%
120 0x078	tune minimum rate	1	r/w	uint16	0...9999
122 0x07A	tune maximum rate	1	r/w	uInt16	0...9999
99 0x063	filter	1	r/w	uint8	0...99
VAR	RELAY OUTPUT	REGs	R/W	TYPE	VALUE / REMARKS
?? 0x0??	relay 1	1	r/w	uint8	
?? 0x0??	relay 2	1	r/w	uint8	
?? 0x0??	relay 3	2	r/w	uint32	
VAR	COMMUNICATION	REGs	R/W	TYPE	VALUE / REMARKS
144 0x090	speed (baudrate)	1	r/w	uint8	0=1200 1=2400 2=4800 3=9600
145 0x091	Modbus address	1	r/w	uint8	1…255
146 0x092	Modbus mode	1	r/w	uint8	0=off 1=RTU 2=ASCII
VAR	OTHERS	REGs	R/W	TYPE	VALUE / REMARKS
160 0x0A0	model number	1	r	uint16	0…9999
162 0x0A2	firmware version	2	r	uint32	0…999999 Representation: xx.xx.xx
165 0x0A5	serial number	2	r	uint32	0…9999999
168 0x0A8	password	1	r	uint16	0…9999
170 0x0AA	tag number	2	r/w	uint32	0...9999999

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LIST OF FIGURES IN THIS MANUAL

DECLARATION OF CONFORMITY

Declaration of Conformity

Fluidwell F1- series

Veghel, February 2015

We, Fluidwell BV, declare under our sole responsibility that the F1- series are designed and will operate conform the following applicable European Directives and Standards, when installed and operated according to the manual:

EMC Directive 2004/108/EC

EN61000-6-2:2005, EN61000-6-3:2007
EN61326-1:2006

RoHS Directive 2011/65/EU

EN 50581:2012

ATEX Directive 94/9/EC
Models –XI, Intrinsically Safe:

EN60079-0:2009
EN60079-11:2007
EN60079-26:2007
EN61241-11:2006

Protective system:

⟨Ex⟩

II 1 G   Ex ia IIC T4 Ga

II 1 D   Ex ia IIIC T100 °C Da IP6X

Certificate:

KEMA 03ATEX1074 X, issue 4

Notified body 0344: DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, The Netherlands.

Additionally, for options applicable or safe area versions:
Low Voltage Directive 2006/95/EC   EN61010-1:2010
The last two digits of the year in which the CE marking was affixed: 03.

Remark: compliance is not affected by standards EN60079-0:2012 and EN60079-11:2012.

Fluidwell BV

I. Meij, Product Manager

Note: Fluidwell BV are ISO9001 certified by DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, The Netherlands.

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 decs K-fact	0		
2 - FLOWRATE			
21 unit	L		
22 time	/min		
23 decimals	0000000		
24 K-factor	0000001		
25 decs K-fact	0		
26 calculation / pulses	010		
27 cut-off time	30.0 sec.		
3 - ALARM			
31 flowzero	ignore		
32 alarm lo	0		
33 alarm hi	0		
34 delay lo	0.0 sec		
35 delay hi	0.0 sec		
4 - DISPLAY			
41 function	total		
42 alarm set	operator level		
43 light	100%		
5 - POWER MAN			
51 LCD-new	1 sec.		
52 battmode	operational		
6 - FLOWMETER			
61 signal	coil-lo		
7 - LINEARIZATION			
71 frequency	0.0Hz		
M-Factor	1.000000		
72 frequency	0.0Hz		
M-Factor	1.000000		
73 frequency	0.0Hz		
M-Factor	1.000000		
74 frequency	0.0Hz		
M-Factor	1.000000		
75 frequency	0.0Hz		
M-Factor	1.000000		
76 frequency	0.0Hz		
M-Factor	1.000000		
77 frequency	0.0Hz		
M-Factor	1.000000		

SETTING	DEFAULT	DATE :	DATE :
7 – LINEARIZATION (cont.)	Enter your settings here		
78 frequency	0.0Hz		
M-Factor	1.000000		
79 frequency	0.0Hz		
M-Factor	1.000000		
7A frequency	0.0Hz		
M-Factor	1.000000		
7B linear	disable		
7C decimals	1111.1		
8 - ANALOG OUTPUT			
81 output	disable		
82 rate min (4-mA)	0000000		
83 rate max (20mA)	9999999		
84 cut off percentage	0.0%		
85 tune min (4mA)	0208		
86 tune max (20mA)	6656		
87 filter	00 (off)		
9 - RELAY OUTPUT			
91 relay1	off		
92 relay 2	off		
93 relay 3	off		
94 width	0.000		
95 decimals	0		
96 amount	0001000		
A - COMMUNICATION			
A1 speed (baudrate)	9600		
A2 address	1		
A3 mode	bus-rtu		
B - OTHERS			
B1 model	F118-P		
B2 s-version	03.01.xx		
B3 serial nr	xxxxxxx		
B4 password	0000		
B5 tagnr	0000000		

Limited Warranty Policy

Great Plains Industries, Inc. 5252 E. 36th Street North, Wichita, KS USA 67220-3205, hereby provides a limited warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This product includes a 2 year warranty. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of manufacture or on the date of purchase with an original sales receipt. This warranty shall not apply if:

A. the product has been altered or modified outside the warrantor's duly appointed representative;

B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, contact the GPI Customer Service Department at 316-686-7361 or 888-996-3837. Or by mail at:

Great Plains Industries, Inc.
5252 E. 36th St. North,
Wichita, KS, USA 67220-3205

If you are outside North or South America contact:

Great Plains Industries – Australia
1/16 Atkinson Road,
Taren Point NSW 2229, Sydney, Australia

The company shall, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to a duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC., EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

Note: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT – Part 702 (governs the resale availability of the warranty terms).

Wichita ⁄ Sydney ⁄ Mexico City | GREAT PLAINS INDUSTRIES *GPI*

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