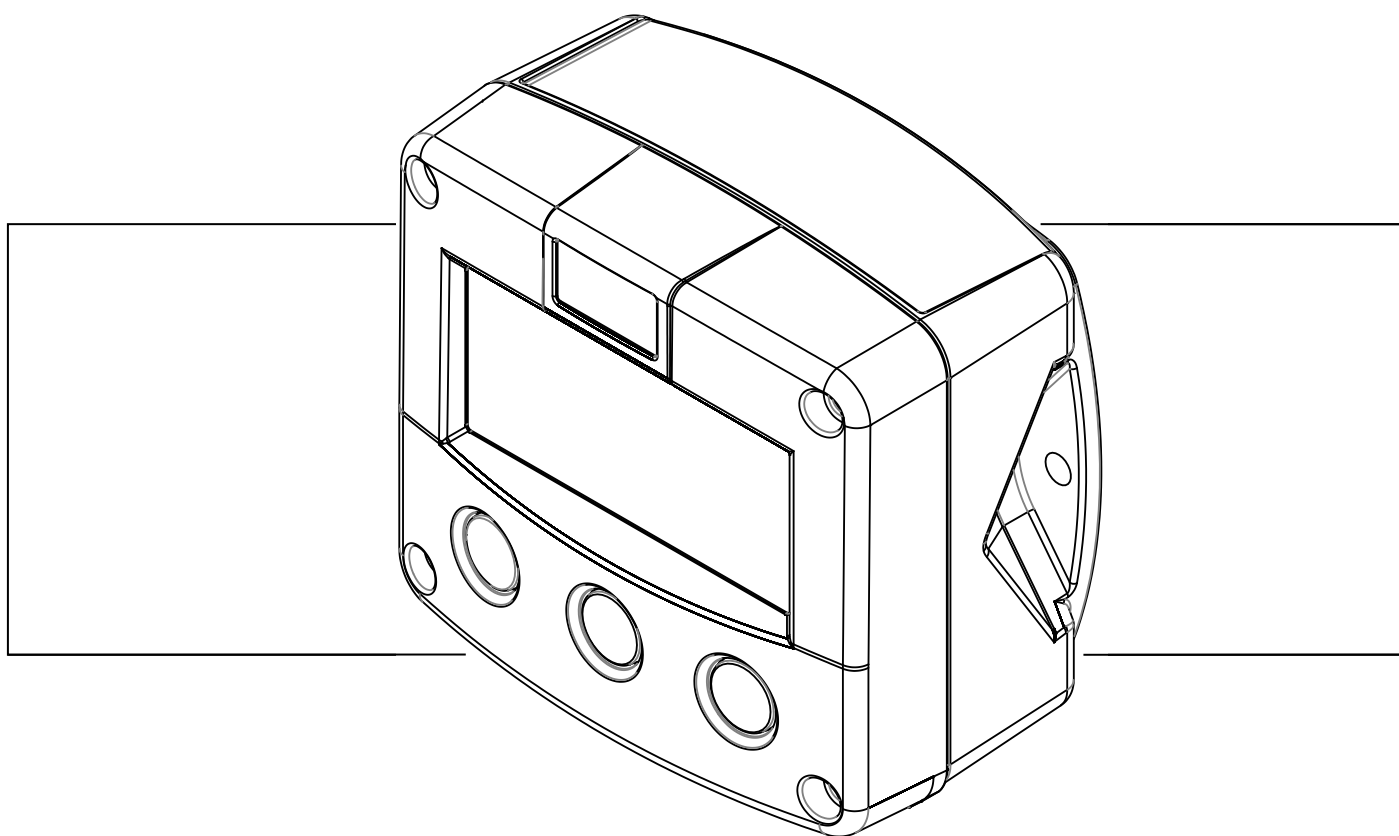# F114-P

Ratio monitor / totalizer
with high / low alarms and analog outputs

Signal input flowmeter: pulse, Namur and coil

Signal outputs: 4-20mA ref. ratio or flow rate

Alarm outputs: maximum four flow rate alarms

Options: Intrinsically Safe, Modbus communication

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

SAFETY INSTRUCTIONS

WARNING

- *Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.*
- *LIFE SUPPORT APPLICATIONS: The F114-P is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.*
- *Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.*
- *This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).*
- **Do connect a proper grounding to the metal enclosure as indicated if the F114-P has an incoming power line which carries a 115-230V AC. The Protective Earth (PE) wire may never be disconnected or removed.**
- *Intrinsic 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 wheelie 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 F114-P 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 F114-P 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 F114-P is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this 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 F114-P or connected instruments.

A "**caution !**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the F114-P or connected instruments.

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

WARRANTY AND TECHNICAL SUPPORT

For warranty and technical support for your Fluidwell products,
visit our internet site www.fluidwell.com or contact us at support@fluidwell.com.

CONTENTS MANUAL

1. INTRODUCTION

1.1. SYSTEM DESCRIPTION

Functions and features

The function of the F114-P is to calculate, show and monitor the ratio between two flows as well as the flow rates and the totals.

This product has been designed with a focus on:

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

Flowmeter input

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

Two flowmeters with a passive or active pulse, Namur or sine wave (coil) signal output can be connected to the F114-P. To power the sensor, several options are available.

Standard outputs

- Max. four configurable alarm outputs: flow rate alarm, high-, low-, high-high- or low-low-flow rate alarm. Switched as long as the flow rate is too high or too low.
- 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.
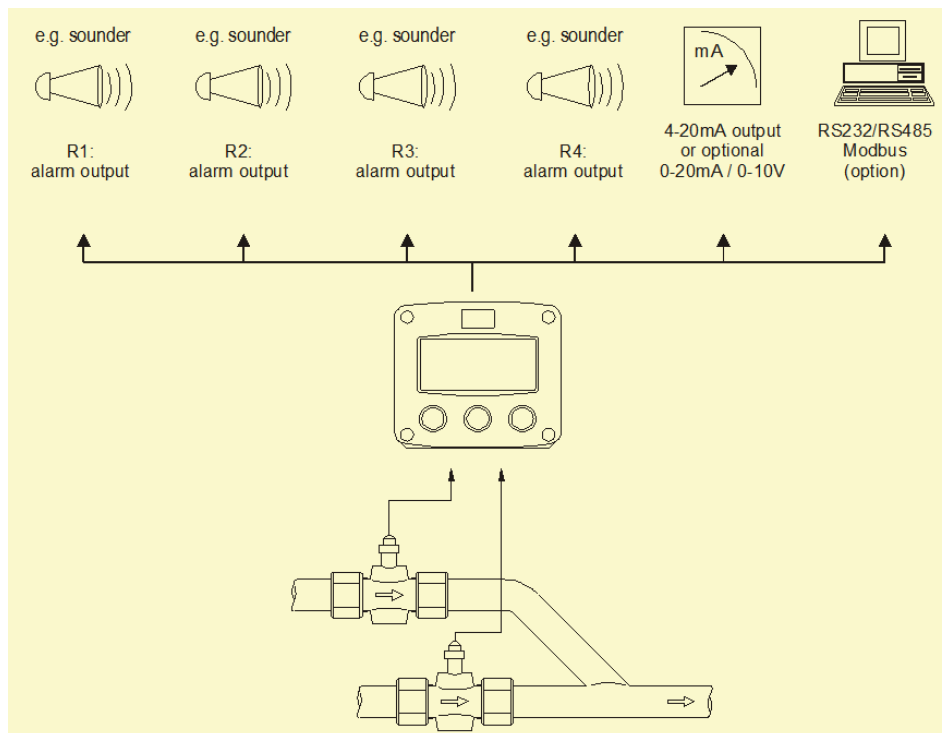
Fig. 1: Typical application

Configuration of the unit

The F114-P is designed for use in many types of applications. For that reason, a setup menu is available to program the F114-P according to your specific requirements.

The setup includes several important features, such as K-Factors, 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.

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 F114-P . 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 flow rates, the (accumulated) total and the alarm messages.
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 F114-P 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 F114-P in the background, independent from the selected display refresh rate.
Not all information can be shown at once, but first after pressing the select-key. At the bottom-left of the display, the actual liquid number (A or B) is shown when necessary.
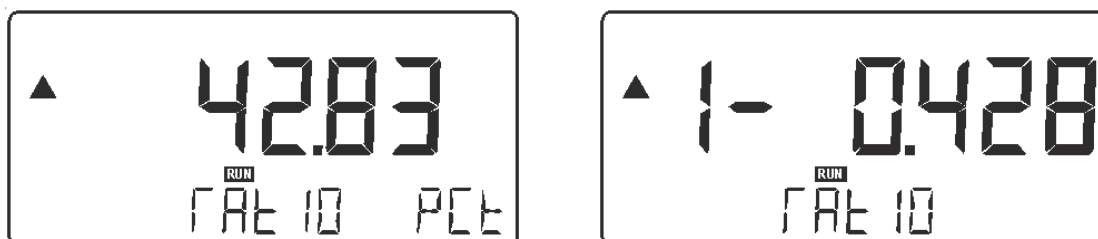
Fig. 3: Process information (typical)

For the Operator, the following functions are available:

- **Display ratio:**
  This is the main display information of the F114. After selecting other information, it will return to the main display automatically. The ratio is calculated by measuring the flow A and flow B. The shown ratio can indicate:
  - the actual flow rate of the additive compared to the flow rate of the main flow, or
  - the actual flow rate of the additive compared to the total flow (summed additive + main flow).
  The arrows ⬍ indicate the increase/decrease of the ratio trend.

- **Display flow rate:**
  When enabled in the setup menu, the display shows the flow rate only. When you press the select key, the total shows momentarily.
  When "-------" is shown, then the flow rate value is too high to be shown. The arrows ⬍ indicate the increase/decrease of the flow rate trend.

- **Programming the ratio alarm values**
  When enabled in the setup menu,
  When you press the SELECT/▲ key several times, the following ratio alarm values are shown:
  - low-low ratio alarm (LL): enter here 1-0.010 for example,
  - low ratio alarm (LO): enter here 1-0.2 for example,
  - high ratio alarm (HI): enter here 1-1.0 for example,
  - high-high ratio alarm (HH): enter here 1-1.2 for example.

  To change the alarm value, the following procedure must be executed:
  1. Press the PROG/ENTER key to access the submenu.
  2. Use the SELECT/▲ key to increase the digit. Use the CLEAR/▸ key to go to the next number.
  3. Confirm the new alarm value by pressing ENTER.
     If you do not press the PROG/ENTER key to confirm, your selection is not saved.

![Note]
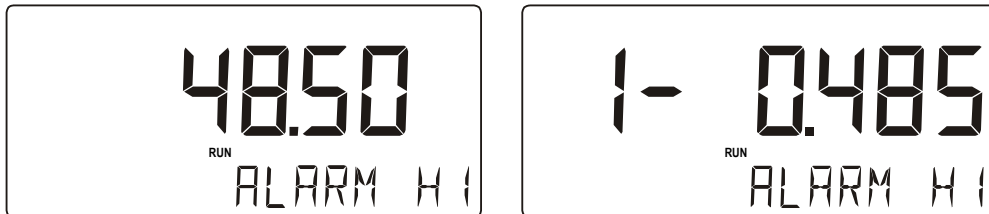
Fig. 4: Examples display information in % and 1:x during programming the high ratio value

- **Ratio alarm**
  When the actual ratio is outside the allowed range, an alarm message will be shown indicating the type of alarm. The alarm is terminated automatically as soon as the ratio is within its range again.

- **Display total:**
  The actual total quantity of each flowmeter is shown after pressing select several times.

- **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.

- **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. 5: 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 F114-P.
The setup menu is accessible at all times while the F114-P 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 is denied.

3.1. HOW TO PROGRAM THE F114-P

The setup menu has different submenus. Each submenu has an unique number which is shown in front of the menu name.
Each setting has an unique two-digit number which is shown in front of the setting. The first digit refers to the submenu and the second digit refers to the setting. Note that sometimes the name of the setting is shown on the upper line of the display.
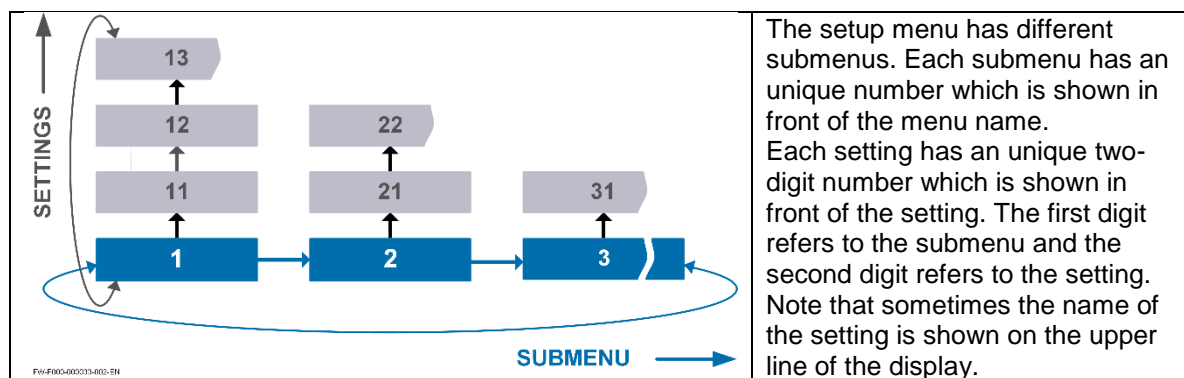
How to enter the setup menu

When the setup menu is protected by a password, the F114-P 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 F114-P. 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 F114-P goes back to the related main menu.
- in the last setting and you navigate to the next setting, the F114-P 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^3 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^3 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^3 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

1	TOTAL A		
	11	unit	L; m3; kg; lb; GAL; USGAL; bbl; no unit
	12	decimals	0000000; 111111.1; 22222.22; 3333.333
	13	K-factor:	0.000010 - 9999999
	14	decimals K-factor	0 - 6
2	**FLOW RATE A**		
	21	unit	mL; L; m3; mg; g; kg; ton; gal; bbl; lb; cf; rev; - - - - (no unit); scf; nm3; nL; p
	22	time	/sec; /min; /hour; /day
	23	decimals	0000000; 111111.1; 22222.22; 3333.333
	24	K-factor	0.000010 - 9,999,999
	25	decimals K-factor	0 - 6
	26	period	0.1 - 99.9 seconds
3	**TOTAL B**		
	31	K-Factor	0.000010 - 9999999
	32	decimals K-Factor	0 - 6
4	**FLOW RATE B**		
	41	K-Factor	0.000010 - 9999999
	42	decimals K-Factor	0 - 6
5	**RATIO**		
	51	ratio	b/a; b/a+b;- b-a/a;- b-a/b;- b/a-b
	52	function	1:_ - percentage
	53	decimals	0000000; 111111.1; 22222.22; 3333.333
	54	filter	0 - 99
6	**ALARM**		
	61	flowzero	default; no relay; ignore
	62	ratio ll	0000.000 - 9999999
	63	ratio lo	0000.000 - 9999999
	64	ratio hi	0000.000 - 9999999
	65	ratio hh	0000.000 - 9999999
	66	delay ll	0.1 - 999.9
	67	delay lo	0.1 - 999.9
	68	delay hi	0.1 - 999.9
	69	delay hh	0.1 - 999.9
7	**DISPLAY**		
	71	function	disabled; rate; total; both
	72	alarm set	operate; setup; hidden; disabled
	73	light	0% (off); 20%; 40%; 60%;- 80%; 100% (full brightness)
	74	bl alarm	off; on; flash
8	**POWER MANAGEMENT**		
	81	LCD new	fast; 1 sec; 3 sec; 15 sec; 30 sec; off
	82	battery mode	operational; shelf
9	**FLOWMETER**		
	91	signal A	npn; npn-lp; reed; reed-lp; pnp; pnp-lp; namur; coil-hi; coil-lo; 8-1 DC; 12 DC; 24 DC
	92	signal B	npn; npn-lp; reed; reed-lp; pnp; pnp-lp; namur; coil-hi; coil-lo; 8-1 DC; 12 DC; 24 DC
A	**ANALOG**		
	A1	output	disable; enable
	A2	output select	ratio; flow A; flow B
	A3	ana-min	00000.00 – 999.99
	A4	ana-max	00000.00 – 999.99
	A5	cut-off	0.0 - 9.9%
	A6	tune-min	0 - 9999
	A7	tune-max	0 - 9999
	A8	filter	00 - 99
B	**RELAYS**		
	B1	relay 1	off; lo-lo; lo; hi; hi-hi; all
	B2	relay 2	off; lo-lo; lo; hi; hi-hi; all
	B3	relay 3	off; lo-lo; lo; hi; hi-hi; all
	B4	relay 4	off; lo-lo; lo; hi; hi-hi; all

C	COM-MODB		
	C1	speed	1200; 2400; 4800; 9600; 9600HP; 19200; 38400
	C2	address	1 – 247
	C3	mode	bus-rtu; bus-asc; off
	C4	databits	8 bits; 7 bits
	C5	parity	none; even; odd
D	OTHERS		
	D1	model	F114-P
	D2	software version	nn:nn:nn
	D3	serial no.	nnnnnnn
	D4	password	0000 - 9999
	D5	tag-nr	0000000 - 9999999

3.1.2   EXPLANATION OF SETUP-MENU 1 - TOTAL-A

UNIT 11	This setting is used to select the engineering unit for the indication of the differential total, total (A and B), the accumulated total (A and B), and the pulse output. *When you change the engineering unit, you must recalculate and reprogram the K-factor for the (accumulated) total. When you recalculate and reprogram the K-Factor, 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 K-Factor.*
DECIMALS 12	This setting is used to set the amount of digits behind the decimal point for the (accumulated) total indication (A and B).
K-FACTOR 13	The K-Factor A determines the calculation factor for the **forward** total ! This setting is used to set the K-Factor for the total (A). With the K-Factor, the flowmeter pulse signals are converted to a quantity. The K-Factor is based on the number of pulses generated by the flowmeter per selected engineering unit, for example per m^3. A more accurate K-Factor (more decimals, as set in decimals K-Factor) allows for a more accurate operation of the system. **Example 1: Calculating the K-Factor.** The flowmeter generates 2.4813 pulses per liter and the selected unit is m^3. A cubic meter consists of 1000 liter which gives 2.4813 pulses*1000 liter=2481.3 pulses per m^3. So, the K-Factor is 2481.3. Enter for the Flowmeter K-Factor: 24813 and for the flowmeter K-Factor decimals: 1. **Example 2: Calculating the K-Factor.** The flowmeter generates 6.5231 pulses per gallon and the selected engineering unit is gallons. So, the K-Factor is 6.5231. Enter for the Flowmeter K-Factor: 65231 and for the Flowmeter K-Factor decimals: 4. *When you recalculate and reprogram a new K-Factor, 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 K-Factor.*
DECIMALS K-FACTOR 14	This setting is used to set the amount of digits behind the decimal point for the K-Factor (A).

3.1.3   EXPLANATION OF SETUP-MENU 2 - FLOW RATE-A

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.

UNIT 21	This setting is used to select the engineering unit for the indication of the flow rate (A and 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 K-Factor has to be adapted as well; the calculation is not done automatically.*

TIME 22	This setting is used to set the time unit for the flow rate calculation (A and B). Note that the flow rate is given in engineering unit/time unit, e.g. liters/minute (l/min). Note ! *When you change this setting, also recalculate and change the settings for the analog rate-min and analog rate-max.*
DECIMALS 23	This setting is used to set the amount of digits behind the decimal point for the flow rate indication (A and B).
K-FACTOR 24	This setting is used to set the K-Factor for the flow rate (A). With the K-Factor, the flowmeter pulse signals are converted to a quantity. The K-Factor is based on the number of pulses generated by the flowmeter per selected engineering unit, for example per m3. A more accurate K-Factor (more decimals, as set in decimals K-Factor) allows for a more accurate operation of the system.
DECIMALS K-FACTOR 25	This setting is used to set the amount of digits behind the decimal point for the K-Factor (A).
Period 26	This setting is used to calculate the flow rate by counting the number of pulses within a certain time, for example 1 second. The longer the time the more accurate the flow rate will be. Note ! • *This setting does influence the update time for the analog output directly. If the output response is too slow, decrease the number of pulses.* • *The shorter the update time, the higher the power consumption of the unit will be (important for battery powered applications).*

3.1.4   EXPLANATION OF SETUP-MENU 3 - TOTAL-B

For Total, you can only set the K-Factor B when in the flowmeter menu the K-Factor is set to Dual. Per default setting, the K-Factor is set to single (K-Factor A = K-Factor B). When Dual is selected, the Total-B settings are not visible (editable). This is normal behavior.	
K-FACTOR 31	K-Factor B determines the calculation factor for the **reverse** total ! This setting is used to set the K-Factor for the total (B). With the K-Factor, the flowmeter pulse signals are converted to a quantity. The K-Factor is based on the number of pulses generated by the flowmeter per selected engineering unit, for example per m^3. A more accurate K-Factor (more decimals, as set in decimals K-Factor) allows for a more accurate operation of the system.
DECIMALS K-FACTOR 32	This setting is used to set the amount of digits behind the decimal point for the (accumulated) total indication (B).

3.1.5   EXPLANATION OF SETUP-MENU 4 - FLOW RATE-B

For Flow rate, you can only set the K-Factor B when in the flowmeter menu the K-Factor is set to Dual. Per default setting, the K-Factor is set to single (K-Factor B = K-Factor A). When Dual is selected, the Total-B settings are not visible (editable). This is normal behavior.	
K-FACTOR 41	K-Factor B determines the calculation factor for the **reverse** flow rate ! This setting is used to set the K-Factor for the flow rate (B). With the K-Factor, the flowmeter pulse signals are converted to a quantity. The K-Factor is based on the number of pulses generated by the flowmeter per selected engineering unit, for example per m^3. A more accurate K-Factor (more decimals, as set in decimals K-Factor) allows for a more accurate operation of the system.
DECIMALS K-FACTOR 42	This setting is used to set the amount of digits behind the decimal point for the K-Factor (B).

3.1.6   EXPLANATION OF SETUP-MENU 5 - RATIO

The definition of the ratio shown is set with this function. The ratio can be expressed as:
1) the flow rate of the "additive flow"
   compared to the flow rate of the "main flow", or as
2) the flow rate of the "additive flow"
   compared to the flow rate of the "total flow"
Further, it is necessary to take the position of flowmeter "A" and flowmeter "B" into account. With the K-factor, the flowmeter pulse signals are converted to a flow rate.

RATIO BETWEEN THE ADDITIVE AND THE TOTAL FLOW:

$$RATIO = \frac{B}{A+B}$$

$$RATIO = \frac{B}{A}$$

$$RATIO = \frac{B-A}{B}$$

RATIO BETWEEN THE ADDITIVE AND THE MAIN FLOW:

$$RATIO = \frac{B}{A}$$

$$RATIO = \frac{B}{A-B}$$

$$RATIO = \frac{B-A}{A}$$

RATIO 51	The ratio is shown as a percentage (PCT) or a ratio as 1-____. This setting also influences the analog output refl. the ratio.
FUNCTION 52	The ratio or percentage will be shown with maximum of five digits: 1 : xxxxx or 99999%. If you have a ratio of 1:5 than two or three decimals might be required. If you have a ratio of 1:1000, than you might prefer no decimals. If you have a ratio of 2% than two or three decimals might be required. If you have a ratio of 120%, than you might prefer no decimals.
DECIMALS 53	This setting is used to set the amount of digits behind the decimal point for the ratio.
FILTER 54	This setting is used to stabilize the calculated ratio between both flows. With the help of this digital filter a more stable but less actual representation of the flow rate can be obtained. 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..

3.1.7   EXPLANATION OF SETUP-MENU 6 - ALARM

These settings determine how the flow rate is monitored and how the F114-P will process the alarm conditions. For the setup of the configurable outputs, refer to setup menu: Relays.

FLOWZERO 61	When the flow rate is zero, then it is possible to ignore or disable the flow rate monitoring. The following settings can be selected: DEFAULT: in case of a low-flow rate alarm and zero flow, it will switch the alarm output and indicate the alarm on the display. NO RELAY: in case of a low-flow rate alarm and zero flow, it won't switch the alarm output but will indicate the alarm on the display only. IGNORE: in case of a low-flow rate alarm and zero flow, it won't switch the alarm output and nothing will be indicated on the display.
RATIO LL 62	This setting is used to activate the related alarm condition and to set the threshold value for a this ratio alarm. The setting 0.0 disables this alarm.
RATIO LO 63	This submenu is used to activate the related alarm condition and to set the threshold value for a this ratio alarm. The setting 0.0 disables this alarm.
RATIO HI 64	This setting is used to activate the related alarm condition and to set the threshold value for a this ratio alarm. The setting 0.0 disables this alarm.
RATIO HH 65	This setting is used to activate the related alarm condition and to set the threshold value for a this ratio alarm. The setting 0.0 disables this alarm.
DELAY LL 66	This setting is used to set a delay time for the related alarm. When the alarm condition is still valid after the delay time, an alarm is given.
DELAY LO 67	This setting is used to set a delay time for the related alarm. When the alarm condition is still valid after the delay time, an alarm is given.
DELAY HI 68	This setting is used to set a delay time for the related alarm. When the alarm condition is still valid after the delay time, an alarm is given.
DELAY HH 69	This setting is used to set a delay time for the related alarm. When the alarm condition is still valid after the delay time, an alarm is given.

3.1.8.   EXPLANATION OF SETUP MENU 7 - DISPLAY

FUNCTION 71	Additionally to the ratio, the flow rate and a resettable totalizer of channel A and channel B can be shown. Following can be selected: <u>disabled</u>: total and flow rate will not be shown. <u>rate</u>: only flow rate A and B will be shown <u>total</u>: only total A and B will be shown. <u>both</u>: all flow rates and totals will be shown.
ALARM SET 72	This setting is used to determine in which menu you can change the alarm settings. When programmed for setup menu only, the alarm settings in the operator menu are read-only.
LIGHT 73	The backlight brightness can be adjusted from 0% (off) to 100% (full brightness) in steps of 20%. When the F114-P is only loop powered, the backlight is disabled. An external power supply is required to supply the backlight.
BL ALARM 74	This setting is used to set the behavior of the backlight (bl) during an alarm condition.

3.1.9   EXPLANATION OF SETUP-MENU 8 - 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 F114-P has several smart power management functions to extend the battery life time significantly. Two of these functions can be set.

LCD NEW 81	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. **Example battery life-time with a coil pick-up:** • 1kHz pulse and FAST update: about 2 years; • 1kHz pulse and 1 sec update: about 5 years.
BATTERY-MODE 82	The F114-P has two modes: operational or shelf. After "shelf" has been selected, the F114-P 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. To wake up the F114-P again, press the SELECT/▲ key two times.

3.1.10   EXPLANATION OF SETUP-MENU 9 - FLOWMETER

The F114-P is able to handle several types of input signal. The pickup / signal is selected with:
• SETUP 91 (Input A), Read also chapter 4
• SETUP 92 (Input B), Read also chapter 4.

Note ! *The selections "active pulse" offer a detection level of 50% of the supply voltage.*

SIGNAL A 91				
TYPE OF SIGNAL	**EXPLANATION**	**RESISTANCE**	**FREQ. / mV**	**REMARK**
NPN	NPN input	100 kΩ pull-up	max.6 kHz.	(open collector)
NPN - LP	NPN with low pass filter	100 kΩ pull-up	max.1.2 kHz.	(open collector) less sensitive
REED	Reed-switch input	1 MΩ pull-up	max.1.2 kHz.	
REED - LP	Reed-with low pass filter	1 MΩ pull-up	max.120 Hz.	Less sensitive
PNP	PNP input	100K pull-down	max.6 kHz.	
PNP - LP	PNP with low pass filter	100K pull-down	max.1.2 kHz.	Less sensitive

NAMUR	NAMUR input	820 Ω pull-down	max.4 kHz.	External power required
COIL-HI	High sensitive coil input	-	min. 20 mV$_{pp}$	Sensitive for interference!
COIL-HI (type ZF)			min. 10 mV$_{pp}$	
COIL-HI (type ZG)			min. 5 mV$_{pp}$	
COIL LO	Low sensitive coil input	-	min. 80 mV$_{pp}$	Normal sensitivity
8-1 DC	Active pulse input detection level 8.2V DC	3K9	max.10KHz.	External power required
12 DC	Active pulse input detection level 12V DC	4K	max.10KHz.	External power required
24 DC	Active pulse input detection level 24V DC	3K	max.10KHz.	External power required
SIGNAL B 92	The secondary signal B is used to detect the direction of flow. In most applications, the type of signal for input B will be the same type as the main signal A (setting 71). For selection, read setting 71.			

3.1.11 EXPLANATION OF SETUP-MENU A - ANALOG OUTPUT

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.

OUTPUT A1 Note !	If the analog output is not used, select disable to minimize the power consumption (e.g. save battery life-time). *Option AP: When a power supply is available but the output is disabled, a 3.5mA signal will be generated.*
OUTPUT SELECTION A2	This setting determines if the analog output is according the actual ratio, flow rate A or flow rate B.
ANA-MIN A3	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.
ANA-MAX A4	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.
CUT-OFF A5	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. **Example:** Calculate the cut-off. Rate-min: 0L/min [4mA], Rate-max: 100 L/min [16mA], Cut-off: 2% **Required rate [L/min]:** (rate-max - rate-min)*cut-off: (100-0)*2%=2.0L/min **Output [mA]:** rate-min + (rate-max*cut-off): 4+(16*2%)=4.32mA
TUNE-MIN A6	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.
⚠ WARNING	**Before tuning the signal, make sure that the analog signal is idle (not used) for any application!**
	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.
Note !	*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.*

TUNE-MAX A7 ⚠ WARNING ✎ Note !	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. **Before tuning the signal, make sure that the analog signal is idle (not used) for any application!** 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. *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.*
FILTER A8	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. 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.

3.1.12. EXPLANATION OF SETUP MENU B - RELAYS

The outputs are configurable, they can be set to a specific alarm output.

✎ Note ! *There are four outputs in the submenu, but the amount of outputs can vary due to regulations or chosen options. Standard, there are three outputs, option XI has only two outputs and option OS has four outputs.*

RELAY 1 B1	This setting is used to set the function of related output R1..
RELAY 2 B2	This setting is used to set the function of related output R2.
RELAY 3 B3	Not available for type: XI: This submenu is used to set the function of related output R2.
RELAY 4 B4	Only available for option OS: This submenu is used to set the function of related output R4.

3.1.13 EXPLANATION OF SETUP-MENU C - 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.

SPEED C1	This setting is used to set the Baudrate. 9600 is a low power setting, 9600HP is a high power setting (Modbus compliant).
ADDRESS C2	This setting is used to set the communication address for the F114-P.
MODE C3	This setting is used to set the Modbus transmission mode. Select OFF to disable the communication.
DATABITS C4	This setting determines for communication the number of data bits. Select 8 bit for BUS-RTU and 7 bits for BUS-ASC.
PARITY C5	As demanded by the connected equipment, select a parity bit (odd, even or none).

3.1.14   EXPLANATION OF SETUP-MENU D - OTHERS

For support and maintenance it is important to have information about the characteristics of the F114-P. Your supplier will ask for this information when support is required.

|	
MODEL **D1**	This setting shows the model name.
SOFTWARE VERSION **D2**	This setting shows the version number of the firmware (software).
SERIAL NO. **D3**	This setting shows the serial number.
PASSWORD **D4**	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.
TAG-NR **D5**	This setting is used to set a tag number for the F114-P.

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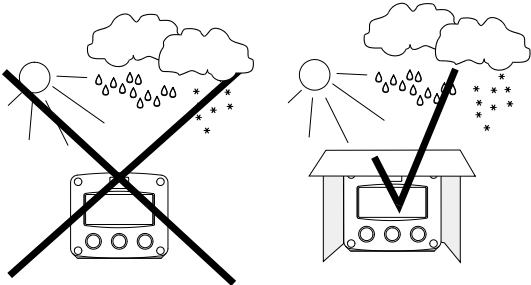
Take the relevant IP classification of the enclosure into account (see identification plate). Even an enclosure rated for IP67 / TYPE 4(X) should NEVER be exposed to strongly varying (weather) conditions.

When panel-mounted, the front panel of the F114-P is rated for IP65 / TYPE 4(X)!
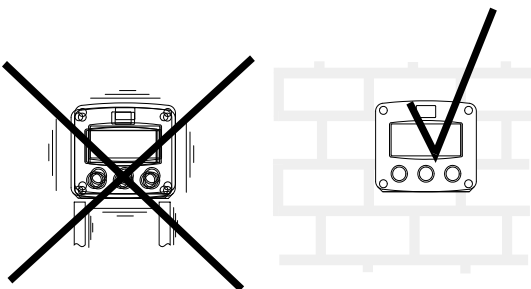
When used in very cold surroundings or varying climatic conditions, inside the instrument case, take the necessary precautions against moisture.

Mount the F114-P onto a solid structure to avoid vibrations.
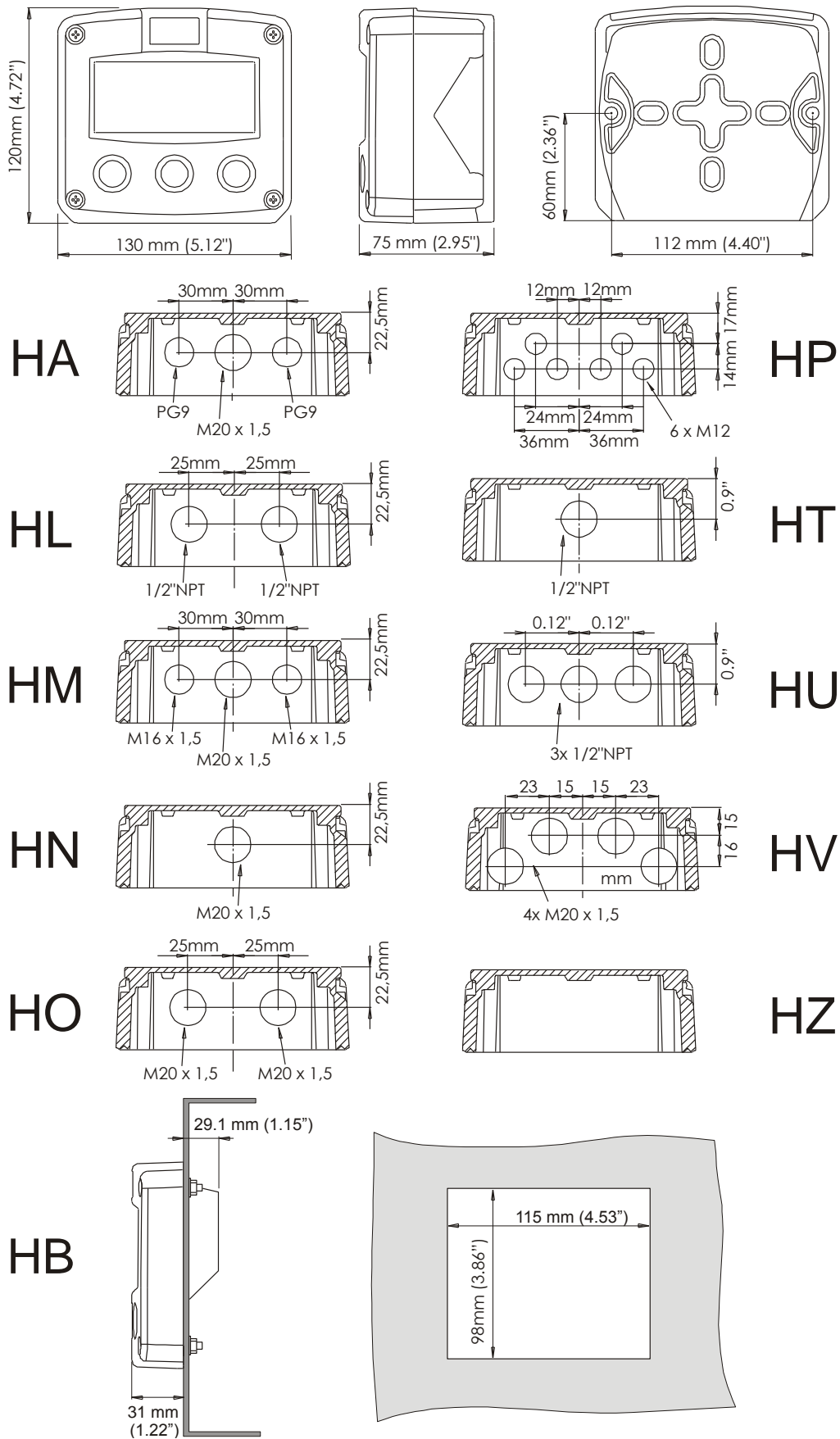
4.3. DIMENSIONS- ENCLOSURE
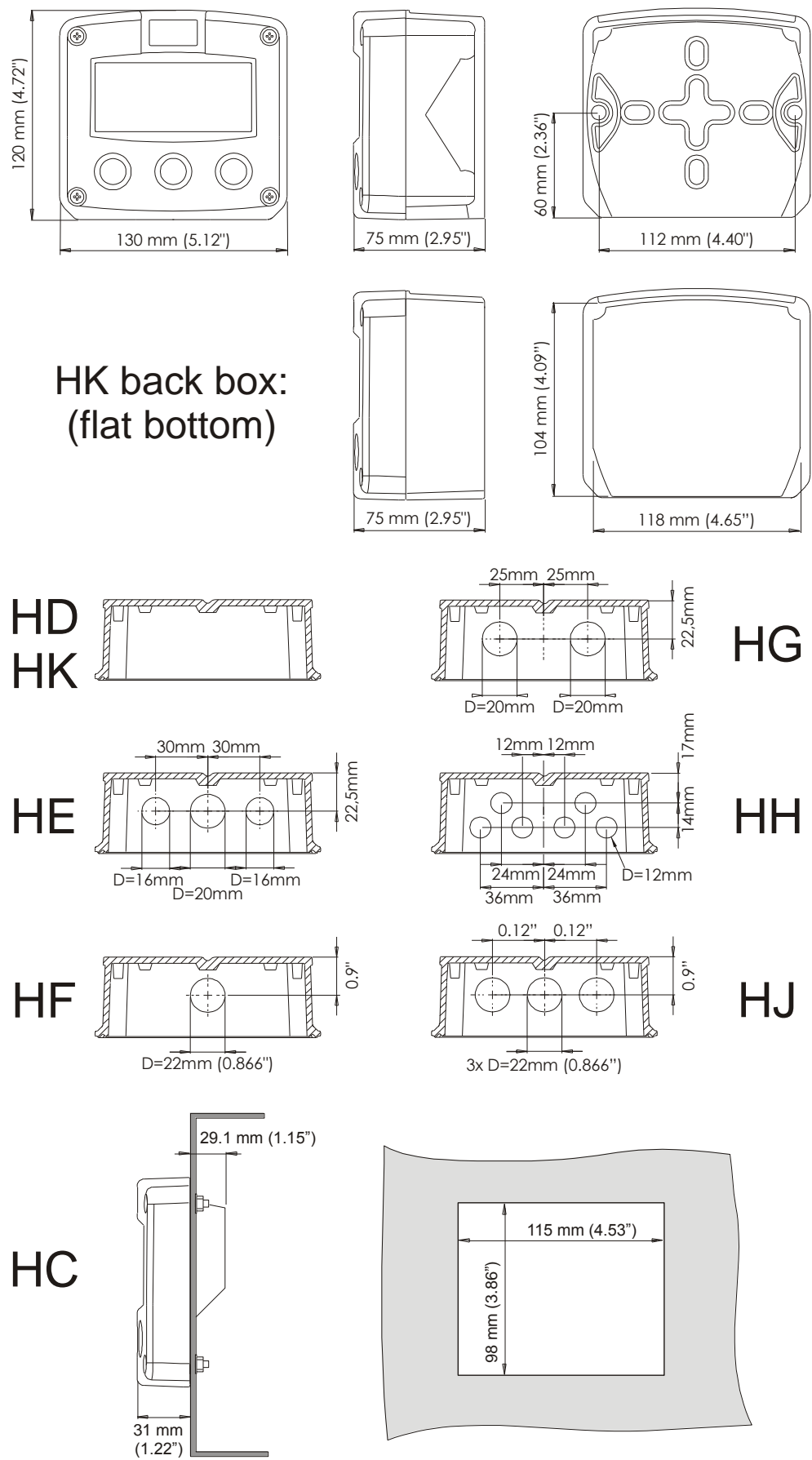

Fig. 6: Aluminum enclosures - Dimensions

120 mm (4.72")

130 mm (5.12")

75 mm (2.95")

60 mm (2.36")

112 mm (4.40")

HK back box:
(flat bottom)

104 mm (4.09")

75 mm (2.95")

118 mm (4.65")

HD
HK

25mm 25mm

22.5mm

D=20mm   D=20mm

HG

HE

30mm 30mm

22.5mm

D=16mm   D=16mm
D=20mm

12mm 12mm

17mm

14mm

24mm 24mm
36mm   36mm

D=12mm

HH

HF

0.9"

D=22mm (0.866")

0.12"   0.12"

0.9"

3x D=22mm (0.866")

HJ

HC

29.1 mm (1.15")

31 mm
(1.22")

115 mm (4.53")

98 mm (3.86")

Fig. 7: GRP enclosures - Dimensions

4.4.   INSTALLING THE HARDWARE

⚠️ **WARNING**

- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the F114-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 F114-P . Chapter 5 gives additional specific information regarding Intrinsically safe installation and overrules the information given in this chapter.

⚠️ **WARNING**

- 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 F114-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 F114-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: make sure, 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.
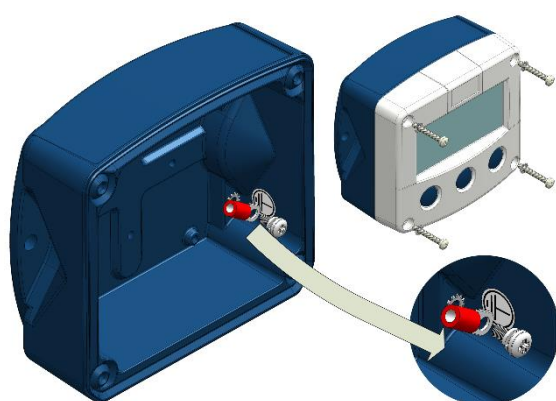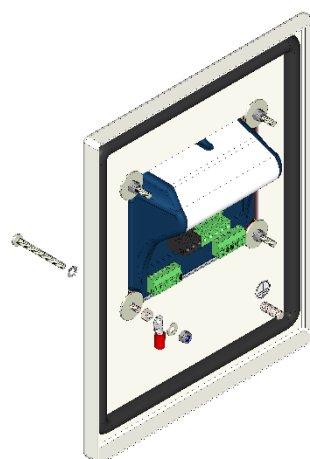
Field mounted   **Panel mounted**

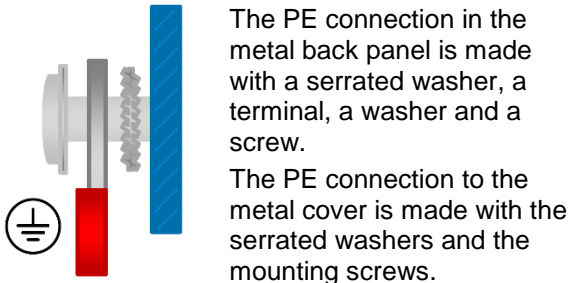### 4.4.2. ALUMINUM ENCLOSURE - FIELD MOUNTED

⚠️ **WARNING**

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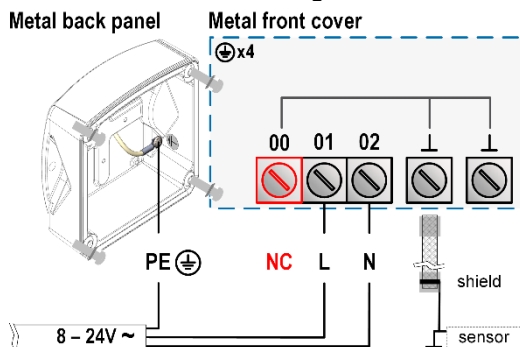
The PE connection
The PE connection is made with the PE stud inside the back panel and the 4 mounting screws that attach the cover to the back panel.

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.
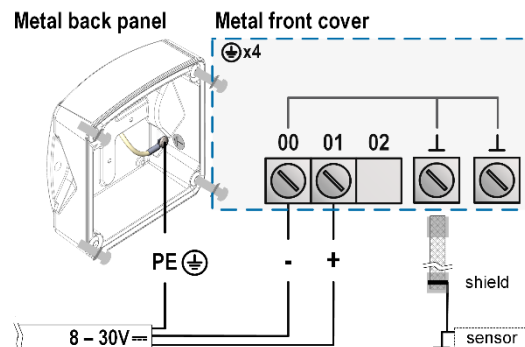
Type PM (110-230V AC)

Type OR (8-24V AC)
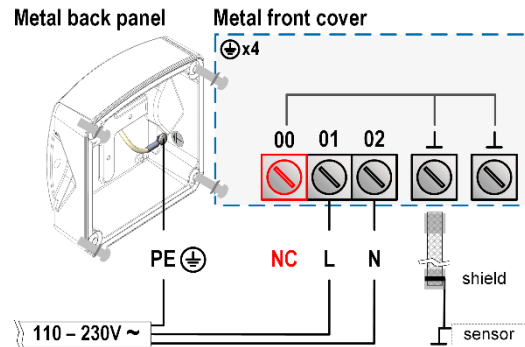
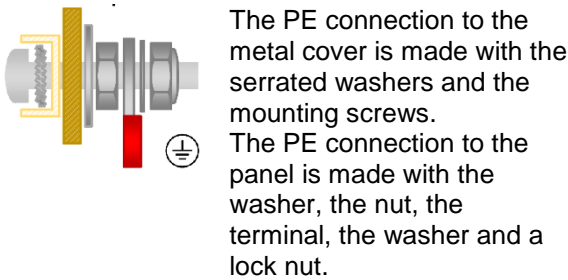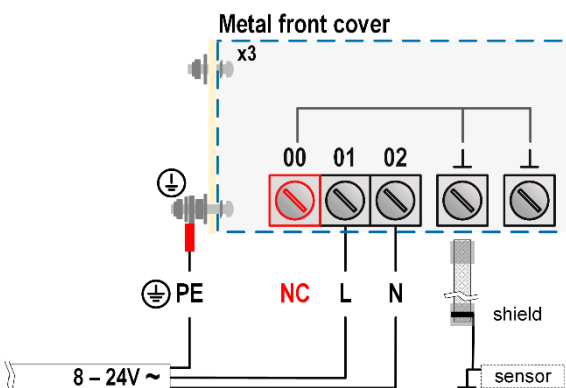**Type OR (8-30V DC)**

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.
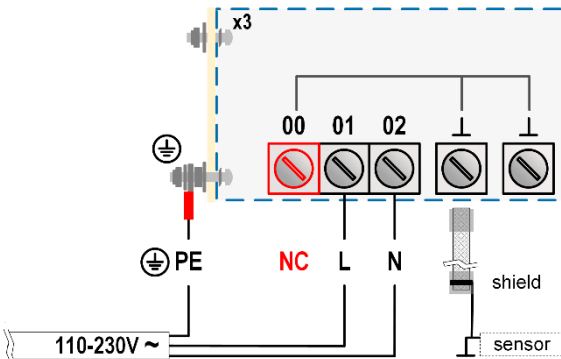
The PE connection to the metal cover is made with the serrated washers and the mounting screws.
The PE connection to the panel is made with the washer, the nut, the terminal, the washer and a lock nut.
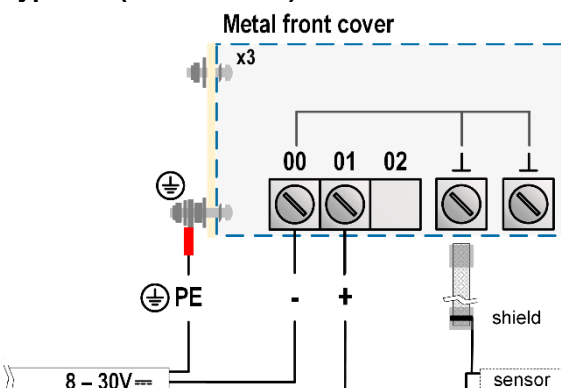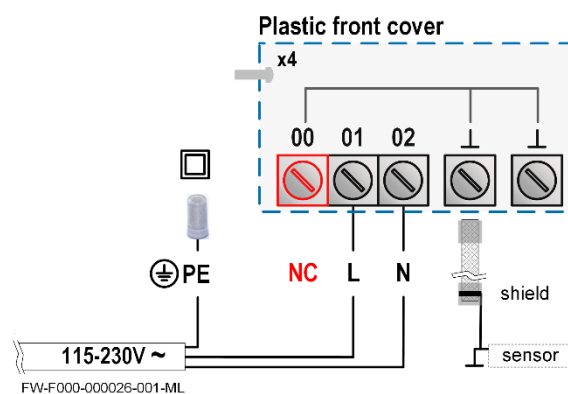
Type PM (110-230V AC)
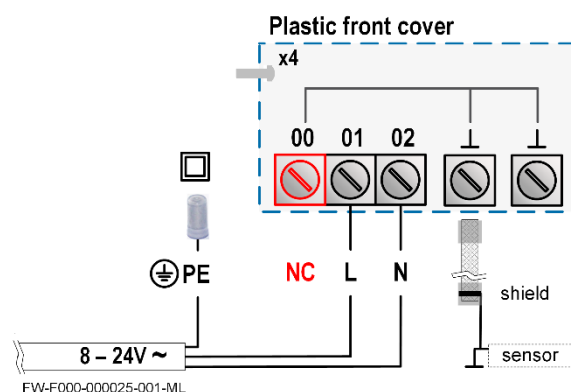
Type OR (8-24V AC)

Type OR (8-30V DC)

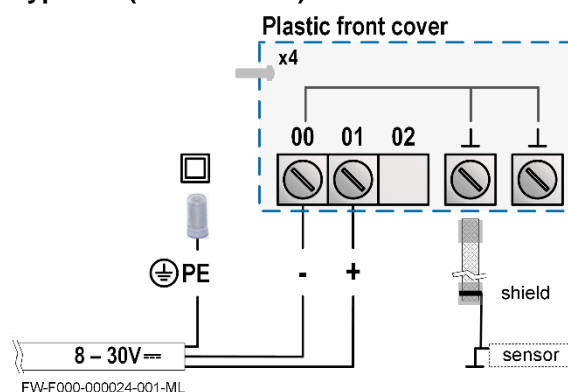### 4.4.4.   PLASTIC (GRP) ENCLOSURE

The PE connection
The F114-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

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
	Power supply			**Alarm Output 2**		**Alarm Output 1**		**Analog Output**		**Sensor A Input**		**Supply**	**Sensor B Input**		**Supply**	**Alarm Output 3**	
PD; PF ∼		L	N									+↓			+↓		
PD; PF ⎓	−	+										+↓			+↓		
PM ∼		L	N									+↓			+↓		
PX ⎓	−	+										+↓			+↓		
P										⊥	⊓↑		⊥	⊓↑			
OA; OT				⊥	⊓↓	⊥	⊓↓									⊥	⊓↓
OR				com	NO	com	NO										
AA; AB; AI; AP								I-	I+								
AU								U-	U+								
A-PL										I-	I+		I-	I+			

PB; PC	Battery supply: 3.6V ⎓ (PX remains available, battery supply operates as back-up power)
PX	Sensor supply A (11) and B (14) by software (Coil; Reed) · 1.2; 3V ⎓
PD; PF; PM	Sensor supply A (11) and B (14) 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-F114-000001-001-EN

Fig. 8: Overview of terminal connectors - Standard configuration and options

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 F114-P safe. If applicable, mind the battery power.
2. Open the F114-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 F114-P.

⚠ **WARNING**

Risk of electrocution - High voltage!

Make sure, all the leads to the terminals are disconnected from the F114-P and NEVER connect the mains power supply to the unit when the protection cover has been removed!
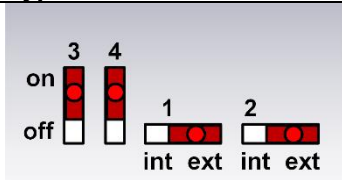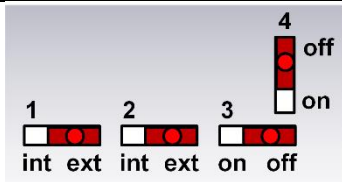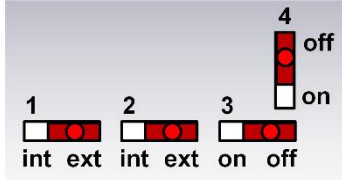
Type PD	Power supply in: 8-24V AC / 10-30V DC				
Switch location (typical)	**Sensor**		**V_{out} selection**		**Sensor supply out**
	A	**B**			
	1	**2**	**3**	**4**	NOTE: Use an AC autotransformer (spartrafo) with galvanic isolation.
	int	int	off	off	Coil 1.2V DC; <1mA Reed 3V DC; <1mA
	ext	ext	on	on	8.2V DC @8V_{in} AC / 10V_{in} DC
			on	off	12V DC @10V_{in} AC / 14V_{in} DC
			off	off	24V DC @18V_{in} AC / 26V_{in} DC
Type PF	Power supply in: 15-24V AC / 20-30V DC				
Switch location (typical)	**Sensor**		**V_{out} selection**		**Sensor supply out**
	A	**B**			
	1	**2**	**3**	**4**	
	int	int	off	off	Coil 1.2V DC; <1mA Reed 3V DC; <1mA
	ext	ext	on	on	8.2V DC @8V_{in} AC / 10V_{in} DC
			on	off	12V DC @10V_{in} AC / 14V_{in} DC
			off	off	24V DC @18V_{in} AC / 26V_{in} DC
Type PM	Power supply in: 115V - 230V AC				
Switch location (typical)	**Sensor**		**V_{out} selection**		**Sensor supply out**
	A	**B**			
	1	**2**	**3**	**4**	
	int	int	off	off	Coil 1.2V DC; <1mA Reed 3V DC; <1mA
	ext	ext	on	on	8.2V DC
			on	off	12V DC
			off	off	24V DC

Fig. 9: Sensor supply voltage - Switch setting
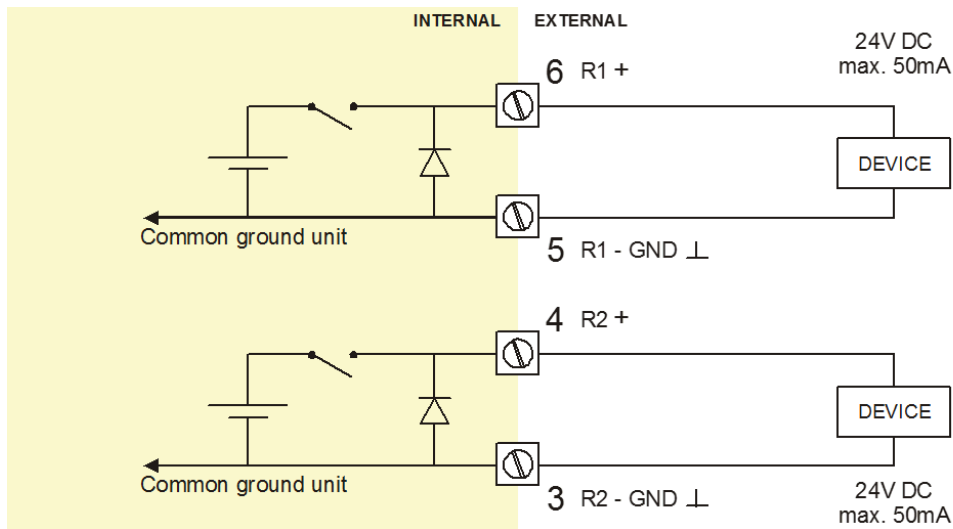
Terminal 03-04; alarm output R2:
This output is an alarm output according setup B2.

Terminal 05-06; alarm output R1:
This output is an alarm output according setup B1.

Type OA:
An active 24V DC signal according to the functions R1 and R2 is available with this option.
Max. driving capacity 20mA@24V per output. (Requires power supply type PD/PF/PM).

Fig. 10: Terminal connections - Active output (typical)

Type OR:
A mechanical relay output according the functions R1 and R2 is available with this option.
Max. switch power 240V-0,5A per output. (Requires power supply type PD/PF/PM).
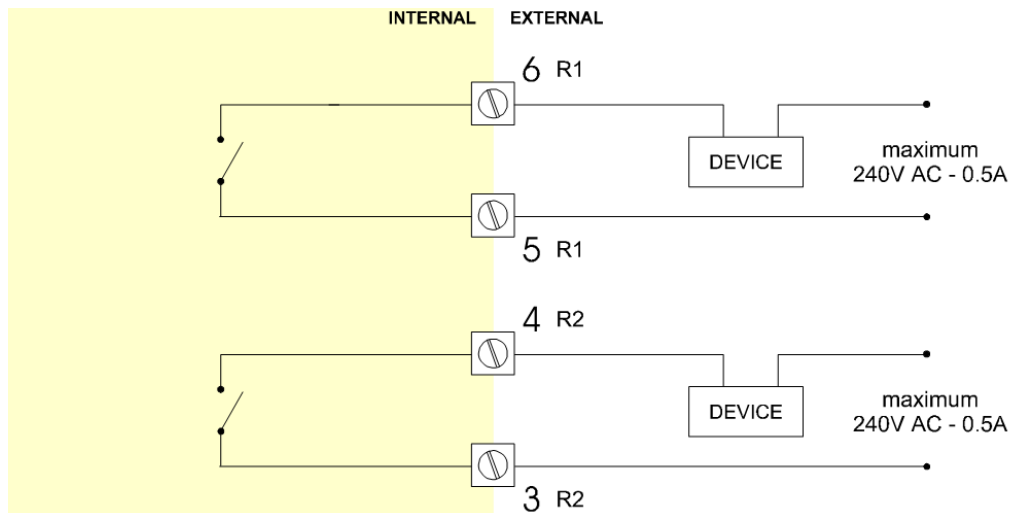
Fig. 11: Terminal connections - Mechanical relay output (typical)

Type OT:
Two passive transistor outputs according the functions R1 and R2 are available with this option.
Max. driving capacity 300mA@50V DC.
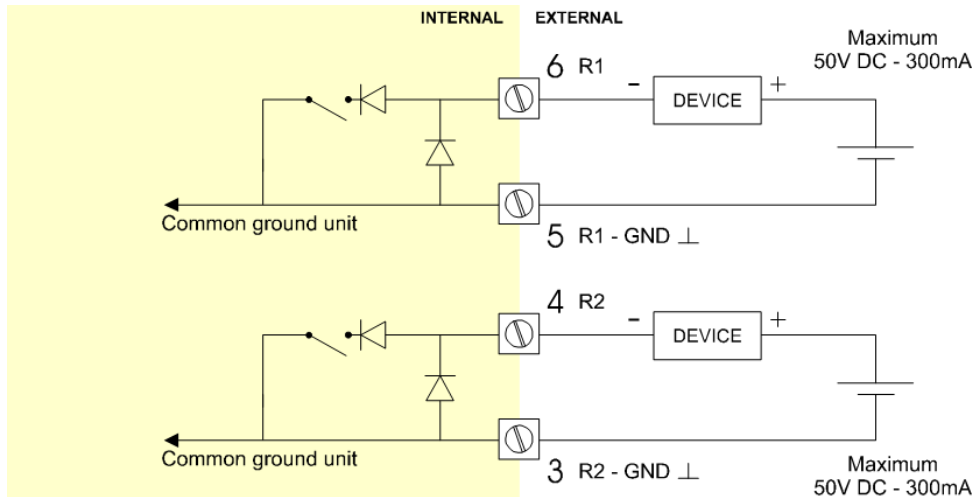
Fig. 12: Terminal connections - Passive transistor output (typical)

FW_F114P_v1702_02_EN

Terminal 07-08; basic <u>POWER SUPPLY</u> - type AP - output loop powered
Connect an external power supply of 8-30VDC to these terminals or a 4-20mA loop. Do connect the "-" to terminal 7 and the "+" to terminal 8. When power is applied to these terminals, the (optional) internal battery will be disabled / enabled automatically to extend the battery life time.

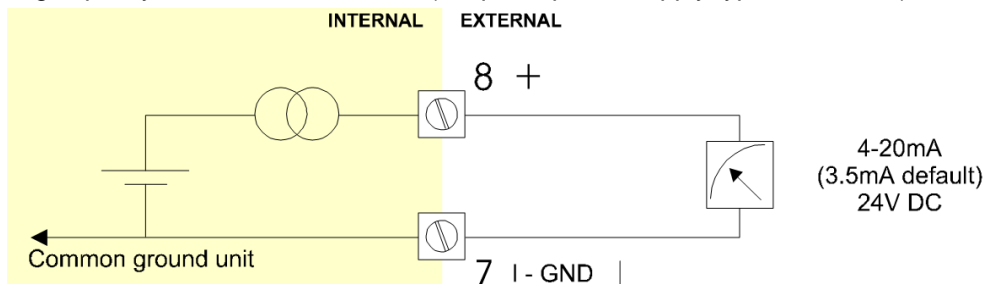**Terminal 07-08 analog output (SETUP 7) :**
An analog output signal proportional to the flow rate is available as standard.

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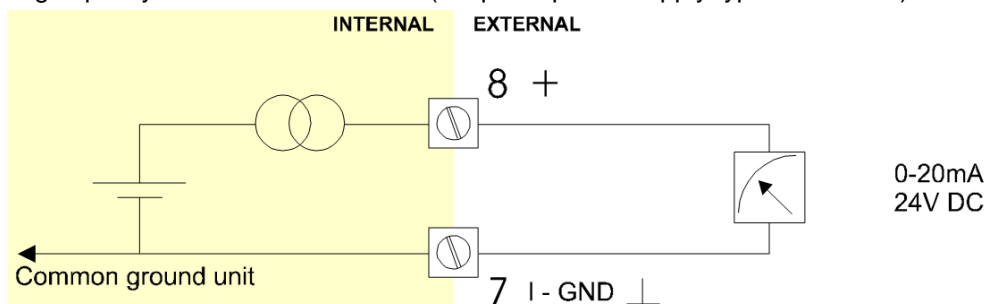

Fig. 13: Terminal connections - 4-20mA analog output (typical)

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

Fig. 14: Terminal connections - Active 0-20mA analog output (typical)

Type AF:
For the Intrinsically Safe <u>floating 4-20mA signal</u>: please read Chapter 5.

Type AI:
An <u>isolated 4-20mA signal</u> 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.
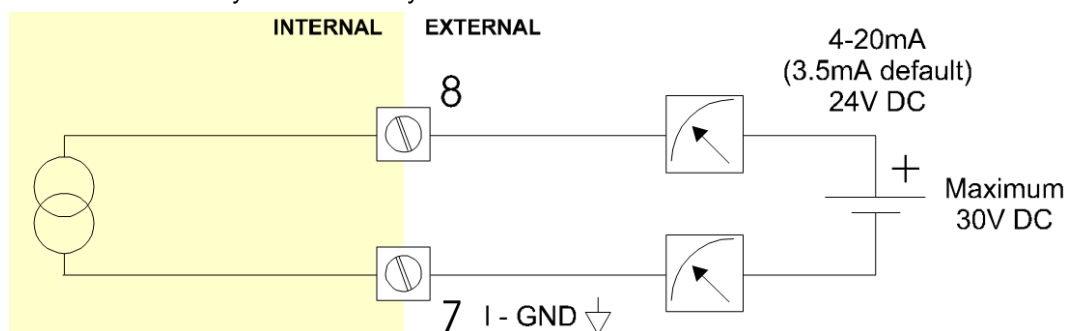
Fig. 15: Terminal connections - Isolated 4-20mA analog output (typical)

Type AP:
A <u>passive 4-20mA signal</u> 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. 16: Terminal connections - Passive 4-20mA analog output (typical)

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

Fig. 17: Terminal connections - Active 0-10V analog output (typical)

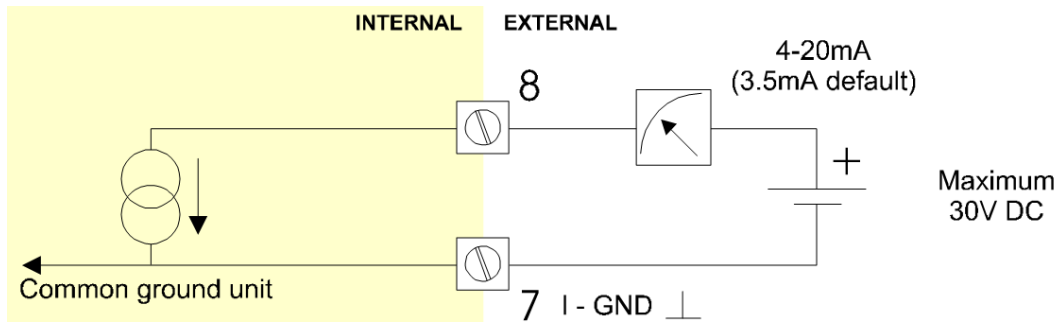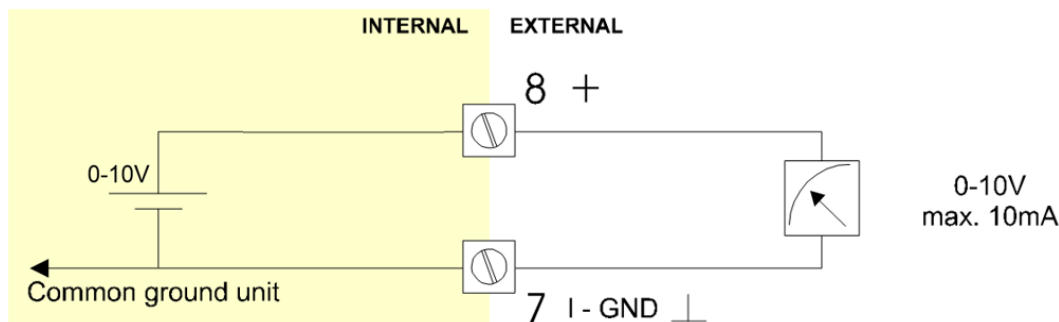**Terminal 09-11; Terminal 12-14; Flowmeter input A and B**:
Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or coil. The connections for flowmeter A (Terminal 09-11) and B (Terminal 12-14) are the same. The screen of the signal wire must be connected to the related common ground terminal (unless earthed at the sensor itself) The maximum input frequency is approximately 10 kHz (depending on the type of signal). The input signal type has to be selected in the flowmeter setup (read chapter 3).

Coil-signal:
The F114-P is suitable for use with flowmeters which have a coil output signal.
Two sensitivity levels can be selected
- COIL-LO: sensitivity from about 80mV$_{pp}$;
- COIL-HI: sensitivity from about 20mV$_{pp}$;
- type ZF, COIL-HI: sensitivity from about 10mV$_{pp}$;
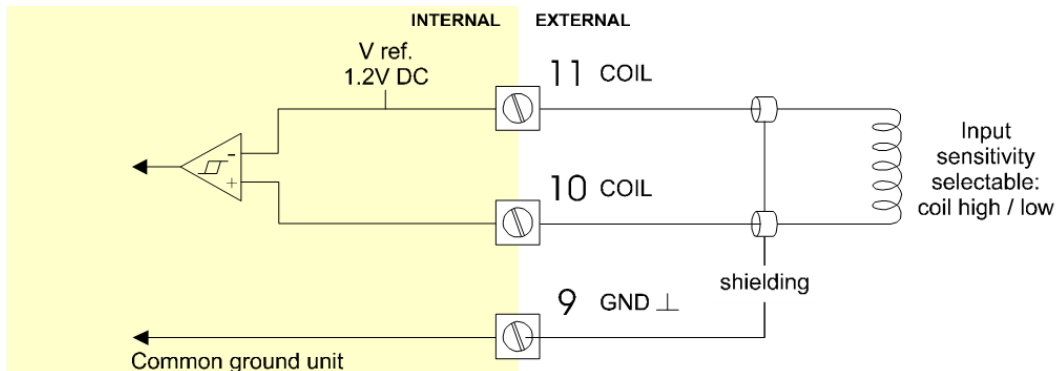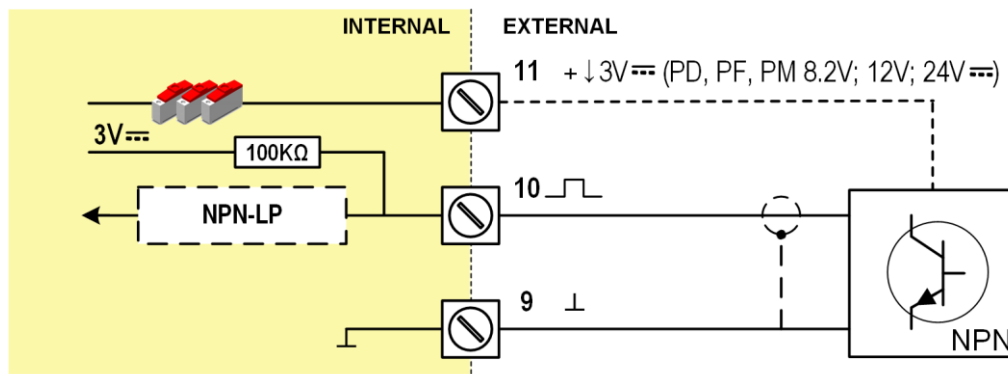- type ZG, COIL-HI: sensitivity from about 5mV$_{pp}$.

Fig. 18: Terminal connections - Coil signal input (typical)

Pulse-signal NPN / NPN-LP:

detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency (read chapter 3).

Fig. 19: Terminal connections - NPN signal input (typical)

Pulse-signal PNP / PNP-LP:

The F114-P is suitable for use with flowmeters which have a PNP output signal. 3V is offered on terminal 11 which has to be switched by the sensor to terminal 10 (SIGNAL). For a reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs a low-pass signal noise filter, which limits the maximum input frequency (read chapter 3).
A sensor supply voltage of 8.2, 12 or 24V DC can be provided with power supply type PD, PF, PM. For a signal detection level of 50% of the supply voltage: please refer to "active signals".
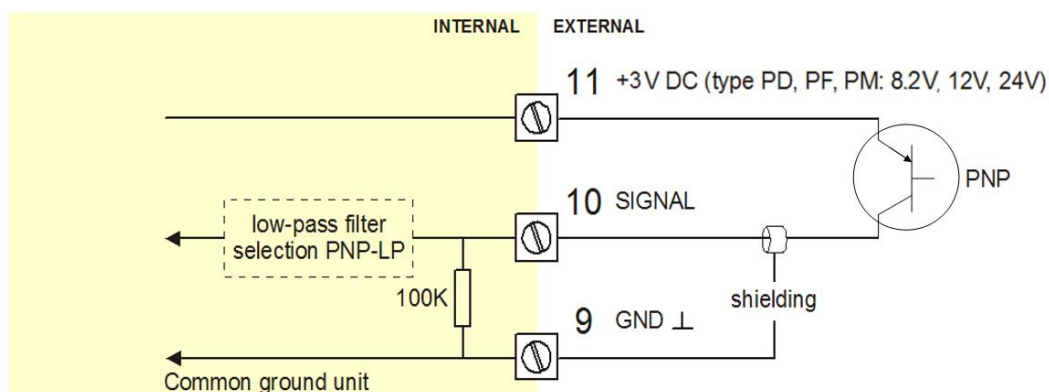
Fig. 20: Terminal connections - PNP signal input (typical)

Active signal 8.2V, 12V and 24V:

If a sensor gives an active signal (read chapter 3).The detection levels are 50% of the selected supply voltage; approx. 4V (8-1 DC) or 6V (12 DC) or 12V (24 DC). Active signal selection may well be desired in case of power supply type PD, PF, PM is available for sensor supply.
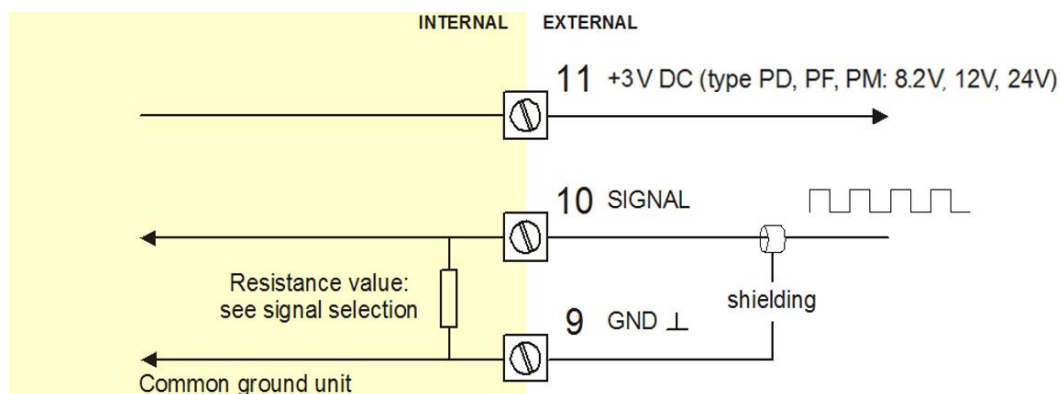
Fig. 21: Terminal connections - Active signal input (typical)

Reed-switch:
The F114-P is suitable for use with flowmeters which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP – low-pass filter (read chapter 3).
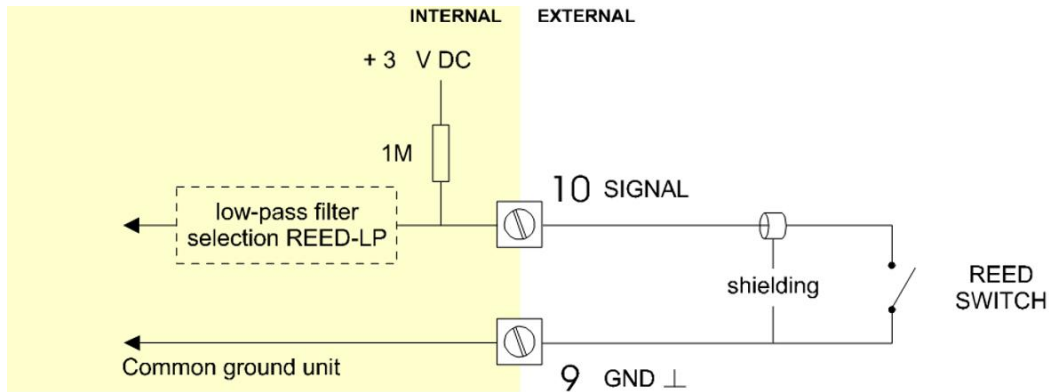
Fig. 22: Terminal connections - Reed-switch signal input (typical)

NAMUR-signal:
The F114-P is suitable for flowmeters with an Namur signal. The standard F114-P is not able to power the Namur sensor, as an external power supply for the sensor is required. However, a 8.2V sensor supply voltage (terminal 11) can be provided with power supply type PD, PF, PM.
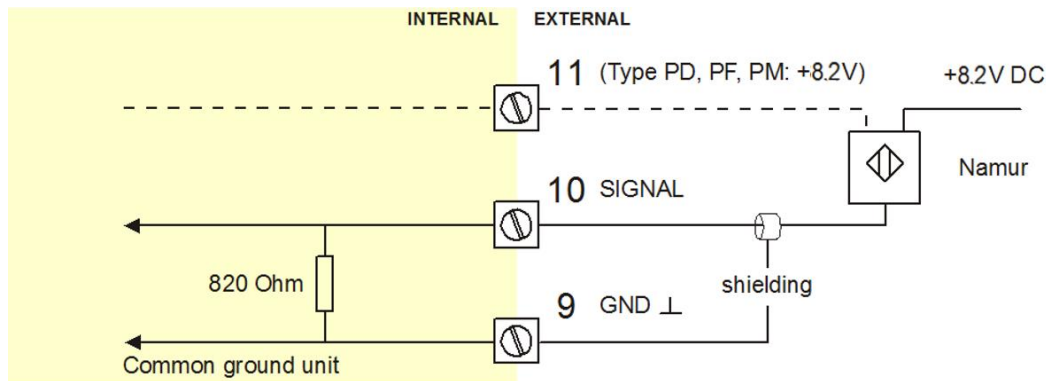
Fig. 23: Terminal connections - NAMUR signal input (typical)

Terminal 15-16; alarm output R3:
This output is an alarm output according setup B3.
Type OA:
An <u>active 24V DC</u> ratio or flow rate alarm output is available with this option.
Max. driving capacity 20mA@. (Requires power supply type PD / PF / PM).
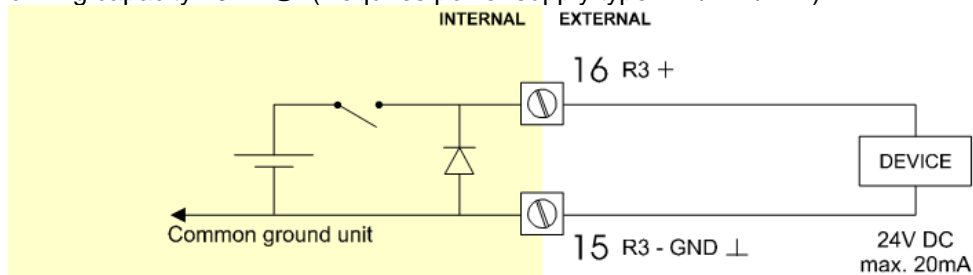
Fig. 24: Terminal connections - Active output (typical)

Type OT:
A <u>passive</u> transistor output is available with this option. Max. driving capacity 300mA@50V DC.
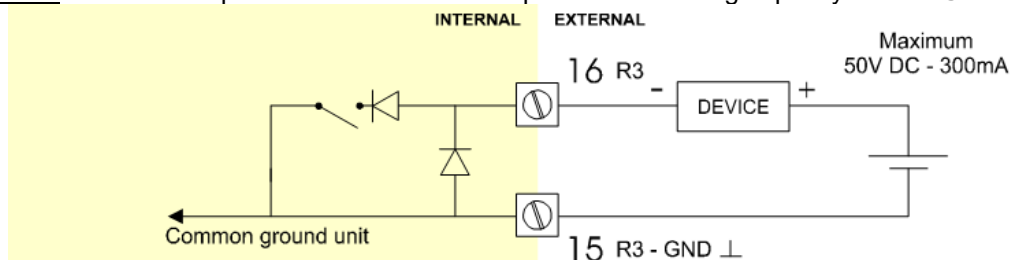
Fig. 25: Terminal connections - Passive transistor output (typical)

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

WARNING

- 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 F114-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
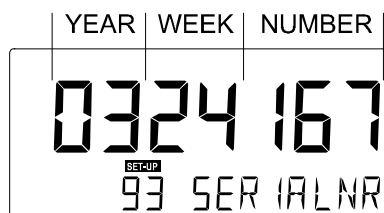This information can be looked-up in the setup menu: Others.

Fig. 26: Example serial number (typical)

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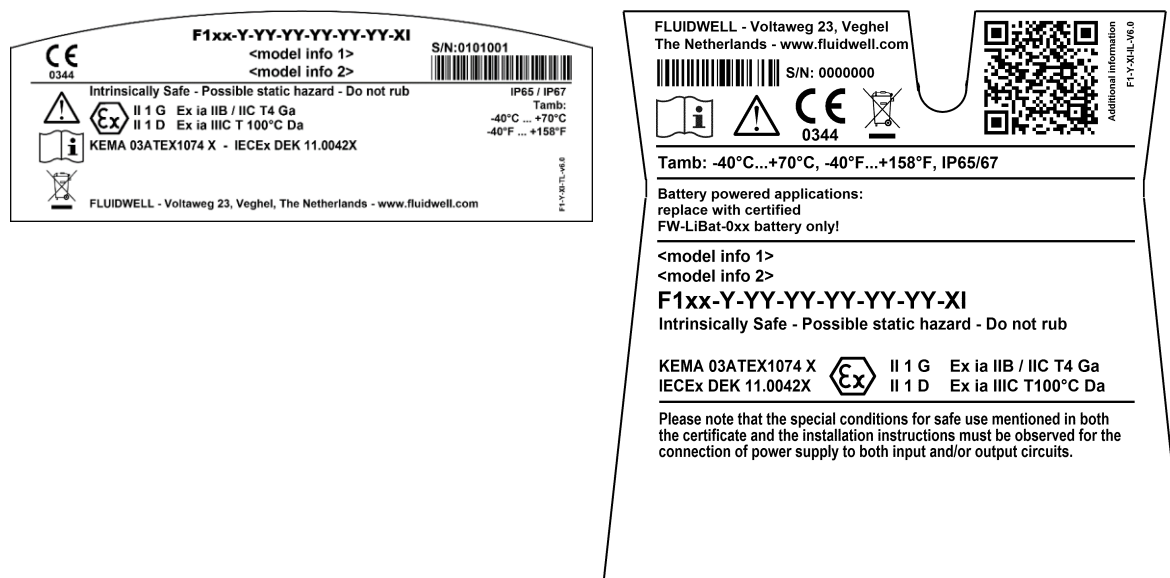

Fig. 27: Label information - Intrinsically safe application (typical)

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 F114-P-XI:
For intrinsically safe applications, consult the safety values in the certificate.

	Power supply	Alarm Output 2	Alarm Output 1	Analog Output	Sensor A Input	Sensor A Supply	Sensor B Input	Sensor B Supply

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

PX Sensor supply A (11) and B (14) by software (Coil; Reed) 1.2; 3V
PD Sensor supply A (11) and B (14) 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-F114-000002-001-EN
Fig. 28: 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.
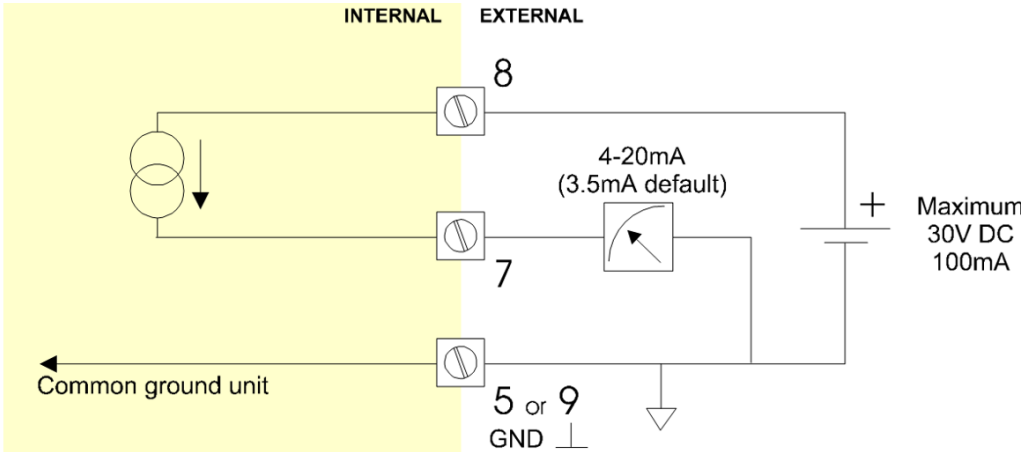
Fig. 29: Terminal connections - Intrinsically safe floating 4-20mA analog output (typical)

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 F114-P safe. If applicable, mind the battery power.
2. Open the F114-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 F114-P.

⚠ **WARNING**

Risk of electrocution - High voltage!
Make sure, all the leads to the terminals are disconnected from the F114-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			
	Sensor			Sensor supply out
	A	**B**		
	1	**2**		
	off	off		Coil 1.2V DC; <1mA Reed 3V DC; <1mA
FW-PD-000002-001-EN	on	on		8.2V DC; 7mA (max)
Switch location (typical)				

Fig. 30: Switch position voltage selection type PD-XI

5.3.   CONFIGURATION EXAMPLES INTRINSICALLY SAFE APPLICATIONS
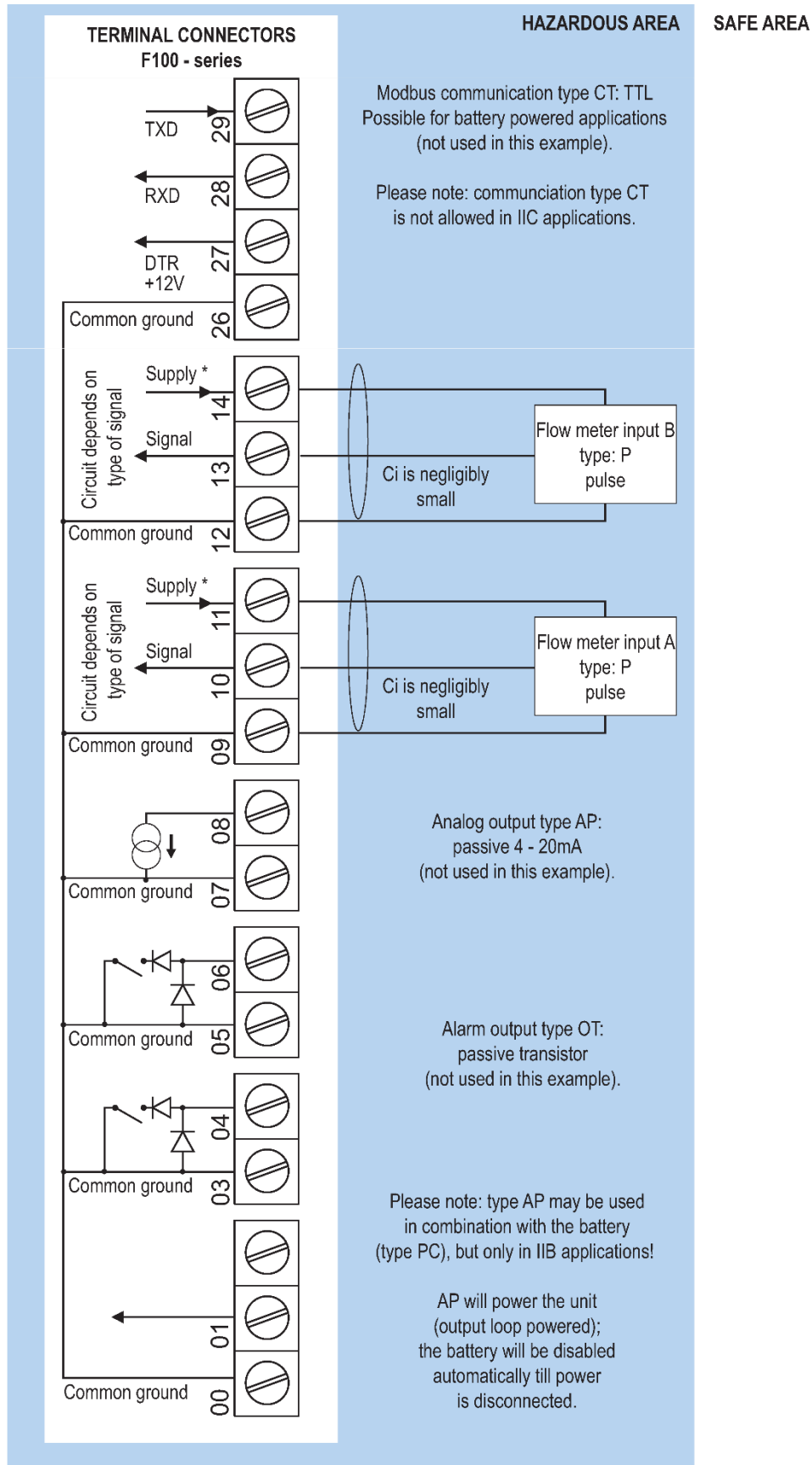
* Note sensor supply voltage: 1.2V DC for coil sensors or 3.2V DC for other pulse sensors.

Fig. 31: F114-P-(AP)-(CT)-(OT)-PC-XI - Battery powered - IIB/IIC – IIIC

Fig. 32: F114-P-AP-CT-OT-(PD)-XI - Output loop powered - IIB/IIC - IIC

5.4   BATTERY REPLACEMENT INSTRUCTIONS

5.4.1.   SAFETY INSTRUCTIONS

WARNING

- 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.
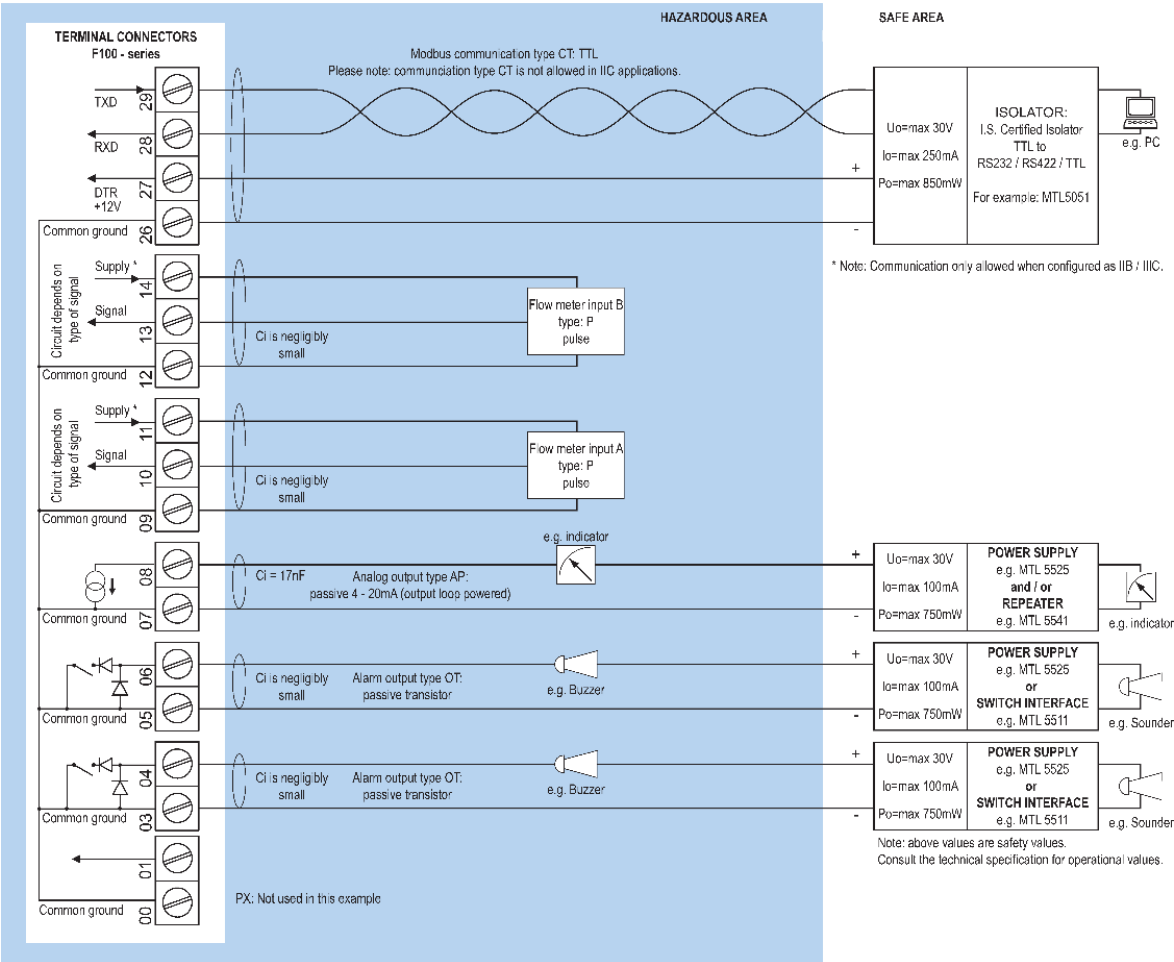
Caution !

- 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.

### 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.
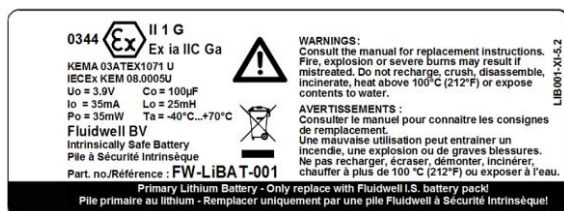
REMOVE THE BATTERY

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.
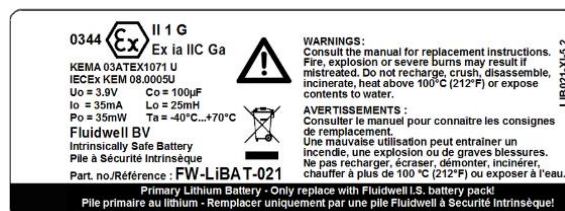
INSTALL THE BATTERY

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 F114-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 F114-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 K-Factor 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:
a. 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.
b. 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 SPECIFICATIONS

GENERAL	
Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Digits	Seven 17mm (0.67") and eleven 8mm (0.31"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec - 30 secs.
Type ZB	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-resistant silicone keypad.
Painting	Aluminum enclosure only: UV-resistant 2-component industrial painting.
Panel-mount enclosures	Dimensions: 130 x 120 x 60mm (5.10" x 4.72" x 2.38") – LxHxD.
Classification	IP65 / 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 HL	Drilling: 2x ½"NPT.
Type HM	Drilling: 2x M16 – 1x M20.
Type HN	Drilling: 1x M20.
Type HO	Drilling: 2x M20.
Type HP	Drilling: 6x M12.
Type HT	Drilling: 1x ½"NPT.
Type HU	Drilling: 3x ½"NPT.
Type HV	Drilling: 4x M20
Type HZ	No drilling.
GRP enclosures	
Type HD	No drilling.
Type HE	Drilling: 2x 16mm (0.63") – 1x 20mm (0.78").
Type HF	Drilling: 1x 22mm (0.87").
Type HG	Drilling: 2x 20mm (0.78").
Type HJ	Drilling: 3x 22mm (0.87").
Type HH	Drilling: 6x 12mm (0.47").
Type HK	Flat bottom - no drilling.
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	**For Intrinsically safe applications, consult the safety values in the certificate.**
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. 1.5mm² and 2.5mm²

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

Hazardous area (option)		
Intrinsically safe Type XI	**ATEX approval :** ⟨Ex⟩ II 1 G Ex ia IIB/IIC T4 Ga II 1 D Ex ia IIIC T100°C Da	**IECEx approval :** Ex ia IIB/IIC T4 Ga Ex ia IIIC T100°C Da
Explosion proof Type XD/XF	ATEX approval ref: ⟨Ex⟩ 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 & Standards	
EMC	EN 61326-1; FCC 47 CFR part 15
Low voltage	EN/IEC 61010-1
ATEX / IECEx	EN/IEC 60079-0; EN/IEC 60079-11
RoHS	EN 50581
IP & NEMA	EN 60529; NEMA 250

INPUTS

Flowmeter	
Type P	npn; npn-lp; reed; reed-lp; pnp; pnp-lp; namur; coil-hi; coil-lo; 8-1 DC; 12 DC; 24 DC
Frequency	Minimum 0 Hz - maximum 7 kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-Factor	0.000010 - 9999999 with variable decimal position.
Low-pass filter	Available for all pulse signals.

OUTPUTS

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

Alarm outputs	
Function	Max. four user defined ratio alarm outputs.
Alarm output	low, high, low-low or high-high ratio alarm.
Type OA	Three active 24V DC output; max. 50mA per output (requires type PD or PM).
Type OR	Two electro-mechanical relay outputs; max. switch power 230V AC - 0,5A and one OT output (requires type PD or PM).
Type OS	Four electro-mechanical relay outputs; max. switch power 230V AC - 0,5A (requires type AP, OR and PD).
Type OT	Three passive transistor outputs - not isolated. Load: max. 50V DC - 300mA

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	
Shown functions	• ratio 1:__ or as %. • total A (this function can be disabled). • flow rate A (this function can be disabled). • total B (this function can be disabled). • flow rate B (this function can be disabled). • alarm value's low - high - low-low and high-high ratio (this function can be disabled). • alarm value's can be entered (this function can be disabled) • total can be reset to zero by pressing the CLEAR-key twice.

Ratio	
Digits	5 digits.
Units	1:__ or %.
Decimals	0000000; 111111.1; 22222.22; 3333.333

Total	
Digits	7 digits.
Units	L; m^3; kg; lb; GAL; USGAL; bbl; no unit
Decimals	0000000; 111111.1; 22222.22; 3333.333
Note	total can be reset to zero.

Flow rate	
Digits	7 digits.
Units	mL; L; m^3; mg; g; kg; ton; gal; bbl; lb; cf; rev; - - - - (no unit); scf; nm^3; nL; p
Decimals	0000000; 111111.1; 22222.22; 3333.333
Time units	/sec; /min; /hour; /day

Alarm values	
Digits	7 digits.
Units	According to selection for ratio.
Decimals	According to selection for ratio.
Time units	According to selection for ratio.
Type of alarm	flowzero; ratio ll; ratio lo; ratio hi; ratio hh; delay ll; delay lo; delay hi; delay hh

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F114-P is going to be installed or while it is in operation.

Flowmeter does not generate pulses:
Check:
- Signal selection;
- Pulse amplitude;
- Flowmeter, wiring and connection of terminal connectors;
- Power supply of flowmeter.

Flowmeter generates "too many pulses":
Check:
- Settings for total and Flow rate;
- Type of signal selected with actual signal generated;
- Sensitivity of coil input;
- Proper grounding of the F114-P;
- Use screened wire for flowmeter signals and connect screen to terminal 9. (unless connected at sensor).

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.

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

The password is unknown:
- If the password is not 1234, there is only one possibility left: call your supplier.

ALARM
When the alarm flag starts to blink an internal alarm condition has occurred. Press the "select button" several times to display the 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.

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.
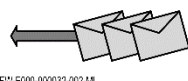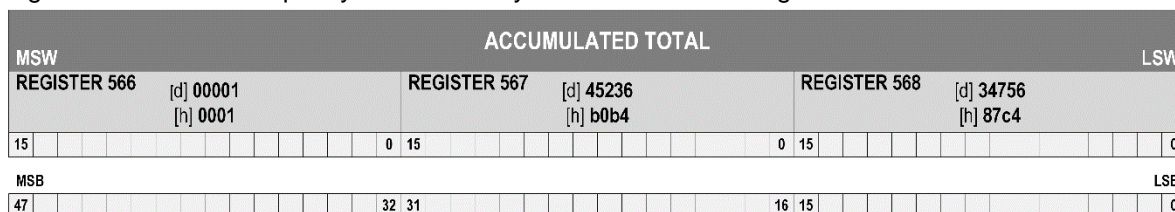
ACCUMULATED TOTAL: [register 566 * 4294967296] + [register 567* 65536] + [register 568*1] =
[d] ACCUMULATED TOTAL: [00001 * 4294967296] + [45236 × 65536] + [34756*1] = 7259588540
[h] ACCUMULATED TOTAL: 0x[0001] [b0b4] [87c4] = 1B0B487BC

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] 82 [h] 0x052	40083	Ratio	2	r	uint32	0…9999999, Representation: unit, time, decimals depending on variables 67,68
[d] 572 [h] 0x23C	40573	flow rate A	2	r	uint32	0…9999999, Representation: unit, time, decimals depending on variables 48, 49, 50
[d] 566 [h] 0x236	40567	total A	3	r*	uint48	0…9999999999, Representation: unit, decimals depending on variables 32, 33
[d] 560 [h] 0x230	40561	accumulated total A	3	r	uint48	0…99999999999999, Representation: unit, decimals depending on variables 32, 33
[d] 588 [h] 0x24C	40589	flow rate B	2	r	uint32	0…9999999, Representation: unit, time, decimals depending on variables 48, 49, 50
[d] 1078 [h] 0x436	41079	total B	3	r*	uint48	0…9999999999, Representation: unit, decimals depending on variables 32, 33
[d] 1072 [h] 0x430	41073	accumulated total B	3	r	uint48	0…99999999999999, Representation: unit, decimals depending on variables 32, 33
[d] 516 [h] 0x204	40517	error status (bitfield)	1	r	uint16	[d] 0 = no error [d] 1 = display error [d] 2 = data-storage error [d] 3 = error 1 + error 2 simultaneously [d] 4 =: initialization error

Reading differential 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-A	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS			
[d] 32 [h] 0x020	40033	unit	1	r/w	uint16	0=none 3=kg 6= USGAL 1=L 4= lb 7=bbl 2= m^3 5=GAL			
[d] 33 [h] 0x021	40034	decimals	1	r/w	uint16	0…3			
[d] 34 [h] 0x022	40035	K-factor	2	r/w	uint32	1...9999999 Representation: 0.000010…9999999 depending on variable 54: decimals K-factor.			
[d] 37 [h] 0x025	40038	decimals K-factor	1	r/w	uint16	0…6			

PDU ADDRESS	REGISTER	VARIABLE FLOW RATE A	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^3 6=ton 10=cf 14=NM^3 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	K-factor	2	r/w	uint32	1...9999999 Representation: 0.000010…9999999 depending on variable: decimals K-factor.			
[d] 54 [h] 0x036	40055	decimals K-factor	1	r/w	uint16	0…6			
[d] 71 [h] 0x047	40072	period	2	r/w	uint16	1...999 Representation: 0.1 – 99.9 sec			

PDU ADDRESS	REGISTER	VARIABLE TOTAL B	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 40 [h] 0x028	40041	K-factor	2	r/w	uint32	1...9999999 Representation: 0.000010…9999999 depending on variable: decimals K-factor.
[d] 43 [h] 0x02b	40044	decimals K-factor	1	r/w	uint16	0…6

PDU ADDRESS	REGISTER	VARIABLE FLOW RATE B	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 227 [h] 0x0E3	40228	K-factor	2	r/w	uint32	1...9999999; Representation: 0.000010…9999999 depending on variable: decimals K-factor.
[d] 230 [h] 0x0E6	40231	decimals K-factor	1	r/w	uint16	0…6

PDU ADDRESS	REGISTER	VARIABLE RATIO	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS		
[d] 85 [h] 0x055	40086	ratio	1	r/w	uint16	0= b/a 2= b/a-b 4= b-a/b 1= b/a+b 3= b-a/a		
[d] 86 [h] 0x056	40087	function	1	r/w	uint16	1:____ - percentage		
[d] 88 [h] 0x058	40089	decimals ratio	1	r/w	uint16	0..3		
[d] 87 [h] 0x057	40088	filter	1	r/w	uint16	1..99		

PDU ADDRESS	REGISTER	VARIABLE ALARM	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS		
[d] 70 [h] 0x046	40071	flowzero	1	r/w	uint16	0=ignore 1=default 2=no relay		
[d] 234 [h] 0x0EA	40235	ratio ll	2	r/w	uint32	0...999999		
[d] 240 [h] 0x0F0	40241	ratio lo	2	r/w	uint32	0...999999		
[d] 243 [h] 0x0F3	40244	ratio hi	2	r/w	uint32	0...999999		
[d] 237 [h] 0x0ED	40238	ratio hh	2	r/w	uint32	0...999999		

PDU ADDRESS	REGISTER	VARIABLE ALARM	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS		
[d] 205 [h] 0x0CD	40206	delay ll	1	r/w	uint16	0...999.9		
[d] 246 [h] 0x0F6	40247	delay lo	1	r/w	uint16	0...999.9		
[d] 248 [h] 0x0F8	40249	delay hi	1	r/w	uint16	0...999.9		
[d] 222 [h] 0x0DE	40223	delay hh	1	r/w	uint16	0...999.9		

PDU ADDRESS	REGISTER	VARIABLE DISPLAY	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS		
[d] 64 [h] 0x040	40065	display function	1	r/w	uint16	0=disabled 1=rate	2=total 3=both	
[d] 68 [h] 0x044	40069	alarm set	1	r/w	uint16	0=operate 1=setup	2=hidden 3=off	
[d] 67 [h] 0x043	40068	backlight brightness	1	r/w	uint16	0=0% (off) 1=20%	2=40% 3=60%	4=80% 5=100% (full)
[d] 110 [h] 0x06E	40111	backlight alarm	1	r/w	uint16	0=OFF	1=ON	2=FLASH

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 1=1sec	2=3sec 3=15sec	4=30sec 5=off
[d] 81 [h] 0x051	40082	power mode	1	r/w	uint16	0=operational 1=shelf		

PDU ADDRESS	REGISTER	VARIABLE FLOWMETER	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS		
[d] 96 [h] 0x060	40097	flowmeter signal A	1	r/w	uint16	0=NPN 1=NPN LP 2=Reed 3=Reed LP	4=PNP 5=PNP LP 6=NAMUR 7=coil hi	8= coil lo 9=act 8.1V 10= act 12 V 11=act 24V
[d] 97 [h] 0x061	40098	flowmeter signal B	1	r/w	uint16	0=NPN 1=NPN LP 2=Reed 3=Reed LP	4=PNP 5=PNP LP 6=NAMUR 7=coil hi	8= coil lo 9=act 8.1V 10= act 12 V 11=act 24V

PDU ADDRESS	REGISTER	VARIABLE ANALOG	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS		
[d] 112 [h] 0x070	40113	output	1	r/w	uint16	0=disable 1=enable		
[d] 124 [h] 0x07C	40125	output select	1	r/w	uint16	0=ratio	1=rate A	2=rate B
[d] 113 [h] 0x071	40114	ana-min	2	r/w	uint32	0…999999 Representation: unit, time, decimals depending on variables 48, 49, 50		
[d] 116 [h] 0x074	40117	ana-max	2	r/w	uint32	0…999999 Representation: unit, time, decimals depending on variables 48, 49, 50		
[d] 119 [h] 0x077	40120	cut off	1	r/w	uint16	0...99 Representation: 0.0 – 9.9%		
[d] 120 [h] 0x078	40121	tune-min	1	r/w	uint16	0...9999		
[d] 122 [h] 0x07A	40123	tune-max	1	r/w	uInt16	0...9999		
[d] 127 [h] 0x07F	40128	filter	1	r/w	uint16	1...99		

PDU ADDRESS	REGISTER	VARIABLE RELAYS	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS		
[d] 135 [h] 0x087	40136	relay 1	1	r/w	uint16	0=off 1=LL	2=LO 3=HI	4=HH 5=all
[d] 136 [h] 0x088	40137	relay 2	1	r/w	uint16	0=off 1=LL	2=LO 3=HI	4=HH 5=all
[d] 137 [h] 0x089	40138	relay 3	1	r/w	uint16	0=off 1=LL	2=LO 3=HI	4=HH 5=all
[d] 138 [h] 0x08A	40139	relay 4 (optional)	1	r/w	uint16	0=off 1=LL	2=LO 3=HI	4=HH 5=all

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 1=2400 2=4800	3=9600 4=9600HP 5=19200	6=38400
[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] 1271 [h] 0x4F7	41272	databits	1	r/w	uint16	0=7bits	1=8bits	
[d] 1272 [h] 0x4F8	41273	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	software version	2	r	uint32	0…999999 Representation: xx.xx.xx
[d] 165 [h] 0x0A5	40166	serial no.	2	r	uint32	0…9999999
[d] 168 [h] 0x0A8	40169	password	1	r	uint16	0…9999
[d] 170 [h] 0x0AA	40171	tag-nr	2	r/w	uint32	0…9999999

APPENDIX D: DECLARATION OF CONFORMITY

Declaration of Conformity

Fluidwell F1-series indicators

Veghel, February 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:	EN60079-0:2009; EN60079-11:2007; EN60079-26:2007; EN61241-11:2006
	Protective system:	ⓧ II 1 G Ex ia IIB/IIC T4 Ga
		ⓧ II 1 D Ex ia IIIC T100 °C Da IP6X
Certification	Certificates:	KEMA 03ATEX1074 X, Issue 4
	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.
Remark: compliance is not affected by standards EN60079-0:2012, EN60079-11:2012 and EN60079-26:2015.

The object of the declaration above is in conformity with the relevant Union harmonisation legislation:

	until April 19th, 2016	from April 20th, 2016
EMC Directive	2004/108/EC	2014/30/EU
RoHS Directive	2011/65/EU	2011/65/EU
Low Voltage Directive	2006/95/EC	2014/35/EU
ATEX Directive	94/9/EC	2014/34/EU

Fluidwell BV

I. Meij, Manager Technology

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

INDEX OF THIS MANUAL

LIST OF FIGURES IN THIS MANUAL

LIST OF CONFIGURATION SETTINGS			
SETTING	DEFAULT	DATE :	DATE :
1 - TOTAL A	Enter your settings here		
11 unit	L		
12 decimals	0000000		
13 K-factor	0000001		
14 decimals K-factor	0		
2 - FLOW RATE A			
21 unit	L		
22 time	/min		
23 decimals	0000000		
24 K-factor	0000001		
25 decimals K-factor	0		
26 period	1.0 sec.		
3 - TOTAL B			
31 K-factor	0000001		
32 decimals K-factor	0		
4 - FLOW RATE B			
41 K-factor	0000001		
42 decimals K-factor	0		
5 - RATIO			
51 ratio	b/a		
52 function	1-		
53 decimals	2		
54 filter	01		
6 - ALARM			
61 flow zero	ignore		
62 ratio ll	0		
63 ratio lo	0		
64 ratio hi	0		
65 ratio hihi	0		
66 delay ll	0.0 sec		
67 delay lo	0.0 sec		
68 delay hi	0.0 sec		
69 delay hihi	0.0 sec		

SETTING	DEFAULT	DATE :	DATE :
7 - DISPLAY		Enter your settings here	
71 function	disabled		
72 alarm set	operator level		
72 light	100%		
74 bl alarm	off		
8 - POWER MANAGEMENT			
81 LCD-new	1 sec.		
82 battery mode	operational		
9 - FLOWMETER			
91 signal A	coil-lo		
92 signal B	coil-lo		
A - ANALOG OUTPUT			
A1 output	disabled		
A2 output selection	ratio		
A3 ana-min	0000000		
A4 ana-max	9999999		
A5 cut off	0.0%		
A6 tune min	0160		
A7 tune max	6656		
A8 filter	01 (off)		
B - RELAYS			
B1 relay 1	off		
B2 relay 2	off		
B3 relay 3	off		
B4 relay 4	off		
C - COMMUNICATION			
C1 speed	9600		
C2 address	1		
C3 mode	BUS-RTU		
C4 databits	8 bits		
C5 parity	none		
D - OTHERS			
D1 model	F114-P		
D2 s-version	03:__:__		
D3 serial nr	_ _ _ _ _ _ _		
D4 password	0000		
D5 tag-nr	0000000		