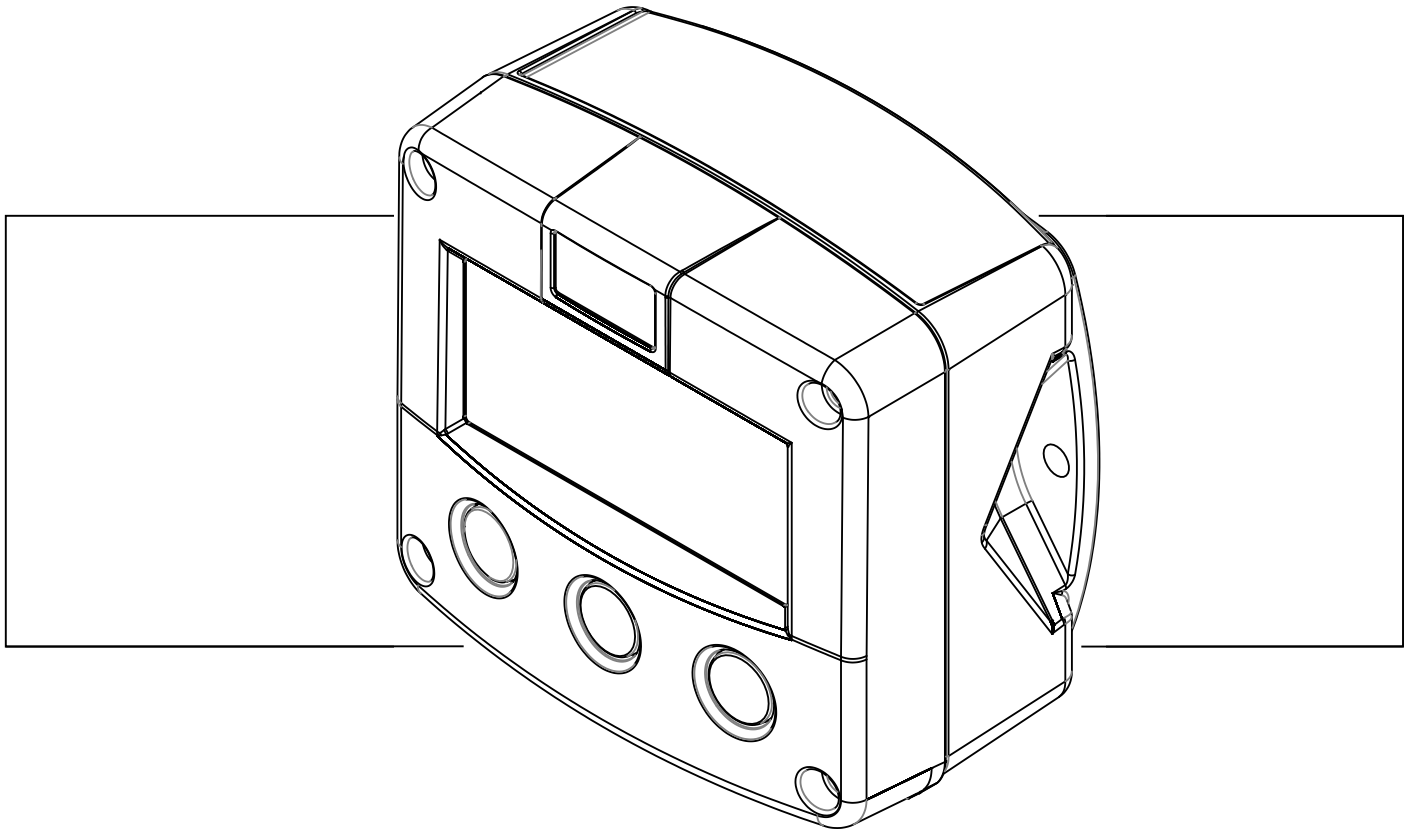
F113-A

FLOWRATE INDICATOR / TOTALIZER WITH HIGH / LOW FLOWRATE ALARMS



Signal input flowmeter: (0)4-20mA

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

Alarm outputs: maximum four flowrate alarms

Options: Intrinsically Safe, Modbus communication, external reset and backlight

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

SAFETY INSTRUCTIONS

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

LIFE SUPPORT APPLICATIONS: The F113-A is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.

Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.

This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).

Do connect a proper grounding to the aluminum enclosure as indicated if the F113-A has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-enclosure and removable terminal-block may never be removed.

- ***Intrinsically Safe applications: follow the instructions as mentioned in Chapter 5 and consult "Fluidwell F1..-..-XI - Documentation for Intrinsic Safety".***

DISPOSAL

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

SAFETY RULES AND PRECAUTIONARY MEASURES

- The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and the procedures as described in this manual are not followed.
- Modifications of the F113-A implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Installation, use, maintenance and servicing of this equipment must be carried out by authorized technicians.
- Check the mains voltage and information on the manufacturer's plate before installing the unit.
- Check all connections, settings and technical specifications of the various peripheral devices with the F113-A supplied.
- Open the enclosure only if all leads are free of potential.
- Never touch the electronic components (ESD sensitivity).
- Never expose the system to heavier conditions than allowed according to the enclosure classification (see manufacture's plate and chapter 4.2.).
- If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
- The local labor and safety laws and regulations must be adhered to..

ABOUT THE OPERATION MANUAL

This operation manual is divided into two main sections:

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

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

A hazardous situation may occur if the F113-A is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this operating manual indicated by the pictograms:

A "**warning**" indicates actions or procedures which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the F113-A or connected instruments.

A "**caution**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the F113-A or connected instruments.

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

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Software version	:	03.03.xx
Manual	:	FW_F113-A_v0601_01_EN
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Information in this manual is subject to change without prior notice. The manufacturer is not responsible for mistakes in this material or for incidental damage caused as a direct or indirect result of the delivery, performance or use of this material.

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1. INTRODUCTION

1.1. SYSTEM DESCRIPTION OF THE F113-A

Functions and features

The flowrate / totalizer model F113-A is a microprocessor driven instrument designed to display flowrate, total and accumulated total as well as the monitoring of the flowrate for high / low values.
This product has been designed with a focus on:

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

Flowmeter input

This manual describes the unit with an analog type input from the flowmeter "-A version". Other versions are available to process pulses or 0-10V flowmeter signals. One flowmeter with a (0)4-20mA signal output can be connected to the F113-A. To power the sensor, several options are available.

Standard outputs

- Max. four configurable alarm outputs: flowrate alarm, high-, low-, high-high- or low-low-flowrate alarm. Switched as long as the flowrate is too high or too low.
- Max. four configurable pulse outputs: a scaled pulse mirroring a certain totalized quantity. Maximum frequency 60Hz.
- Configurable passive linear 4-20mA analog output with 10-bits resolution mirroring the actual flowrate. Flowrate levels as well as the minimum and maximum signal output can be tuned.

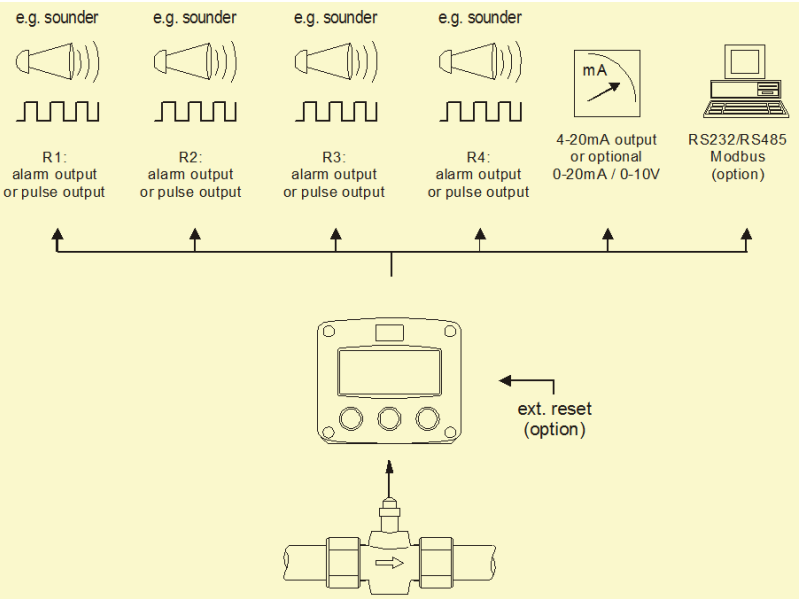


Fig. 1: Typical application for the F113-A .

Configuration of the unit

The F113-A was designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F113-A according to your specific requirements.
SETUP includes several important features, such as K-factors, measurement units, signal selection etc. All setting are stored in EEPROM memory and will not be lost in the event of power failure or a drained battery. To extend the battery-life time (option), please make use of the power-management functions as described in chapter 3.2.3.
A backup of the total and accumulated total in EEPROM memory is made every minute.

Display information

The unit has a LCD with (optional) backlight to show the process information, status and alarm messages.

Options

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

Backlight

When a backlight is available, the brightness can be tuned as desired. For battery and loop powered applications the backlight will not function.

2. OPERATIONAL

2.1. GENERAL

Caution !

The F113-A may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.

This chapter describes the daily use of the F113-A . This instruction is meant for users / operators.

2.2. CONTROL PANEL

The following keys are available:

Fig. 2: Control Panel.

Functions of the keys

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

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

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

2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the F113-A will always function at Operator level. The information displayed is dependent upon the SETUP-settings. All pulses generated by the connected flowmeter are measured by the F113-A in the background, whichever screen refresh rate setting is chosen. After pressing a key, the display will be updated very quickly during a 30 second period, after which it will slow-down again.

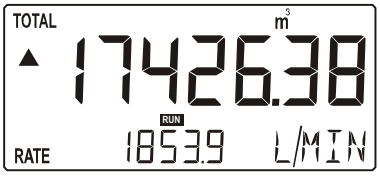


Fig. 3: Example of display information during process.

For the Operator, the following functions are available:

- **Display flowrate / total or flowrate**
  This is the main display information of the F113-A. After selecting any other information, it will always return to this main display automatically. Total is displayed on the upper-line of the display and flowrate on the bottom line.It is possible to display flowrate only with the large 17mm digits; in this instance press the SELECT-key to read the total.
  When "-------" is shown, then the flowrate value is too high to be displayed. The arrows ⬍ indicate the flowrate trend.
- **Clear total**
  The value for total can be re-initialized. To do so, press CLEAR twice. After pressing CLEAR once, the flashing text "PUSH CLEAR" is displayed. To avoid reset at this stage, press another key than CLEAR or wait for 20 seconds.
  Reset of total DOES NOT influence the accumulated total.
- **Display accumulated total**
  When the SELECT-key is pressed, total and accumulated total are displayed. The accumulated total cannot be re-initialized. The value will count up to 99,999,999,999. The unit and number of decimals are displayed according to the configuration settings for total.
- **Programming the flowrate alarm values**

Note !

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

When the SELECT-key is pressed a few times, following flowrate alarm values are displayed:
- low-low flowrate alarm (lolo): enter here 20 L/min for example,
- low flowrate alarm (lo) : enter here 40 L/min for example,
- high flowrate alarm (hi): enter here 200 L/min for example,
- high-high flowrate alarm (hihi): enter here 250 L/min for example.

To change the alarm value, the following procedure must be executed:
1) Press PROG: the word "PROGRAM" will flash or a password will be requested,
2) Use ▸ to select the digits and ▲ to increase that value,
3) Confirm the new alarm value by pressing ENTER.

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

When data is altered but ENTER has not been pressed yet, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER during three seconds: the former value will be reinstated.

- **Flowrate alarm**
  When the actual flowrate is outside the allowed range, an alarm message will be displayed indicating the type of alarm: "LO RATE", "HI RATE", "LO-LO RATE" or "HI-HI RATE".
  The alarm is terminated automatically as soon as the flowrate is within its range again.
- **Low-battery alarm**
  During operation the battery voltage drops. When the battery voltage becomes too low, the battery indicator comes on to show that the operation and indication become less reliable. When the battery indicator is on, install a fresh and new battery (as soon as possible) to keep a reliable operation and indication.

Fig. 5: Example of low-battery alarm.

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

3. CONFIGURATION

3.1. INTRODUCTION

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

Caution !

Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.

The F113-A may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.

Ensure that the measuring system is correctly wired up according to the wiring diagrams. The housing may only be opened by trained personnel.

Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.

3.2. PROGRAMMING SETUP-LEVEL

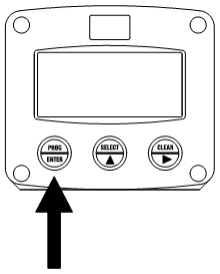
3.2.1. GENERAL

Configuration of the F113-A is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows ⬍ will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically.
SETUP can be reached at all times while the F113-A remains fully operational.

Note !

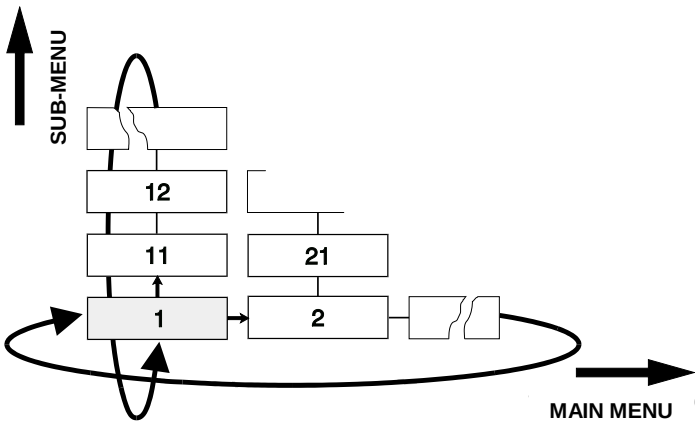
A Password may be required to enter SETUP.
Without this Password access to SETUP is denied.

To enter SETUP-level:



Press the PROG/ENTER key for 7 seconds.

Matrix structure SETUP-menu:



The menu is structured with a two digit menu-number and selectable items in the menu screens. The first digit gives the sub menu (11) where the second digit (11) gives the menu-item.
The number is show at the lower line before the menu-item name.

SCROLLING THROUGH SETUP-LEVEL

Selection of function-group and function:

SETUP is divided into several function groups and functions.

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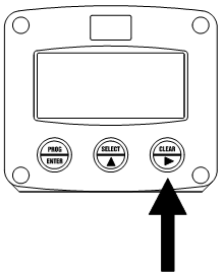
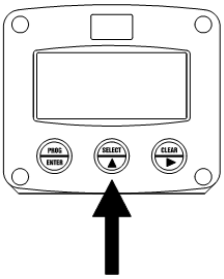
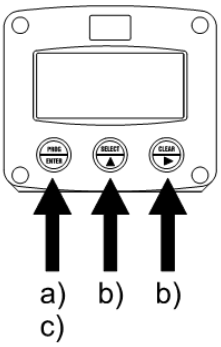


Select a setup menu
with the CLEAR/ ▸ key.



Select a menu item
with the SELECT/ ▲ key.

To change or select a value:



- Momentarily, press the PROG/ENTER key.
  The program indicator start to flash.
- Select or enter a value with the SELECT/ ▲ key and/or
  the CLEAR/ ▸ key.
- Press the PROG/ENTER key to confirm the value/selection.

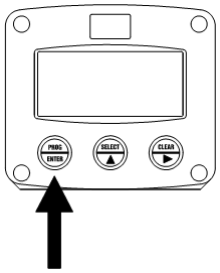
To change a value, use ▸ to select the digits and ▲ to increase that value.
To select a setting, both ▲ and ▸ can be used.
During editing, if the entered value is too high or too low the increase sign ▲ or decrease-sign ▼ will come on.

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

Note !

Changes will only be applied after ENTER has been pressed!

To return to OPERATOR-level:



Press the PROG/ENTER key for 3 seconds.

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

3.2.2. OVERVIEW FUNCTIONS SETUP LEVEL

1	**TOTAL**	
11	UNIT	L; m3; kg; lb; GAL; USGAL; bbl; no unit
12	DECIMALS	0000000; 111111.1; 22222.22; 3333.333
13	SPAN	0.000001 - 999999 unit/second
14	DECIMALS SPAN	0 - 6
2	**FLOWRATE**	
21	UNIT	L; m3; mg; g; kg; ton; GAL; bbl; lb; cf; rev; - - - - (no unit); scf; Nm3; Nl; P; mL
22	TIME	/sec; /min; /hr; /day
23	DECIMALS	0000000; 111111.1; 22222.22; 3333.333
24	SPAN	0.000001 - 999999 unit/second
25	DECIMALS SPAN	0 - 6
3	**ALARM**	
31	FLOWZERO	default; no relay; ignore
32	ALARM LL	0000.000 - 9999999
33	ALARM LO	0000.000 - 9999999
34	ALARM HI	0000.000 - 9999999
35	ALARM HH	0000.000 - 9999999
36	DELAY ALARM LL	0.0 - 999.9 seconds
37	DELAY ALARM LO	0.0 - 999.9 seconds
38	DELAY ALARM HI	0.0 - 999.9 seconds
39	DELAY ALARM HH	0.0 - 999.9 seconds
4	**DISPLAY**	
41	FUNCTION	total; rate
42	ALARM SET	operator; setup; hidden
4.3	LIGHT	0% (off); 20%; 40%; 60%; 80%; 100% (full brightness)
4.4	BL ALARM	off; on; flash
5	**POWER MANAGEMENT**	
51	LCD NEW	fast; 1 sec; 3 sec; 15 sec; 30 sec; off
52	BATTERY MODE	operational; shelf
6	**FLOWMETER**	
61	FORMULA	interpolation, square root
62	FILTER	0.1- 99
63	CUT-OFF	0.0 - 99.9%
64	CALIB-LO	default; calibrate; calibrate set
65	CALIB-HI	default; calibrate; calibrate set
7	**ANALOG**	
71	OUTPUT	Disable; enable
72	RATE-MIN	0000.000 - 9999999
73	RATE-MAX	0000.000 - 9999999
74	CUT-OFF	0.0 - 9.9%
75	TUNE-MIN	0 - 9999
76	TUNE-MAX	0 - 9999
77	FILTER	0.1 - 99
8	**PULSE**	
81	RELAY 1	off; lo-lo; lo; hi; hi-hi; all; pulse
82	RELAY 2	off; lo-lo; lo; hi; hi-hi; all; pulse
83	RELAY 3	off; lo-lo; lo; hi; hi-hi; all; pulse
84	RELAY 4	off; lo-lo; lo; hi; hi-hi; all; pulse
85	WIDTH	0.000 – 9.999 sec
86	DECIMALS	0000000; 111111.1; 22222.22; 3333.333
87	AMOUNT	0.001 – 9999999
9	**COMMUNICATION**	
91	SPEED	1200; 2400; 4800; 9600; 9600HP; 19200; 38400
92	ADDRESS	1 - 247
93	MODE	bus-asc; bus-rtu; off
94	DATABITS	8 bits; 7 bits
95	PARITY	none; even; odd
A	**OTHERS**	
A1	MODEL	F113-A
A2	SOFTWARE VERSION	03.03.xx
A3	SERIAL NR	xxxxxxx
A4	PASSWORD	0000 - 9999
A5	TAG-NR	0000000 - 9999999

3.2.3. EXPLANATION OF SETUP-FUNCTIONS

1 - TOTAL	
UNIT **11**	SETUP 11 determines the measurement unit for total, accumulated total and pulse output. The following units can be selected: L; m3; kg; lb; GAL; USGAL; bbl; no unit Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the K-factor has to be adapted as well; the calculation is not done automatically.
DECIMALS **12**	The decimal point determines for total, accumulated total and pulse output the number of digits following the decimal point. The following can be selected: 0000000; 111111.1; 22222.22; 3333.333
SPAN **13**	With the span, the flowmeter signal is converted to a quantity. The **span for Total** is determined on the basis of the measurement unit (setting 11) and the **flowrate per second** at 20mA. Enter the span in whole numbers (decimals are set with SETUP 14). The more accurate the span, the more accurate the functioning of the system will be. **Example 1** **Calculating the Span.** *Let us assume that the flowmeter generates 20mA at a rate of 652.31 USGAL per hour, the selected unit is barrels.* *There are 42 gallons in one barrel; so the rate is 652.31/42 is 15.53119 barrels/hour.* *This is 0.0043142 barrels/second, which is the span.* *Enter for SETUP - 13: "004314" and for SETUP - 14 "6".* **Example 2** **Calculating the Span.** *Let us assume that the flowmeter generates 20mA at a flowrate of 2,481.3 Liters/minute and the selected unit is "cubic meters / m3".* *The rate per second is 2,481.3÷60 is 41.355 L/sec.* *This is 0.041355 m3/sec., which is the span.* *Enter for SETUP - 13: "041355" and for SETUP - 14 - decimals span "6".*
DECIMALS SPAN **14**	This setting determines the number of decimals for the Span (SETUP 13). The following can be selected: 0 - 1 - 2 - 3 - 4 - 5 - 6 Please note that this function influences the accuracy of the Span indirectly. This setting has NO influence on the displayed number of digits for total (SETUP 12)!

2 - FLOWRATE	
The settings for total and flowrate are entirely separate. In this way, different units of measurement can be used for each e.g. cubic meters for total and liters for flowrate. The display update time for flowrate is one second or more. ***Note:*** *these settings also influence the analog output.*	
UNIT **21**	SETUP 21 determines the measurement unit for flowrate. The following units can be selected: L; m3; mg; g; kg; ton; GAL; bbl; lb; cf; rev; - - - - (no unit); scf; Nm3; Nl; P; mL Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the K-factor has to be adapted as well; the calculation is not done automatically.
TIME **22**	The flowrate can be calculated per second (SEC), minute (MIN), hour (HR) or day (DAY).
DECIMALS **23**	This setting determines for flowrate the number of digits following the decimal point. The following can be selected: 0000000; 111111.1; 22222.22; 3333.333

SPAN **24**	With the span, the flowmeter signal is converted to a quantity. The **span for flowrate** is determined on the basis of the **selected measurement unit and time unit** at 20mA. Enter the span in whole numbers (decimals are set with SETUP 25). The more accurate the span, the more accurate the functioning of the system will be.
DECIMALS SPAN **25**	This setting determines the number of decimals for the K-factor (SETUP 24). The following can be selected: 0 - 1 - 2 - 3 - 4 - 5 - 6 Please note that this SETUP - influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for "flowrate" (SETUP 23)!

3 - ALARM

Note !

With these settings, it is determined how the flowrate will be monitored and the functionality of the transistor / relay outputs (terminals 03-04, 05-06 and 15-16) be determined.
***Note:** for transistor / relay output functions: read SETUP 8 "relays".*

FLOWZERO **31**	When the flowrate is zero, then it is possible to ignore or disable the flowrate monitoring. The following settings can be selected: DEFAULT: in case of a low-flowrate alarm and zero flow, it will switch the alarm output and indicate the alarm on the display. NO RELAY: in case of a low-flowrate alarm and zero flow, it won't switch the alarm output but will indicate the alarm on the display only. IGNORE: in case of a low-flowrate alarm and zero flow, it won't switch the alarm output and nothing will be indicated on the display.
ALARM LO-LO **32**	The low-low alarm is set with this setting. An alarm will be generated as long as the flowrate lower as this. With value 0.0 this function is disabled.
ALARM LO **33**	The low alarm is set with this setting. An alarm will be generated as long as the flowrate lower as this. With value 0.0 this function is disabled.
ALARM HI **34**	The high alarm is set with this setting. An alarm will be generated as long as the flowrate higher as this. With value 0.0 this function is disabled.
ALARM HI-HI **35**	The high-high alarm is set with this setting. An alarm will be generated as long as the flowrate higher as this. With value 0.0 this function is disabled.
DELAY ALARM LO-LO **36**	An alarm generated by SETUP 32 "lo-lo" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.
DELAY ALARM LO **37**	An alarm generated by SETUP 33 "lo" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.
DELAY ALARM HI **38**	An alarm generated by SETUP 34 "hi" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.
DELAY ALARM HI-HI **39**	An alarm generated by SETUP 35 "hi-hi" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.

4 - DISPLAY

FUNCTION **41**	The large 17mm digits can be set to display total or flowrate. When "total" is selected, both total and flowrate are displayed simultaneously. When "flowrate" is selected, only flowrate will be displayed with its measuring unit while total will be displayed after pressing SELECT.
ALARM SET **42**	This function determines if the flowrate alarm values can be set at both operator level and SETUP-level or SETUP-level only. If SETUP has been selected, the alarm values are still visible for the Operator but cannot be changed.
LIGHT **43**	BACKLIGHT BRIGHTNESS 0% (off); 20%; 40%; 60%; 80%; 100% (full brightness).
BL ALARM **44**	This function determines the behavior of the backlight (BL) during an alarm. The following can be selected: off; on; flash.

5 - POWER MANAGEMENT

When used with the internal battery option, the user can expect reliable measurement over a long period of time. The F113-A has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:

LCD NEW **51** Note !	The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display update, it is **strongly advised** to select a slow refresh rate. Please understand that NO information will be lost; every pulse will be counted and the output signals will be generated in the normal way. The following can be selected: Fast; 1 sec; 3 sec; 15 sec; 30 sec; off. **Example 3:** **Battery life-time** *battery life-time with a coil pick-up, 1KHz. pulses and FAST update: about 2 years.* *battery life-time with a coil pick-up, 1KHz. pulses and 1 sec update: about 5 years.* *After a button has been pressed by the operator - the display refresh rate will always switch to FAST for 30 seconds. When "OFF" is selected, the display will be switched off after 30 seconds and will be switched on as soon as a button has been pressed.*
BATTERY-MODE **52**	The unit has two modes: operational or shelf. After "shelf" has been selected, the unit can be stored for several years; it will not count pulses, the display is switched off but all settings and totals are stored. In this mode, power consumption is extremely low. To wake up the unit again, press the SELECT-key twice.

6 - FLOWMETER

FORMULA **61**	The F113-A can process the 4-20mA signal in two ways: ▪ Interpolation: the signal is processed linear: **R = S x I** ▪ Square root: for differential pressure: **R = S √ I** where: **R** = Rate: the calculated flowrate **S** = Span: the maximum flowrate at 20mA. The span is programmed with setting 24 for flowrate and with setting 13 for total. **I** = Input: the scaled analog value; in these formulas value 0 (zero) for (0)4mA and value 1 (one) for 20mA.
FILTER **62**	The analog output signal of a flowmeter does mirror the actual flow. This signal is measured several times a second by the F113-A. The value measured is a "snap-shot" of the real flow as it will be fluctuating. With the help of this digital filter a stable and accurate reading can be obtained while the filter level can be set to a desired value. The filter principal is based on three input values: the filter level (0.1-99), the last measured analog value and the last average value. The higher the filter level, the longer the response time on a value change will be. Below, several filter levels with there response times are indicated:

FILTER VALUE	RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE. TIME IN SECONDS			
	50% INFLUENCE	75% INFLUENCE	90% INFLUENCE	99% INFLUENCE
01	filter disabled	filter disabled	filter disabled	filter disabled
02	0.3 seconds	0.5 seconds	1.0 seconds	1.8 seconds
03	0.5 seconds	1.0 seconds	1.5 seconds	3 seconds
05	1.0 seconds	1.8 seconds	2.8 seconds	5.3 seconds
10	1.8 seconds	3.5 seconds	5.6 seconds	11 seconds
20	3.5 seconds	7.0 seconds	11 seconds	23 seconds
30	5.3 seconds	10 seconds	17 seconds	34 seconds
50	8.8 seconds	17 seconds	29 seconds	57 seconds
75	13 seconds	26 seconds	43 seconds	86 seconds
99	17 seconds	34 seconds	57 seconds	114 seconds

CUT-OFF **64**	To ignore e.g. leakage of the flow or vibration, a low-flow cut-off can be set as percentage over the full range of 16mA (or 20mA / 10V). When the analog value is less then required with this setting, the signal will be ignored. The cut-off value can be programmed is the range 0.0 - 99.9%.

FUNCTION (setup 61)	SPAN (setup 13/24)	REQUIRED CUT-OFF	CUT-OFF (setup 63)	REQUIRED OUTPUT
interpolation	450 L/min	25 L/min	25/450 x 100%=5.5%	16mA x 5.5% + 4mA = 4.88mA
square root	450 L/min	25 L/min	$(25/450)^2$ x 100%=0.3%	16mA x 0.3% + 4mA = 4.05mA

CALIB-LO **65** 	With this setting it is possible to calibrate the input value for (0)4mA as the signal from the flowmeter might not be exact 4.0 mA (or 0.0 mA) at flowrate zero. This function will measure the real output value at flow zero. ***Be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!*** After pressing PROG, three settings can be selected: ▪ CALIB: with this setting, the input will be calibrated with the actual "(0)4mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be more than the calibrated value before the signal will be processed. ▪ DEFAULT: with this setting, the manufactures value is re-installed. ▪ CAL SET: to select the last calibrated value.
CALIB-HI **66** 	With this setting it is possible to calibrate the input value for 20mA as the signal from the flowmeter might not be exact 20.0 mA at maximum flowrate. This function will measure the real output value at maximum flowrate. ***Be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!*** After pressing PROG, three settings can be selected: ▪ CALIB: with this setting, the input will be calibrated with the actual "(0)4mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be more than the calibrated value before the signal will be processed. ▪ DEFAULT: with this setting, the manufactures value is re-installed. ▪ CAL SET: to select the last calibrated value.

7 - ANALOG OUTPUT

A linear 4-20mA signal (option AB: 0-20mA or option AU: 0-10V) output signal is generated according to the flowrate with a 10 bits resolution. The settings for flowrate (SETUP 2) directly influence the analog output. When a power supply is available but the output is disabled, a 3.5mA signal will be generated. The relationship between rate and analog output is set with the following functions.

Note: *When the analog output is not used, please make sure that setting 71 is disabled, or else the battery life time will be reduced significantly!*

OUTPUT **71**	The D/A converter has a relatively high power consumption. If the analog output is not being used, select "disable" to switch-off the converter. For more information read par. 4.4.3.
RATE-MIN **72** 	Enter here the flowrate at which the output should generate a 4mA signal (or 0mA / 0V) - in most applications at flowrate "zero". The number of decimals displayed depend upon SETUP 23. The time and measuring units (L/min for example) are dependent upon SETUP 21 and SETUP 22 but are not displayed. *The analog output value can be programmed "up-side-down" if desired, so 20mA at minimum flowrate for example!*
RATE-MAX **73** 	Enter here the flowrate at which the output should generate a 20mA (or 10V) - in most applications at maximum flow. The number of decimals displayed depend upon SETUP 23. The time and measuring units (L/min for example) are dependent upon SETUP 21 and SETUP 22 but cannot be displayed.

	The analog output value can be programmed "up-side-down" if desired, so 4mA at maximum flowrate for example!
CUT-OFF **74**	To ignore leakage of the flow for example, a low flow cut-off can be set as a percentage of the full range of 16mA (or 20mA / 10V). When the flow is less than the required rate, the current will be 4mA. **Example:**

4MA (SETUP 72)	20MA (SETUP 73)	CUT-OFF (SETUP 74)	REQUIRED RATE	OUTPUT
0 L/min	100 L/min	2%	(100-0)*2% = 2.0 L/min	4+(16*2%) = 4.32mA
20 L/min	800 L/min	3.5%	(800-20)*3.5%= 27.3 L/min	4+(16*3.5%)=4.56mA

TUNE-MIN **75** 	The initial minimum analog output value is 4mA (or 0mA / 0V). However, this value might differ slightly due to external influences such as temperature for example. The 4mA value (or 0mA / 0V) can be tuned precisely with this setting. ***Before tuning the signal,*** ***be sure that the analog signal is not being used for any application!*** After pressing PROG, the current will be about 4mA (or 0mA / 0V). The current can be increased/decreased with the arrow-keys and is directly active. Press ENTER to store the new value.
TUNE-MAX **76** 	The initial maximum analog output value is 20mA (or 10V). However, this value might differ slightly due to external influences such as temperature for example. The 20mA value (or 10V) can be tuned precisely with this setting. ***Before tuning the signal,*** ***be sure that the analog signal is not being used for any application!*** After pressing PROG, the current will be about 20mA (or 10V). The current can be increased/decreased with the arrow-keys and is directly active. Press ENTER to store the new value.
FILTER **77**	This function is used to stabilize the analog output signal. The output value is updated every 0.1 second. With the help of this digital filter a more stable but less precise reading can be obtained. The filter principal is based on three input values: the filter level (0.1-99), the last analog output value and the last average value. The higher the filter level, the longer the response time on a value change will be. Below, several filter levels with their response times are indicated:

FILTER VALUE	RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE. TIME IN SECONDS			
	50% INFLUENCE	75% INFLUENCE	90% INFLUENCE	99% INFLUENCE
01	filter disabled	filter disabled	filter disabled	filter disabled
02	0.1	0.2	0.4	0.7
03	0.2	0.4	0.6	1.2
05	0.4	0.7	1.1	2.1
10	0.7	1.4	2.2	4.4
20	1.4	2.8	4.5	9.0
30	2.1	4	7	14
50	3.5	7	11	23
75	5.2	10	17	34
99	6.9	14	23	45

8 - RELAY OUTPUT

These settings determine the function of the switch outputs.
Note: If the unit is Intrinsically Safe, it will have two outputs. If type OS has been supplied, it will have four outputs. Else it has three outputs. The alarm settings - SETUP 3 - need to correspond with the selections below.

RELAY 1 **81**	Assign the output function to R1: high alarm, low alarm, high-high alarm, low-low alarm, flowrate alarm or pulse output (max 5Hz). ***Note:*** *Intrinsically safe applications: this setting has no influence on any output; please read 83: R3.*
RELAY 2 **82**	Assign the output function to R2: high alarm, low alarm, high-high alarm, low-low alarm, flowrate alarm or pulse output (max 60Hz).
RELAY 3 **83**  Note !	Assign the output function to R3: high alarm, low alarm, high-high alarm, low-low alarm, flowrate alarm or pulse output (max 60Hz). *Intrinsically safe applications: This fast output is assigned to output R1 and not R3.*
RELAY 4 **84**	This output is only available if type OS has been supplied (four mechanic relay outputs). Assign the output function to R4: high alarm, low alarm, high-high alarm, low-low alarm, flowrate alarm or pulse output. (max 5 Hz).
WIDTH **85**  Note !	The pulse width determines the duration of the asserted impulse. The duty cycle is 50/50, therefore the minimum time between the pulses is as long as the period time (= two times the pulse width). The pulse width is set in milliseconds in the range 0.001 - 9.999 sec. *Value "zero" disables the pulse output.* *If the frequency should go out of range - when the flowrate increases for example - an internal buffer will be used to "store the missed pulses": As soon as the flowrate slows down, the buffer will be "emptied". It might be that pulses will be missed due to a buffer-overflow, so it is advised to take this in consideration when programming this setting.*
DECIMALS **86**	This setting determines the decimal position for setting 87.
AMOUNT **87**	According to the settings for total, a pulse will be generated every X-quantity.

9 - COMMUNICATION (OPTIONAL)

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

SPEED **91**	For external control, the following communication speeds can be selected: 1200; 2400; 4800; 9600; 9600HP; 19200; 38400 Baud.
ADDRESS **92**	For communication purposes, a unique identity can be attributed to every F113-A . This Modbus address can vary from 1-247.
MODE **93**	The communication protocol is Modbus ASCII or RTU mode. Select OFF, to disable this communication function.
DATABITS **94**	This setting determines for communication the number of data bits. Select 8 bit for bus-rtu and 7 bits for bus-asc.
PARITY **95**	As demanded by the connected equipment, select a parity bit (odd, even or none).

A - OTHERS

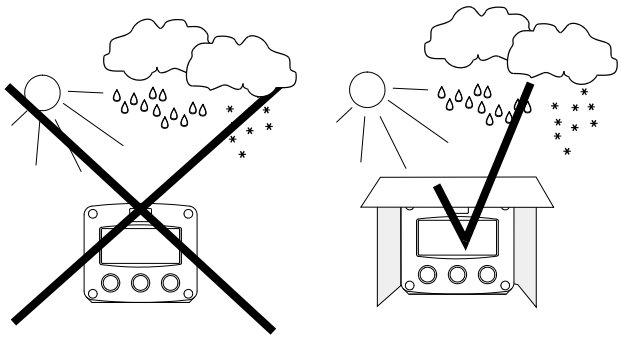
MODEL **A1**	For support and maintenance it is important to have information about the characteristics of the F113-A . Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
SOFTWARE VERSION **A2**	For support and maintenance it is important to have information about the characteristics of the F113-A . Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
SERIAL NR **A3**	For support and maintenance it is important to have information about the characteristics of the F113-A . Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
PASSWORD **A4**	All SETUP-values can be password protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
TAG-NR **A5**	For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.

4. INSTALLATION

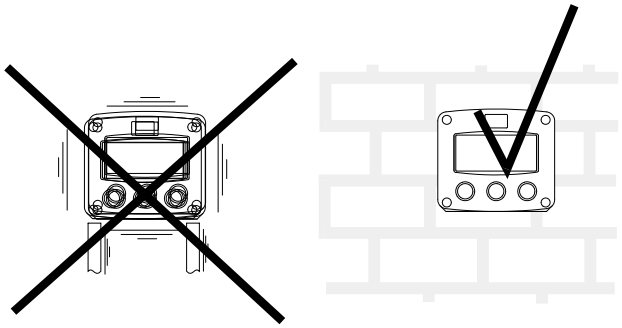
4.1. GENERAL DIRECTIONS

- ***Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.***
- ***The F113-A may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.***
- ***Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.***
- ***Take careful notice of the " Safety rules, instructions and precautionary measures " at the front of this manual.***

4.2. INSTALLATION / SURROUNDING CONDITIONS



Take the relevant IP classification of the enclosure into account (see manufactures plate). Even an IP67/Type 4(X) enclosure should NEVER be exposed to strongly varying (weather) conditions.
When panel-mounted, the unit is IP65/Type 4(X)!
When used in very cold surroundings or varying climatic conditions, take the necessary precautions against moisture by placing a dry sachet of silica gel, for example, inside the instrument case.



Mount the F113-A on a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE

Aluminum enclosures:

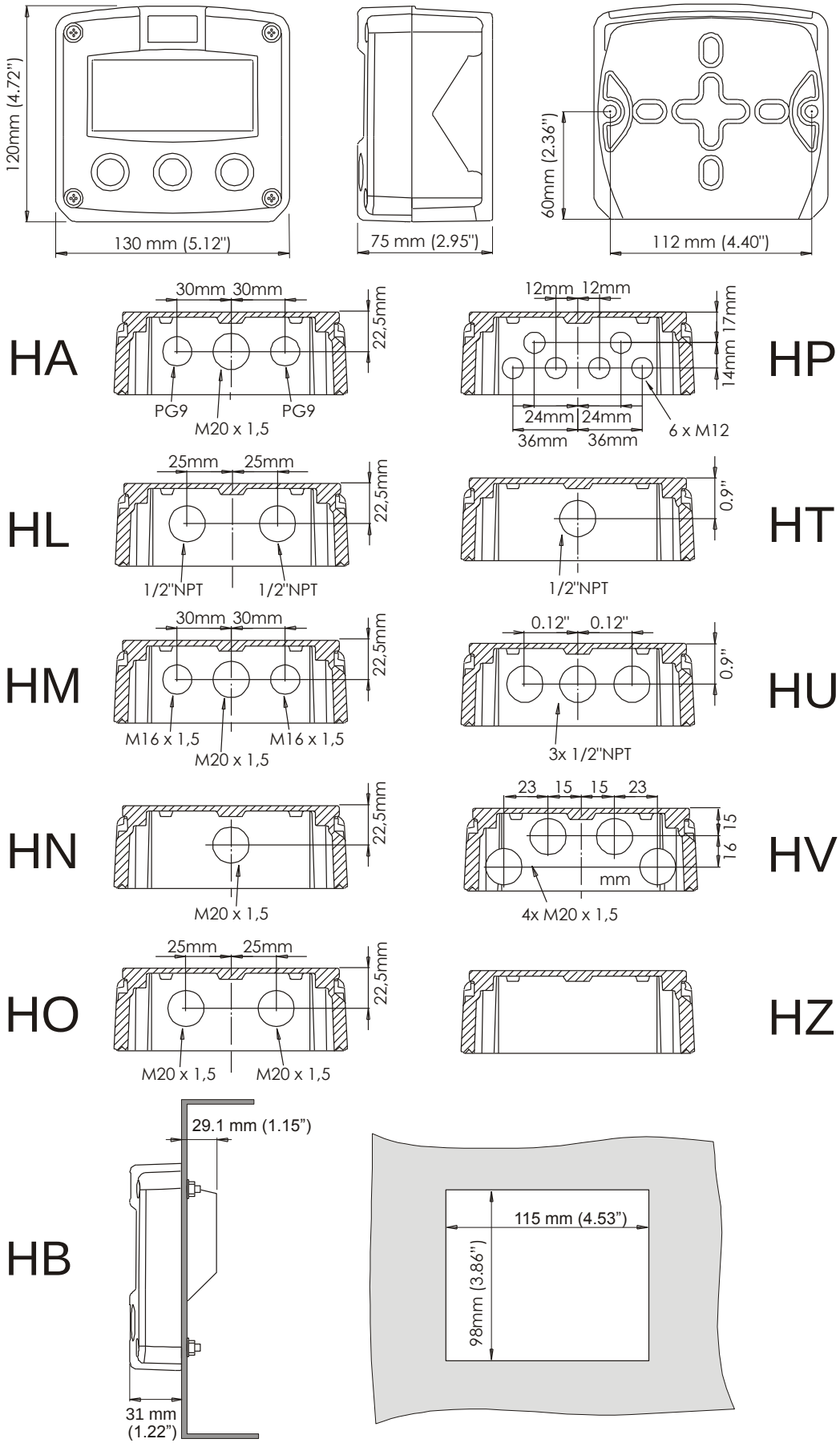
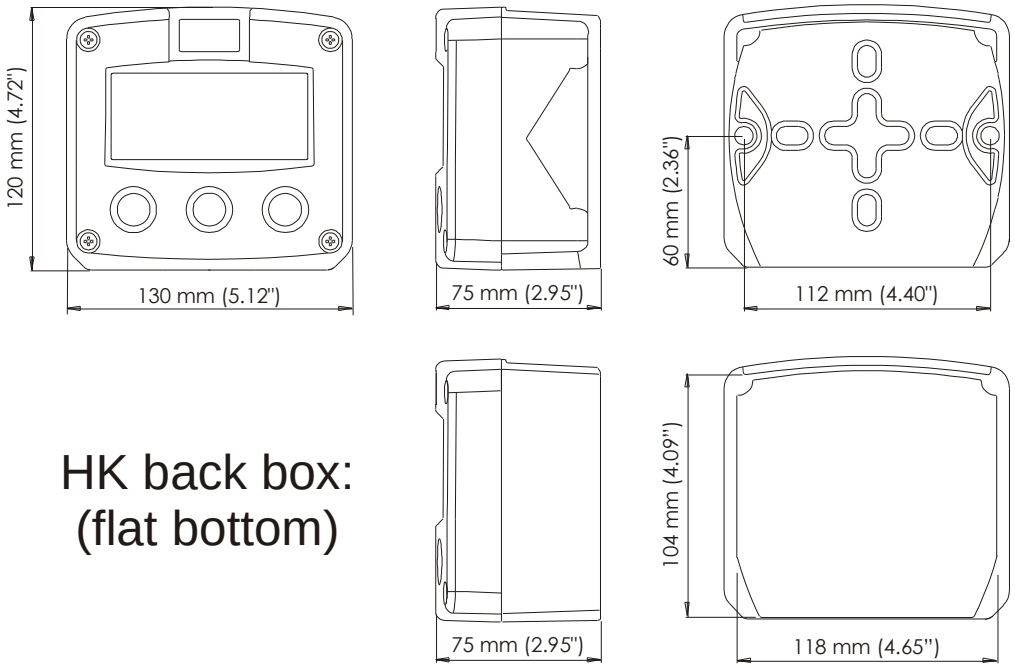


Fig. 6: Dimensions aluminum enclosures.

GRP enclosures:



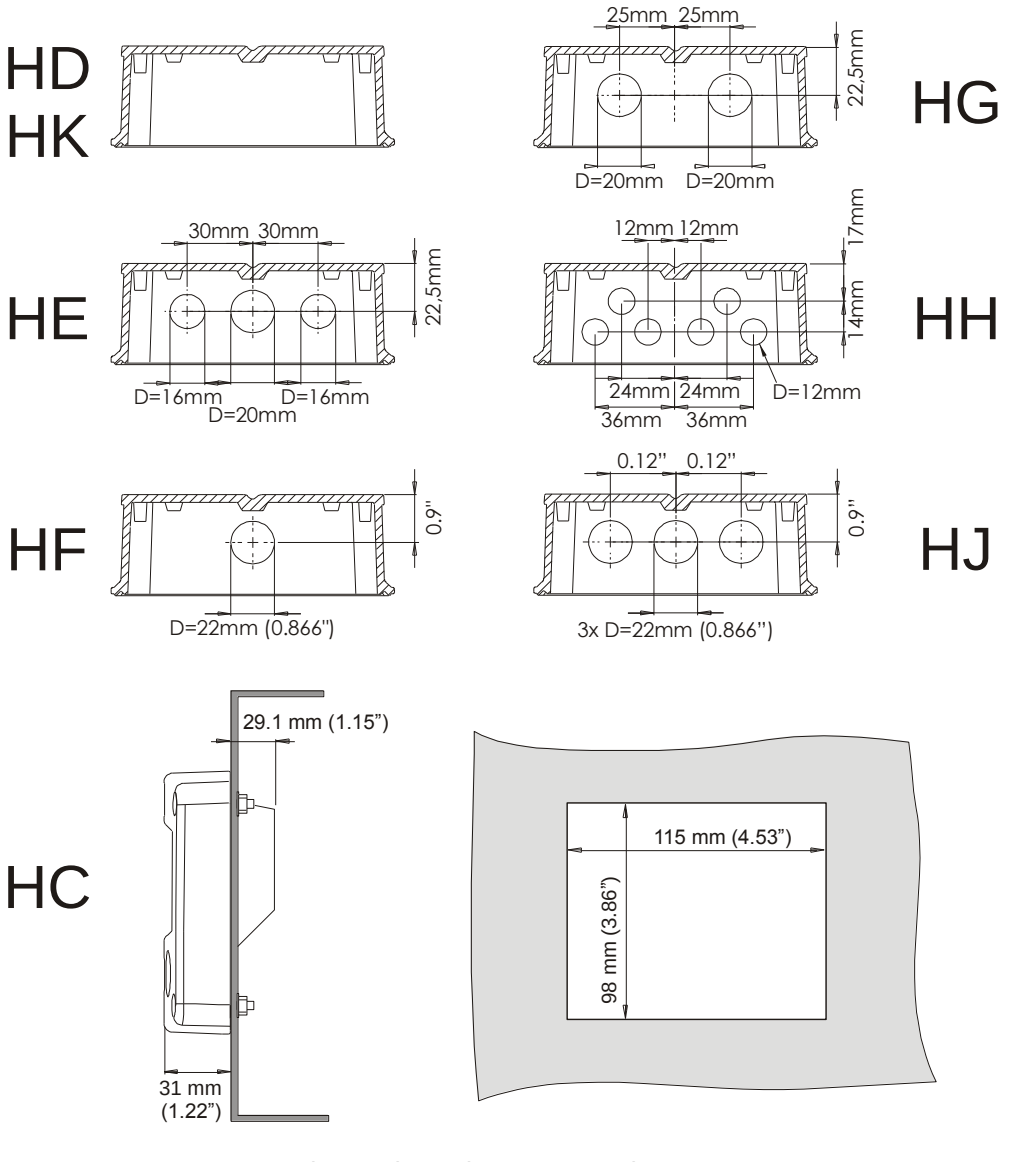


Fig. 7: Dimensions GRP enclosures.

4.4. INSTALLING THE HARDWARE

4.4.1. INTRODUCTION

Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.

This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).

Aluminum enclosures

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

Do ground the aluminum enclosure properly as indicated, if the F113-A has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-enclosure and removable terminal-block may never be removed.

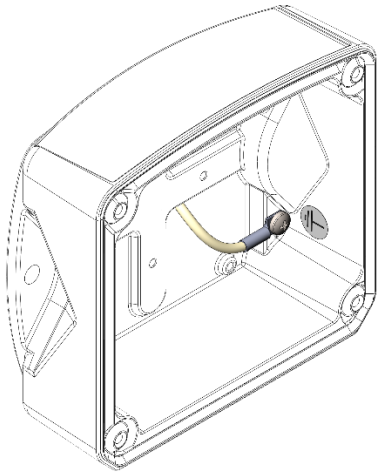


Fig. 8: Grounding aluminum enclosure with type PM 115-230V AC.

FOR INSTALLATION, PAY ATTENTION TO:

- Separate cable glands with effective IP67/Type 4(X) seals for all wires.
- Unused cable entries: ensure that you fit IP67/Type 4(X) plugs to maintain rating.
- A reliable ground connection for both the sensor, and if applicable, for the metal enclosure.
- 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.

4.4.2. VOLTAGE SELECTION SENSOR SUPPLY

For Intrinsically Safe applications: read chapter 5.

Type PB / PC / PX (AP) - battery powered and output loop-powered applications:
Terminal 11 provides a limited supply voltage of 3 V DC (coil signals 1.2V) for the signal output of the flowmeter.

Note !

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

Type PD / PF / PM: Sensor supply: 1.2 - 3V - 8.2V - 12V or 24 V DC:
With this option, a real power supply for the sensor is available. The flowmeter can be powered with 8.2 - 12 or 24 V DC.
Total power consumption PD: max. 50mA@24V and PF / PM: max. 400mA@24V.
The voltage is selected with the three switches inside the enclosure.

WARNING

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

First, remove the terminal strip(s) after which the internal plastic cover can be removed. The switches are located in the top left corner (type PD) or on the right hand (type PF / PM) as indicated:

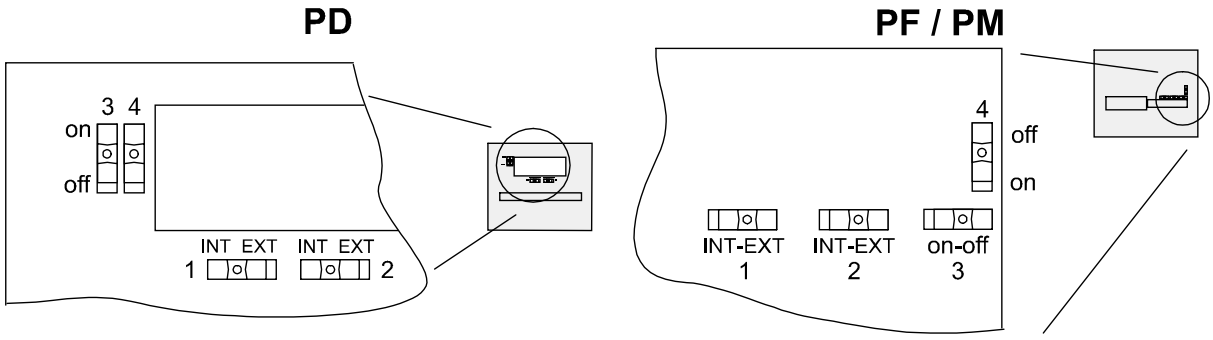


Fig. 9: Switch position voltage selection (type PD, PF and PM).

Switch positions

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

SENSOR B
NOT AVAILABLE FOR THIS MODEL

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

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

4.4.3. TERMINAL CONNECTORS

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

The following terminal connectors are available:

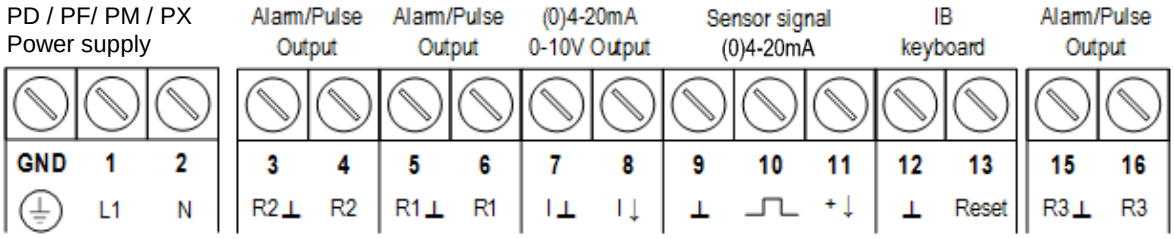


Fig. 10: Overview of terminal connectors standard configuration F113-A and options.

REMARKS: TERMINAL CONNECTORS:

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

TYPE	SENSOR SUPPLY	Terminal			backlight	TYPE AA	TYPE AU	Type OA	Type OR
		GND	1	2					
PD 8-24V AC	8,2-12-24V max. 50mA		AC	AC	◊	◊	◊	◊	
PD 8-30V DC	8,2-12-24V max. 50mA	L-	L+		◊	◊	◊	◊	
PF 24V AC ± 15%	8,2-12-24V max. 400mA		AC	AC	◊	◊	◊		◊
PF 24V DC ± 15%	8,2-12-24V max. 400mA	L-	L+		◊	◊	◊		◊
PM 115-230V AC ± 15%	8,2-12-24V max. 400mA	PE	L	N	◊	◊	◊	◊	◊
Note PD	do not use a AC autotransformer (Spartrafo) without a galvanic isolation.								
Note PF / PM	The total consumption of the sensors and outputs may not exceed 400mA@24V								

◊=option

Note !

Power Supply: Terminal GND- 01- 02 <u>only available with type PX</u>:
8-30V DC
This is not a real sensor supply.
Only suitable for sensors with a very low power consumption.

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

Terminal 03-04; alarm / pulse output R2:
This output is always a fast output. With SETUP 8, the function of this output is set to a flowrate alarm output or pulse output.
If pulse output function is selected: the maximum pulse frequency of this output is 500Hz. If a relay output option has been supplied, be sure that the output frequency does not exceed 0.5Hz else the life-time of the relay will be reduced significantly.

Terminal 05-06; alarm / pulse output R1:
This output is always a slow output. With SETUP 8, the function of this output is set to a flowrate alarm output or pulse output.
If pulse output function is selected: the maximum pulse frequency of this output is 0.5Hz as determined by the relay limitations.

Type OA

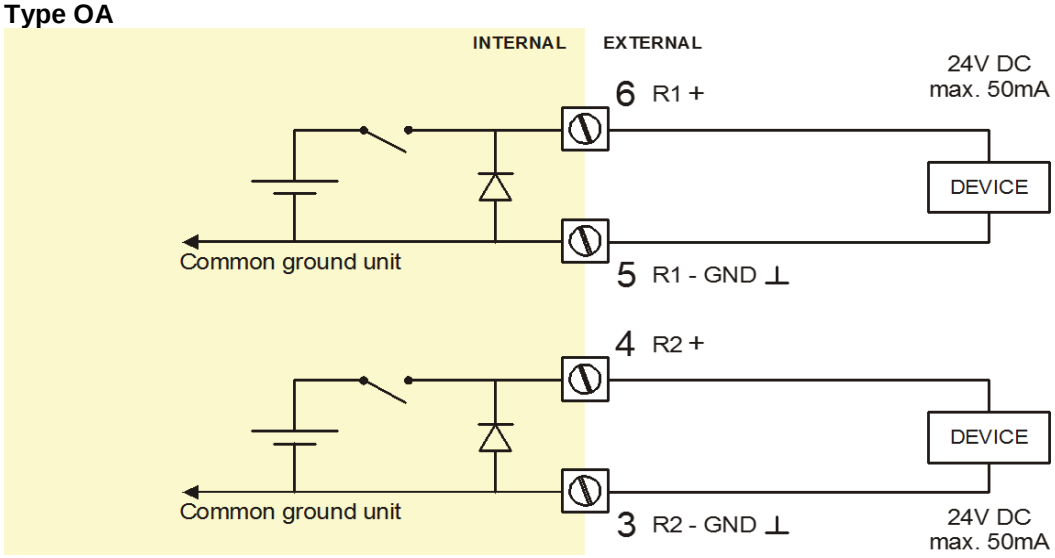


Fig. 11: Terminal connections - Active output R1 – R2.

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

Type OR:
A mechanical relay output flowrate alarm output or pulse output is available with this option.
Max. switch power 230V 0.5A per output. (Requires power supply type PF / PM).

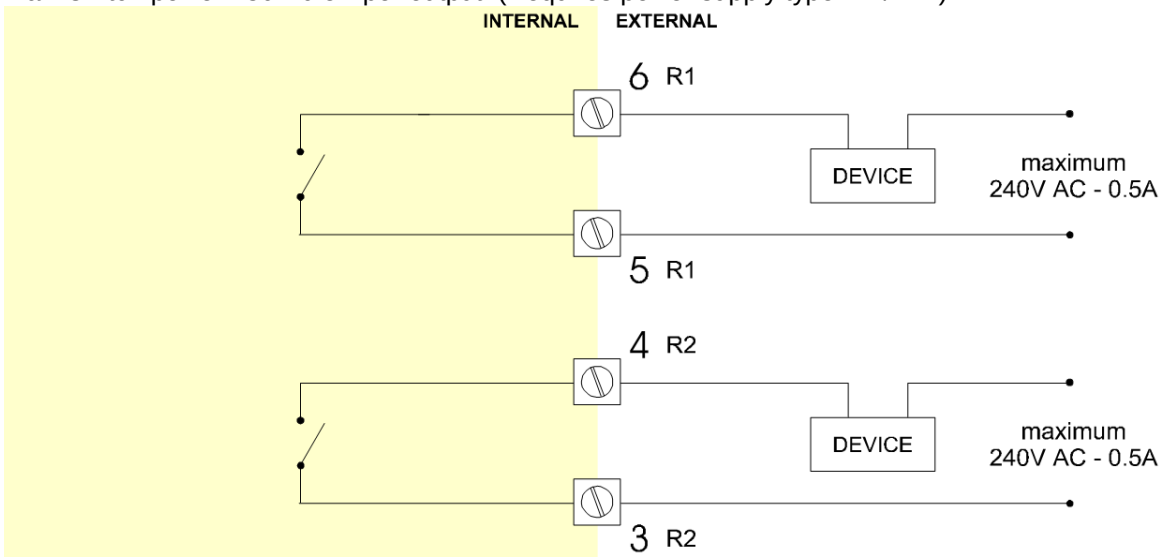
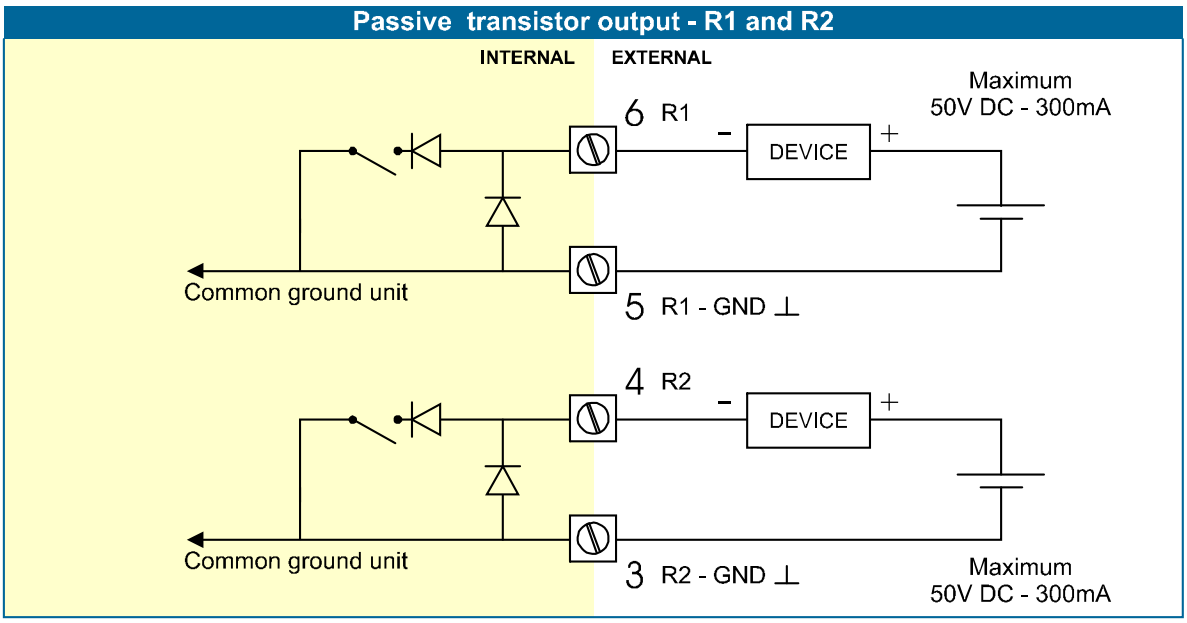


Fig. 12: Terminal connections - Mechanical relay output R1 – R2.

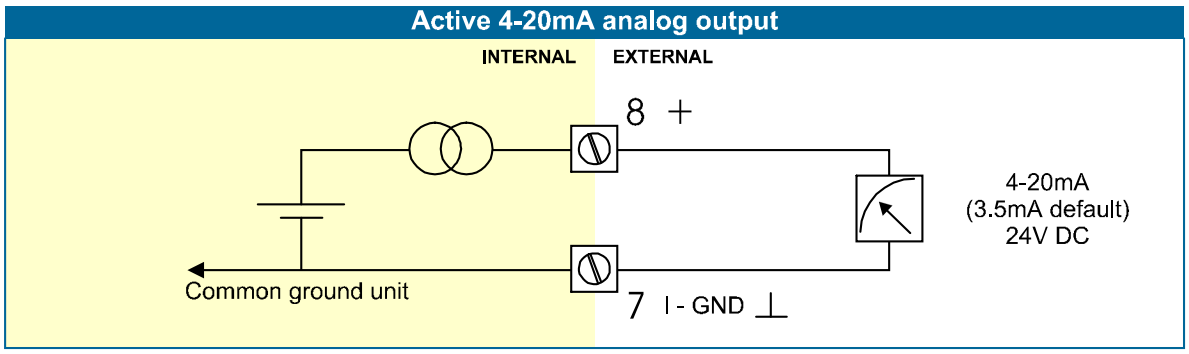
Type OT:
A passive transistor output is available with this option. Max. driving capacity 300mA@50V DC.



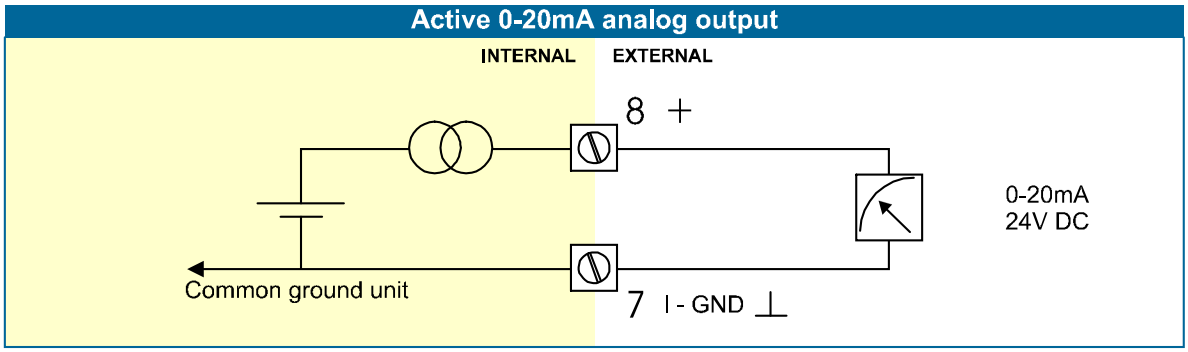
Terminal 07-08 POWER SUPPLY type PX - output loop powered:
Connect an external power supply of 8-30VDC to these terminals or a 4-20mA loop. For a DC supply: connect the "-" to terminal 7 and the "+" to terminal 8. When power is applied to these terminals, the (optional) internal battery will be disabled / enabled automatically to extend the battery life time. (Only valid for standard passive output).

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

Type AA:
An active 4-20mA signal proportional to the flowrate is available with this option.
When the output is disabled, a 3.5mA signal will be generated on these terminals.
Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD / PF / PM).

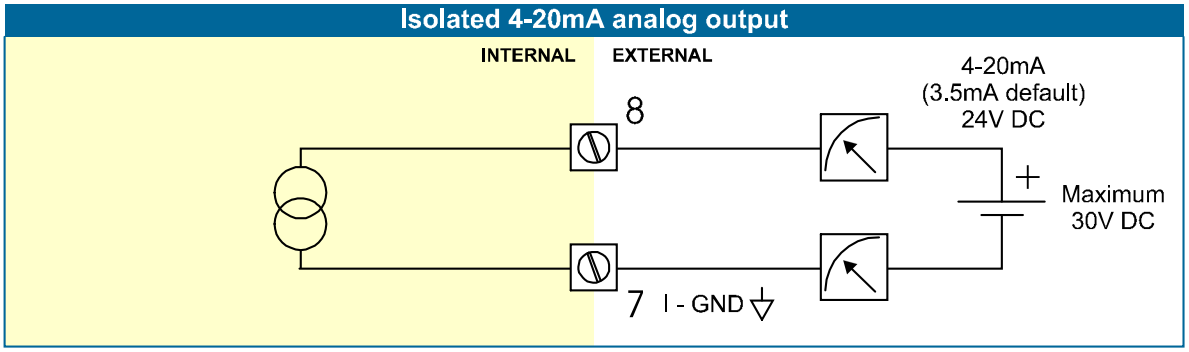


Type AB:
An active 0-20mA signal proportional to the flowrate is available with this option.
Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD / PF / PM).

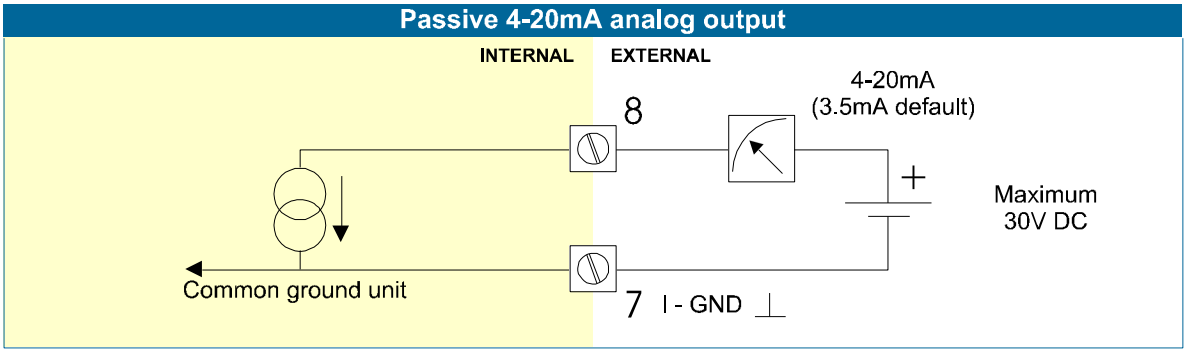


Type AF:
For the Intrinsically Safe floating 4-20mA signal: please read Chapter 5.

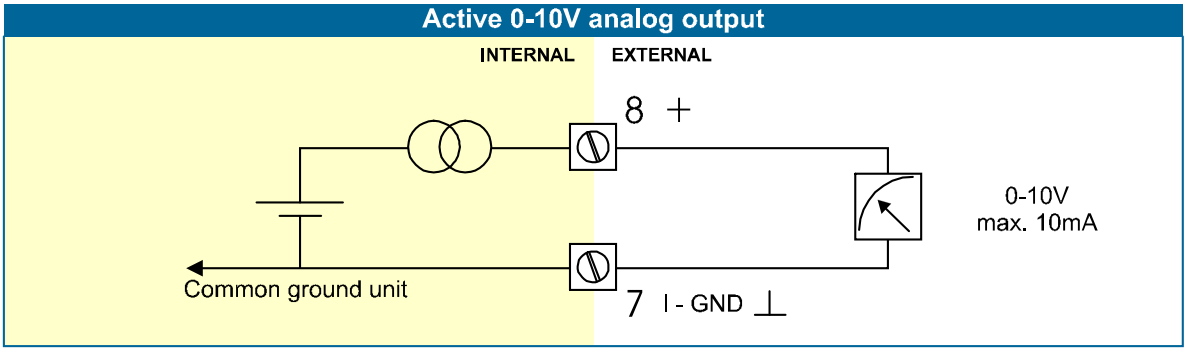
Type AI:
An isolated 4-20mA signal proportional to the flowrate is available with this option.
When the output is disabled, a 3.5mA signal will be generated on these terminals.
Max. driving capacity 1000 Ohm @ 30VDC.
This option can be battery powered but the life time of the battery is about 2 -3 years.



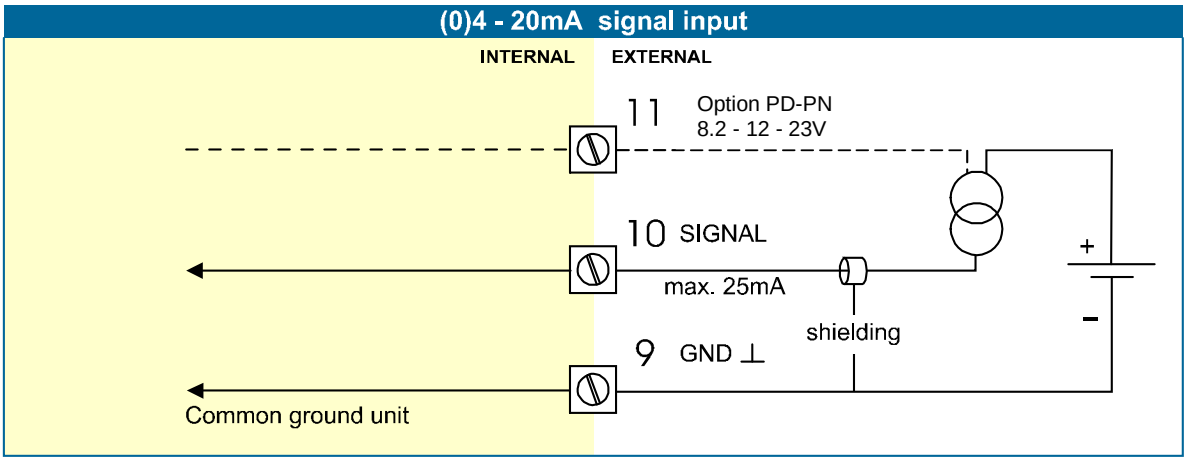
Type AP:
A passive 4-20mA signal proportional to the flowrate is available with this option. When a power supply is connected but the output is disabled, a 3.5mA signal will be generated.
Max. driving capacity 1000 Ohm. This output does loop power the unit as well (type PX).



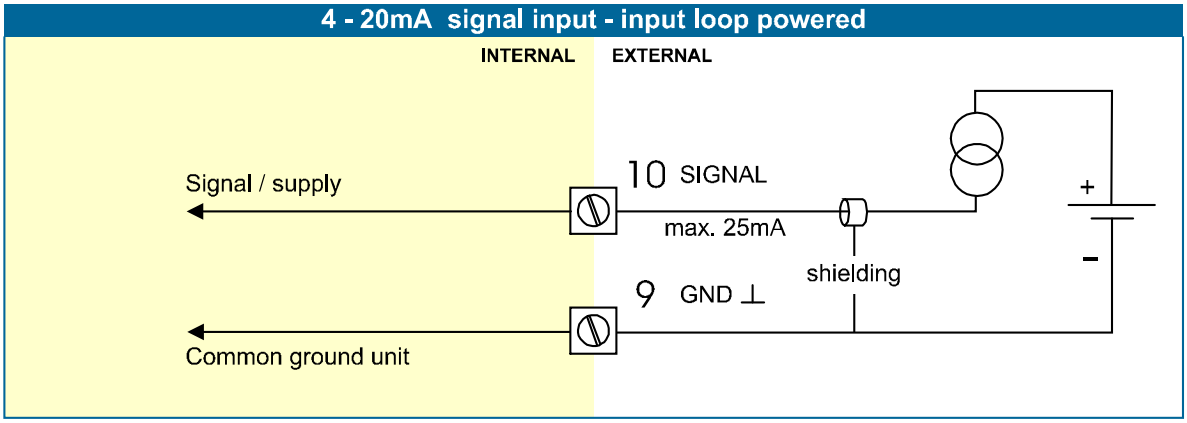
Type AU:
A 0-10VDC signal proportional to the flowrate is available with this option.
Max. load 10mA @ 10VDC. (Requires power supply type PD / PF / PM).



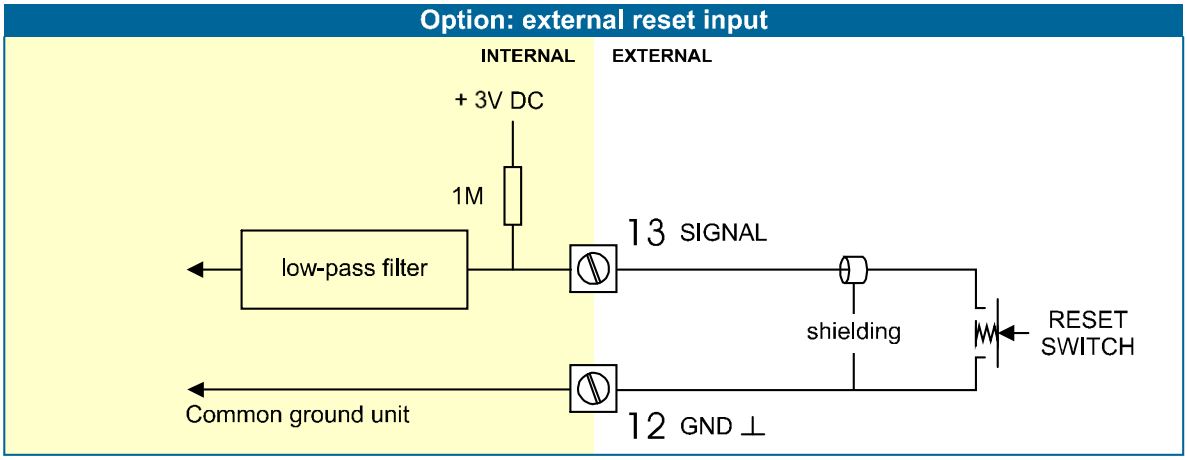
Terminal 09-11: Type A – Flowmeter input (general)
The F113-A requires a (0)4-20mA flowmeter signal which will be processed 4 times a second with a 14 bits accuracy. The input is not isolated.
For Intrinsically safe applications (without input loop power): please read chapter 5.



Terminal 09-10: Type A-PL – Flowmeter input / power supply:
The F113-A-PL requires a 4-20mA flowmeter signal which has a double function:
The signal will be processed 4 times a second with a 14 bits accuracy and the unit will be powered from the sensor signal (input loop powered). The input is not isolated and not intrinsically safe.

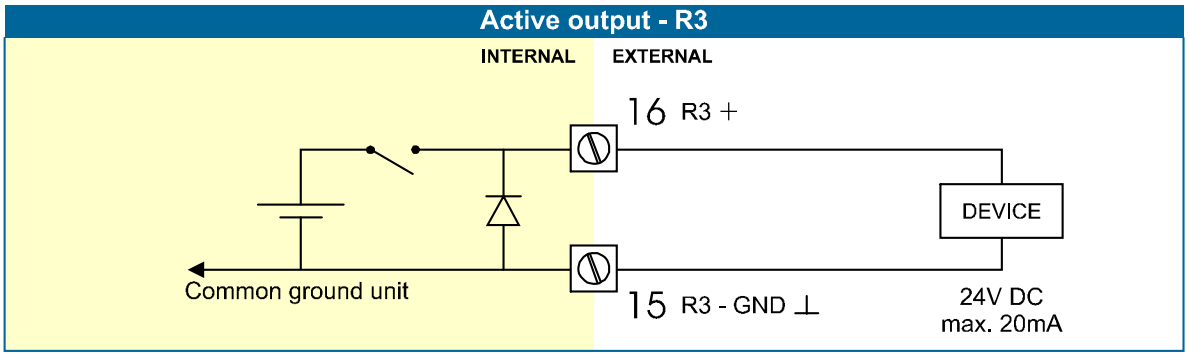


Type IB - Terminal 12-13; external reset:
With this function the total can be reset to zero with an external switch. The Total resets only when the switch *opens*. When closed Total still counts but the ”Clear Total” function is disabled (see chapter 2).
The input must be switched with a potential free contact to the GND-terminal number 12.

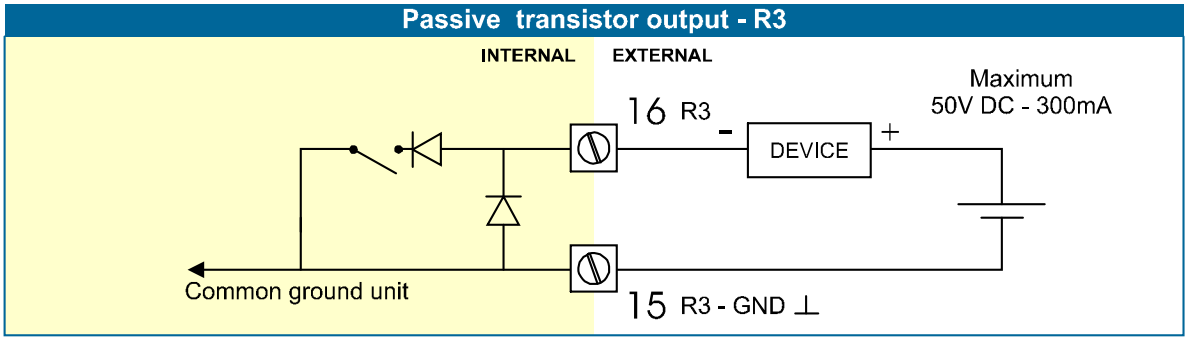


Terminal 14-15; alarm / pulse output R3:
This output is always a fast transistor output. With SETUP 8, the function of this output is set to a flowrate alarm output or pulse output. If used as a pulse output: the maximum frequency of this output is 60Hz.

Type OA:
An active 24V DC flowrate alarm output or pulse output is available with this option.
Max. driving capacity 20mA@. (Requires power supply type PD / PF / PM).



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



Terminal 26 - 31: type CB / CH / CI / CT - communication RS232 / RS485 / TTL: see the manufacturer's plate.

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

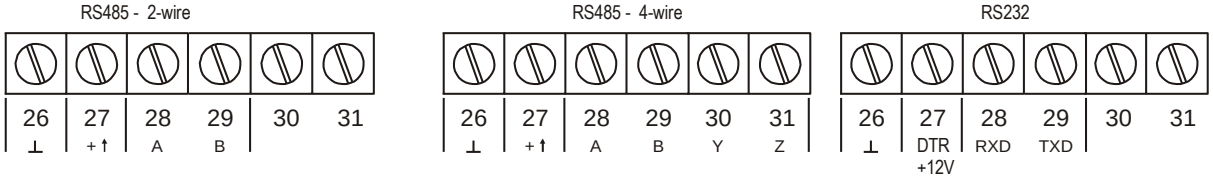


Fig. 11: Overview terminal connectors communication option.

When using the RS232 communication option, terminal 27 can be 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 GND - 01: type ZB backlight (option):

Note !

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

To supply the F113-A with power (>24V DC) for the backlight, use the terminal connectors below:

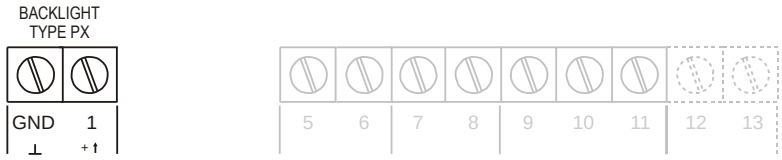


Fig. 12: Overview terminal connectors backlight option.

Option		System/backlight supply	TERMINAL		
			GND	01	
PX	8-30V DC		0V	+24V	

Note !

Option PX:
PX is used to supply the F113-A with power for the backlight.
With option PX it is not possible to use a sensor supply output (= option PD).

5. INTRINSICALLY SAFE APPLICATIONS

5.1. GENERAL INFORMATION AND INSTRUCTIONS

Cautions

- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- This device may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the cabinet has been opened (danger of electric shock). The housing may only be opened by trained personnel.
- To maintain the degree of protection of at least IP65 in accordance with IEC 60529, certified cable entries in accordance with IEC 60079-0 must be used and correctly installed. Unused openings must be closed with suitable blanking elements.
- When the enclosure of the Indicator is made of aluminum alloy, when used in a potentially explosive atmosphere requiring apparatus of equipment protection level Ga and Da, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.
- Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.

Safety Instructions

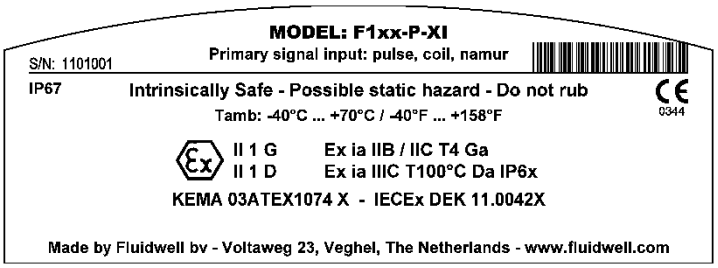
- When two or more active intrinsically safe circuits are connected to the indicator, in order to prevent voltage and/or current addition, applicable to the external circuits, precautions must be taken to separate the intrinsically safe circuits in accordance with IEC 60079-11.
- For the combined connection of the different supply, input and output circuits, the instructions in this manual must be observed.
- From the safety point of view the circuits shall be considered to be connected to earth.
- For installation under ATEX directive: this intrinsically safe device must be installed in accordance with the ATEX directive 94/9/EC and the product certificate KEMA 03ATEX1074 X.
- For installation under IECEx scheme: this intrinsically safe device must be installed in accordance the product certificate IECEx DEK 11.0042X.
- Exchange of Intrinsically Safe battery FWLiBAT-0xx with certificate number KEMA 03ATEX1071 U or IECEx KEM 08.0005U is allowed in Hazardous Area. See paragraph 5.4. for detailed battery replacement instructions.

Please Note

- Certificates, safety values and declaration of compliance can be found in the document named: “Fluidwell F1..-..-XI - Documentation for Intrinsic Safety”.
- Special conditions for safe use mentioned in both the certificate and the installation instructions must be observed for the connection of power to both input and / or output circuits.
- When installing this device in hazardous areas, the wiring and installation must comply with the appropriate installation standards for your industry.
- Study the following pages with wiring diagrams per classification.

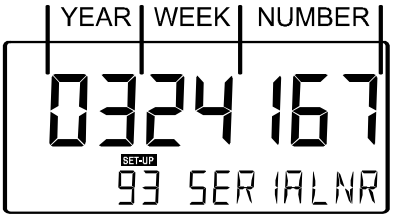
Label information (inside and outside the enclosure)

Indicated labels on the back cover (below) and on the inside cover (right) show the type labels for intrinsically safe certified units.
For details on usage see the separate “Fluidwell F1..-..-IX Documentation for Intrinsic Safety”.



Serial number and year of production

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



5.2. TERMINAL CONNECTORS INTRINSICALLY SAFE APPLICATIONS

Note !

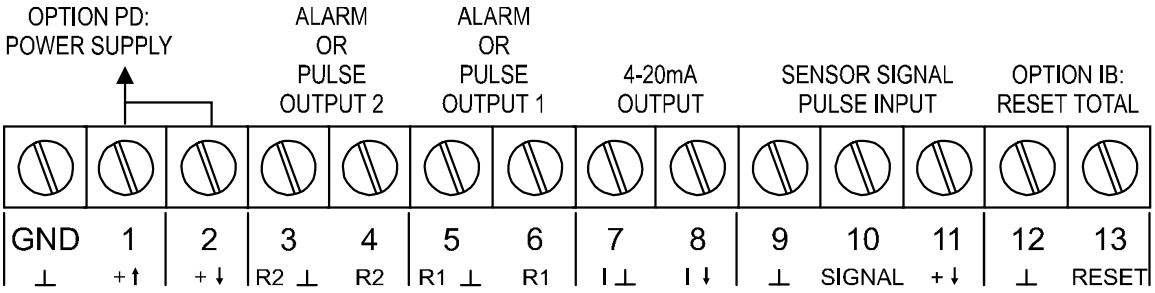
The unit is classified as group IIB/IIIC by default.

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

- The indicator is either supplied by
  - the internal supply (option -PC); or
  - the external supply connected to terminals 0 and 1 (option -PD); or
  - the circuit supply connected to terminals 7 and 8 (option -AP);

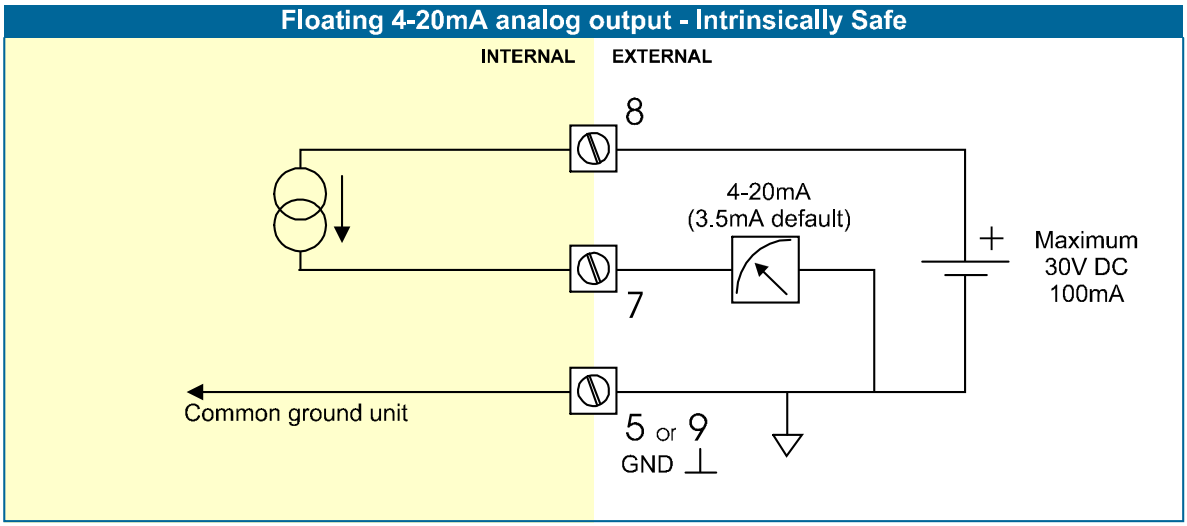
  The maximum values for any of those circuits are those as defined for group IIB/IIIC;
- No other active external intrinsically safe circuits may be connected to the indicator, with exception of circuits connected to terminals 3 and 4 and/or terminals 5 and 6; the maximum values for any of those circuits are those as defined for group IIB/IIIC

Terminal connectors F113-A -XI:



Explanation Intrinsically Safe options:

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



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

TYPE		SENSOR SUPPLY	Terminal		
			GND	01	02
PD-XI	Input voltage: 16-30V DC	3 – 8.2V	L-	L+	output voltage is according the input voltage; internally linked with terminal 01.

Terminal 02: this terminal offers the same voltage as connected to terminal 01.
Terminal 11: this terminal offers a 3V or 8.2V to power the sensor.
This voltage is selected with the switch(es) inside the enclosure. First, remove the terminals after which the internal plastic cover can be removed.

Switch position terminal 11		Switch position no function	
SWITCH 1	VOLTAGE	SWITCH 2	
on	8.2V DC	not available	
off	3V DC		

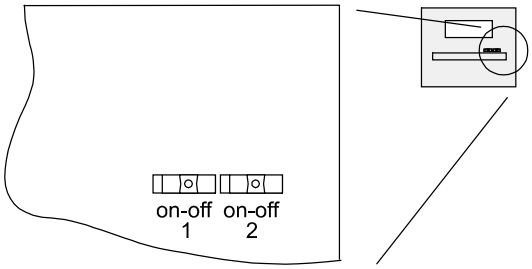


Fig. 13: Switch position voltage selection type PD-XI.

5.3 CONFIGURATION EXAMPLES

Configuration example IIB/IIIC - F113-A-AP-IB-CT-OT-(PD)-XI

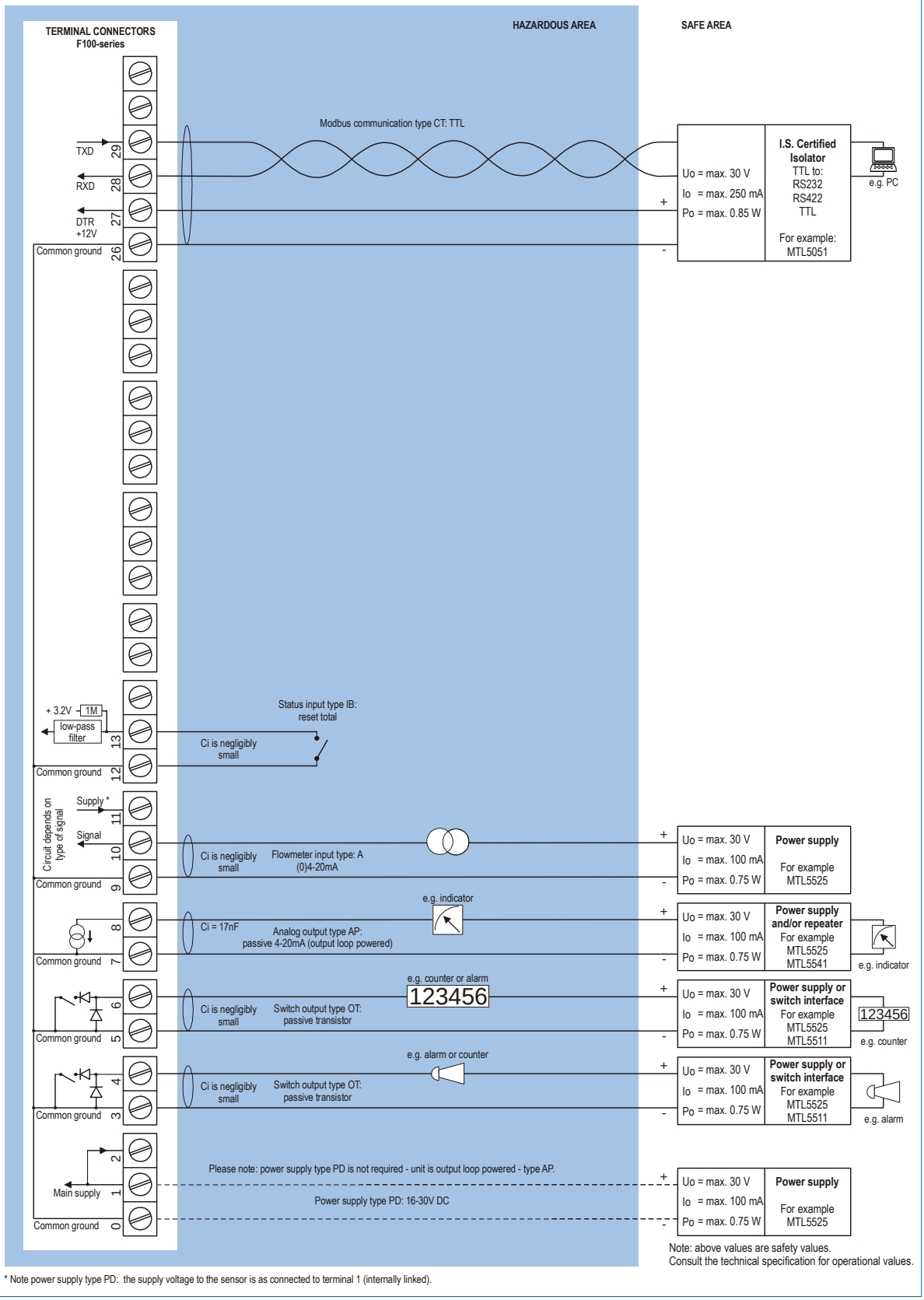


Fig. 14: Configuration example 1 Intrinsically Safe

Configuration example IIB/IIIC and IIC - F113-P-AP-IB-(CT)-OT-PD-XI

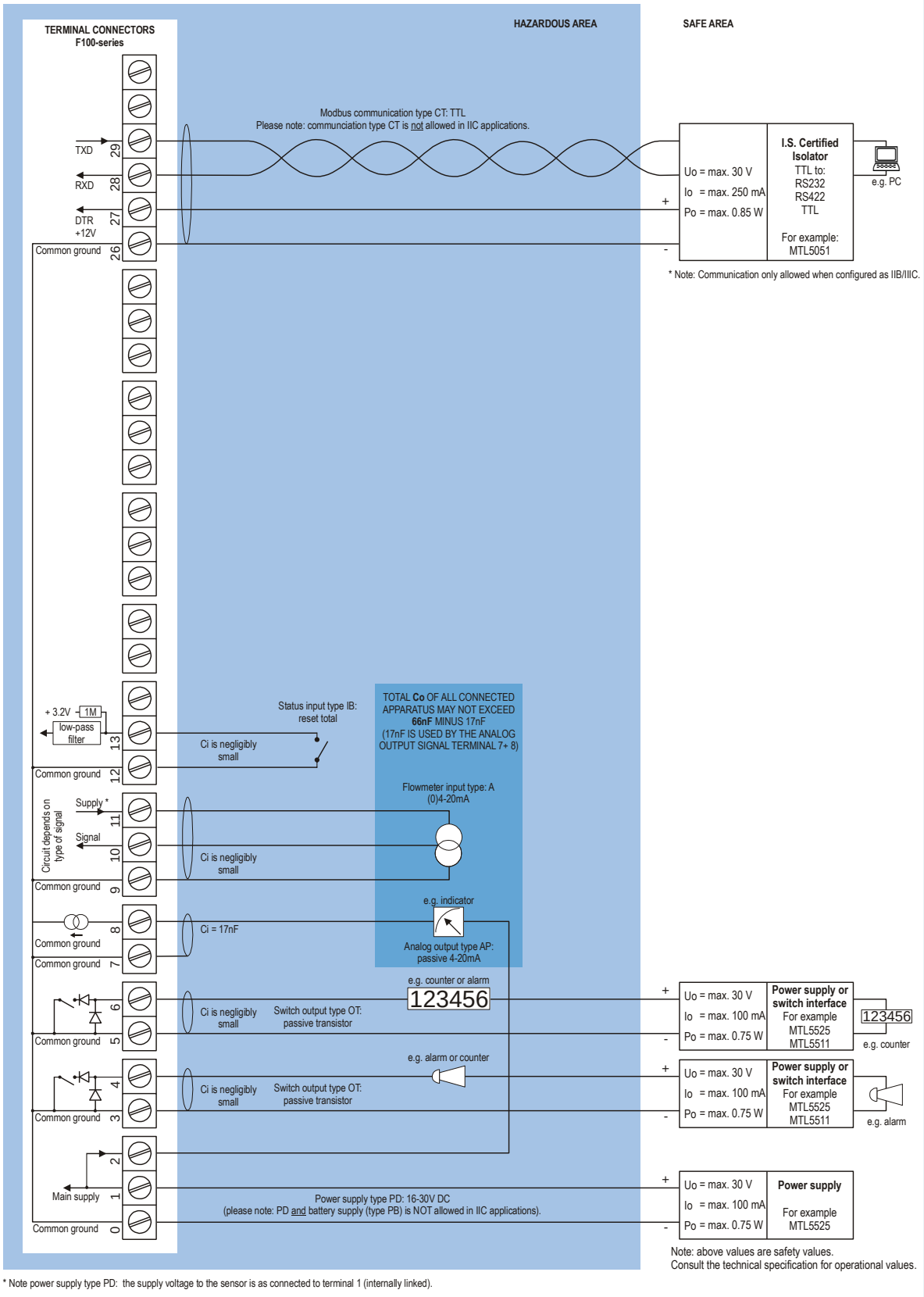


Fig. 15: Configuration example 2 Intrinsically Safe.

5.4 BATTERY REPLACEMENT INSTRUCTIONS

Safety Instructions

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

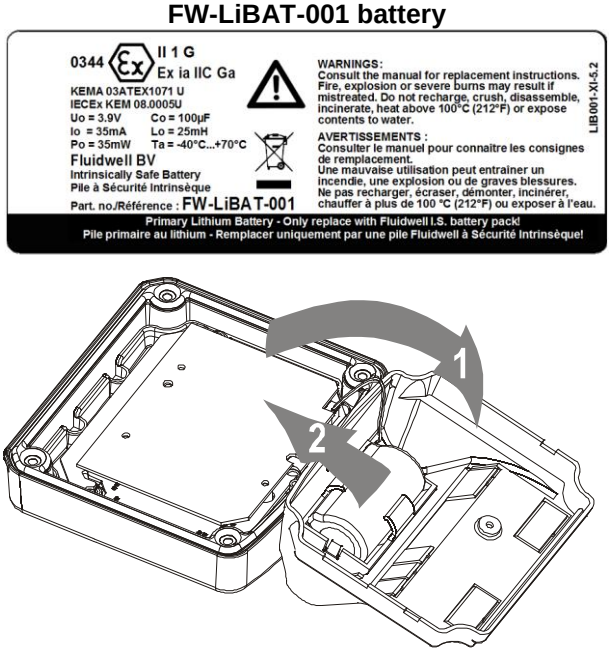
Safety instructions for hazardous areas

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

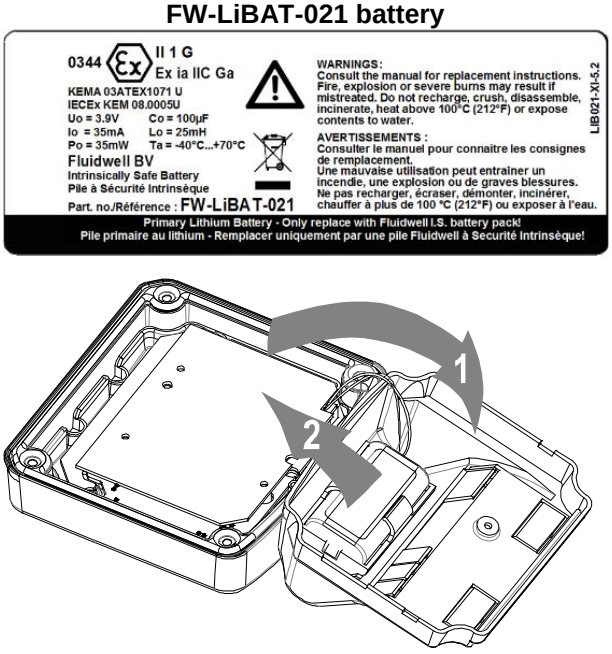
Battery replacement procedure

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

FW-LiBAT-001 battery



FW-LiBAT-021 battery



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

Disposal of batteries

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

6. MAINTENANCE

6.1. GENERAL DIRECTIONS

Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.

The F113-A may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
Ensure that the measuring system is correctly wired up according to the wiring diagrams.
Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.
Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.

The F113-A 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 F113-A in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the enclosure just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.

Battery life-time:
It is influenced by several issues :

- Analog output signal; be sure that an external power supply is connected or that the function is disabled if not in use; or else it will have a major influence on the battery life-time (SETUP 71).
- Display update: fast display update uses significantly more power; SETUP 51.
- Pulse output and communications .
- Low temperatures; the available power will be less due to battery chemistry.

Note: *It is strongly advised to disable 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 the enclosure with soapy-water. Do not use any aggressive solvents as these might damage the polyester coating.

6.2. REPAIR

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

APPENDIX A: TECHNICAL SPECIFICATION

GENERAL	
Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Digits	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 green LED backlight. Good readings in full sunlight and darkness. Note: only available for safe area applications. Power requirements: 12-24V DC + 10% or type PD, PF, PM. Power consumption max. 1 Watt.
Enclosures	
General	Die-cast aluminum or GRP (Glassfibre Reinforced Polyamide) enclosure with Polycarbonate window, silicone and EPDM gaskets. UV stabilized and flame retardant material.
Control Keys	Three industrial micro-switch keys. UV-stabilized silicone keypad.
Painting	Aluminum enclosure only: UV-resistant 2-component industrial painting.
Panel-mount enclosures	Dimensions: 130 x 120 x 60mm (5.10" x 4.72" x 2.38") – LxHxD.
Classification	IP65 / 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	
Typ HA	Drilling: 2x PG9 – 1x M20.
Typ HL	Drilling: 2x ½”NPT
Typ HM	Drilling: 2x M16 – 1x M20.
Typ HN	Drilling: 1x M20.
Typ HO	Drilling: 2x M20.
Typ HP	Drilling: 6x M12.
Typ HT	Drilling: 1x ½”NPT.
Typ HU	Drilling: 3x ½”NPT.
Typ HZ	No drilling.
GRP enclosures	
Type HD	No drilling.
Type HE	Drilling: 2x 16mm (0.63”) – 1x 20mm (0.78”).
Type HF	Drilling: 1x 22mm (0.87”).
Type HG	Drilling: 2x 20mm (0.78”).
Type HH	Drilling: 6x 12mm (0.47”).
Operating temperature	
Safe area/ordinary location	-40°C to +80°C (-40°F to +176°F)
Intrinsically Safe (XI)	-40°C to +70°C (-40°F to +158°F)
Explosion proof (XD/XF)	-20°C to +40°C (-4°F to +104°F)
Power supply	
Type PB	Lithium battery - life-time depends upon settings - up to 5 years.
Type PC	Intrinsically Safe lithium battery - life-time depends upon settings - up to 5 years.
Type PD	8-24V AC / DC ± 10%. Power consumption max. 10 Watt. Intrinsically safe: 16-30V DC; power consumption max. 0.75 Watt.
Type PF	24V AC / DC ± 10%. Power consumption max. 15 Watt.
Type PM	115-230V AC ± 10%. Power consumption max. 15 Watt.
Type PX	8-30V DC. Power consumption max. 0.5 Watt.
Note PF / PM	The total consumption of the sensors`, backlight and outputs may not exceed 400mA@24V.
Note XI	For intrinsically safe applications, consult the safety values in the certificate.
Sensor excitation	
Type PB / PC / PX	3V DC for pulse signals and 1.2V DC for coil pick-up. Note: This is not a real sensor supply. Only suitable for sensors with a very low power consumption.
Type PD	1.2 - 3 - 8.2 - 12 and 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 and 24V DC - max. 400mA@24V DC.
Terminal connections	
Type:	Removable plug-in terminal strip. Wire max. 1.5mm2 and 2.5mm2 (Type PM / PF)

Data protection	
Type	EEPROM backup of all setting. Backup of running totals every minute. Data retention at least 10 years.
Password	Configuration settings can be password protected.
Hazardous area (option)	
Intrinsically safe Type XI	**ATEX approval:**  II 1 G Ex ia IIB/IIC T4 Ga II 1 D Ex ia IIIC T100°C Da IP6x **IECEx approval:** Ex ia IIB/IIC T4 Ga Ex ia IIIC T100°C Da IP6x
Explosion proof Type XD/XF	**ATEX approval:**  II 2 G / Ex d IIB T5 Gb II 2 D / Ex d IIIB T100°C Db Weight appr. 15kg. Dimensions of enclosure [LxHxD]: 350 x 250 x 200mm (13.7" x 9.9" x 7.9"). Protection degree: IP65
Directives and Standards	
EMC	EN 61326-1; FCC 47 CFR part 15
LVD	EN/IEC 61010-1
ATEX / IECEx	EN/IEC 60079-0; EN/IEC 60079-11; EN/IEC 60079-26
RoHS	EN 50581
IP & NEMA	EN 60529; NEMA 250

INPUTS

Flowmeter	
Type A	(0)4-20mA - with signal calibration feature.
Accuracy	Resolution: 14 bit.. Error < 0.025mA / ±0.125% FS. Low level cut-off programmable.
Span	0.000010 - 9,999,999 with variable decimal position.
Update time	Four times a second.
Voltage drop	2.5 Volt.
Load impedance	3kOhm
Relationship	Linear and square root calculation.
Note	For signal type A external power to sensor is required; e.g. type PD.
Reset (option)	
Type IB	Make contact - external reset totalizer. Additional functionality to lock the RESET button of the keyboard (as long as this contact is being made).
Duration	Minimum 100mSec. to reset Total.

OUTPUTS

Analog output	
Function	transmitting flowrate.
Resolution	10-bit.
Accuracy	error < 0.05% - update 10 times a second. Software function to calibrate the (0)4.00mA and 20.00mA / 0 and 10V levels precisely.
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	Floating 4-20mA output for Intrinsically Safe applications (isolated output)
Type AI	Galvanic isolated output - also for battery powered models.
Type AP	Passive 4-20mA output - output loop powered (type PX)
Type AU	Active 0-10V output (requires type OA + PD, PF or PM).

Alarm outputs	
Function	User defined: flowrate alarm or pulse output.
Alarm output	lo-lo; lo; hi; hi-hi flow rate alarm
Pulse output	Max. frequency 500Hz. Pulse length user definable.
Type OA	Three active 24V DC output; max. 50mA per output (requires type PD, PF or PM).
Type OR	Two electro-mechanical relay outputs; max. switch power 230V AC - 0.5A and one OT or OA output (requires type PF 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	
Functions	reading display information, reading / writing all settings.
Protocol	Modbus ASCII or RTU
Speed	1200; 2400; 4800; 9600 baud
Address	maximum 247 addresses.
Type CB	RS232
Type CH	RS485 2-wire
Type CI	RS485 4-wire
Type CT	TTL Intrinsically Safe communication.
Type CX	no communication.

OPERATIONAL

Operator functions	
Displayed functions	• total and/or flowrate. • total and accumulated total. • total can be reset to zero by pressing the CLEAR-key twice. • alarm values for lo-lo; lo; hi; hi-hi flowrate • alarm values can be entered (this function can be disabled)
Total	
Digits	7 digits.
Units	L; m3; kg; lb; GAL; USGAL; bbl; no unit
Decimals	0000000; 111111.1; 22222.22; 3333.333
Note	total can be reset to zero.
Accumulated total	
Digits	11 digits.
Units / decimals	according to selection for total.
Flowrate	
Digits	7 digits.
Units	mL; L; m3; mg; g; kg; ton; GAL; bbl; lb; cf; REV; no unit; scf; Nm3; NL; P
Decimals	0000000; 111111.1; 22222.22; 3333.333
Time units	/sec - /min - /hr - /day.
Alarm values	
Digits	7 digits.
Units	According to selection for flowrate.
Decimals	According to selection for flowrate.
Time units	According to selection for flowrate.
Type of alarm	lo-lo; lo; hi; hi-hi flowrate alarm. Includes delay time alarm and configurable alarm outputs.

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F113-A is going to be installed or while it is in operation.

Flowmeter does not generate pulses:
Check:
- Signal selection SETUP - 61,
- Pulse amplitude (par. 4.4.3.),
- Flowmeter, wiring and connection of terminal connectors (par. 4.4.3.),
- Power supply of flowmeter (par. 4.4.2.).

Flowmeter generates "too many pulses":
Check:
- Settings for total and Flowrate: SETUP 11-14 and 21-27,
- Type of signal selected with actual signal generated - SETUP - 61,
- Sensitivity of coil input - SETUP - 61 and par. 4.4.3.
- Proper grounding of the F113-A - par. 4.4.1.
- Use screened wire for flowmeter signals and connect screen to terminal 9. (unless connected at sensor)

Analog output does not function properly:
Check:
- SETUP 71 - is the function enabled?
- SETUP 72 / 73: are the flow-levels programmed correctly?
- connection of the external power-supply according to the specification.

Pulse output does not function:
Check:
- SETUP 85 - pulse per “x” quantity; is the value programmed reasonable and will the maximum output be under 20Hz?
- SETUP 86 - impulse width; is the external device able to recognize the selected pulse width and frequency?

Flowrate displays "0 / zero" while there is flow (total is counting):
Check:
- SETUP 22 / 25: are the K-factor and time unit correct?
- SETUP 26 / 27: The unit has to count the number of pulses according to SETUP 26 within the time according to SETUP 27. Make sure that 27 is set 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 5-digit error code. The codes are:

0001: irrecoverable display-data error: data on the display might be corrupted.
0002: irrecoverable data-storage error: the programming cycle might have gone wrong: check programmed values.

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

APPENDIX C: COMMUNICATION VARIABLES

GENERAL

The F113-A 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 Modbus PDU addresses in the decimal representation, followed by its hexadecimal representation (0x0000). When the PLC address range is required (4x references typically used by PLCs), please add a value of 40001 to the Modbus PDU address. E.g. reading the serial number with PLC-based addressing means reading 165 + 40001 = register 40166.
Variables spanning multiple registers use ‘big-endian’ data representation. This means that the lowest register holds the least significant word of the variable. Although most Modbus Masters will support variables that span 2 registers, variables spanning more registers sometimes require you to manually calculate the resulting value.

Variables spanning multiple registers have always to be read / written in 1 single action!
Following example shows how data is represented and how this calculation can be accomplished:
For a total-value of 158928, the following register data has been received by the Modbus master:

PDU Address 566 = 0x0000 = 0
PDU Address 567 = 0x0002 = 2
PDU Address 568 = 0x6CD0 = 27856

If we interpret this as a 48 bit unsigned integer value, it's value would be:
0x0000.0002.6CD0 = 158928.
If this value needs to be calculated: 0*65536*65536 + 2*65536 + 27856 = 158928.
For additional information regarding using your Fluidwell Modbus device, please read the ‘Fluidwell General Modbus Communication Protocol’ and ‘Modbus troubleshooting guide’ that are available through our website or your distributor.

RUNTIME VARIABLES OF THE F113-A

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
572d 0x23C	40573	flow rate	2	R	uint32	0…9999999, Representation: unit, time, decimals depending on variables 48, 49, 50
566d 0x236	40567	Total	3	R	uint48	0…9999999999, Representation: unit, decimals depending on variables 32, 33
560d 0x230	40561	accumulated total	3	R	uint48	0…99999999999999, Representation: unit, decimals depending on variables 32, 33

Reading differential flowrate, 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 displayed on the display – this is due to the fact that the display is limited in the number of digits and may have a slower update rate set.
For example when two decimals are selected for total and total has a value of 123456,78 the display will show 23456,78 while communication will read a “total” of 12345678 (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 in a single write action. Writing any other value will result in the reply of an error message.

Type
uint16 = 16 bits unsigned integer
uint32 = 32 bits unsigned integer
uint48 = 48 bits unsigned integer
uint64 = 64 bits unsigned integer
char = 8 bits ASCII character

PDU ADDRESS	REGISTER	VARIABLE TOTAL	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
32 0x020	40033	unit	1	r/w	uint16	0=none 1=L 2= m^3 3=kg 4=lb 5=gal 6 =usgal 7=bbl
33 0x021	40034	decimals	1	r/w	uint16	0…3
34 0x022	40035	Span	2	r/w	uint32	0.000001 – 9999999 unit / second
37 0x025	40038	Decimals span	1	r/w	uint16	0 … 6
PDU ADDRESS	**REGISTER**	**VARIABLE FLOWRATE**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**
48 0x030	40049	Unit	1	r/w	uint16	0=ml 1=L 2= m^3 3=mg 4=g 5=kg 6=ton 7=gal 8=bbl 9=lb 10=cf 11=rev (rpm) 12=none 13=scf 14=nm^3 15=nL 16=P
49 0x031	40050	time unit	1	r/w	uint16	0=sec 1=min 2=hour 3=day
50 0x032	40051	Decimals	1	r/w	uint16	0…3
51 0x033	40052	Span	2	r/w	uint16	0.000001 – 9999999 unit / time-unit
54 0x036	40055	Decimals span	1	r/w	uint16	0…6
PDU ADDRESS	**REGISTER**	**VARIABLE ALARM**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**
70 0x046	40071	flow zero	1	r/w	uint16	0=ignore 1=default 2=no relay
234 0x0EA	40235	alarm value low-low	2	r/w	uint32	0...9999999
240 0x0F0	40241	alarm value low	2	r/w	uint32	0...9999999
243 0x0F3	40244	alarm value high	2	r/w	uint32	0...9999999
237 0x0ED	40238	alarm value high-high	2	r/w	uint32	0...9999999
205 0x0CD	40206	delay time value low-low	1	r/w	uint16	0...999.9
246 0x0F6	40247	delay time value low	1	r/w	uint16	0...999.9
248 0x0F8	40249	delay time value high	1	r/w	uint16	0...999.9
222 0x0DE	40223	delay time value high-high	1	r/w	uint16	0...999.9
PDU ADDRESS	**REGISTER**	**VARIABLE DISPLAY**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**
64 0x040	40065	display function	1	r/w	uint16	0=total 1=flow rate
68 0x044	40069	alarm set	1	r/w	uint16	0=operate 1=setup 2=hidden
67 0x043	40068	backlight brightness	1	r/w	uint16	0=off 1=20% 4=40% 3=60% 4=80% 5=100%
110 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**
80 0x050	40081	LCD update time	1	r/w	uint16	0=fast 1=1s 2=3s 3=15s 4=30s 5=off
81 0x051	40082	power mode	1	r/w	uint16	0=operational 1=shelf

PDU ADDRESS	REGISTER	VARIABLE FLOWMETER	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
0=interpolation	40099	Formula	1	r/w	uint16	0=interpolation 1=square root
99 0x063	40100	Filter	1	r/w	uint16	1…99
100 0x064	40101	Cut-Off	1	r/w	uint16	0.0 – 99.9%
102 0x066	40103	Calibrate Low – (0)4mA	1	r/w	uint16	0=calibrate set 2=default 1=calibrate
103 0x067	40104	Calibrate High – 20mA	1	r/w	uint16	0=calibrate set 2=default 1=calibrate
PDU ADDRESS	**REGISTER**	**VARIABLE ANALOG**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**
112 0x070	40113	analog output	1	r/w	uint16	0=disable 1=enable
113 0x071	40114	minimum rate	2	r/w	uint32	0…9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
116 0x074	40117	maximum rate	2	r/w	uint32	0…9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
119 0x077	40120	cut off percentage	1	r/w	uint16	0...99 Representation: 0.0 – 9.9%
120 0x078	40121	tune minimum rate	1	r/w	uint16	0...9999
122 0x07A	40123	tune maximum rate	1	r/w	uInt16	0...9999
127 0x07F	40128	filter	1	r/w	uint16	1...99
PDU ADDRESS	**REGISTER**	**VARIABLE RELAYS**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**
135 0x087	40136	relay 1	1	r/w	uint16	0=off 1=Lolo 2=Lo 3=Hi 4=Hihi 5=All 6=Pulse
136 0x088	40137	relay 2	1	r/w	uint16	0=off 1=Lolo 2=Lo 3=Hi 4=Hihi 5=All 6=Pulse
137 0x089	40138	relay 3	1	r/w	uint16	0=off 1=Lolo 2=Lo 3=Hi 4=Hihi 5=All 6=Pulse
138 0x08A	40139	relay 4 (optional)	1	r/w	uint16	0=off 1=Lolo 2=Lo 3=Hi 4=Hihi 5=All 6=Pulse
128 0x080	40129	Pulse Width	1	r/w	uint16	0.000 – 9.999 seconds (0=off)
133 0x085	40134	Decimals	1	r/w	uint16	0 … 3
130 0x082	40131	Amount	2	r/w	uint32	0.001 - 9999999
PDU ADDRESS	**REGISTER**	**VARIABLE COMMUNICATION**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**
144 0x090	40145	speed (baudrate)	1	r/w	uint16	0=1200 1=2400 2=4800 3=9600 4=9600HP 5=19200 6=38400
145 0x091	40146	Modbus address	1	r/w	uint16	1…255
146 0x092	40147	Modbus mode	1	r/w	uint16	0=OFF 1=RTU 2=ASCII
247 0x0F7	40248	Databits	1	r/w	uint16	0=8bits 1=7bits
248 0x0F8	40249	Parity	1	r/w	uint16	0=none 1=even 2=odd

PDU ADDRESS	REGISTER	VARIABLE OTHERS	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
160 0x0A0	40161	model number	1	r	uint16	113
173 0x0AD	40174	type	1	r	uint16	'A'
162 0x0A2	40163	firmware version	2	r	uint32	0…999999 Representation: xx.xx.xx
165 0x0A5	40166	serial number	2	r	uint32	0…9999999
168 0x0A8	40169	password	1	r	uint16	0…9999

OTHER F113-A VARIABLES FOR COMMUNICATION

TOTAL - variable number 566 (236h) – 6 bytes

Read total: The value of total read using RS communications might differ from the value that appears on the display. This is due to the fact that the display can only display up to seven digits (for example when two decimals are selected for total and total has a value of 123456,78 the display will show 23456,78 while communication will read a "total" of 12345678 and a "total decimals" of 2).

Write total: total can only be cleared. This means writing a value different from 0 will result in the reply of an error message. Only writing 6 bytes of zero's to total will be accepted.

ACCUMULATED TOTAL - variable number 560 (230h) – 6 bytes

Read acc. total: A difference between the read value and the display value, as explained for "Read total", might appear here too.

Write acc. total: Not possible.

When reading or writing total or accumulated total it should be noted that the used values are given including the decimals. This means that a read/write to one of these variables should be accompanied with a read/write to the variable that holds the number of decimals for this variable:

Example: read var. 566 for total:

Read var. 33 for total decimals and
calculate the real value of total by multiplying total with $10^{-(\text{total decimals})}$

FLOWRATE - variable number 572 (23Ch) – 4 bytes

Read flowrate: The value difference as mentioned with total/acc. total might appear here too.

Write flowrate: Not possible.

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:	⟨Ex⟩ II 1 G Ex ia IIB/IIC T4 Ga
		⟨Ex⟩ 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

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

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LIST OF CONFIGURATION SETTINGS			
SETTING	**DEFAULT**	**DATE**	**DATE**
1 - TOTAL		Enter your settings here	
11 unit	L		
12 decimals	0000000		
13 span	1600		
14 decimals span	0		
2 - FLOWRATE			
21 unit	L		
22 time	/sec		
23 decimals	0000000		
24 span	1600		
25 decimals span	0		
3 - ALARM			
31 flowzero	ignore		
32 alarm lo-lo	0		
33 alarm lo	0		
34 alarm hi	0		
35 alarm hi-hi	0		
36 delay alarm lo-lo	0.0		
37 delay alarm lo	0.0		
38 delay alarm hi	0.0		
39 delay alarm hi-hi	0.0		
4 - DISPLAY			
41 function	total		
42 alarm set	operate		
43 light	100%		
44 bl alarm	off		
5 - PWR MANAGEMENT			
51 LCD-new	1 sec		
52 battery mode	operate		
6 - FLOWMETER			
61 formula	interpolate		
62 filter	1		
63 cut-off	PCT 0.0		
64 calib-lo	default		
65 calib-hi	default		
7 - ANALOG			
71 output	disable		
72 rate-min	0		
73 rate-max	1600		
74 cut off	PERC. 0.0		
75 tune-min	160		
76 tune-max	6656		
77 filter	1		
8 - PULSE			
81 relay 1	off		
82 relay 2	off		
83 relay 3	off		
84 relay 4 (option OS)	off		
85 width	0.000		
86 decimals	0000000		
87 amount	1000		

LIST OF CONFIGURATION SETTINGS			
SETTING	**DEFAULT**	**DATE**	**DATE**
9 - COMMUNICATION			
91 speed	9600		
92 address	1		
93 mode	BUS-RTU		
94 databits	8 bits		
95 parity	none		
A - OTHERS			
A1 model	F113-A	F113-A	F113-A
A2 software version	03.nn.nn		
A3 serial nr	nnnnnnn		
A4 password	0000		
A5 tag-nr	0000000		

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