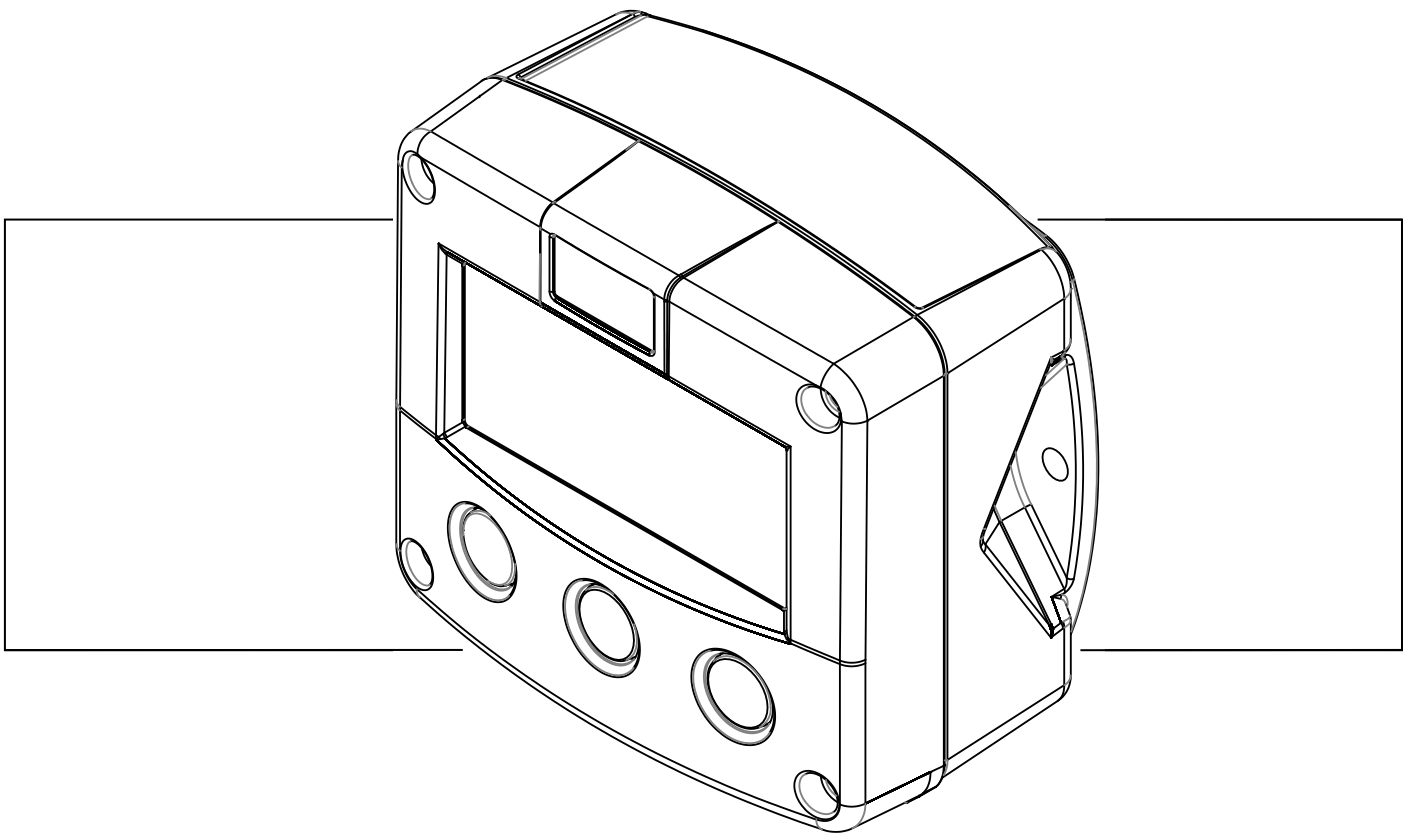


# **F112-A**

**FLOWRATE INDICATOR / TOTALIZER  
WITH LINEARIZATION**



**Signal input flowmeter: (0)4-20mA**

**Signal outputs: 4-20mA ref. flowrate and pulse ref. total.**

**Options: Intrinsically safe, Modbus communication, external reset and backlight.**





## SAFETY INSTRUCTIONS

- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- **LIFE SUPPORT APPLICATIONS:** The F112-A 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 metal enclosure as indicated if the F112-A has an incoming power line which carries a 115-230V AC. The Protective Earth (PE) wire may never be disconnected or removed.
- **Intrinsically safe applications:** follow the instructions as mentioned in Chapter 5 and consult “Fluidwell F1...-XI - Documentation for Intrinsic safety”.

## DISPOSAL OF ELECTRONIC WASTE



- The WEEE Directive requires the recycling of disposed electrical and electronic equipment in the European Union. When the WEEE Directive does not apply to your region, we support its policy and ask you to be aware on how to dispose of this product.
- The crossed out wheeled bin symbol as illustrated and found on our products tells that this product shall not be disposed of into the general waste system or into a landfill.
- At the end of its life, equipment shall be disposed of according to the local regulations regarding waste of the electrical and the electronic equipment.
- Please contact your local dealer, national distributor or the manufacturer's Technical helpdesk for information on the product disposal.

## 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 F112-A implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- 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 F112-A supplied.
- Open the enclosure 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 the classification of the enclosure (see manufacture's plate and chapter 4).
- 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 MANUAL

This manual is divided into two main sections:

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

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

**A hazardous situation may occur if the F112-A is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this operating manual indicated by the pictograms:**



A "**warning !**" indicates actions or procedures which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the F112-A or connected instruments.



A "**caution !**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the F112-A 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.

## WARRANTY AND TECHNICAL SUPPORT

For warranty and technical support for your Fluidwell products, visit our internet site [www.fluidwell.com](http://www.fluidwell.com) or contact us at [support@fluidwell.com](mailto:support@fluidwell.com).

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Software version : 03.04.xx  
Manual : FW\_F112A\_v1702\_02\_EN  
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# 1. INTRODUCTION

## 1.1. SYSTEM DESCRIPTION

### Functions and features

The flow rate / totalizer model F112-A is a microprocessor driven instrument designed to display the flow rate, the total and the accumulated total.

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),
- ability to process all types of flowmeter signals;
- transmitting possibilities with analog, pulse and communication outputs;
- several mounting possibilities with GRP or aluminum enclosures for industrial surroundings.

### Flowmeter input

This manual describes the unit with a (0)4-20mA input from the flowmeter. Other versions are available to process pulse signals.

One flowmeter with a (0)4-20mA output can be connected to the F112-A. To power the sensor, several options are available.

### Standard outputs

- Pulse output to transmit a pulse that represents a linearized totalized quantity as programmed.
- Linear (0)4-20mA or 0-10V analog output to represent the actual flow rate as programmed. The (0)4-20mA or 0-10V signal limits can be tuned.

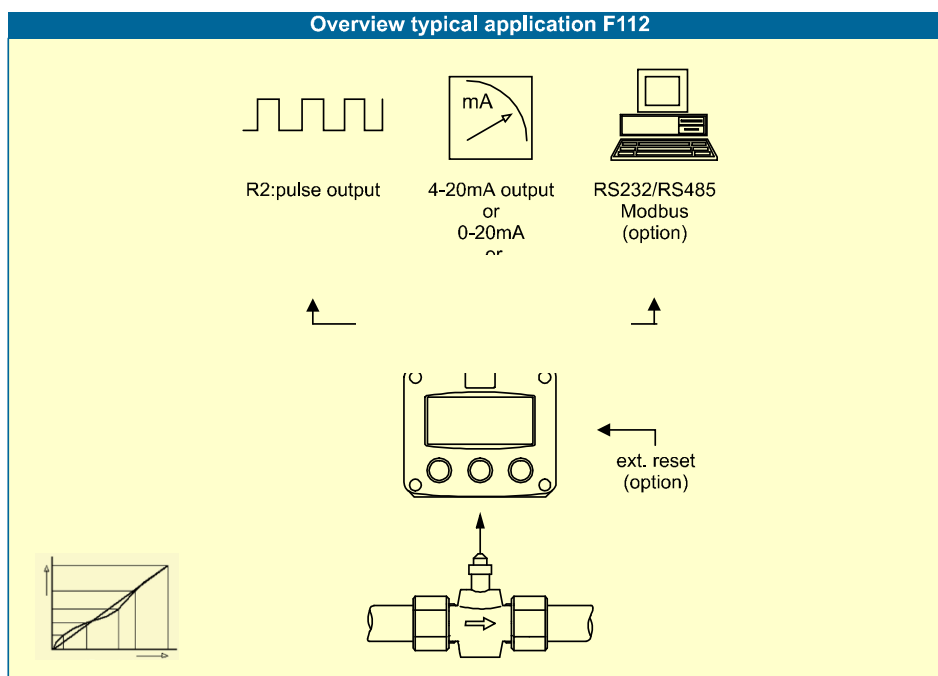


Fig. 1: Typical application

### Configuration

The F112-A is designed for use in many types of applications. For that reason, a setup menu is available to program the F112-A according to your specific requirements.

The setup includes several important features, such as span, engineering units, signal selection, power management (to extend battery life-time), etc. All settings are stored in a non-volatile memory and therefore kept in the event of a power failure or an exhausted battery.

### Display information

The unit has a LCD with (optional) backlight to show the process information, status and alarm messages. The display refresh rate is programmed in the setup menu.

At a key press, the display refresh rate will switch to FAST for 30 seconds. When 'OFF' is selected, the display goes off after 30 seconds after the last key press. The display temporarily comes on after a key press.

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

### Options

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

## 2. OPERATIONAL



Caution !

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

This chapter describes the daily use of the F112-A. This instruction is meant for users / operators.

### 2.1. CONTROL PANEL

The control panel has three keys. The available keys are:



Fig. 2: Control Panel

#### Functions of the keys



This key is used to program and save new values or settings.  
The PROG/ENTER key is also used to gain access to the setup menu (read chapter 3).



This key is used to select the accumulated total and the temperature.  
The SELECT/▲ key is also used to increase a value after the PROG/ENTER key has been pressed (read chapter 3).



This key is used to reset the total.  
The CLEAR/► key is also used to select a digit or an option after the PROG/ENTER key has been pressed (read chapter 3).

### 2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the F112-A operates in the operator mode. The shown information depends on the settings which are made in the setup menu. The signal from the connected sensor is processed by the F112-A in the background, independent from the selected display refresh rate.



Fig. 3: Process information (typical)

For the Operator, the following functions are available:

- **Display (linearized) flow rate / total or flow rate**

This is the main display information of the F112-A. After the selection of any other information, it will always return to this main display automatically. Total is shown on the upper line of the display and flow rate on the bottom line. When selected in the setup menu, the display shows the flow rate only. When you press the select key, the total shows momentarily.

- **Clear total**

The value for total can be reset. To do so, press the CLEAR/▶ key twice. When the key is pressed once, the text "PUSH CLEAR" is shown. To avoid a reset at this stage, press another key other than the CLEAR/▶ key or wait for 20 seconds. A reset of the total does not influence the accumulated total.

Type IB: When a Normally Closed (NC) contact is used, the local clear total function is disabled and a clear total is only possible with the external reset command.

- **Display (linearized) accumulated total**

When the SELECT/▲ key is pressed, total and accumulated total are shown. The accumulated total cannot be reset. The value will count up to 99,999,999,999. The unit and number of decimals are shown according to the settings for the total.

- **Low-battery alarm**



Note !

*Only use original batteries. Original batteries can be ordered at the manufacturer.  
The use of unapproved batteries will void the warranty.*

At the end of the battery's life-time, the voltage starts to drop. When the voltage becomes too low, the battery indicator comes on. When the battery indicator is on, install a new and fresh battery as soon as possible.



Fig. 4: Low-battery alarm (typical)

- **Alarm**

When the alarm indicator is shown, refer to Appendix B: Problem Solving.

### 3. CONFIGURATION

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 this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Make sure, 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 persons authorized by the operator of the facility.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.

The setup menu is used to program the F112-A .

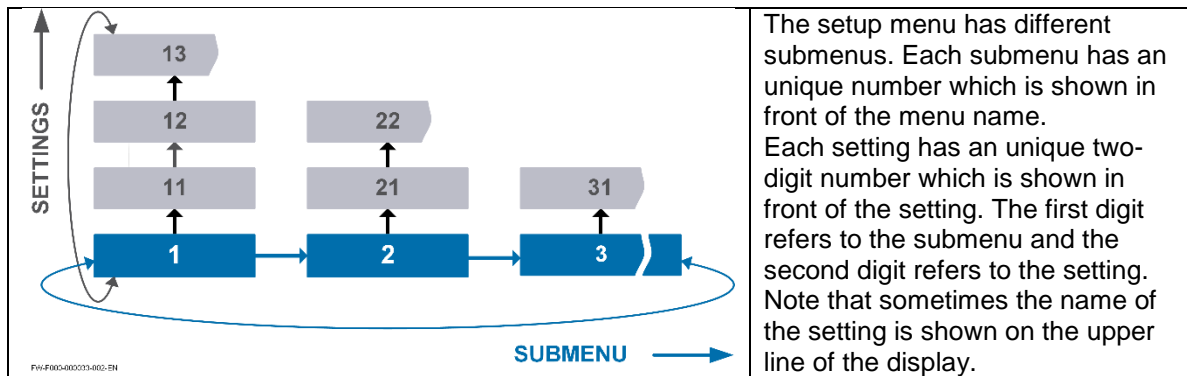
The setup menu is accessible at all times while the F112-A remains fully operational. Be aware that in this case any change to the settings may have an influence on the operation.



Note !

*It is possible to prevent access to the SETUP menu with a password. A password may be required to enter the SETUP menu. Without this password, access to SETUP is denied.*

#### 3.1. HOW TO PROGRAM THE F112-A



##### How to enter the setup menu

When the setup menu is protected by a password, the F112-A asks for a password to access the setup menu. When in the operator mode, press and hold the PROG/ENTER key for 7 seconds to access the setup menu.

##### How to navigate in the setup menu

The setup menu has different submenus to program the F112-A . For navigation, the submenus and the settings are identified with numbers (for the submenu: e.g. 1; for the setting: e.g. 12.).

The CLEAR/► key and the PROG/ENTER key are used for navigation. The explanation assumes that you are in the submenu TOTAL.

Action	Result	Remark
1 Press the CLEAR/► key to select the next submenu.	• The submenu FLOW RATE shows	-
2 Press again to go to the next submenu.	• The submenu DISPLAY shows.	-
3 Momentarily, press the PROG/ENTER key to select the previous submenu.	• The submenu FLOW RATE shows	The PROG/ENTER key is used as a ◀ key.
4 Press again to go to the previous submenu.	• The submenu TOTAL shows	The PROG/ENTER key is used as a ◀ key.



The SELECT/▲ key and the CLEAR/► key are used for navigation.

The explanation assumes that you are in the submenu TOTAL. When you are:

- in the first setting and you navigate to the previous setting, the F112-A goes back to the related main menu.
- in the last setting and you navigate to the next setting, the F112-A goes to the related main menu.

Action	Result	Remark
1 Press the SELECT/▲ key to select the first setting.	• The setting UNIT shows.	-
2 Press the SELECT/▲ key again to go to the next setting.	• The setting DECIMALS shows.	-
3 Press the CLEAR/► key to select the previous setting.	• The setting UNIT shows.	-
4 Press the CLEAR/► key again to go to the previous setting.	• The submenu TOTAL shows	This is normal behavior because the setting UNIT is the first setting of the submenu TOTAL.

### How to make a setting



Caution !

Changes are only saved when you press the PROG/ENTER key.



The explanation assumes that you are in the submenu TOTAL and the setting UNIT. When you do not want to save the change, wait for approximately 20 seconds or press and hold the PROG/ENTER key for approximately 3 seconds.

Action	Result	Remark
1 Momentarily, press the PROG/ENTER key.	• The PROG indicator blinks. • The engineering unit L shows.	To access the setting.
2 Press the SELECT/▲ key to select the next engineering unit.	• The PROG indicator blinks. • The engineering unit m <sup>3</sup> shows.	If you wait too long, the program mode goes off and changes are not saved, this is normal behavior.
3 Press the SELECT/▲ key to select the next engineering unit.	• The PROG indicator blinks. • The engineering unit US GAL shows.	-
4 Press the CLEAR/► key to select the previous engineering unit	• The PROG indicator blinks. • The engineering unit m <sup>3</sup> shows.	-
5 To confirm the changes: Momentarily, press the PROG/ENTER key.	• The PROG indicator goes off. • The change is saved. • The engineering unit m <sup>3</sup> shows.	If you do not press the PROG/ENTER key to confirm, your selection is not saved.
To discard the changes: Press and hold the PROG/ENTER key for approximately 3 seconds.	• The PROG indicator goes off. • The change is discarded. • The engineering unit L shows.	-

## 3.1.1. SETUP MENU - SETTINGS



<b>1</b>	<b>TOTAL</b>		
	11	unit	L; m <sup>3</sup> ; kg; lb; GAL; USGAL; bbl; no unit
	12	decimals	0000000; 111111.1; 22222.22; 3333.333
	13	span	0.000001 - 999,999
	14	decs span	0 - 6
<b>2</b>	<b>FLOWRATE</b>		
	21	unit	mL; L; m <sup>3</sup> ; mg; g; kg; ton; gal; bbl; lb; cf; rev; - - - - (no unit); scf; nm <sup>3</sup> ; nL; p
	22	time	/sec; /min; /hour; /day
	23	decimals	0000000; 111111.1; 22222.22; 3333.333
	24	span	0.000001 - 999,999
	25	decs span	0 - 6
<b>3</b>	<b>DISPLAY</b>		
	31	function	total; rate
	32	light	0% (off); 20%; 40%; 60%;- 80%; 100% (full brightness)
<b>4</b>	<b>POWER MANAGEMENT</b>		
	41	LCD new	fast; 1 sec; 3 sec; 15 sec; 30 sec; off
	42	battmode	operational; shelf
<b>5</b>	<b>FLOWMETER</b>		
	51	formula	interpolation; square root
	52	filter	01 - 99
	53	cut-off	0.0 - 99.9%
	54	calib-lo	default; calibrate; calibrate set
	55	calib-hi	default; calibrate; calibrate set
<b>6</b>	<b>LINEARIZATION</b>		
	61	% / M-FACTOR 1	0.01% – 99.99% / 0 – 9.999999
	62	% / M-FACTOR 2	0.01% – 99.99% / 0 – 9.999999
	↑	↑	↑
	6F	% / M-FACTOR 15	0.01% – 99.99% / 0 – 9.999999
	6G	linearization	enable; disable
<b>7</b>	<b>ANALOG</b>		
	71	output	disable; enable
	72	rate-min	000.000 - 999999
	73	rate-max	000.000 - 999999
	74	cut-off	0.0 - 9.9%
	75	tune-min	0 - 9999
	76	tune-max	0 - 9999
	77	filter	01 - 99
<b>8</b>	<b>PULSE</b>		
	81	width	0.001 - 9.999
	82	decimals	0000000; 111111.1; 22222.22; 3333.333
	83	amount	0.001 - 9999999
<b>9</b>	<b>COMMUNICATION</b>		
	91	speed	1200; 2400; 4800; 9600; 9600HP; 19200; 38400
	92	address	1 – 247
	93	mode	bus-rtu; bus-asc; off
	94	databits	8 bits; 7 bits
	95	parity	none; even; odd
<b>A</b>	<b>OTHERS</b>		
	A1	model	F112-A
	A2	software version	nn:nn:nn
	A3	serial no.	nnnnnnnn
	A4	password	0000 - 9999
	A5	tag-nr	0000000 - 9999999

### 3.1.2. EXPLANATION OF SETUP-MENU 1 - TOTAL

<b>UNIT</b> <b>11</b>	This setting is used to select the engineering unit for the indication of the total, the accumulated total and the pulse output.
 Note !	<b>When you change the engineering unit , you must recalculate and reprogram the span for the (accumulated) total. When you recalculate and reprogram the span, the history for (accumulated) total is not correct anymore, because the (accumulated) total is not recalculated. For future reference, best practice is to make a note of the accumulated total before you program the recalculated span.</b>
<b>DECIMALS</b> <b>12</b>	This setting is used to set the amount of digits behind the decimal point for the (accumulated) total indication.
<b>SPAN</b> <b>13</b>	<p>This setting is used to set the span for the total. With the span, the flowmeter signal is converted to a quantity. The span for Total is based on the engineering unit (SETUP 11) and the flow rate per second at 20mA (or max signal). Enter the span with the decimals (decimals are not shown yet and are set in SETUP 14). The more accurate the span, the more accurate the functioning of the system will be.</p> <p><b>Example 1: Calculating the Span.</b> Assume that the flowmeter generates 20mA at a rate of 652.31 USGAL per hour, the selected unit is barrels. There are 42 gallons in one barrel; so the rate is <math>652.31/42</math> is 15.53119 barrels/hour. This is 0.0043142 barrels/second, which is the span. Enter for the span: "004314" and for the span decimals "6".</p> <p><b>Example 2: Calculating the Span.</b> Assume that the flowmeter generates 20mA at a flow rate of 2,481.3 Liters/minute and the selected unit is "m<sup>3</sup>". The rate per second is <math>2,481.3 \div 60</math> is 41.355 L/sec. This is 0.041355 m<sup>3</sup>/sec., which is the span. Enter for the span: "041355" and for the span decimals "6".</p> <p> Note ! <b>When you recalculate and enter a new span, the history for (accumulated) total is not correct anymore, because the (accumulated) total is not recalculated. for future reference. Best practice is to make a note of the accumulated total before you enter the recalculated span.</b></p>
<b>DECS SPAN</b> <b>14</b>	This setting is used to set the amount of digits behind the decimal point for the span.

### 3.1.3. EXPLANATION OF SETUP-MENU 2 - FLOW RATE

The settings for total and flow rate are entirely separate. In this way, different engineering units can be used for each e.g. cubic meters for total and liters for flow rate.

<b>UNIT</b> <b>21</b>	This setting is used to select the engineering unit for the indication of the flow rate.
 Note !	<b>Alteration of the engineering unit will have consequences for operator and setup values, they will not be automatically recalculated to the value of the new selected unit. The span has to be adapted as well; the calculation is not done automatically.</b>
<b>TIME</b> <b>22</b>	<p>This setting is used to set the time unit for the flow rate calculation. Note that the flow rate is given in engineering unit/time unit, e.g. liters/minute (l/min).</p> <p> Note ! <b>When you change this setting, also recalculate and change the settings for the analog rate-min and analog rate-max.</b></p>
<b>DECIMALS</b> <b>23</b>	This setting is used to set the amount of digits behind the decimal point for the flow rate indication.
<b>SPAN</b> <b>24</b>	This setting is used to set the span for the total. With the span, the flowmeter signal is converted to a quantity. The span for Total is based on the engineering unit (SETUP 21) and the flow rate per second at 20mA (or max signal). Enter the span with the decimals (decimals are not shown yet and are set in SETUP 25). The more accurate the span, the more accurate the functioning of the system will be.
<b>DECS SPAN</b> <b>25</b>	This setting is used to set the amount of digits behind the decimal point for the span.

### 3.1.4. EXPLANATION OF SETUP-MENU 3 - DISPLAY

<b>FUNCTION</b> <b>31</b>	<p>This setting can be set to display (linearized) total or (linearized) rate.</p> <ul style="list-style-type: none"> <li>When 'total' is selected, simultaneously, total is shown with the large digits and flow rate with the smaller digits. When SELECT is pressed, the accumulated total is shown temporarily.</li> <li>When 'rate' is selected, only flow rate will be shown with the large digits together with its measuring unit. When SELECT is pressed, the total and the accumulated total are shown temporarily.</li> </ul>
<b>LIGHT</b> <b>32</b>	<p>The backlight brightness can be adjusted from 0% (off) to 100% (full brightness) in steps of 20%.</p> <p>When the F112-A is only loop powered, the backlight is disabled. An external power supply is required to supply the backlight.</p>

### 3.1.5. EXPLANATION OF SETUP-MENU 4 - POWER MANAGEMENT



When used with the internal battery option (type PB/PC), the user can expect reliable measurement over a long period of time. The F112-A has several smart power management functions to extend the battery life time significantly. Two of these functions can be set.

<b>LCD NEW</b> <b>41</b>	<p>The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display refresh rate, 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. At a key press, the display refresh rate will switch to FAST for 30 seconds. When 'OFF' is selected, the display goes off after 30 seconds after the last key press. The display temporarily comes on after a key press.</p> <p><b>Example battery life-time with a coil pick-up:</b></p> <ul style="list-style-type: none"> <li>FAST update: about 2 years;</li> <li>1 sec update: about 5 years.</li> </ul>
<b>BATTERY MODE</b> <b>42</b>	<p>The F112-A has two modes: operational or shelf.</p> <p>After "shelf" has been selected, the F112-A can be stored for several years; it will not process the sensor signal; the display is switched off but all settings and totals are stored. In this mode, power consumption is extremely low.</p> <p>To wake up the F112-A again, press the SELECT/▲ key two times.</p>

### 3.1.6. EXPLANATION OF SETUP-MENU 5 - FLOWMETER

<b>FORMULA</b> <b>51</b>	<p>The F112-A can process the (0)4-20mA signal in two ways: Interpolation or Square root:</p> <ul style="list-style-type: none"> <li>Interpolation: the signal is processed linear: <math>R = S \times I</math></li> <li>Square root: for differential pressure: <math>R = S \sqrt{I}</math></li> </ul> <p>where:</p> <p><b>R</b> = Rate: the calculated flow rate</p> <p><b>S</b> = Span: the maximum flow rate at 20mA. The span is programmed with setting 24 for flow rate and with setting 13 for total.</p> <p><b>I</b> = Input: the scaled analog value; in these formulas value 0 (zero) for (0)4mA and value 1 (one) for 20mA.</p>
<b>FILTER</b> <b>52</b>	<p>The analog output signal of a sensor represents the actual temperature. This signal is measured several times a second. The value measured is a "snap-shot" of the real temperature as it will be fluctuating.</p> <p>With the help of this digital filter a stable and accurate reading can be obtained while the filter level can be set to a desired value.</p> <p>The filter principal is based on three input values: the filter level (01-99), the last measured analog value and the last average value. The higher the filter level, the longer the response time on a value change will be.</p>
<b>CUT-OFF</b> <b>53</b>	<p>To ignore e.g. leakage of the flow or vibration, a low-flow cut-off can be set as percentage over the full range of 16mA (or 20mA / 10V). When the analog value is less than the programmed percentage, with this setting, the flow rate will be set to zero. The cut-off value can be programmed is the range 0.0 - 99.9%.</p>

EXAMPLE:

FUNCTION (SETUP 51)	SPAN (SETUP 13/24)	REQUIRED CUT-OFF	CUT-OFF (SETUP 53)	REQUIRED OUTPUT
interpolation	450 L/min	25 L/min	$25/450 \times 100\%=5.5\%$	$16\text{mA} \times 5.5\% + 4\text{mA} = 4.88\text{mA}$
square root	450 L/min	25 L/min	$(25/450)^2 \times 100\%=0.3\%$	$16\text{mA} \times 0.3\% + 4\text{mA} = 4.05\text{mA}$
<b>CALIB-LO 54</b>				
 Caution !		<p>This setting is used to calibrate the input value for (0)4mA as the signal from the flowmeter might not be exact 4.0 mA (or 0.0 mA) at flow rate zero. This function will measure the real output value at flow zero.</p> <p><b>Be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!</b></p>		
		<p>After pressing PROG, three settings can be selected:</p> <ul style="list-style-type: none"><li>▪ CALIB: with this setting, the input will be calibrated with the actual "(0)4mA" value. After pressing enter, CAL SET will be shown as soon as the calibration is completed. From that moment, the analog value must be more than the calibrated value before the signal will be processed.</li><li>▪ DEFAULT: with this setting, the manufactures value is re-installed.</li><li>▪ CAL SET: to select the last calibrated value.</li></ul>		
<b>CALIB-HI 55</b>				
 Caution !		<p>This setting is used to calibrate the input value for 20mA as the signal from the flowmeter might not be exact 20.0 mA at maximum flow rate. This function will measure the real output value at maximum flow rate.</p> <p><b>Be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!</b></p>		
		<p>After pressing PROG, three settings can be selected:</p> <ul style="list-style-type: none"><li>▪ CALIB: with this setting, the input will be calibrated with the actual "20mA" value. After pressing enter, CAL SET will be shown as soon as the calibration is completed. From that moment, the analog value must be less than the calibrated value for a reliable measurement.</li><li>▪ DEFAULT: with this setting, the manufactures value is re-installed.</li><li>▪ CAL SET: to select the last calibrated value.</li></ul>		

### 3.1.7. EXPLANATION OF SETUP MENU 6 - LINEARIZE

The linearization function is available to approach the real flow curve better as with the general K-Factor (KF0). This to obtain a more accurate flow rate, total and accumulated total as well as the analog and pulse output at any flowmeter frequency. A maximum of 15 linearization-positions can be entered while the interpolation will calculate any other position in-between.

For each linearization position, the percentage of the signal and a Meter Factor (MF) must be entered. The lowest percentage and MF you enter will be valid from (0)4mA. The highest percentage and MF will be valid till 20mA. It is advised to enter the percentages in increasing order, however it is not necessary.

Please have a look at following example to understand the calculation and the method of linearization:

No.1:

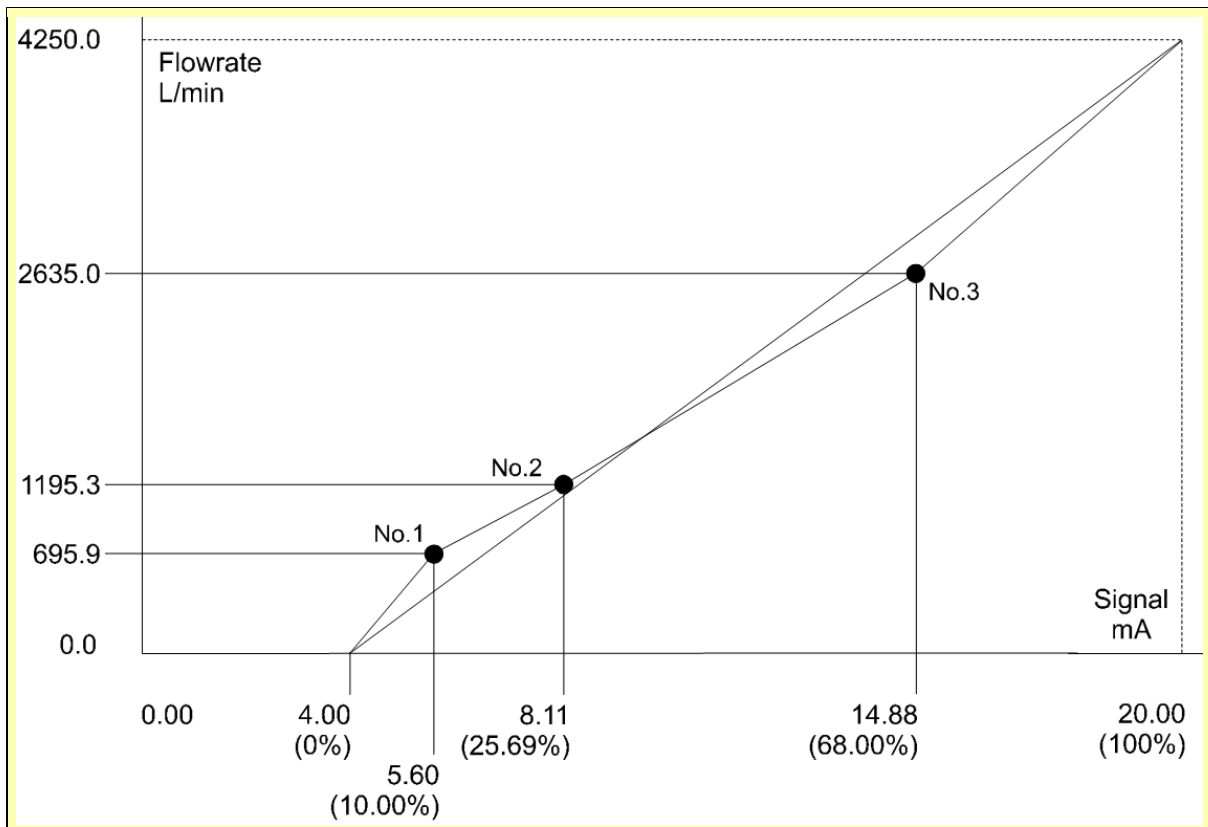
The measured flow is 695.9 L/min @ 5.60mA  
 $(5.60 - 4.00) / (20.00 - 4.00) \times 100\% = 10.00\%$  of signal  
 At 10% of the signal, you would expect:  $4250.0 \times 10\% = 425.0$  L/min  
 The M-Factor for No.1 is:  $695.9 / 425.0 = 1.636471$

No.2:

The measured flow is 1195.3 L/min @ 8.11mA  
 $(8.11 - 4.00) / (20.00 - 4.00) \times 100\% = 25.69\%$  of signal  
 At 25.69% of the signal, you would expect:  $4250.0 \times 25.69\% = 1091.7$  L/min  
 The M-Factor for No.2 is:  $1195.3 / 1091.7 = 1.094898$

No.3:

The measured flow is 2635.0 L/min @ 14.88mA  
 $(14.88 - 4.00) / (20.00 - 4.00) \times 100\% = 68.00\%$  of signal  
 At 68.00% of the signal, you would expect:  $4250.0 \times 68.00\% = 2890.0$  L/min  
 The M-Factor for No.3 is:  $2635.0 / 2890.0 = 0.911765$



**FREQUENCY /  
M-FACTOR  
61 TO 6F**



Note !


The percentage is shown at the bottom line of the display.  
With value 0%, the M-Factor is disabled. The M-Factor (MF) is shown at the top-line of the display. The minimum value to be entered is 0.000001 and the maximum value is 9.999999.  
The MF is mostly a figure around 1.000000, like 0.945354 or 1.132573 and always has six decimals, but the decimal separator is not shown.

**LINEARIZE  
6G**





This setting is used to enable or disable the linearization function.

### 3.1.8. EXPLANATION OF SETUP MENU 7 - ANALOG

A linear 4-20mA signal (option AB: 0-20mA or option AU: 0-10V) output signal is generated that represents the flow rate. The settings for the flow rate influence the analog output directly. The relationship between the flow rate and the analog output is set with the following settings.

<b>OUTPUT 71</b>  <p>Note !</p>	<p>If the analog output is not used, select disable to minimize the power consumption (e.g. save battery life-time). <i>Option AP: When a power supply is available but the output is disabled, a 3.5mA signal will be generated.</i></p>
<b>RATE-MIN 72</b>	<p>Enter here the flow rate at which the output should generate the minimum signal (0)4mA or 0V - in most applications at zero flow. The number of decimals shown depend upon setup 23. The engineering units/time (e.g. L/min) are dependent upon setup 21 and 22.</p>
<b>RATE-MAX 73</b>	<p>Enter here the flow rate at which the output should generate the maximum signal (20mA or 10V) - in most applications at maximum flow. The number of decimals shown depend upon setup 23. The engineering units/time (e.g. L/min) are dependent upon setup 21 and 22.</p>
<b>CUT-OFF 74</b>	<p>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, 20mA or 10V. When the flow is less than the required rate, the current will be the minimum signal (0)4mA or 0V. <b>Example:</b> Calculate the cut-off. Rate-min: 0L/min [4mA], Rate-max: 100 L/min [16mA], Cut-off: 2% <b>Required rate [L/min]:</b> (rate-max - rate-min)*cut-off: (100-0)*2%=2.0L/min <b>Output [mA]:</b> rate-min + (rate-max*cut-off): 4+(16*2%)=4.32mA</p>



<div>TUNE-MIN 75</div> <div>   Note !</div>	<p>The (0)4mA or 0V value can be tuned precisely with this setting. The initial minimum analog output value is (0)4mA or 0V. However, this value might differ slightly due to ambient influences such as temperature for example.</p> <p><b>Before tuning the signal, be sure that the analog signal is not being used for any application!</b></p> <p>After pressing PROG, the current will be about 4mA (0mA or 0V). The current can be increased / decreased with the arrow keys and is directly active. Press ENTER to store the new value.</p> <p><i>If required, you can program the analog output 'up-side-down'. The (0)4mA or 0V represents the maximum flow rate and the 20mA or 10V represents the minimum flow rate.</i></p>																																																							
<div>TUNE-MAX 76</div> <div>   Note !</div>	<p>The 20mA or 10V value can be tuned precisely with this setting. The initial maximum analog output value is 20mA or 10V. However, this value might differ slightly due to ambient influences such as temperature for example.</p> <p><b>Before tuning the signal, be sure that the analog signal is not being used for any application!</b></p> <p>After pressing PROG, the current will be about 20mA or 10V. The current can be increased / decreased with the arrow keys and is directly active. Press ENTER to store the new value.</p> <p><i>If required, you can program the analog output 'up-side-down'. The (0)4mA or 0V represents the maximum flow rate and the 20mA or 10V represents the minimum flow rate.</i></p>																																																							
<div>FILTER 77</div>	<p>This setting is used to stabilize the output signal. With the help of this digital filter a more stable but less actual representation of the flow rate can be obtained.</p> <p>The filter principal is based on three input values: the filter level (01-99), the last calculated flow rate and the last average value. The higher the filter level, the longer the response time on a value change will be.</p>																																																							
<div>FILTER VALUE</div>	<div>RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE. TIME IN SECONDS</div> <table><tr><th>INFLUENCE</th><th>50%</th><th>75%</th><th>90%</th><th>99%</th></tr><tr><td>01</td><td>filter disabled</td><td>filter disabled</td><td>filter disabled</td><td>filter disabled</td></tr><tr><td>02</td><td>0.1 sec</td><td>0.2 sec</td><td>0.4 sec</td><td>0.7 sec</td></tr><tr><td>03</td><td>0.2 sec</td><td>0.4 sec</td><td>0.6 sec</td><td>1.2 sec</td></tr><tr><td>05</td><td>0.4 sec</td><td>0.7 sec</td><td>1.1 sec</td><td>2.1 sec</td></tr><tr><td>10</td><td>0.7 sec</td><td>1.4 sec</td><td>2.2 sec</td><td>4.4 sec</td></tr><tr><td>20</td><td>1.4 sec</td><td>2.8 sec</td><td>4.5 sec</td><td>9.0 sec</td></tr><tr><td>30</td><td>2.1 sec</td><td>4 sec</td><td>7 sec</td><td>14 sec</td></tr><tr><td>50</td><td>3.5 sec</td><td>7 sec</td><td>11 sec</td><td>23 sec</td></tr><tr><td>75</td><td>5.2 sec</td><td>10 sec</td><td>17 sec</td><td>34 sec</td></tr><tr><td>99</td><td>6.9 sec</td><td>14 sec</td><td>23 sec</td><td>45 sec</td></tr></table>	INFLUENCE	50%	75%	90%	99%	01	filter disabled	filter disabled	filter disabled	filter disabled	02	0.1 sec	0.2 sec	0.4 sec	0.7 sec	03	0.2 sec	0.4 sec	0.6 sec	1.2 sec	05	0.4 sec	0.7 sec	1.1 sec	2.1 sec	10	0.7 sec	1.4 sec	2.2 sec	4.4 sec	20	1.4 sec	2.8 sec	4.5 sec	9.0 sec	30	2.1 sec	4 sec	7 sec	14 sec	50	3.5 sec	7 sec	11 sec	23 sec	75	5.2 sec	10 sec	17 sec	34 sec	99	6.9 sec	14 sec	23 sec	45 sec
INFLUENCE	50%	75%	90%	99%																																																				
01	filter disabled	filter disabled	filter disabled	filter disabled																																																				
02	0.1 sec	0.2 sec	0.4 sec	0.7 sec																																																				
03	0.2 sec	0.4 sec	0.6 sec	1.2 sec																																																				
05	0.4 sec	0.7 sec	1.1 sec	2.1 sec																																																				
10	0.7 sec	1.4 sec	2.2 sec	4.4 sec																																																				
20	1.4 sec	2.8 sec	4.5 sec	9.0 sec																																																				
30	2.1 sec	4 sec	7 sec	14 sec																																																				
50	3.5 sec	7 sec	11 sec	23 sec																																																				
75	5.2 sec	10 sec	17 sec	34 sec																																																				
99	6.9 sec	14 sec	23 sec	45 sec																																																				

### 3.1.9 EXPLANATION OF SETUP MENU 8 - PULSE

One transistor or mechanic relay output is available as a scaled pulse output according to the total.

<b>WIDTH</b> <b>81</b>	<p>The pulse width determines the time that the output will be active; in other words the pulse duration. Value "zero" will disable the pulse output.</p> <p>The pulse signal always has a 50% duty cycle, hence the minimum time between the pulses is equal to the pulse width setting. If the frequency should go out of range – when the flow rate increases for example – an internal buffer will be used to "store the missed pulses": As soon as the flow rate slows down, the buffer will be "emptied".</p> <p>It might be that pulses will be missed due to a buffer-overflow, so it is advised to program this setting within its range!</p>
<b>DECIMALS</b> <b>82</b>	<p>This setting is used to set the amount of digits behind the decimal point for the amount.</p>
<b>AMOUNT</b> <b>83</b>	<p>A pulse will be generated every time a certain quantity is added to the total. Enter this quantity here while taking the decimals for pulse into account.</p>

### 3.1.10. EXPLANATION OF SETUP-MENU 9 - COMMUNICATION (OPTION)

This product is designed for the connection to a communication network. Products with a communication option do not include cyber security functions. Fluidwell cannot take any responsibility for the cyber security, omissions or errors in the communication safety. To maintain a secure operation, automation and control, it is the sole responsibility of the owner to install and manage the appropriate safety measures to protect the network, the product and the communication against any kind of security breaches.

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

<b>SPEED 91</b>	This setting is used to set the Baudrate. 9600 is a low power setting, 9600HP is a high power setting (Modbus compliant).
<b>ADDRESS 92</b>	This setting is used to set the communication address for the F112-A.
<b>MODE 93</b>	This setting is used to set the Modbus transmission mode. Select OFF to disable the communication.
<b>DATABITS 94</b>	This setting determines for communication the number of data bits. Select 8 bit for BUS-RTU and 7 bits for BUS-ASC.
<b>PARITY 95</b>	As demanded by the connected equipment, select a parity bit (odd, even or none).

### 3.1.11. EXPLANATION OF SETUP-MENU A - OTHERS

For support and maintenance it is important to have information about the characteristics of the F112-A. Your supplier will ask for this information when support is required.

<b>MODEL A1</b>	This setting shows the model name.
<b>SOFTWARE VERSION 92</b>	This setting shows the version number of the firmware (software).
<b>SERIAL NO A3</b>	This setting shows the serial number.
<b>PASSWORD A4</b>	This setting is used to set a password (pin code) to limit the access for the setup menu. Only persons who know the pin code can access the setup menu. The pin code 0000 disables the pin code to allow for access by any person.
<b>TAG-NR A5</b>	This setting is used to set a tag number for the F112-A .



## 4. INSTALLATION

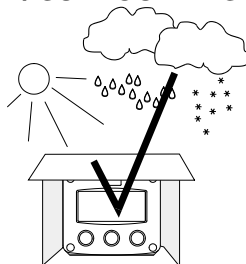
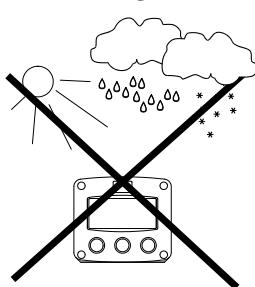
### 4.1. General directions



Caution !

- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Make sure, 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 persons authorized by the operator of the facility.
- Take careful notice of the "Safety rules, instructions and precautionary measures" at the front of this manual.

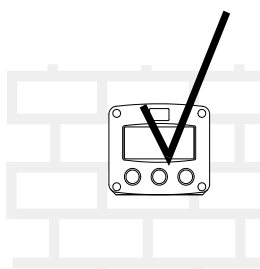
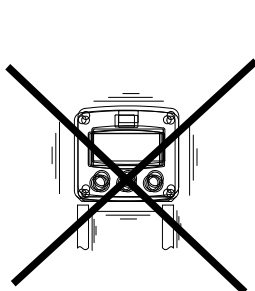
### 4.2. INSTALLATION / SURROUNDING CONDITIONS



Take the relevant IP classification of the enclosure into account (see identification plate). Even an enclosure rated for IP67 / TYPE 4(X) should NEVER be exposed to strongly varying (weather) conditions.

**When panel-mounted, the front panel of the F112-P is rated for IP65 / TYPE 4(X)!**

When used in very cold surroundings or varying climatic conditions, inside the instrument case, take the necessary precautions against moisture.



Mount the F112-P onto a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE

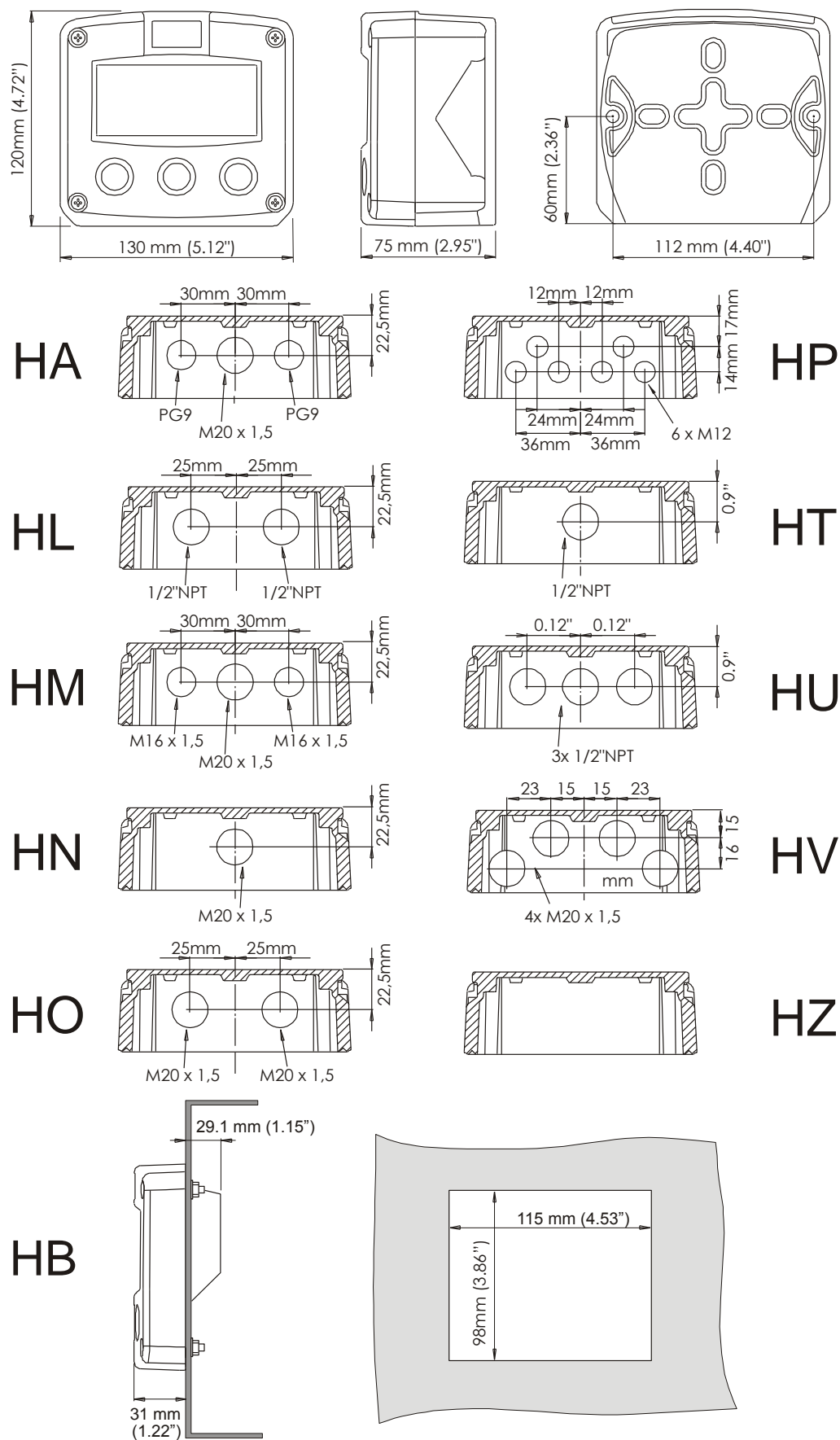


Fig. 5: Aluminum enclosures - Dimensions

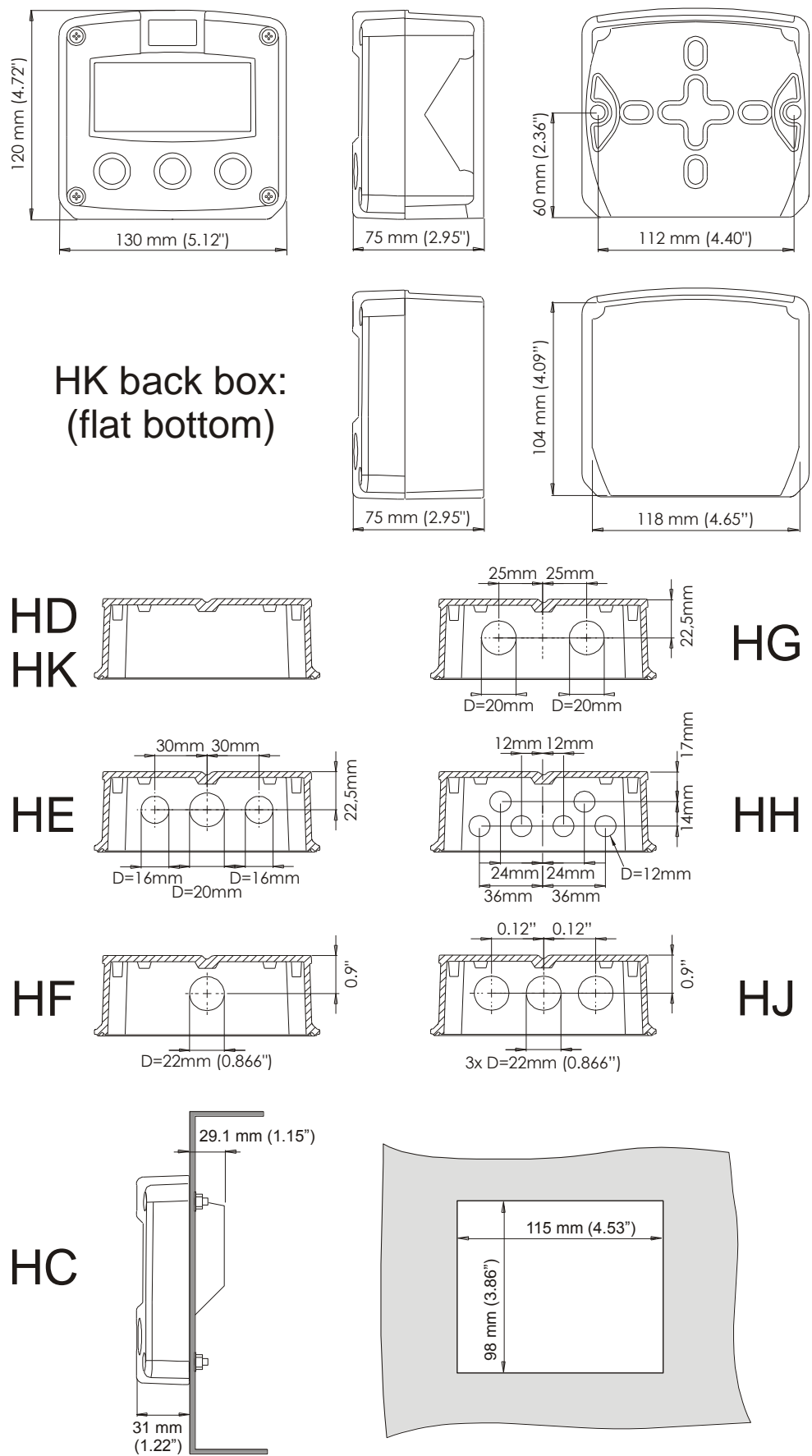


Fig. 6: GRP enclosures - Dimensions

#### 4.4. INSTALLING THE HARDWARE

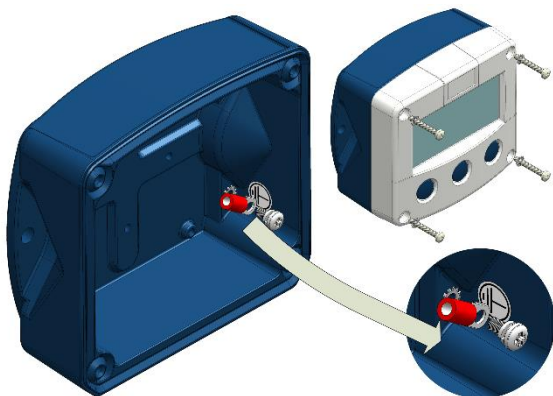


- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the F112-P, the installer has to discharge himself by touching a well-grounded object.
- Do ground the aluminum enclosure properly as indicated. It is the responsibility of the installer to install, connect and test the Protective Earth connections in accordance with the (inter)national Rules and Regulations.
- This chapter shows general information regarding the electrical installation of the F112-P. Chapter 5 gives additional specific information regarding Intrinsically safe installation and overrules the information given in this chapter.
- 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.

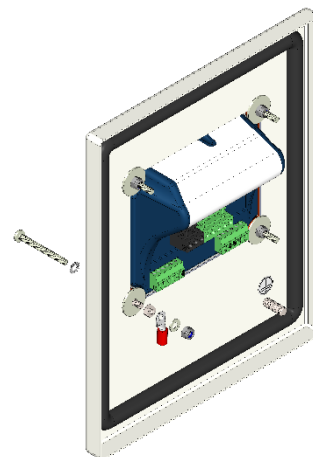


##### 4.4.1. GENERAL INSTALLATION GUIDELINES

- In the F112-P, different types of bonding and earthing are used. The common (ground) is mostly used for termination of the wire shields and the Protective Earth (PE) is used for electrical safety.
- The F112-P that came with a power module type PM; 110V-230V AC or type PD/PF with an option OR (the relays can handle 110V-230V AC) shall be connected to the Protective Earth (PE) stud which is installed in the metal back panel. The metal front panel is connected to the Protective Earth by the mounting screws and serrated washers.
- For V AC applications, the terminal 00 shall not be connected to avoid earth loops. For V DC applications, the terminal 00 shall be connected to the common (do NOT use for PE).
- The wire screens (shield) are meant to prevent electromagnetic interference and shall be, galvanic isolated, connected to the common ground terminals that belong to the specific sensor connection. The wire screens shall be terminated at one side to prevent wire loops. Inside of the Fluidwell unit, the different common ground terminals are connected to each other. It is advised, as illustrated, to terminate the wire screens in the vicinity of the sensor and to insulated the wire screen with a shrink tube at the Fluidwell unit side.
- Separate cable glands with effective IP67 / TYPE 4(X) seals for all wires.
- Unused cable entries: ensure that you fit IP67 / TYPE 4(X) plugs to maintain rating.
- A reliable ground connection for both the sensor, and if applicable, for the metal enclosure (above).
- An effective screened cable for the input signal, and grounding of its screen to the “⊥” terminal or at the sensor itself, whichever is appropriate to the application.



Field mounted



Panel mounted

#### 4.4.2. ALUMINUM ENCLOSURE - FIELD MOUNTED

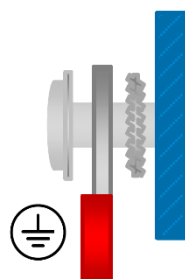


##### Risk of damage to equipment!

Do not use the terminal 00 to connect the protective earth wire, the 00 and the common ground terminals are internally connected. Be careful, to prevent damage to equipment when you connect different power supplies (sensor, PLC, etc.). Inside the Fluidwell display, the common grounds are internally connected to each other.

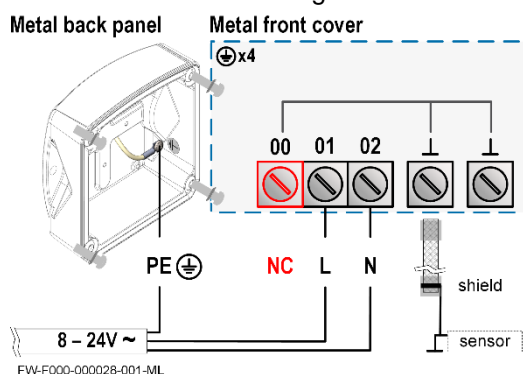
##### The PE connection

The PE connection is made with the PE stud inside the back panel and the 4 mounting screws that attach the cover to the back panel.

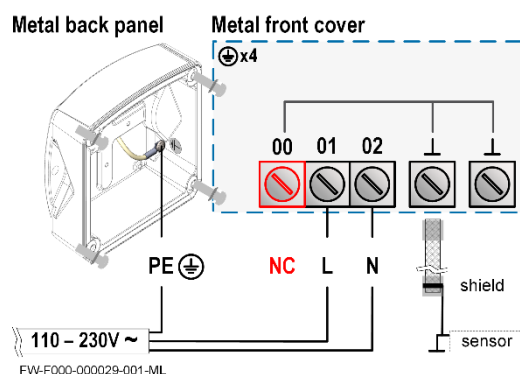


The PE connection in the metal back panel is made with a serrated washer, a terminal, a washer and a screw.

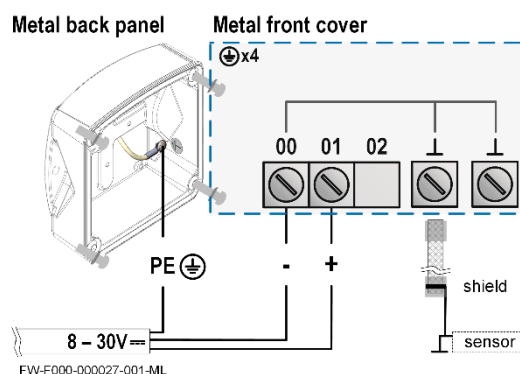
The PE connection to the metal cover is made with the serrated washers and the mounting screws.



Type OR (8-24V AC)



Type PM (110-230V AC)

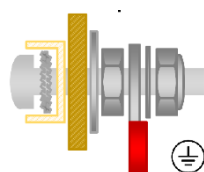


Type OR (8-30V DC)

#### 4.4.3. ALUMINUM ENCLOSURE - PANEL MOUNTED

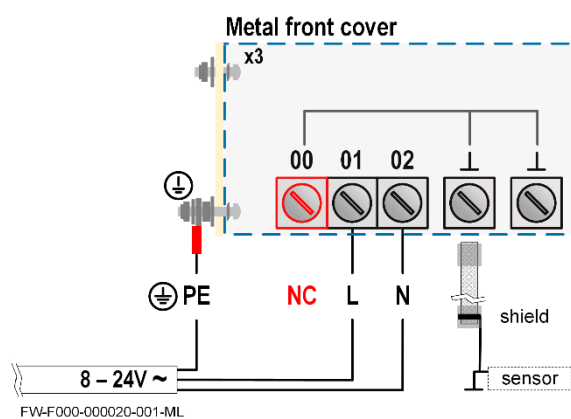
##### The PE connection

The PE connection is made with one of the mounting screws that attaches the front panel to the panel.

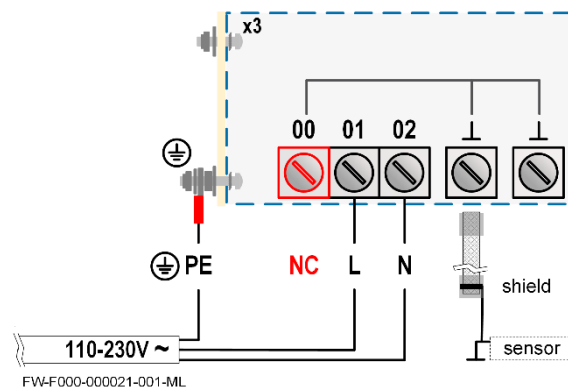


The PE connection to the metal cover is made with the serrated washers and the mounting screws.

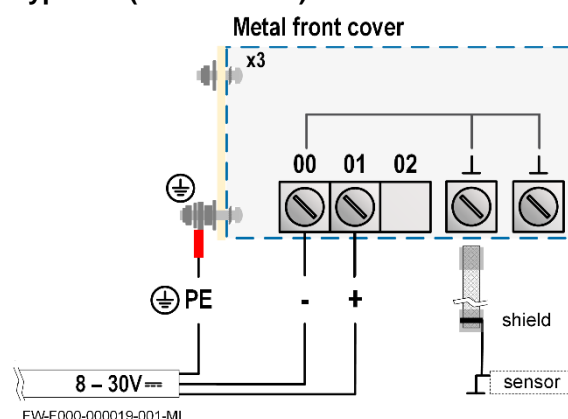
The PE connection to the panel is made with the washer, the nut, the terminal, the washer and a lock nut.



Type OR (8-24V AC)



Type PM (110-230V AC)

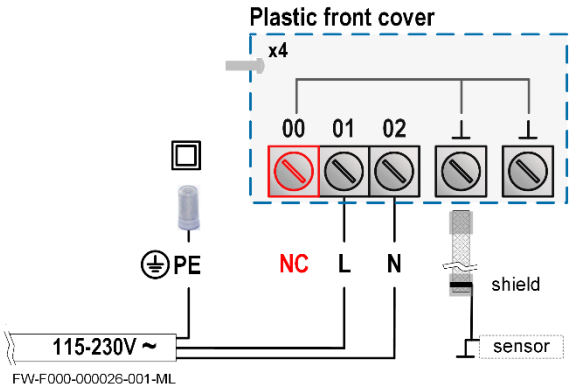


Type OR (8-30V DC)

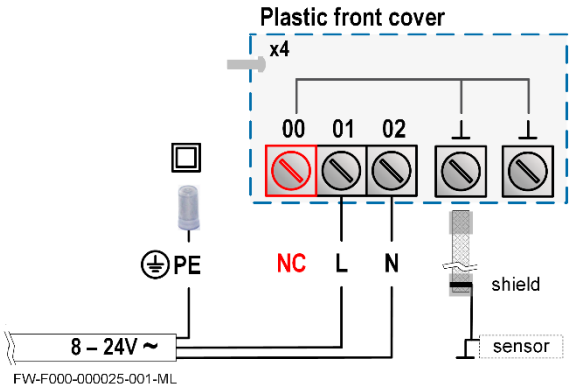
4.4.4. PLASTIC (GRP) ENCLOSURE

The PE connection

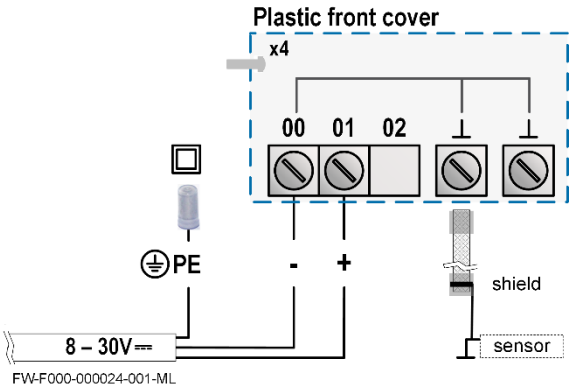
The F112-P in a GRP enclosure meets the requirements of class 2 (double insulated). Therefore the incoming PE wire is terminated with an insulating end cap.



Type PM (110-230V AC)



Type OR (8-24V AC)






Type OR (8-30V DC)

#### 4.4.5. TERMINAL CONNECTORS

Refer to Appendix A: Technical Specification

	Power supply				Digital Output 1		Analog Output		Sensor A Input		Sensor A Supply	External Reset	
	00	01	02		05	06	07	08	09	10	11	12	13
PD; PF ~		L	N								+ ↓		
PD; PF ≡	-	+									+ ↓		
PM ~		L	N								+ ↓		
PX ≡	-	+									+ ↓		
A									⊥	↗ ↘			
OA; OT					⊥	NO							
OR					com								
AA; AB; AI; AP							I-	I+					
AU							U-	U+					
IB												⊥	reset

	PB; PC	Battery supply: 3.6V ≡ (PX remains available, battery supply operates as back-up power)	
	PX	Sensor supply A (11) by software setting	3V ≡
	PD; PF; PM	Sensor supply A (11) by switch 1, 2, 3 and 4	8.2; 12; 24V ≡
		Fieldmount: use the PE terminal and the mounting screws/serrated washers. Panel mount: create a PE terminal by the mounting screws/serrated washers.	

	Communication DTR = 12V DC					
	26	27	28	29	30	31
CB	⊥	+ DTR	RxD↑	TxD↓		
CH	⊥		A	B		
CI	⊥		A	B	Y	Z

FW-F112-000003-001-EN

**Fig. 7: Overview of terminal connectors - Standard configuration and options**

#### 4.4.6. SENSOR SUPPLY

**For type PB/PC; PX; AP:** There is no real sensor supply out available. Only a limited power supply is available. This power supply MAY NOT be used to supply 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). The sensor supply is fixed: 1.2V DC or 3V DC (set by the firmware).

**For type PD; PF; PM:** It is possible to supply the sensor with different voltages. You can set the voltage with the switches. Internal power is only applicable for low power sensors (Coil, Reed). External power is only available when the main external power supply is connected. The sensor supply voltage is selectable: 1.2; 3; 8.2; 12 or 24V DC.

**Set the sensor supply**

1. Make the F112-P safe. If applicable, mind the battery power.
2. Open the F112-P and carefully remove the cable-connectors and the protective cover.
3. Find and set the switches and select the  $V_{out}$  as required.
4. Close the protective cover and install the cable connectors.
5. Close the F112-P.

**Risk of electrocution - High voltage!**

Make sure, all the leads to the terminals are disconnected from the F112-P and NEVER connect the mains power supply to the unit when the protection cover has been removed!

Type PD		Power supply in: 8-24V AC / 10-30V DC				
 FW-PD-000001-001-EN Switch location (typical)		Sensor		V <sub>out</sub> selection		Sensor supply out
		A				
		1	2	3	4	NOTE: Use an AC autotransformer (spartrafo) with galvanic isolation.
		int	-	off	off	Coil 1.2V DC; <1mA Reed 3V DC; <1mA
		ext	-	on on off	on off off	8.2V DC @8V <sub>in</sub> AC / 10V <sub>in</sub> DC 12V DC @10V <sub>in</sub> AC / 14V <sub>in</sub> DC 24V DC @18V <sub>in</sub> AC / 26V <sub>in</sub> DC
Type PF		Power supply in: 15-24V AC / 20-30V DC				
 FW-PFPM-000001-001-EN Switch location (typical)		Sensor		V <sub>out</sub> selection		Sensor supply out
		A				
		1	2	3	4	
		int	-	off	off	Coil 1.2V DC; <1mA Reed 3V DC; <1mA
		ext	-	on on off	on off off	8.2V DC @8V <sub>in</sub> AC / 10V <sub>in</sub> DC 12V DC @10V <sub>in</sub> AC / 14V <sub>in</sub> DC 24V DC @18V <sub>in</sub> AC / 26V <sub>in</sub> DC
Type PM		Power supply in: 115V - 230V AC				
 FW-PFPM-000001-001-EN Switch location (typical)		Sensor		V <sub>out</sub> selection		Sensor supply out
		A				
		1	2	3	4	
		int	-	off	off	Coil 1.2V DC; <1mA Reed 3V DC; <1mA
		ext	-	on on off	on off off	8.2V DC 12V DC 24V DC

Fig. 8: Sensor supply voltage - Switch setting

**Terminal 05-06; scaled pulse output R1:**

Setup 8 (read chapter 3). determines the pulse output function. The maximum pulse frequency of this output is 500Hz. If a relay output option has been supplied, be sure that the output frequency does not exceed 5Hz or else the life-time of the relay will be reduced significantly.

**Type OA:**

An active 24V DC pulse signal output is available with this option.

Max. driving capacity 50mA@24V per output. (Requires power supply type PD/PF/PM).

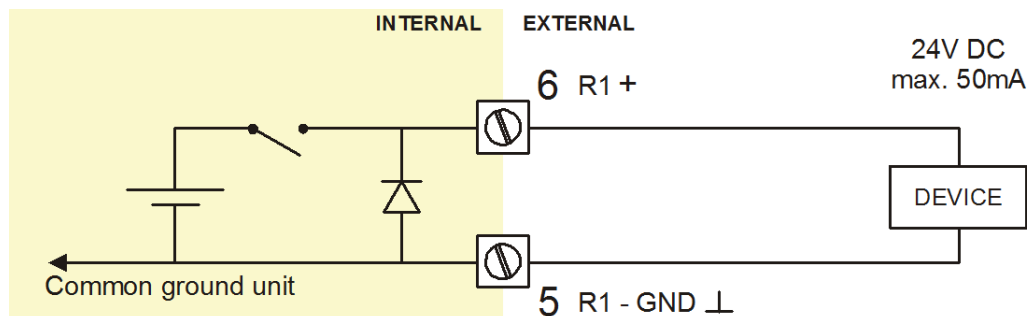


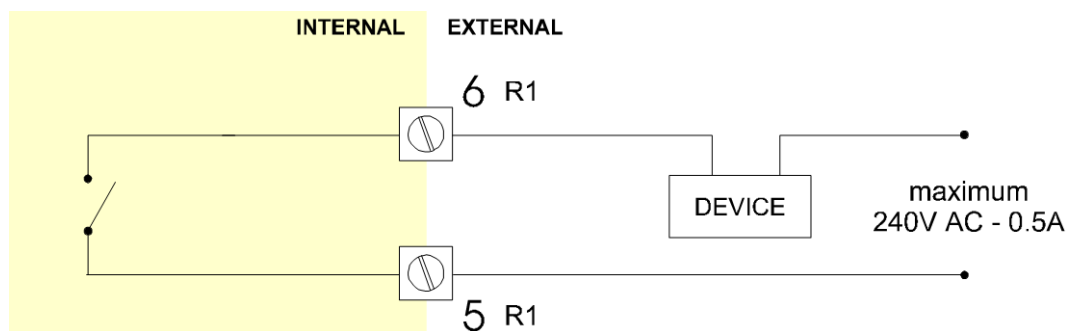
Fig. 9: Terminal connections - Active output (typical)



**Type OR:**

A mechanical relay output is available with this option.

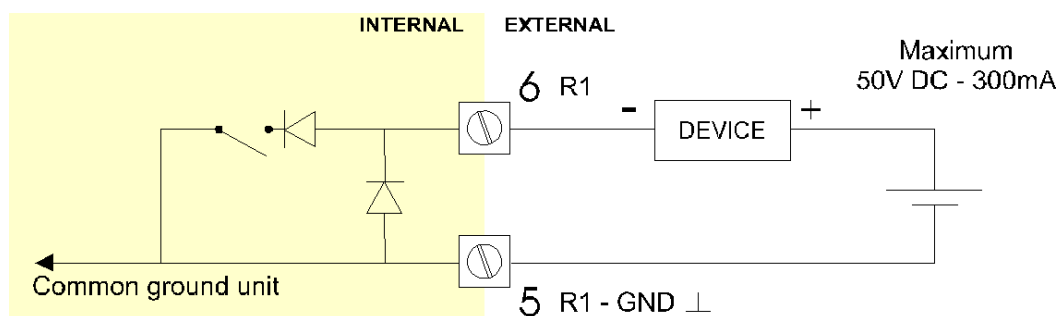
Max. switch power 240V 0,5A per output. (Requires power supply type PD/PF/PM). Be sure that the output frequency does not exceed 5Hz, else the relay life time will be reduced significantly.



**Fig. 10: Terminal connections - Mechanical relay output (typical)**

**Type OT:**

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



**Fig. 11: Terminal connections - Pulse output (typical)**

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

Connect an external power supply of 8-30VDC to these terminals or a (0)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.

**Terminal 07-08 analog output (SETUP 8) :**

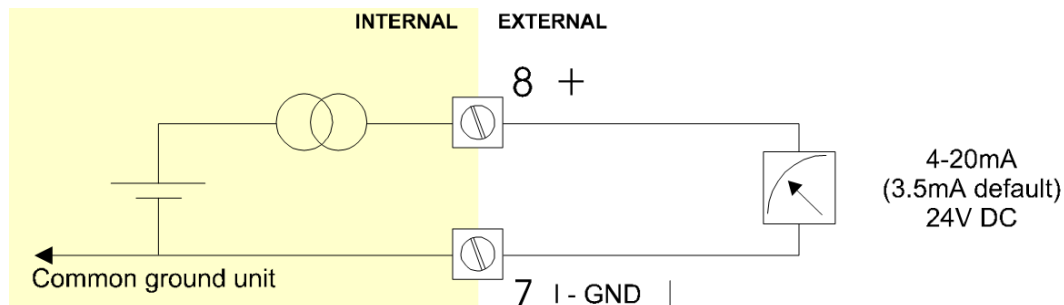
An analog output signal proportional to the flow rate is available as standard.

**Type AA:**

An active 4-20mA signal proportional to the flow rate is available with this option.

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

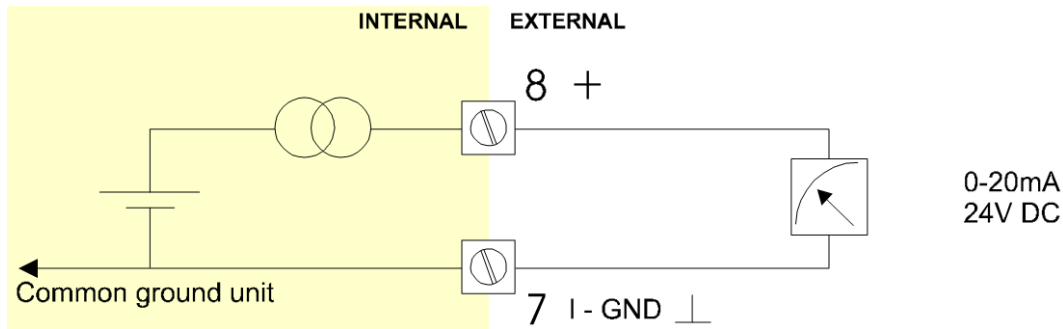
Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD/PF/PM).



**Fig. 12: Terminal connections - 4-20mA analog output (typical)**

**Type AB:**

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



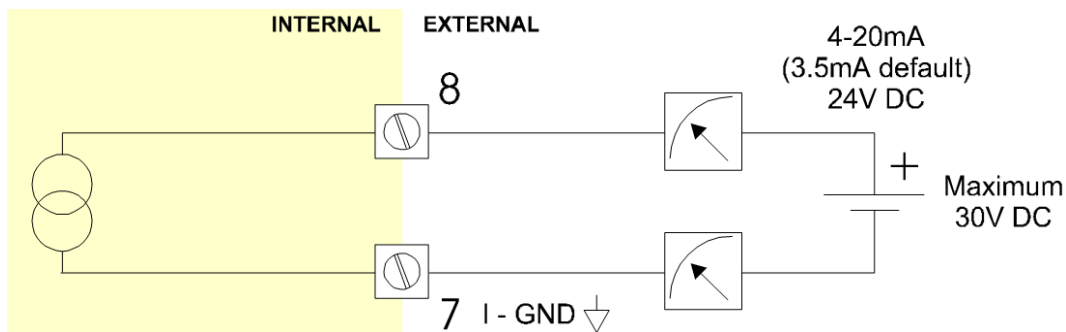
**Fig. 13: Terminal connections - Active 0-20mA analog output (typical)**

**Type AF:**

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

**Type AI:**

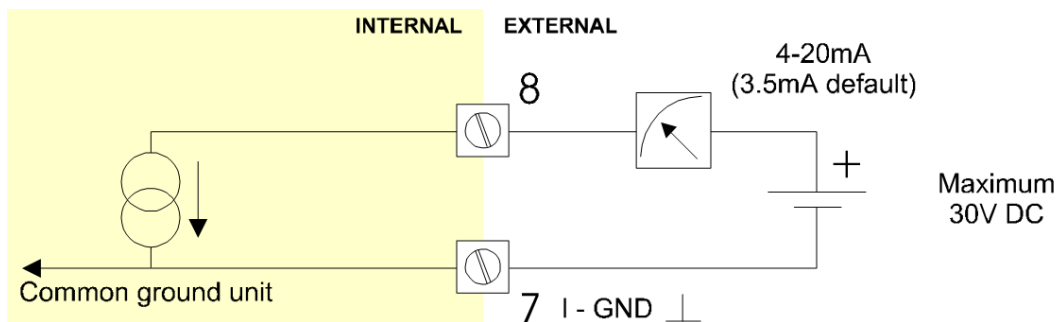
An isolated 4-20mA signal proportional to the flow rate is available with this option.  
When the output is disabled, a 3.5mA signal will be generated on these terminals.  
Max. driving capacity 1000 Ohm @ 30VDC. This option can be used with a battery powered unit but the life time of the battery is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



**Fig. 14: Terminal connections - Isolated 4-20mA analog output (typical)**

**Type AP:**

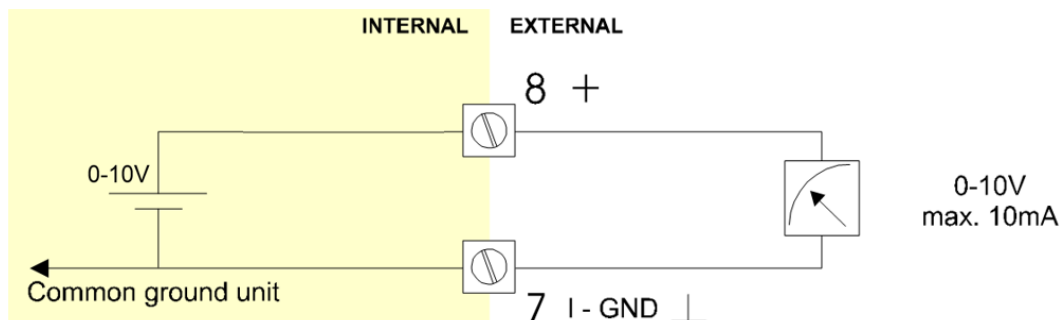
A passive 4-20mA signal proportional to the flow rate is available with this option. When a power supply is connected but the output is disabled, a 3.5mA signal will be generated.  
Max. driving capacity 1000 Ohm. This output does loop power the unit as well.



**Fig. 15: Terminal connections - Passive 4-20mA analog output (typical)**

**Type AU:**

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

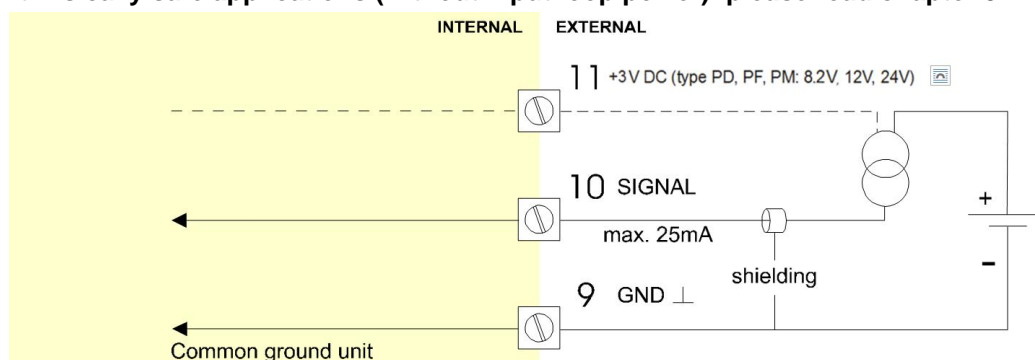


**Fig. 16: Terminal connections - Active 0-10V analog output (typical)**

**Terminal 09-11: Type A – Flowmeter input (general)**

The F112-A requires a (0)4-20mA flowmeter signal which will be processed 4 times a second with a 16 bits accuracy. The input is not isolated.

**For Intrinsically safe applications (without input loop power): please read chapter 5.**

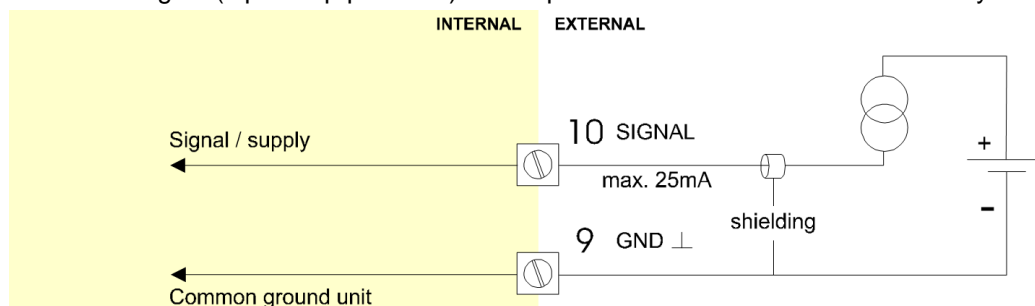


**Fig. 17: Terminal connections - Analog signal input (typical)**

**Terminal 09-10: Type A-PL – Flowmeter input / power supply:**

The F112-A-PL requires a 4-20mA flowmeter signal which has a double function:

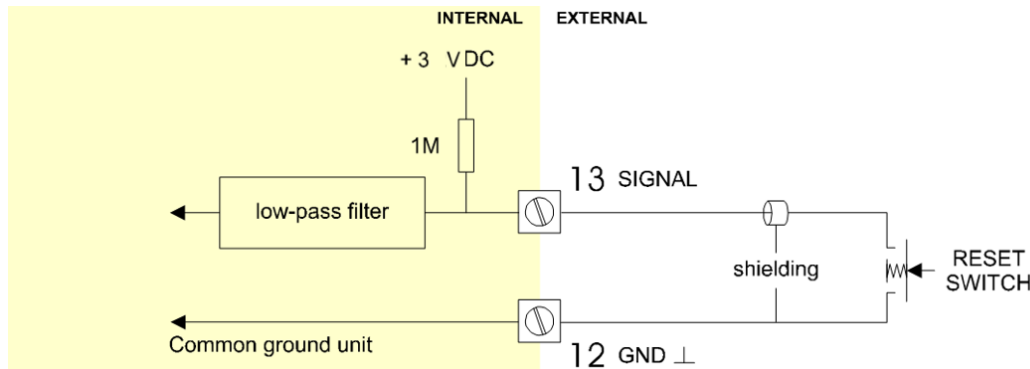
The signal will be processed 4 times a second with a 16 bits accuracy and the unit will be powered from the sensor signal (input loop powered). The input is not isolated and not intrinsically safe.



**Fig. 18: Terminal connections - Analog signal input – Loop-powered (typical)**

**Terminal 12-13: Type IB – external reset:**

With this function the total can be reset to zero with an external switch. The Total resets only when the switch **opens**. When a Normally Closed (NC) contact is used, the local clear total function is disabled and a clear total is only possible with the external reset command. The input must be switched with a potential free contact to the terminal 12.



**Fig. 19: Terminal connections - External reset (typical)**

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

For connections, refer to figure: Overview of terminal connectors - Standard configuration and options

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.

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 00 - 01: type ZB backlight (option):**

If the unit is supplied with a power supply:

- type PD, PF or PM, the backlight supply is integrated.
- type PX, use the terminals 00 and 01 to supply the backlight.

The backlight intensity is set in the setup menu: Display.

## 5. INTRINSICALLY SAFE APPLICATIONS

### 5.1. GENERAL INFORMATION AND INSTRUCTIONS



- 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.
- Certificates, safety values, control drawing and declaration of compliance can be found in the document named: "Fluidwell F1...-XI - Documentation for Intrinsic safety".
- For installation under ATEX directive: this Intrinsically safe device must be installed in accordance with the latest ATEX directive and 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. Read chapter 6 for battery replacement instructions.
- When the enclosure of the F112-P is made of aluminum alloy, when used in a potentially explosive atmosphere requiring apparatus of EPL Ga, the indicator shall be installed so, 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.
- 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 EN 60079-11.
- To maintain the degree of protection of at least IP65 in accordance with IEC 60529, suitable cable entries and blanking elements must be used and correctly installed.
- For enclosures and windows with a high surface resistance, potential charging hazard exists. Do not rub these surfaces of the indicator. Clean window and enclosure only with a lint-free cleaning cloth made damp with a mild soap solution.
- Chapter 4 shows general information regarding the electrical installation of your indicator. This chapter gives additional specific information regarding Intrinsically safe installation and overrules the information given in chapter 4.



Caution !

- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Make sure, 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 persons authorized by the operator of the facility.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.



Note !

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

Serial number and year of production

This information can be looked-up in the setup menu: Others.

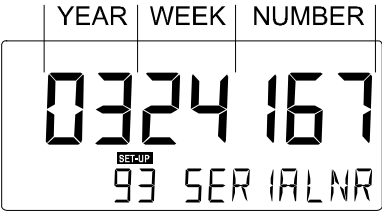


Fig. 20: Example serial number (typical)

Label information pulse input type – F1xx-...-XI (inside and outside the enclosure)



Fig. 21: Label information - Intrinsically safe application (typical)

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 (type PC);
  - the external supply connected to terminals 0 and 1 (type PD);
  - the circuit supply connected to terminals 7 and 8 (type 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 F112-P-...-XI:

For intrinsically safe applications, consult the safety values in the certificate.

	Power supply				Digital Output 1		Analog Output		Sensor A Input Supply			External Reset	
	00	01	02		05	06	07	08	09	10	11	12	13
PD	-	+									+ ↓		
PX	-	+									+ ↓		
A									⊥	↗			
OT					⊥	⏏							
AF; AP							I-	I+					
IB												⊥	reset

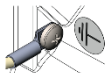


PC Battery supply: 3.6V   
(PX remains available, battery supply operates as back-up power)



PX Sensor supply A (11) by software setting

3V



PD Sensor supply A (11) by switch 1, 2, 3 and 4

8.2



Fieldmount: use the PE terminal and the mounting screws/serrated washers.  
Panel mount: create a PE terminal by the mounting screws/serrated washers.

	Communication (DTR = 12V DC)					
	26	27	28	29	30	31
CT	⊥	+ DTR	RxD↑	TxD↓		

FW-F112-000004-001-EN

Fig. 22: Overview terminal connectors XI - Intrinsically safe applications

Explanation Intrinsically safe options:

Type AF – Intrinsically safe floating 4-20mA analog output:

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

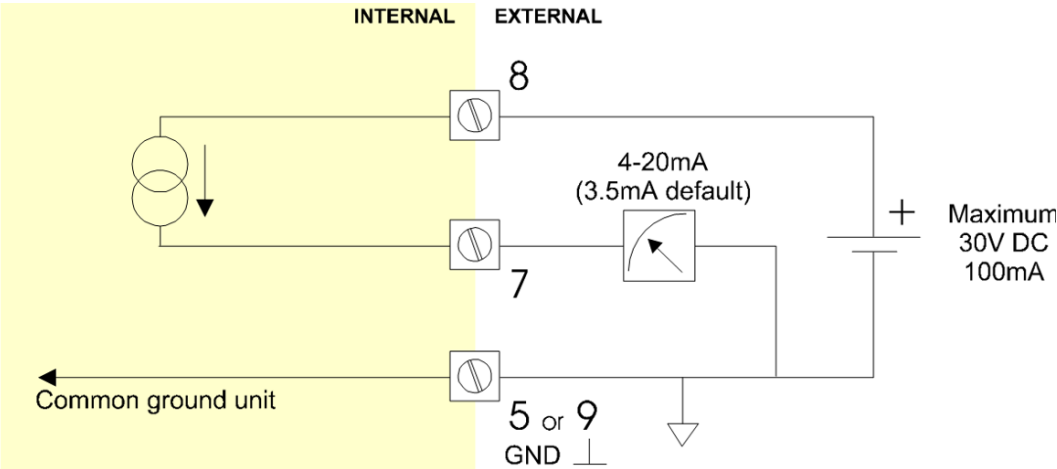


Fig. 23: Terminal connections - Intrinsically safe floating 4-20mA analog output (typical)

**For type PD-XI:** It is possible to supply the sensor with different voltages. You can set the voltage with the switches. Internal power is only applicable for low power sensors (Coil, Reed). The sensor supply is set by the firmware: 1.2V DC or 3V DC. External power is only available when the main external power supply is connected. The sensor supply voltage is fixed: 8.2V DC.

Set the sensor supply

1. Make the F112-P safe. If applicable, mind the battery power.
2. Open the F112-P and carefully remove the cable-connectors and the protective cover.
3. Find and set the switches and select the  $V_{out}$  as required.
4. Close the protective cover and install the cable connectors.
5. Close the F112-P.



Risk of electrocution - High voltage!

Make sure, all the leads to the terminals are disconnected from the F112-P and NEVER connect the mains power supply to the unit when the protection cover has been removed!

Type PD-XI		Power supply in: 16-30V DC / max. 1W			
<div> <div> <div>1</div> <div>2</div> </div> <div> <div>on off</div> <div>on off</div> </div> </div> <div>FW-PD-000002-001-EN</div> <div>Switch location (typical)</div>		Sensor		Sensor supply out	
		A			
		1	2		
		off	-		Coil 1.2V DC; <1mA Reed 3V DC; <1mA
		on	-		8.2V DC; 7mA (max)

Fig. 24: Switch position voltage selection type PD-XI



## 5.3. CONFIGURATION EXAMPLES INTRINSICALLY SAFE APPLICATIONS

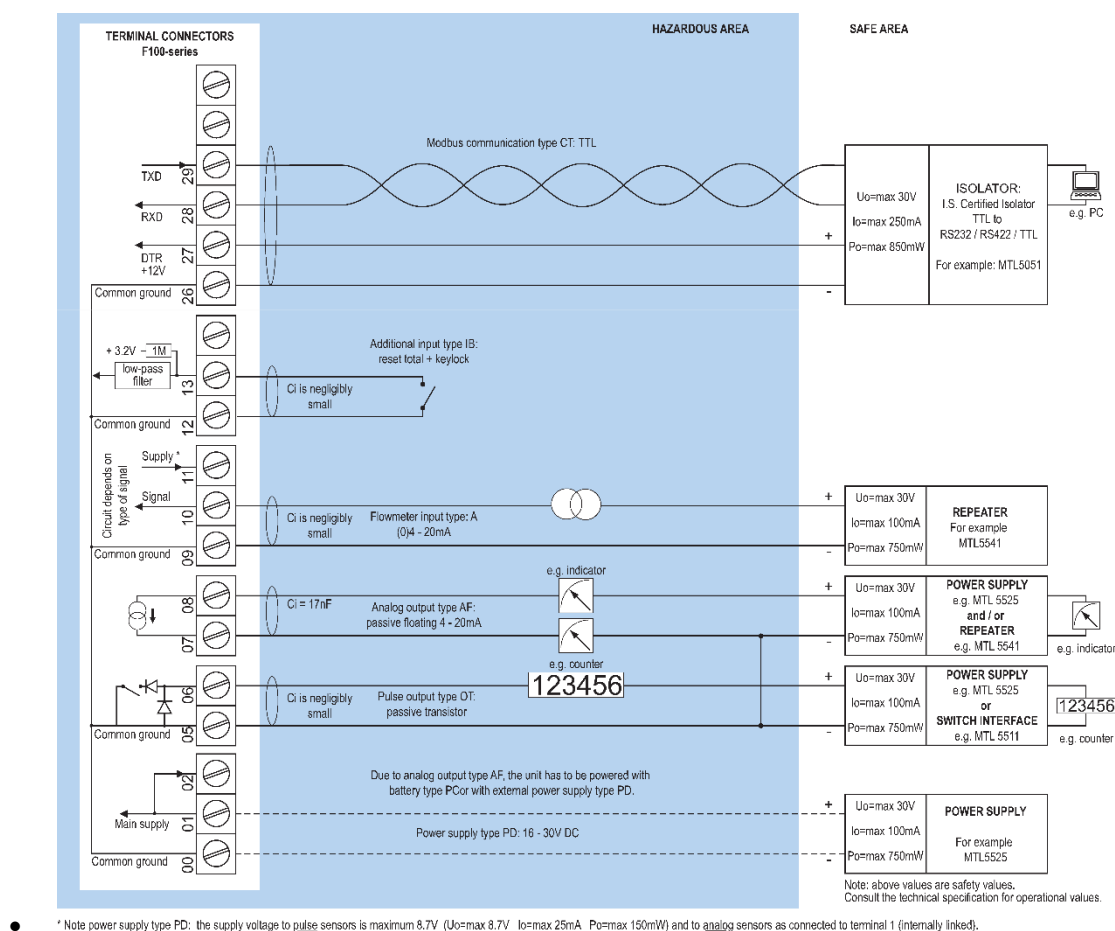
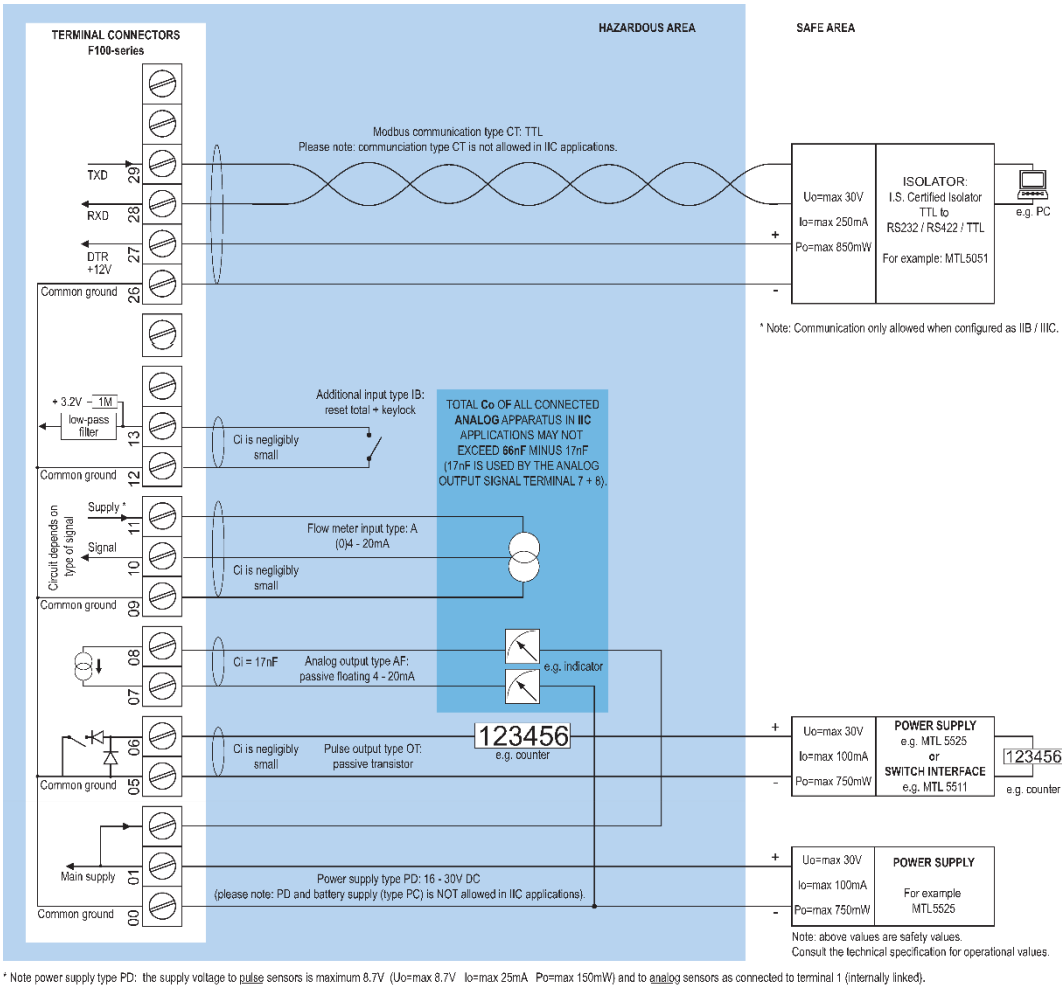


Fig. 25: F112-A-AF-CT-IB-OT-(PC)-(PD)-XI - Battery powered - IIB/IIC – IIIC



**Fig. 26: F112-A-AF-(CT)-IB-OT-PD-XI - External power supply - IIB/IIIC – IIIC**

## 5.4 BATTERY REPLACEMENT INSTRUCTIONS

### 5.4.1. SAFETY INSTRUCTIONS



- Handle the battery with care. A mistreated battery can become unsafe. Unsafe batteries can cause (serious) injury to persons.
- Only use batteries which are certified for use in hazardous areas. The use of standard batteries in hazardous area's is not safe and prohibited. Batteries that are regarded as unsafe can cause (serious) injury to persons and damage to the property.
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- Only use batteries which are certified for use in hazardous areas. The use of standard batteries in hazardous area's is not safe and prohibited. Batteries that are regarded as unsafe can cause (serious) injury to persons and damage to the property.
- For use in hazardous areas we advise to apply FW-LiBAT batteries only.

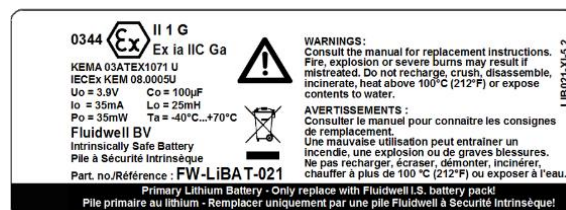
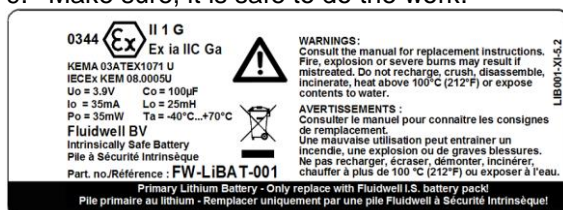


Caution !

### 5.4.2. REPLACE THE BATTERY (HAZARDOUS AREA)

The batteries are used to store electrical energy. The battery is a high power battery which must be treated carefully. When the battery is mistreated or damaged, there is a risk of a fire, an explosion and serious burns.

1. Mind that you cannot switch off a battery.
2. Make sure, it is safe to work on the battery system.
3. Handle the battery with the utmost care to prevent a short circuit and damage.
4. Do not recharge, crush, disassemble, incinerate, heat above its rated temperature or expose the contents to water.
5. Dispose of the battery in accordance with the (inter)national, the manufacturer's and the plant owner's standards and regulations.
6. Read and understand the instructions.
7. Get approval from the safety officer to do the work.
8. Lock-out/Tag-out the unit and related system.
9. Make sure, it is safe to do the work.



### REMOVE THE BATTERY

1. If necessary, clean the housing with an anti-static cloth made damp with a mild soap solution.
2. Let the enclosure dry onto the air.
3. Carefully, open the enclosure.
4. Keep the removed parts in a clean location.
5. Get access to the battery.
6. Find the battery connector and disconnect the battery from the unit.
7. Remove and keep the battery from the unit.
8. Install an insulation tape over the battery connector to prevent a short circuit.

### INSTALL THE BATTERY

1. Make sure, the new battery is certified for use in the unit.
2. Work as clean as possible, to prevent contamination to enter the unit.
3. Carefully, install the battery.
4. Make sure, the battery is correctly locked into the battery holder.
5. Install the battery connector.
6. Carefully assemble the unit and close the enclosure.
7. With the enclosure carefully closed, do a test of the unit.
8. If necessary, get access to the setup menu and make any adjustments to obtain the correct settings.

### 5.4.3. DISPOSAL OF BATTERIES



- Batteries pose an environmental hazard.
- Do not dispose of as general waste or incinerate.
- Return used batteries to a recycling point.

## 6. MAINTENANCE

### 6.1. GENERAL DIRECTIONS



Caution !

- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Make sure, 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 persons authorized by the operator of the facility.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.

The F112-P does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the users responsibility to take all precautions to dehumidify the internal atmosphere of the F112-P in such a way that no condensation will occur, e.g. to put a dose of desiccant (drying agent) inside the enclosure just before closing it. Furthermore, it is required to replace the desiccant periodically as advised by its supplier.

#### Battery life-time:

It is influenced by several issues :

- Type of sensor (read chapter 3): NPN and PNP inputs consume more energy than coil inputs;
- Input frequency: the higher the frequency, the shorter the battery life-time;
- Analog output signal; be sure that an external power supply is connected or that the function is disabled if not in use; or else it will have a major influence on the battery life-time;
- Display update: fast display update uses significantly more power;
- Pulse output and communications;
- Low temperatures; the available power will be less due to battery chemistry.



Note !

*It is strongly advised to disable the unused functions.*

#### Check periodically:

- The condition of the enclosure, cable glands and front panel.
- The input/output wiring for reliability and aging symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the flowmeter might be necessary. Do not forget to re-enter any subsequent Span and linearization alterations.
- The indication for low-battery.
- Clean window and enclosure only with a lint-free cleaning cloth made damp with a mild soap solution.. Do not use any aggressive solvents as these might damage the coating.

### 6.2. REPAIR

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

### 6.3. REPAIR POLICY



If you have any problem with your Fluidwell product and you wish to repair it, please follow the procedure below:

- Obtain a Return Material Authorization (RMA) from your supplier or distributor Together with the RMA, you need to complete a repair form to submit detailed information about the problem.
- Send the product, within 30 days, to the address provided with the RMA. The physical return of your repair can only take place after the authorization of your repair application, as confirmed by the RMA number.

If the product is within the warranty period, it will be repaired or exchanged and returned within three weeks. If the product is no longer under warranty, you will receive a repair estimate.

## APPENDIX A: TECHNICAL SPECIFICATION

GENERAL	
Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Digits	Seven 17mm (0.67") and eleven 8mm (0.31"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec - 30 secs.
Type ZB	LCD with LED backlight. Improved readability in full sunlight and darkness. 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 / TYPE 4(X)
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 / TYPE 4(X)
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").
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)
Relative humidity	90%, no condensation allowed.
Power supply	
Type AP	8-30V DC; Power consumption max. 0.5 Watt.
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 / 8-30V DC; Power consumption max. 5 Watt.
Type PD-ZB	10-24V AC / 12-30V DC; Power consumption max. 5 Watt.
Type PD-XI	16-30V DC; Power consumption max. 1 Watt.
Type PF	15-24V AC / 20-30V DC; Power consumption max. 15 Watt.
Type PM	115-230V AC; Power consumption max. 15 Watt.
Type PX	8-30V DC; Power consumption max. 0.75 Watt.
Type PX-ZB	12-30V DC; Power consumption max. 1.5 Watt.
Type PX-XI	8-30V DC; Power consumption max. 0.75 Watt.
Note I.S. applications	<b>For Intrinsically safe applications, consult the safety values in the certificate.</b>
Sensor excitation	
Type PB / PC / PX	3V DC for low power pulse signals and 1.2V DC for coil pick-up.
Type PD	1.2; 3; 8.2; 12; 24V DC - max. 50mA@24V DC
Type PD-XI	Intrinsically safe: Pulse signals: 1.2; 3; 8.2 - max. 7mA@8.2V DC.
Type PF / PM	1.2; 3; 8.2; 12; 24V DC - max. 400mA@24V DC.

Terminal connections		
Type:	Removable plug-in terminal strip. Wire max. 1.5mm <sup>2</sup> and 2.5mm <sup>2</sup>	
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		
Intrinsically safe Type XI	ATEX approval :  II 1 G Ex ia IIB/IIC T4 Ga II 1 D Ex ia IIIC T100°C Da	IECEx approval : Ex ia IIB/IIC T4 Ga Ex ia IIIC T100°C Da
Explosion proof Type XD/XF	ATEX approval ref:  II 2 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 and Standards		
EMC	EN 61326-1; FCC 47 CFR part 15	
LVD	EN/IEC 61010-1	
ATEX / IECEx	EN/IEC 60079-0; EN/IEC 60079-11	
RoHS	EN 50581	
IP & NEMA	EN 60529: NEMA 250	

## INPUTS

<b>Flowmeter</b>	
Type A	(0)4-20mA - with signal calibration feature at any current within the range.
Accuracy	Resolution: 16 bit.. Error < 0.025mA / $\pm 0.125\%$ FS. Low level cut-off programmable.
Span	0.000010 - 9999999 with variable decimal position.
Update time	Four times a second.
Voltage drop	2.5 Volt
Relationship	Linear and square root calculation.
Note	External power to sensor is required; e.g. type PD.
Linearization	15 positions with interpolation function; Meter-Factor 0.000001 - 9.999999 versus Percentage (0)4-20mA.
<b>Reset</b>	
Type IB	Make contact - external reset totalizer. Additional functionality to lock the RESET button of the keyboard (as long as this contact is being made).
Duration	Minimum 100mSec. to reset Total.

## OUTPUTS

Analog output	
Function	transmitting (linearized) flow rate.
Accuracy	10 bit. Error < 0.05% - update 8 times a second. Software function to calibrate the 4.00mA and 20.00mA levels precisely.
Load	max. 1 kOhm
Option AA	Active 4-20mA output (requires option PD or PM).
Option AB	Active 0-20mA output (requires option PD or PM).
Option AF	Floating 4-20mA output for Intrinsically Safe applications (isolated output)
Option AI	Galvanically isolated output - also for battery powered models.
Option AU	Active 0-10V output (requires option PD or PM).

Transistor output(s)	
Pulse output	Max. frequency 500Hz. Pulse length user definable between 0.001 up to 9.999 seconds.
Function	One pulse output - transmitting accumulated total.
Type OA	Active 24V DC transistor output; max. 50mA per output (requires type AA + PD, PF or PM).
Type OR	Isolated mechanic relay output; max. switch power 230V AC - 0,5A (requires type PF or PM).
Type OT	Passive transistor output - not isolated. Load max. 50V DC - 300mA.
Type OR	Electro-mechanical relay output; max. switch power 230V AC - 0,5A (requires option PF or PM).

Communication option	
Protocol	bus-rtu; bus-asc
Speed	1200; 2400; 4800; 9600
Addressing	1 - 247
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	<ul style="list-style-type: none"> <li>linearized total and/or flow rate.</li> <li>linearized total and linearized accumulated total.</li> <li>total can be reset to zero by pressing the CLEAR-key twice.</li> </ul>

Total	
Digits	7 digits.
Units	L; m3; kg; lb; GAL; USGAL; bbl; no unit
Decimals	0000000; 111111.1; 22222.22; 3333.333
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	0000000; 111111.1; 22222.22; 3333.333
Time units	/sec; /min; /hour; /day

## APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F112-A is going to be installed or while it is in operation.

### **Analog output does not function properly:**

Check:

- is the analog output enabled?
- are the flow-levels programmed correctly?
- connection of the external power-supply according to the specification.

### **Pulse output does not function:**

Check:

- Pulse per "x" quantity (amount); is the value programmed reasonable and will the maximum output be under 20Hz?
- Amount; is the external device able to recognize the selected amount?

### **Flow rate displays "0 / zero" while there is flow (total is counting):**

Check:

- are the Span and time unit correct?

### **Linearization does not work:**

Check:

- is the function enabled?
- are all M-Factors and the frequency entered correctly?

### **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 error code. When multiple errors arise at the same time, their error codes are added and their sum is shown. The digital [d] codes are:

### **Not recoverable by the end user:**

- [d] 0 = no error;
- [d] 1 = display error;
- [d] 2 = data-storage error;
- [d] 3 = error 1 + error 2 simultaneously;
- [d] 4 = initialization error.
- [d] 10 = linearization error (calculated M-Factor out of range)

For a not recoverable error, keep the error code at hand and contact your supplier.



## APPENDIX C: COMMUNICATION VARIABLES

### GENERAL

The product 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). The tables below show the various variables that can be accessed through the communication. Currently, the function codes supported are:

- function code 3 "Read Holding Registers" (4x references);
- function code 16 "Preset Multiple Registers" (4x references).

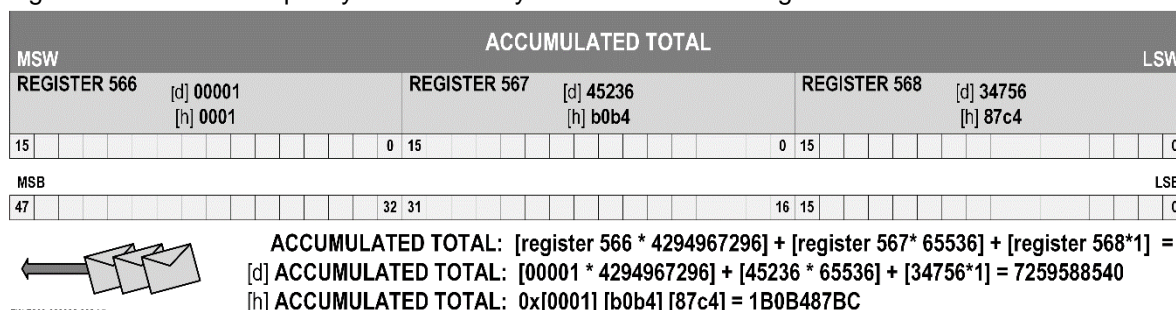
The table below shows the Modbus PDU addresses in a decimal format, followed by its hexadecimal representation (0x0000). When the PLC address range is required (4x references are typically used by PLCs), please add a value of 40001 to the Modbus PDU address. E.g. reading the serial number of the product with PLC-based addressing means: 165 + 40001 = register 40166.

**The variables that consist of a multiple register must always read/write in 1 single action!**

Refer to the illustration:

For this example it is assumed that the variable accumulated total has 3 registers (words) with address 566, 567 and 568. When a transmission is done, register 566, which acts as the MSW, arrives first with bit 15 which is the MSB of the lowest addressed word, but is also the MSB (bit 47) of the complete variable that represents the Accumulated total.

Although most Modbus Masters will support variables that span 2 registers, variables spanning more registers sometimes require you to manually calculate the resulting value.



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

### Runtime variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 572 [h] 0x23C	40573	flow rate	2	r	uint32	0...9999999, Representation: unit, time, decimals depending on variables 48, 49, 50
[d] 566 [h] 0x236	40567	total	3	r*	uint48	0...9999999999, Representation: unit, decimals depending on variables 32, 33
[d] 560 [h] 0x230	40561	accumulated total	3	r	uint48	0...9999999999999999, Representation: unit, decimals depending on variables 32, 33
[d] 516 [h] 0x204	40517	error status (bitfield)	1	r	uint16	0x0001=Display error 0x0002=EEPROM error 0x0004=EEPROM initialization error 0x0010=Linearization error (calculated M-factor out of range)

**Reading flow rate, total or accumulated total:** The returned values are given including the decimals and represent the actual value. The given value may differ from the value that is shown 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 (note that the decimals should be adapted according the setting in "total decimals" which is in this case 2).

\* **Clearing total:** It is possible to clear the total counter by means of writing a value of 0 to all the 3 registers of total/flow rate in a single write action. Writing any other value will result in the reply of an error message because the registers of total/flow rate are during operation read-only.

## Setup variables

PDU ADDRESS	REGISTER	VARIABLE TOTAL	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 32 [h] 0x020	40033	unit	1	r/w	uint16	0=none      3=kg      6= US GAL 1=L      4= lb      7=bbl 2= m <sup>3</sup> 5=gal
[d] 33 [h] 0x021	40034	decimals	1	r/w	uint16	0...3
[d] 34 [h] 0x022	40035	span	2	r/w	uint32	1...9999999 Representation: 0.000001...9999999 depending on variable 54: decimals span.
[d] 37 [h] 0x025	40038	decimals span	1	r/w	uint16	0...6
PDU ADDRESS	REGISTER	VARIABLE FLOWRATE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 48 [h] 0x030	40049	unit	1	r/w	uint16	0=mL      4=g      8=bbl      12=none 1=L      5=kg      9=lb      13=scf 2= m <sup>3</sup> 6=ton      10=cf      14=NM <sup>3</sup> 3=mg      7=GAL      11=rev      15=NL 16=p
[d] 49 [h] 0x031	40050	time unit	1	r/w	uint16	0=/sec      1=/min      2=/hour      3=/day
[d] 50 [h] 0x032	40051	decimals	1	r/w	uint16	0...3
[d] 51 [h] 0x033	40052	span	2	r/w	uint32	1...9999999 Representation: 0.000001...9999999 depending on variable 54: decimals span.
[d] 54 [h] 0x036	40055	decimals span	1	r/w	uint16	0...6
PDU ADDRESS	REGISTER	VARIABLE DISPLAY	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 64 [h] 0x040	40065	display function	1	r/w	uint16	0=total      1=flow rate
[d] 67 [h] 0x043	40068	backlight brightness	1	r/w	uint16	0=off      2=40%      4=80% 1=20%      3=60%      5=100%
PDU ADDRESS	REGISTER	VARIABLE POWER MANAGEMENT	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 80 [h] 0x050	40081	LCD update time	1	r/w	uint16	0=fast      2=3sec      4=30sec 1=1sec      3=15sec      5=off
[d] 81 [h] 0x051	40082	power mode	1	r/w	uint16	0=operational      1=shelf
PDU ADDRESS	REGISTER	VARIABLE LINEARIZATION	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 1024 [h] 0x400	41025	percentage/M-factor	3	r/w	uint48	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 (PDU address 1024 and LSB of PDU address 1025) contain the percentage part, the three most significant bytes (MSB of PDU address 1025 and PDU address 1026) contain the M-factor part.  Valid range for the percentage is (0)4-20mA.. A value of 0 for percenatge means that entry is disabled.  Valid range for the M-factor 0.000000 to 9.999999.
[d]1038 [h]0x40E	41039	Linearization on/off	1	r/w	uint16	0=disable      1=enable

PDU ADDRESS	REGISTER	VARIABLE FLOWMETER	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 98 [h] 0x062	40099	formula	1	r/w	uint16	0=linear 1=square root
[d] 99 [h] 0x063	40100	filter	1	r/w	uint16	1...99
[d] 100 [h] 0x064	40101	cut-off	1	r/w	uint16	0...999 Representation: 0.0 – 99.9%
[d] 102 [h] 0x066	40103	calibrate low	1	r/w	uint16	0=cal set 1=calibrate 2=default
[d] 103 [h] 0x067	40104	calibrate high	1	r/w	uint16	0=cal set 1=calibrate 2=default
PDU ADDRESS	REGISTER	VARIABLE ANALOG	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 112 [h] 0x070	40113	analog output	1	r/w	uint16	0=disable 1=enable
[d] 113 [h] 0x071	40114	minimum rate	2	r/w	uint32	0...9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
[d] 116 [h] 0x074	40117	maximum rate	2	r/w	uint32	0...9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
[d] 119 [h] 0x077	40120	cut off percentage	1	r/w	uint16	0...99 Representation: 0.0 – 9.9%
[d] 120 [h] 0x078	40121	tune minimum rate	1	r/w	uint16	0...9999
[d] 122 [h] 0x07A	40123	tune maximum rate	1	r/w	uint16	0...9999
[d] 127 [h] 0x07F	40128	filter	1	r/w	uint16	1...99
PDU ADDRESS	REGISTER	VARIABLE PULSE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 128 [h] 0x080	40129	pulse width	1	r/w	uint16	0...9999 Representation: 0.001 – 9.999 sec
[d] 133 [h] 0x085	40134	decimals	1	r/w	uint16	0...3
[d] 130 [h] 0x082	40131	amount	2	r/w	uint32	1...9999999 Representation: 0.001...9999999 depending on variables 133, 32
PDU ADDRESS	REGISTER	VARIABLE COMMUNICATION	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 144 [h] 0x090	40145	speed (Baudrate)	1	r/w	uint16	0=1200 3=9600 6=38400 1=2400 4=9600HP 2=4800 5=19200
[d] 145 [h] 0x091	40146	Modbus address	1	r/w	uint16	1...247
[d] 146 [h] 0x092	40147	Modbus mode	1	r/w	uint16	0: ASCII 1: RTU 2: OFF
[d] 247 [h] 0x0F7	40248	databits	1	r/w	uint16	0=7bits 1=8bits
[d] 248 [h] 0x0F8	40249	parity	1	r/w	uint16	0=none 1=even 2=odd
PDU ADDRESS	REGISTER	VARIABLE OTHERS	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 173 [h] 0x0AD	40174	model number	1	r	uint16	0...9999
[d] 160 [h] 0x0A0	40161	model suffix	1	r	char	Representation: ASCII character
[d] 162 [h] 0x0A2	40163	firmware version	2	r	uint32	0...9999999 Representation: nn:nn:nn
[d] 165 [h] 0x0A5	40166	serial no	2	r	uint32	0...9999999 Representation: nnnnnnn
[d] 168 [h] 0x0A8	40169	password	1	r	uint16	0...9999
[d] 170 [h] 0x0AA	40171	tag-nr	2	r/w	uint32	0...9999999 Representation: nnnnnnn

APPENDIX D: DECLARATION OF CONFORMITY



Declaration of Conformity

Fluidwell F1-series indicators

Veghel, July 2016

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

EMC Directive		EN61000-6-2:2005; EN61000-6-3:2007; EN61326-1:2013
RoHS Directive		EN 50581:2012
Low Voltage Directive	For options –PM or –OR:	EN61010-1:2010
ATEX Directive	For option –XI, intrinsically safe:	EN60079-0:2012+A11; EN60079-11:2012
	Protective system:	Ⓜ II 1 G Ex ia IIB/IIC T4 Ga Ⓜ II 1 D Ex ia IIIC T100 °C Da
Certification	Certificates:	KEMA 03ATEX1074 X, Issue 5
	Notified body 0344:	DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, the Netherlands.

Last two digits of the year in which the CE marking was affixed: 03.

I. Meij, Manager Technology

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

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LIST OF CONFIGURATION SETTINGS			
SETTING	DEFAULT	DATE :	DATE :
<b>1 - TOTAL</b>			
11 unit	L		
12 decimals	0000000		
13 span	1600	/sec	/sec
14 decs span	0		
<b>2 - FLOWRATE</b>			
21 unit	L		
22 time unit	/sec		
23 decimals	0000000		
24 span	1600		
25 decs span	0		
<b>3 - DISPLAY</b>			
31 function	total		
32 light	100%		
<b>4 - POWER MANAGEMENT</b>			
41 LCD-new	1 sec		
42 battmode	operational		
<b>5 - FLOWMETER</b>			
51 formula	interpolation		
52 filter	1		
53 cut-off	0.0%		
54 calib-lo	default		
55 calib-hi	default		
<b>6 - LINEARIZATION</b>			
61 percentage %	0.0%		
M-Factor	1.000000		
62 percentage %	0.0%		
M-Factor	1.000000		
63 percentage %	0.0%		
M-Factor	1.000000		
64 percentage %	0.0%		
M-Factor	1.000000		
65 percentage %	0.0%		
M-Factor	1.000000		
66 percentage %	0.0%		
M-Factor	1.000000		
67 percentage %	0.0%		
M-Factor	1.000000		
68 percentage %	0.0%		
M-Factor	1.000000		
69 percentage %	0.0%		
M-Factor	1.000000		
6A percentage %	0.0%		
M-Factor	1.000000		
6B percentage %	0.0%		
M-Factor	1.000000		
6C percentage %	0.0%		
M-Factor	1.000000		
6D percentage %	0.0%		
M-Factor	1.000000		
6E percentage %	0.0%		
M-Factor	1.000000		
6F percentage %	0.0%		
M-Factor	1.000000		
6G linearization	disabled		

LIST OF CONFIGURATION SETTINGS			
SETTING	DEFAULT	DATE :	DATE :
<b>7 - ANALOG OUTPUT</b>			
71 output	disabled		
72 rate-min	0		
73 rate-max	99999		
74 cut off	0.0%		
75 tune min	160		
76 tune max	6656		
77 filter	1		
<b>8 - RELAY OUTPUT</b>			
81 width	0.000		
82 decimals	0000000		
83 amount	1000		
<b>9 - COMMUNICATION</b>			
91 speed	9600		
92 address	1		
93 mode	BUS-RTU		
94 databits	8 bits		
95 parity	none		
<b>A - OTHERS</b>			
A1 model	F112-A	F112-A	F112-A
A2 s-vers	xx.xx.xx		
A3 serial nr	xxxxxxx		
A4 password	0000		
A5 tag-nr	0000000		

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