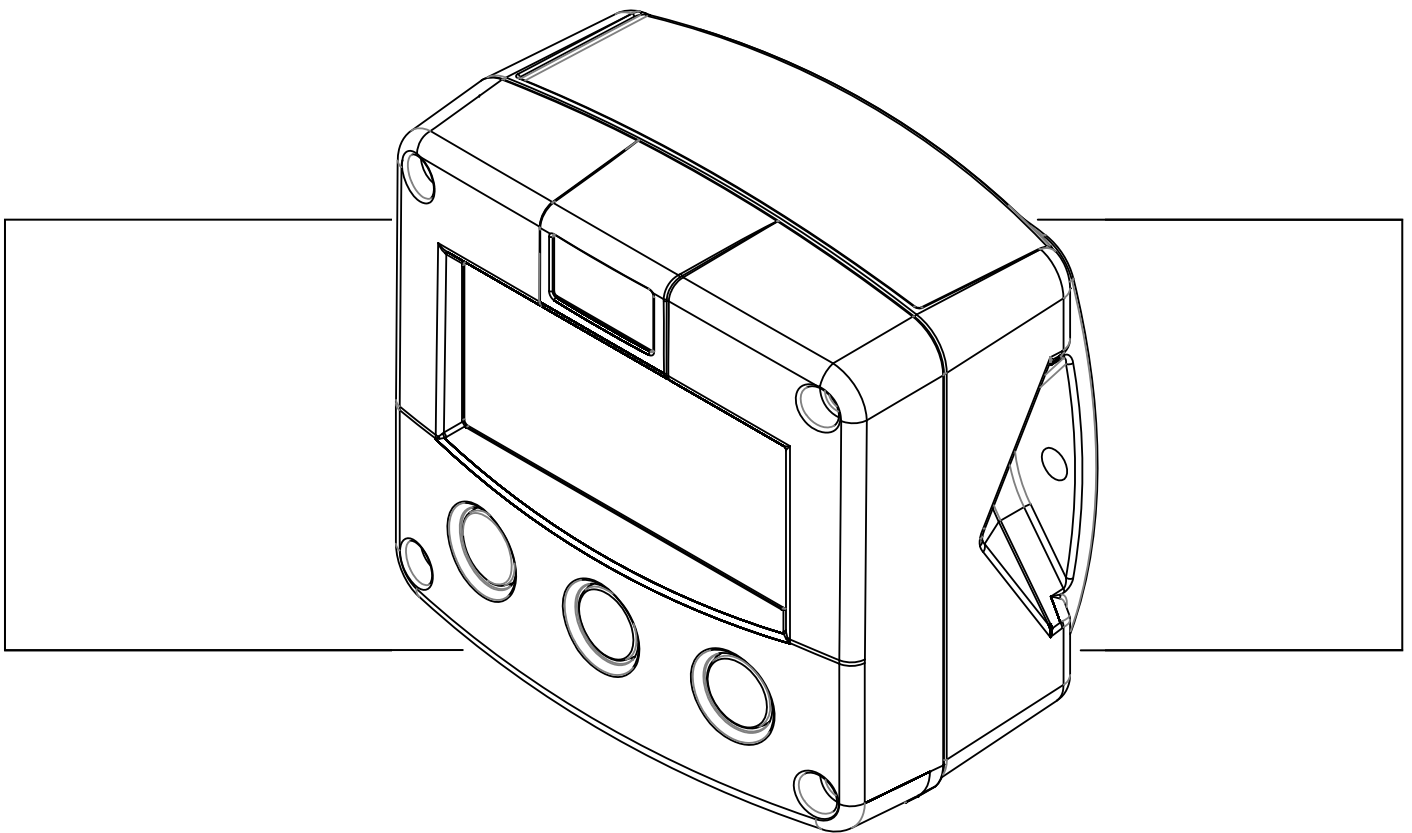


F114-A

RATIO INDICATOR AND MONITOR

WITH TOTALIZER / FLOWRATE INDICATION



Signal input flowmeters: (0)4-20mA

Signal outputs: 4-20mA ref. ratio or flowrate

Alarm outputs: maximum four ratio alarms

Options: Intrinsically Safe, Modbus communication





SAFETY INSTRUCTIONS

- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- **LIFE SUPPORT APPLICATIONS:** The F114-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 casing as indicated if the F114-A has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-casing and removable terminal-block may never be removed.**
- **Intrinsically Safe applications: follow the instructions as mentioned in Chapter 5 and consult “Fluidwell F1...-XI - Documentation for Intrinsic Safety”.**



DISPOSAL

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

SAFETY RULES AND PRECAUTIONARY MEASURES

- The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and the procedures as described in this manual are not followed.
- Modifications of the F114-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 F114-A supplied.
- Open the casing only if all leads are free of potential.
- Never touch the electronic components (ESD sensitivity).
- Never expose the system to heavier conditions than allowed according to the casing classification (see manufacture's plate and chapter 4.2.).
- If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
- The local labor and safety laws and regulations must be adhered to.

About the operation manual

This operation manual is divided into two main sections:

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

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

A hazardous situation may occur if the F114-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 F114-A or connected instruments.



Caution !

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



Note !

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

Hardware version	:	02.01.xx
Software version	:	02.05.xx
Manual	:	HF114AEN_v0501_04
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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 F114-A

Functions and features

The ratio indicator / monitor model F114-A is a microprocessor driven instrument designed to calculate, display and monitor the ratio between two flows as well as the flowrates and totals. This product has been designed with a focus on:

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

Flowmeter input

This manual describes the unit with a (0)4-20mA input from the flowmeter "-A version". Other versions are available to process pulse or 0-10V flowmeter signals.

Two flowmeters with a (0)4-20mA output can be connected to the F114-A. To power the sensors, several options are available

Standard outputs

- Max. four configurable alarm outputs: high-, low-, high-high- or low-low-ratio alarm. Switched as long as the ratio is too high or too low.
- Configurable (0)4-20mA or 0-10V analog output with 10-bits resolution mirroring the actual ratio or flowrate. The minimum and maximum signal output levels can be tuned.

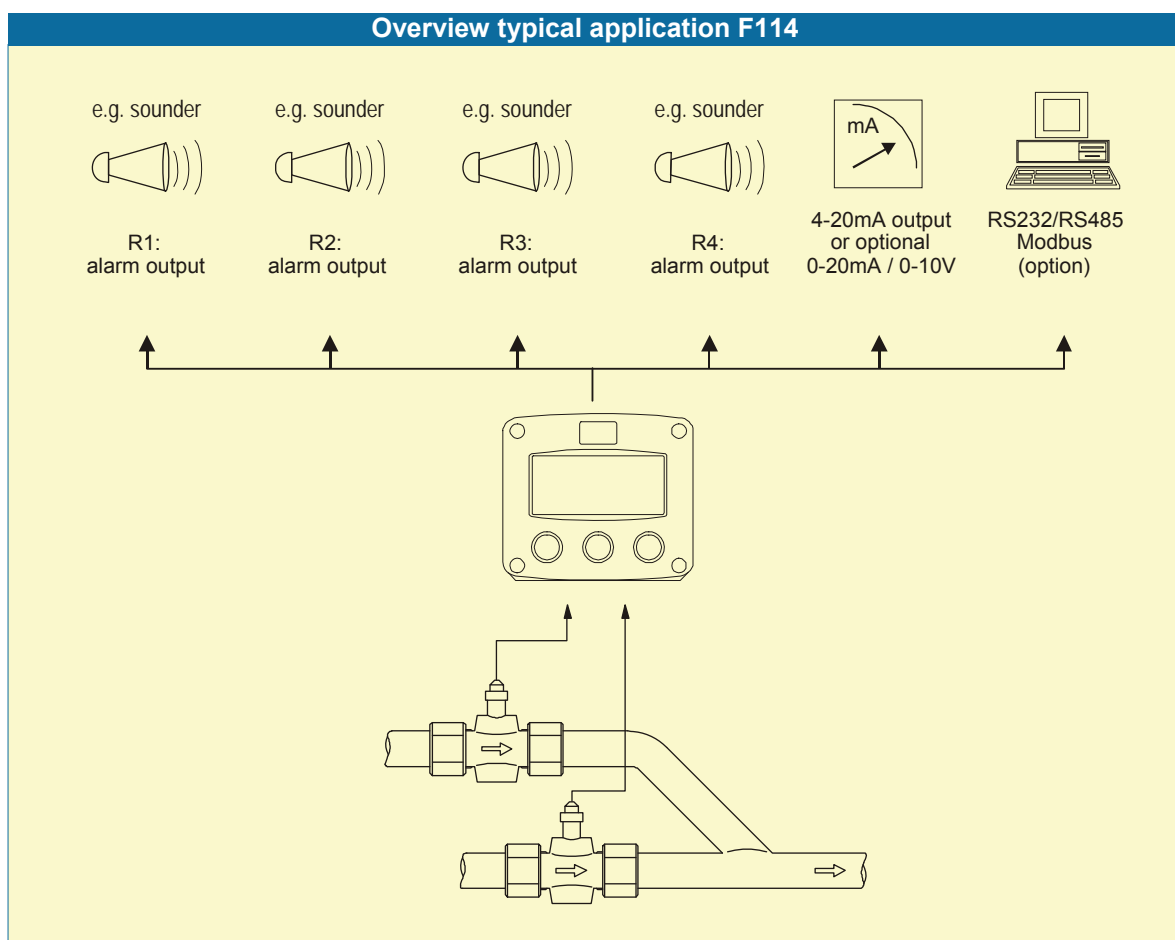


Fig. 1: Typical application for the F114-A.

Configuration of the unit

The F114-A was designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F114-A according to your specific requirements. SETUP includes several important features, such as Span, measurement units etc. All settings are stored in EEPROM memory and will not be lost in the event of power failure or a drained battery. To extend the battery-life time (option), please make use of the power-management functions as described in chapter 3.2.3.

Display information

The unit has a large transfective LCD with all kinds of symbols and digits to display measuring units, status information, trend-indication and key-word messages. Ratio, flowrate and totals are displayed with the large 17mm digits. A backup of the total's is made in EEPROM memory every minute.

Options

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

2. OPERATIONAL

2.1. GENERAL



- *The F114-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 F114-A. This instruction is meant for users / operators.

2.2. CONTROL PANEL

The following keys are available:

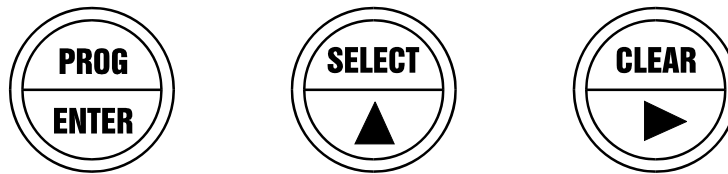


Fig. 2: Control Panel.

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 the flowrates, totals and alarm values.
The arrow-key ▲ is used to configure the unit; please read chapter 3.



Press this key twice to CLEAR the value for total.
The arrow-key ► is used to configure the unit; please read chapter 3.

2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the F114-A will always function at Operator level. The information displayed is dependant upon the SETUP-settings. All pulses generated by the connected flowmeter are measured by the F114-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. Not all information can be displayed at once, but first after pressing the select-key. At the bottom-left of the display, the actual liquid number (A or B) is displayed when necessary.

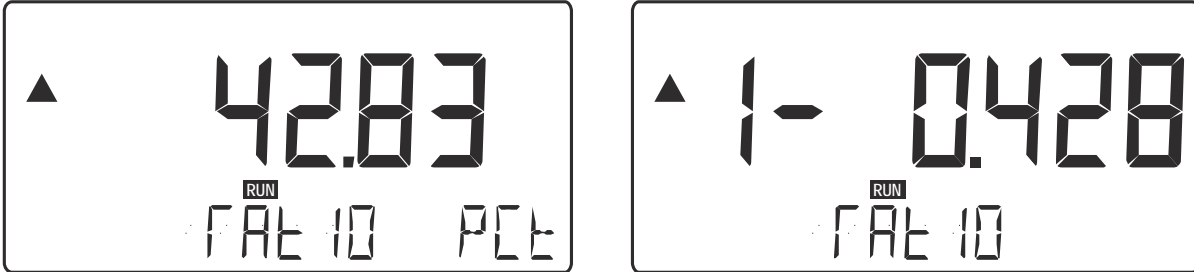


Fig. 3: Example of display information during process.

For the Operator, the following functions are available:

▪ **Display ratio:**

This is the main display information of the F114. After selecting other information, it will return to the main display automatically.

The ratio is calculated by measuring two flows: flow A and flow B. The displayed ratio can indicate:

- the actual flowrate of the additive compared to the flowrate of the main flow, or
- the actual flowrate of the additive compared to the flowrate of the total flow (sum of the additive+main flow).

The arrows \blacktriangle indicate the increase/decrease of the ratio.

▪ **Programming the ratio 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 ratio alarm values are displayed:

- low-low ratio alarm (LL): enter here 1-0.010 for example,
- low ratio alarm: enter here 1-0.2 for example,
- high ratio alarm: enter here 1-1.0 for example,
- high-high ratio alarm (HH): enter here 1-1.2 for example.

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

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

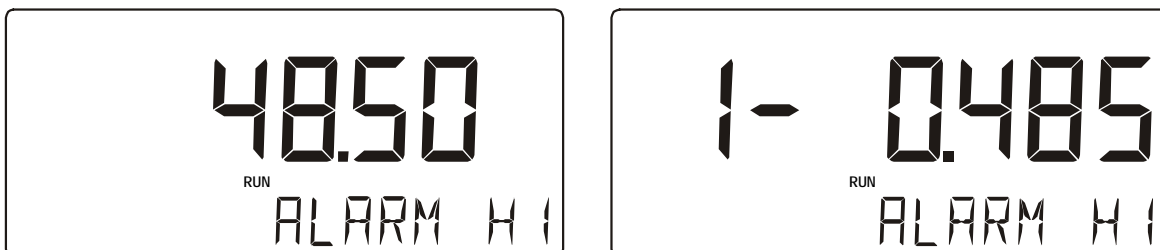


Fig. 4: Examples display information in % and 1:x during programming the high ratio value.

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

- **Ratio alarm**

When the actual ratio is outside the allowed range, an alarm message will be displayed indicating the type of alarm: "LO RATIO", "HI RATIO", "LO-LO RATIO" or "HI-HI RATIO". The alarm is terminated automatically as soon as the ratio is within its range again.

- **Display flowrate:**



Note !

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

The actual flowrate of each flowmeter is displayed after pressing select several times. When "-----" is shown, the flowrate is too high to be displayed. The arrows \blacktriangleleft \blacktriangleright indicate the increase/decrease of the flowrate.

- **Display total:**



Note !

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

The actual total quantity of each flowmeter is displayed after pressing select several times.

- **Clear Total:**

When the total quantity is displayed, the value can be initialized. To do so, press CLEAR twice. After pressing CLEAR once, the text "PUSH CLEAR" is displayed while the display information is flashing. To avoid initialization in that stage, press a different key or wait for 20 seconds.

- **Low-battery alarm**

When the battery voltage drops, it must be replaced. At first "low-battery" will flash, but as soon as it is displayed continuously, the battery MUST be replaced shortly after! Only original batteries supplied by the manufacturer may be used, else the guarantee and liability will be terminated. The remaining lifetime after the first moment of indication is generally several days up to some weeks.



Fig. 5: Example of low-battery alarm.

Alarm 01-03:

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

3. CONFIGURATION

3.1. INTRODUCTION

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



- *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 F114-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

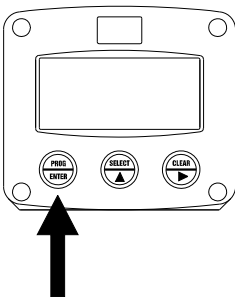
3.2.1. GENERAL

Configuration of the F114-A is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows \blacktriangleleft will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically. SETUP can be reached at all times while the F114-A remains fully operational.



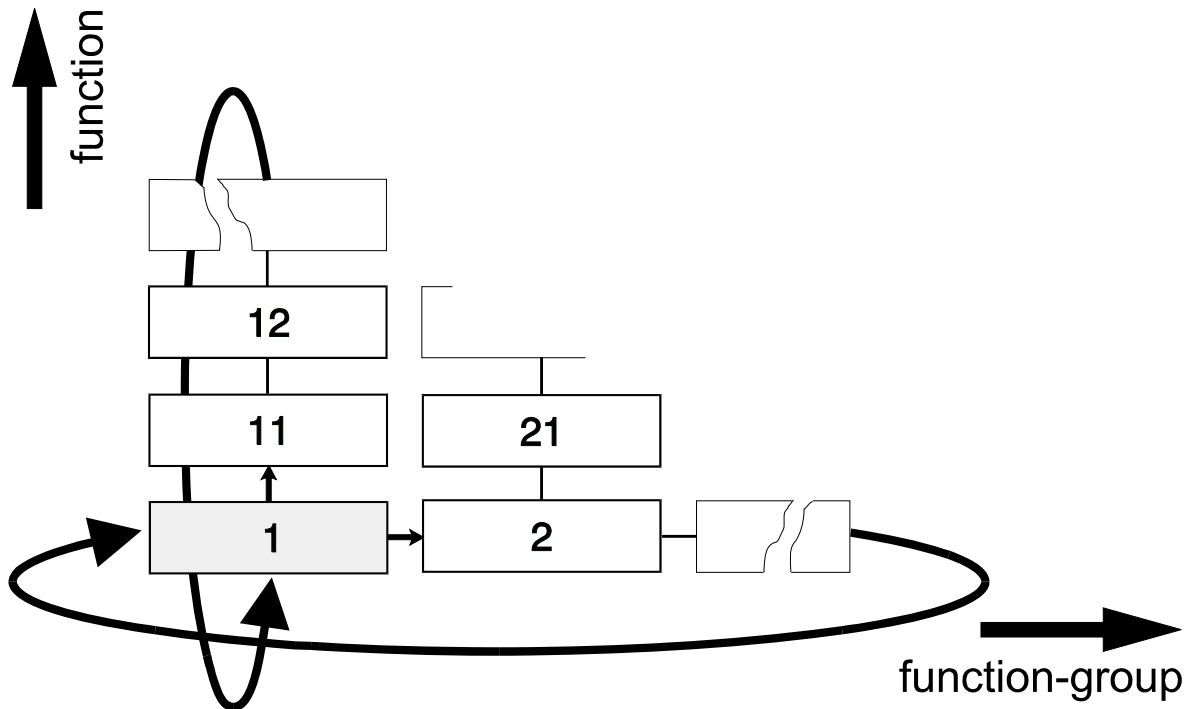
Note: A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.

To enter SETUP-level:



Press  for 7 seconds

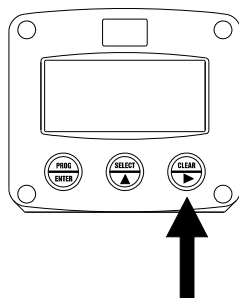
Matrix structure SETUP-level:



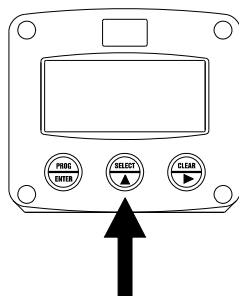
SCROLLING THROUGH SETUP-LEVEL

Selection of function-group and function:

SETUP is divided into several function groups and functions.



Select function-group with



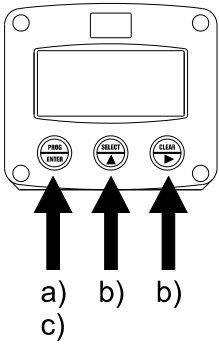
Select function with













Each function has a unique number, which is displayed below the word "SETUP" at the bottom of the display. The number is a combination of two figures. The first figure indicates the function-group and the second figure the sub-function. Additionally, each function is expressed with a keyword.

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

To change or select a value:



- a) press  briefly; **PROGRAM** will start flash
- b) select or enter value with  and / or 
- c) press  to confirm the value / selection.

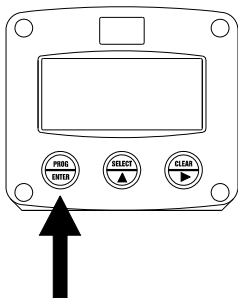
To change a value, use  to select the digits and  to increase that value.
To select a setting, both  and  can be used.
If the new value is invalid, the increase sign  or decrease-sign  will be displayed while you are programming.

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



Note: alterations will only be set after ENTER has been pressed!

To return to OPERATOR-level:



Press  for 3 seconds

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

3.2.2. OVERVIEW FUNCTIONS SETUP LEVEL

SETUP FUNCTIONS AND VARIABLES			
1	TOTAL A		
	11	UNIT	L - m3 - kg - lb - GAL - USGAL - bbl - no unit
	12	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	13	SPAN	0.000001 - 999,999 unit/second
	14	DECIMALS SPAN	0 - 6
2	FLOWRATE A		
	21	UNIT	mL, L, m3, mg, g, kg, ton, GAL, bbl, lb, cf, rev, no unit, SCF, nm3, nL, P
	22	TIME UNIT	sec - min - hour - day
	23	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	24	SPAN	0.000001 - 999,999 unit/time-unit
	25	DECIMALS SPAN	0 - 6
3	TOTAL B		
	31	SPAN	0.000001 - 999,999 unit/second
	32	DECIMALS SPAN	0 - 6
4	FLOWRATE B		
	41	SPAN	0.000001 - 999,999 unit/second
	42	DECIMALS SPAN	0 - 6
5	RATIO		
	51	RATIO	b/a - b/a+b - b-a/a - b-a/b - b/a-b
	52	FUNCTION	1: _ - percentage
	53	DECIMALS RATIO	0 - 1 - 2 - 3 (Ref: displayed value)
	54	FILTER	0 - 99
6	ALARM		
	61	FLOWZERO	default - no relays - ignore
	62	ALARM LOW-LOW	0000.000 - 9,999,999
	63	ALARM LOW	0000.000 - 9,999,999
	64	ALARM HIGH	0000.000 - 9,999,999
	65	ALARM HIGH-HIGH	0000.000 - 9,999,999
	66	DELAY ALARM low-low	0.1 - 999.9 seconds
	67	DELAY ALARM LOW	0.1 - 999.9 seconds
	68	DELAY ALARM HIGH	0.1 - 999.9 seconds
	69	DELAY ALARM high-high	0.1 - 999.9 seconds
7	DISPLAY		
	71	FUNCTION	disabled - rate - total - both
	72	ALARMSET	Operate - Setup - Hidden - Off
8	POWER MANAGEMENT		
	81	LCD UPDATE	fast - 1 sec - 3 sec - 15 sec - 30 sec - off
	82	BATTERY MODE	operational - shelf
9	FLOWMETER A		
	91	FORMULA	interpolation, square root
	92	FILTER	00 - 99
	93	CUT-OFF	0.0 - 99.9%
	94	CALIBRATE LOW	default - calibrate - calibrate set
	95	CALIBRATE HIGH	default - calibrate - calibrate set
A	FLOWMETER B		
	A1	FORMULA	interpolation, square root
	A2	FILTER	00 - 99
	A3	CUT-OFF	0.0 - 99.9%
	A4	CALIBRATE LOW	default - calibrate - calibrate set
	A5	CALIBRATE HIGH	default - calibrate - calibrate set
B	ANALOG		
	B1	OUTPUT	disable - enable
	B2	OUTPUT SELECT	ratio - flow A - flow B
	B3	(0)4mA / 0V	0000.000 - 9,999,999
	B4	20mA / 10V	0000.000 - 9,999,999
	B5	TUNE MIN - 4mA / 0V	0 - 9,999
	B6	TUNE MAX- 20mA / 10V	0 - 9,999

C RELAYS			
C1	RELAY 1		off, lo-lo, lo, hi, hi-hi, all
C2	RELAY 2		off, lo-lo, lo, hi, hi-hi, all
C3	RELAY 3		off, lo-lo, lo, hi, hi-hi, all
C4	RELAY 4		off, lo-lo, lo, hi, hi-hi, all

D COMMUNICATION			
D1	SPEED / BAUDRATE		1200 - 2400 - 4800 - 9600
D2	ADDRESS		1 - 255
D3	MODE		RTU - off

E OTHERS			
E1	TYPE / MODEL		F114-A
E2	SOFTWARE VERSION		xx.xx.xx
E3	SERIAL NO.		xxxxxxx
E4	PASSWORD		0000 - 9999
E5	TAGNUMBER		0000000 - 9999999

3.2.3. EXPLANATION OF SETUP-FUNCTIONS

1 - TOTAL A	
With the exception of Span and decimal Span, all "Total settings" are valid for both flowmeters.	
MEASUREMENT UNIT 11	<p>SETUP - 11 determines the measurement unit for total, accumulated total and pulse output. The following units can be selected:</p> <p style="text-align: center;">L - m3 - kg - lb. - GAL - USGAL - bbl - _ (no unit).</p> <p>Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the Span has to be adapted as well; the calculation is not done automatically.</p>
DECIMALS 12	<p>The decimal point determines for total, accumulated total and pulse output the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">0000000 - 111111.1 - 22222.22 - 3333.333</p>
SPAN 13	<p>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.</p> <p>Example 1: Calculating the span for Total. <i>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 $2,481.3 \div 60$ 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".</i></p> <p>Example 2: Calculating the span for Total <i>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".</i></p>

DECIMALS SPAN 14	<p>This setting determines the number of decimals for the Span (SETUP 13). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>Please note that this function influences the accuracy of the Span indirectly. This setting has NO influence on the displayed number of digits for total (SETUP 12)!</p>
-----------------------------	--

2 - FLOWRATE A

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.

With the exception of Span and decimal Span, all "Flowrate settings" are valid for both flowmeters.

MEASUREMENT UNIT 21	<p>SETUP - 21 determines the measurement unit for flowrate. The following units can be selected:</p> <p style="text-align: center;">mL - L - m3 - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm3 - NL - P.</p> <p>Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the Span has to be adapted as well; the calculation is not done automatically.</p>
TIME UNIT 22	<p>The flowrate can be calculated per second (SEC), minute (MIN), hour (HR) or day (DAY).</p>
DECIMALS 23	<p>This setting determines for flowrate the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">00000 - 1111.1 - 2222.22 - 3333.333</p>
SPAN 24	<p>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.</p> <p>Example 1 Calculating the span for flowrate <i>Let us assume that the flowmeter generates 20mA at a flowrate of 2,481.3 Liters/minute, the selected unit is "Liters" and time unit "minute". The span is 2481.3 Enter for SETUP - 24: "248130" and for SETUP - 25 - decimals span "2".</i></p> <p>Example 2 Calculating the span for flowrate <i>Let us assume that the flowmeter generates 20mA at a rate of 652.31 USGAL per hour, the selected unit is USG and the time unit is minute. The span is 652.31 / 60 minutes is 10.87183 (GPM). Enter for SETUP - 24: "108718" and for SETUP - 25 "4".</i></p>
DECIMALS SPAN 25	<p>This setting determines the number of decimals for Span (SETUP 24). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>Please note that this SETUP - influences the accuracy of the Span indirectly. This setting has NO influence on the displayed number of digits for "flowrate" (SETUP 23)!</p>

3 - TOTAL B	
SPAN 31	<p>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.</p> <p>For examples: please read SETUP 13</p>
DECIMALS SPAN 32	<p>This setting determines the number of decimals for the Span (SETUP 31). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>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)!</p>

4 - FLOWRATE B	
SPAN 41	<p>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 (setup 21 and 22). Enter the span in whole numbers (decimals are set with SETUP 42). The more accurate the span, the more accurate the functioning of the system will be.</p> <p>For examples: please read SETUP 24.</p>
DECIMALS SPAN 42	<p>This setting determines the number of decimals for the Span (SETUP 41). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>Please note that this SETUP - influences the accuracy of the Span indirectly.</p>

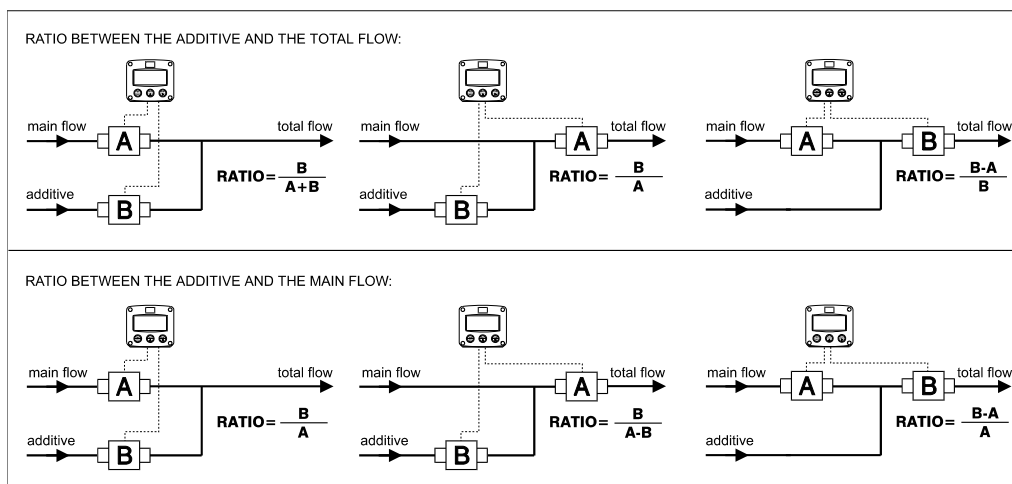
5 - RATIO

FORMULA 51

The definition of the ratio displayed is set with this function. The ratio can be expressed as:

- 1) the flowrate of the "additive flow" compared to the flowrate of the "main flow", or as
- 2) the flowrate of the "additive flow" compared to the flowrate of the "total flow"

Further, it is necessary to take the position of flowmeter "A" and flowmeter "B" into account. With the K-factor, the flowmeter pulse signals are converted to a flowrate.



DISPLAY RATIO 52

The ratio can be displayed as a percentage (PCT) or a ratio as 1-____. This setting also influences the analog output refl. the ratio.

DECIMALS RATIO / PERCENTAGE 53

The ratio or percentage will be displayed with maximum of five digits: 1 : xxxxx or 99999%.

If you have a ratio of 1:5 than two or three decimals might be required.

If you have a ratio of 1:1000, than you might prefer no decimals.

If you have a ratio of 2% than two or three decimals might be required.

If you have a ratio of 120%, than you might prefer no decimals.

FILTER 54

With this digital filter the calculated ratio between both flows can be stabilized while the filter level can be set to a desired value. The filter principal is based on three input values: the filter level (01-99), the last calculated ratio (ten times a second) 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. TIME IN SECONDS			
	50% INFLUENCE	75% INFLUENCE	90% INFLUENCE	99% INFLUENCE
01	filter disabled	filter disabled	filter disabled	filter disabled
02	0.1 second	0.2 second	0.4 second	0.7 second
03	0.2 second	0.4 second	0.6 second	1.2 seconds
05	0.4 second	0.7 second	1.1 seconds	2.1 seconds
10	0.7 second	1.4 seconds	2.2 seconds	4.4 seconds
20	1.4 seconds	2.8 seconds	4.5 seconds	9.0 seconds
30	2.1 seconds	4 seconds	7 seconds	14 seconds
50	3.5 seconds	7 seconds	11 seconds	23 seconds
75	5.2 seconds	10 seconds	17 seconds	34 seconds
99	6.9 seconds	14 seconds	23 seconds	45 seconds

6 - ALARM



Note !

With these settings, it is determined how the ratio will be.

Note: for alarm relay output functions: read SETUP A "relays".

FLOW ZERO 61	When the <u>flowrate of BOTH flows is zero</u> , then it is possible to ignore or disable the ratio monitoring. The following settings can be selected: DEFAULT: in case of a low-ratio alarm and zero flow, it will switch the alarm output and indicate the alarm on the display. NO RELAY: in case of a low-ratio 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-ratio alarm and zero flow, it won't switch the alarm output and nothing will be indicated on the display.
ALARM VALUE LOW - LOW 62	The low-low alarm is set with this setting. An alarm will be generated as long as the ratio lower as this. With value 0.0 this function is disabled.
ALARM VALUE LOW 63	The low alarm is set with this setting. An alarm will be generated as long as the ratio lower as this. With value 0.0 this function is disabled.
ALARM VALUE HIGH 64	The high alarm is set with this setting. An alarm will be generated as long as the ratio higher as this. With value 0.0 this function is disabled.
ALARM VALUE HIGH - HIGH 65	The high-high alarm is set with this setting. An alarm will be generated as long as the ratio higher as this. With value 0.0 this function is disabled.
DELAY TIME ALARM LOW - LOW 66	An alarm generated by SETUP 32 "low-low" can be ignored during X-time period. If the actual ratio is still incorrect after this delay time, then an alarm will be generated.
DELAY TIME ALARM LOW 67	An alarm generated by SETUP 33 "low" can be ignored during X-time period. If the actual ratio is still incorrect after this delay time, then an alarm will be generated.
DELAY TIME ALARM HIGH 68	An alarm generated by SETUP 34 "high" can be ignored during X-time period. If the actual ratio is still incorrect after this delay time, then an alarm will be generated.
DELAY TIME ALARM HIGH - HIGH 69	An alarm generated by SETUP 35 "high-high" can be ignored during X-time period. If the actual ratio is still incorrect after this delay time, then an alarm will be generated.

7 - DISPLAY

FUNCTION 71	Additionally to the ratio, the flowrate and a resettable totalizer of channel A and channel B can be displayed. Following can be selected: <u>disabled:</u> total and flowrate will not be displayed. <u>rate:</u> only flowrate A and B will be displayed <u>total:</u> only total A and B will be displayed. <u>both:</u> all flowrates and totals will be displayed.
SET ALARM 72	Additionally to the ratio, it can be monitored with four ratio alarms. Following can be selected: <u>off:</u> ratio monitoring is switched-off and will not be displayed. <u>operator:</u> the ratio alarm value will be display and can be changed by the operator. <u>setup:</u> the ratio alarm value will be display and can NOT be changed by the operator but only on SETUP level. <u>hidden:</u> the ratio alarm value will not be display and can NOT be changed by the operator but only on SETUP level.

8 - POWER MANAGEMENT

When used with the internal battery option, the user can expect reliable measurement over a long period of time. The F114-A has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:

LCD NEW 81

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

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

Example 3: Battery life-time

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

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

Note: after a button has been pressed by the operator - the display refresh rate will always switch to FAST for 30 seconds. When "OFF" is selected, the display will be switched off after 30 seconds and will be switched on as soon as a button has been pressed.

BATTERY-MODE 82

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



Note !

9 - FLOWMETER A

SIGNAL 91	<p>The F114-A can process the 4-20mA signal in two ways:</p> <ul style="list-style-type: none"> ▪ Interpolation: the signal is processed linear $\mathbf{R = S \times I}$ <ul style="list-style-type: none"> ▪ Square root: for differential pressure $\mathbf{R = S \sqrt{I}}$ <p>where:</p> <p>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.</p>
---------------------	---

FILTER 92	<p>The analog output signal of a flowmeter does mirror the actual flow. This signal is measured several times a second by the F114-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.</p> <p>The filter principal is based on three input values: the filter level (01-99), the last measured analog value and the last average value. The higher the filter level, the longer the response time on a value change will be. Below, several filter levels with there response times are indicated:</p>
---------------------	--



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

Continued next page >>>

9 - FLOWMETER A (CONTINUED)

CUT-OFF 93	<p>To ignore e.g. leakage of the flow or vibration, a low-flow cut-off can be set as percentage over the full range of 16mA (or 20mA / 10V). When the analog value is less then required with this setting, the signal will be ignored.</p> <p>The cut-off value can be programmed is the range 0.0 - 99.9%.</p> <p>Examples:</p>			
FUNCTION (setup 91)	SPAN (setup 13/24)	REQUIRED CUT-OFF	CUT-OFF (setup 93)	REQUIRED OUTPUT
interpolation	450 L/min	25 L/min	$25/450 \times 100\% = 5.5\%$	$16\text{mA} \times 5.5\% + 4\text{mA} = 4.88\text{mA}$
square root	450 L/min	25 L/min	$(25/450)^2 \times 100\% = 0.3\%$	$16\text{mA} \times 0.3\% + 4\text{mA} = 4.05\text{mA}$
TUNE MIN / 4MA 94	<p>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.</p> <p>This function will measure the real output value at flow zero.</p> <ul style="list-style-type: none"> ▪ <i>Warning: 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!</i> <p>After pressing PROG, three settings can be selected:</p> <ul style="list-style-type: none"> ▪ CALIBRATE: 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. 			
TUNE MAX / 20MA 95	<p>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.</p> <p>This function will measure the real output value at maximum flowrate.</p> <ul style="list-style-type: none"> ▪ <i>Warning: 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!</i> <p>After pressing PROG, three settings can be selected:</p> <ul style="list-style-type: none"> ▪ CALIBRATE: with this setting, the input will be calibrated with the actual "20mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be less than the calibrated value for a reliable measurement. ▪ DEFAULT: with this setting, the manufactures value is re-installed. ▪ CAL SET: to select the last calibrated value. 			



A - FLOWMETER B	
SIGNAL A1	<p>The F114-A can process the 4-20mA signal in two ways:</p> <ul style="list-style-type: none"> ▪ Interpolation: the signal is processed linear ▪ Square root: for differential pressure <p>For explanation of this function: please read "9 - Flowmeter A"</p>
FILTER A2	<p>With the help of this digital filter a stable and accurate reading can be obtained while the filter level can be set to a desired value.</p> <p>For explanation of this function: please read "9 - Flowmeter A"</p>
CUT-OFF A3	<p>To ignore e.g. leakage of the flow or vibration, a low-flow cut-off can be set as percentage over the full range of 16mA (or 20mA / 10V). When the analog value is less then required with this setting, the signal will be ignored.</p> <p>The cut-off value can be programmed is the range 0.0 - 99.9%.</p> <p>For explanation of this function: please read "9 - Flowmeter A"</p>
TUNE MIN / 4MA A4	<p>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.</p> <p>This function will measure the real output value at flow zero.</p> <ul style="list-style-type: none"> ▪ <i>Warning: 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!</i> <p>For explanation of this function: please read "9 - Flowmeter A"</p>
TUNE MAX / 20MA A5	<p>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.</p> <p>This function will measure the real output value at maximum flowrate.</p> <ul style="list-style-type: none"> ▪ <i>Warning: 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!</i> <p>For explanation of this function: please read "9 - Flowmeter A"</p>



B - ANALOG OUTPUT

A linear (0)4-20mA or 0-10V output signal is generated according to the calculated ratio, flowrate A or flowrate B with a 10 bits resolution. The settings for ratio (SETUP 52) and flowrate (SETUP - 2) directly influence the analog output.

The relationship between rate and analog output is set with the following functions:

DISABLE / ENABLE B1	The analog output can be disabled. In case of a passive analog output type AP, 3.5mA will be generated if a power supply is available but the output is disabled.
INPUT SELECTION B2	This setting determines if the analog output is according the actual ratio, flowrate A or flowrate B.
MINIMUM SIGNAL B3	Enter here the ratio or flowrate at which the output should generate the minimum signal (e.g. (0)4mA or 0V). The number of decimals displayed depend upon SETUP 23 or 53. The time and measuring units are not displayed.
MAXIMUM SIGNAL B4	Enter here the ratio or flowrate at which the output should generate the maximum signal (e.g. 20mA or 10V). The number of decimals displayed depend upon SETUP 23 or 53. The time and measuring units are not displayed. .
TUNE MIN / 4MA B5	<p>The initial minimum analog output value is 0/4mA or 0V. However, this value might differ slightly due to external influences such as temperature for example. The 0/4mA or 0V value can be tuned precisely with this setting.</p> <ul style="list-style-type: none"> ▪ <i>Before tuning the signal, be sure that the analog signal is not being used for any application!</i> <p>After pressing PROG, the current will be about 4mA (or 0mA / 0V). The current can be increased / decreased with the arrow-keys and is <u>directly active</u>. Press ENTER to store the new value. Remark: the analog output value can be programmed “up-side-down” if desired, so 20mA at minimum ratio for example!</p>
TUNE MAX / 20MA B6	<p>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.</p> <ul style="list-style-type: none"> ▪ <i>Before tuning the signal, be sure that the analog signal is not being used for any application!</i> <p>After pressing PROG, the current will be about 20mA. The current can be increased / decreased with the arrow-keys and is <u>directly active</u>. Press ENTER to store the new value. Remark: the analog output value can be programmed “up-side-down” if desired, so 4mA at maximum ratio for example!</p>





Note !

C - RELAY OUTPUT

With "SETUP 6", four alarm levels can be entered. Based on the options ordered, the F114-A will have 2, 3 or 4 alarm outputs.

Note: If the unit is Intrinsically Safe, it will have two alarm outputs. If option OS (relay board) has been supplied, it will have four alarm outputs. Else it has three alarm outputs.

OUTPUT R1 C1	Assign the output function to output R1. Following can be selected: low-low - low - high - high-high alarm - all alarms - off
OUTPUT R2 C2	Assign the output function to output R2. Following can be selected: low-low - low - high - high-high alarm - all alarms - off
OUTPUT R3 C3	Assign the output function to output R3. Following can be selected: low-low - low - high - high-high alarm - all alarms - off
OUTPUT R4 C4	Assign the output function to output R4. Following can be selected: low-low - low - high - high-high alarm - all alarms - off

D - COMMUNICATION (OPTIONAL)

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

BAUDRATE D1	For external control, the following communication speeds can be selected: 1200 - 2400 - 4800 - 9600 baud
BUS ADDRESS D2	For communication purposes, a unique identity can be attributed to every F114-A. This address can vary from 1-255.
MODE D3	The communication protocol is Modbus RTU mode. Select OFF, to disable this communication function.

E - OTHERS

TYPE OF MODEL E1	For support and maintenance it is important to have information about the characteristics of the F114-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.
VERSION SOFTWARE E2	For support and maintenance it is important to have information about the characteristics of the F114-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 NUMBER E3	For support and maintenance it is important to have information about the characteristics of the F114-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.
PASS CODE E4	All SETUP-values can be pass code protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
TAGNUMBER E5	For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.

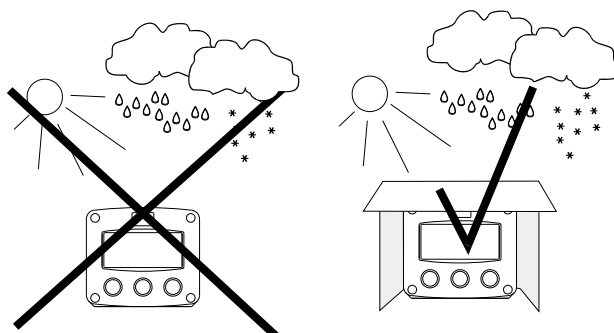
4. INSTALLATION



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 F114-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.

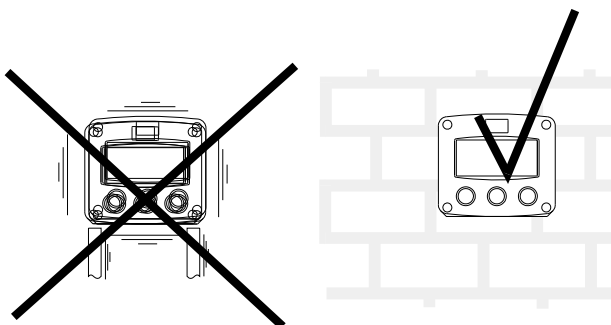
4.2. INSTALLATION / SURROUNDING CONDITIONS



Take the relevant IP classification of the casing into account (see manufactures plate). Even an IP67 (NEMA 4X) casing should NEVER be exposed to strongly varying (weather) conditions.

When panel-mounted, the unit is IP65 (NEMA 4X)!

When used in very cold surroundings or varying climatic conditions, take the necessary precautions against moisture by placing a dry sachet of silica gel, for example, inside the instrument case.



Mount the F114-A on a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE

Aluminum enclosures:

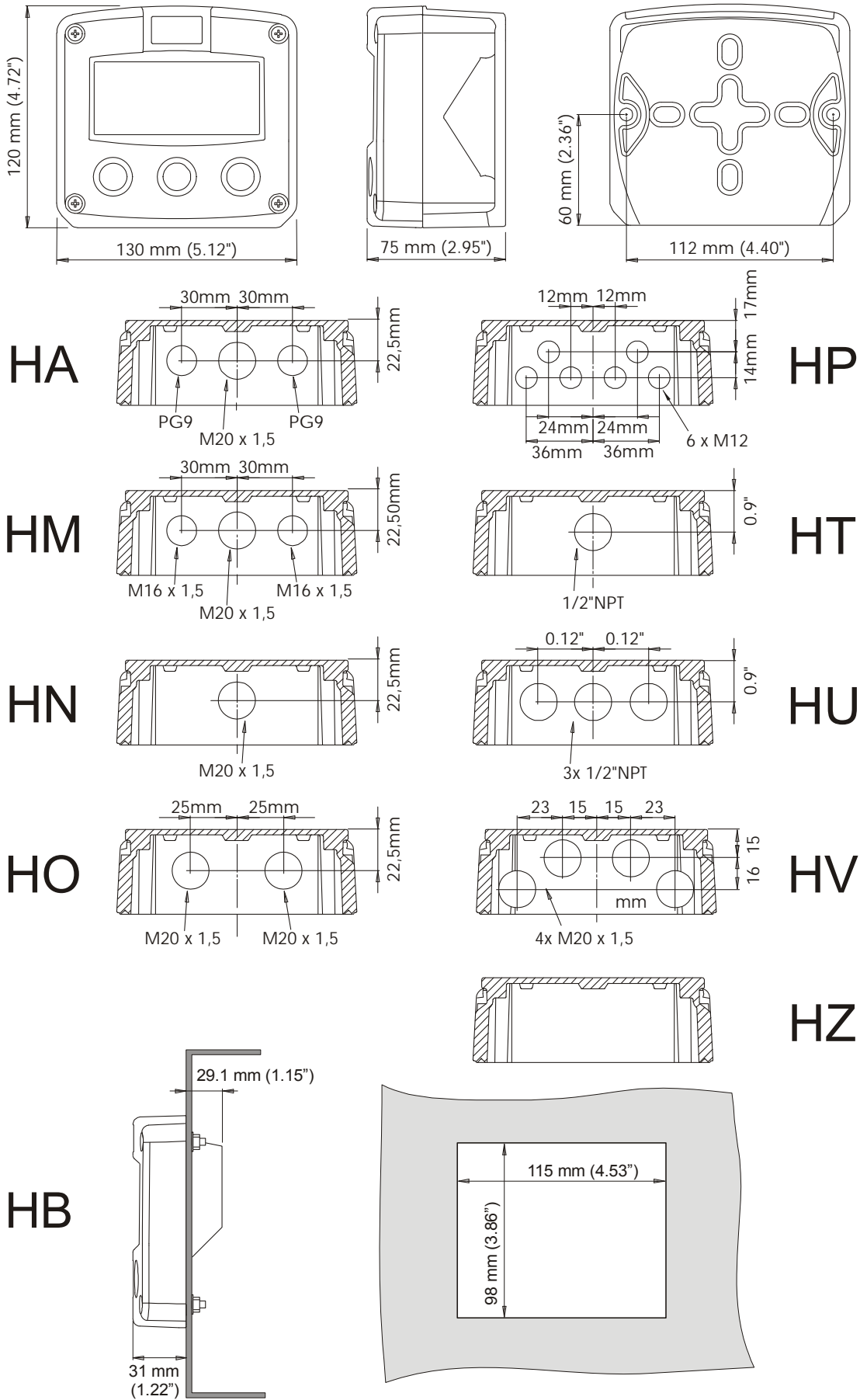
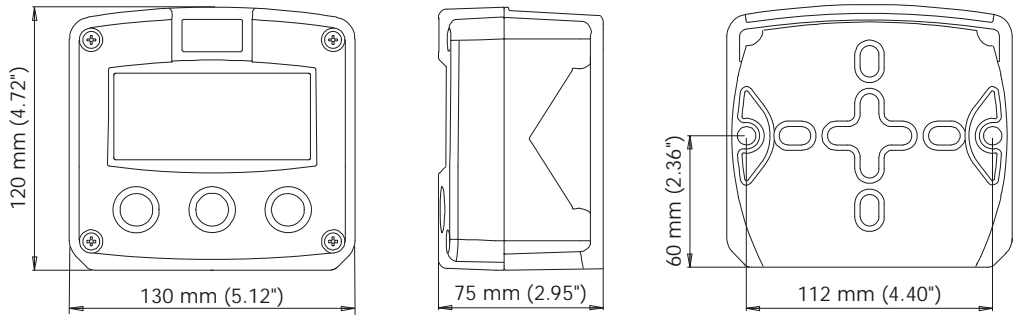
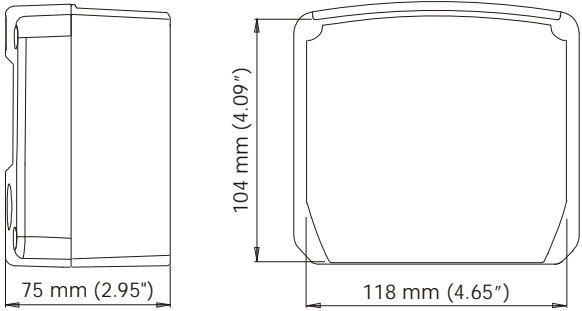


Fig. 6: Dimensions aluminum enclosures.

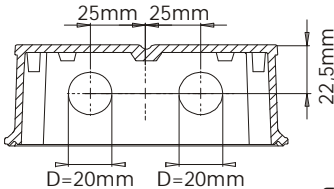
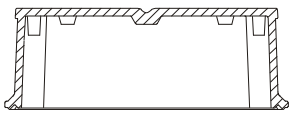
GRP enclosures:



HK back box:
(flat bottom)

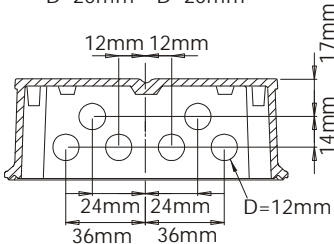
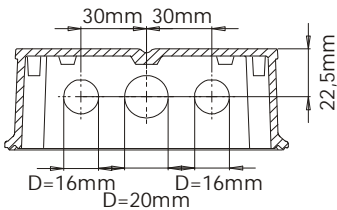


HD
HK



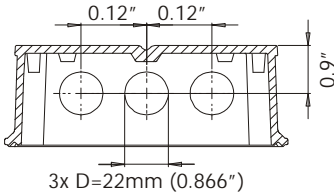
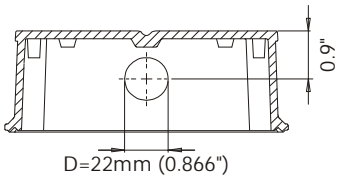
HG

HE



HH

HF



HJ

HC

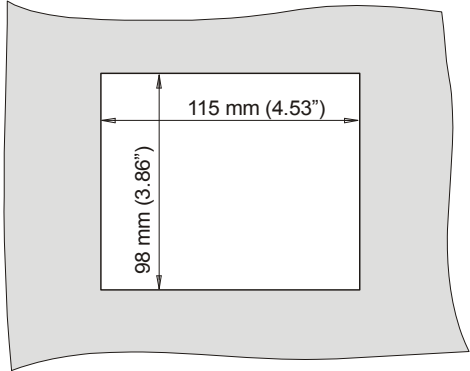
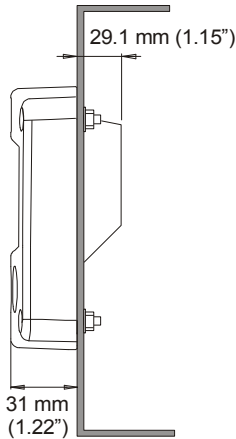


Fig. 7: Dimensions GRP enclosures.

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 F114-A has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-casing and removable terminal-block may never be removed.

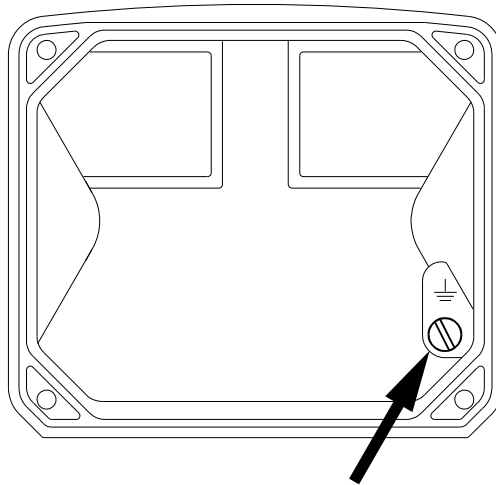


Fig. 8: Grounding aluminum enclosure with type PM 115-230V AC.

FOR INSTALLATION, PAY EMPHATIC ATTENTION TO:

- Separate cable glands with effective IP67 (NEMA4X) seals for all wires.
- Unused cable entries: ensure that you fit IP67 (NEMA4X) plugs to maintain rating.
- A reliable ground connection for both the sensor, and if applicable, for the metal casing.
- An effective screened cable for the input signal, and grounding of its screen to terminal 9 (GND) or at the sensor itself, whichever is appropriate to the application.

4.4.2. VOLTAGE SELECTION SENSOR SUPPLY

For Intrinsically Safe applications: read chapter 5.

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

Terminal 11 provides a limited supply voltage of 3.2 V DC (coil signals 1.2V) for the signal output of the flowmeter.



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

Type PD / PF / PM: Sensor supply: 1.2 - 3.2V - 8.2V - 12V or 24 V DC:

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

Total power consumption PD: max. 50mA@24V and PF / PM: max. 400mA@24V.

The voltage is selected with the three switches inside the enclosure.



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

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

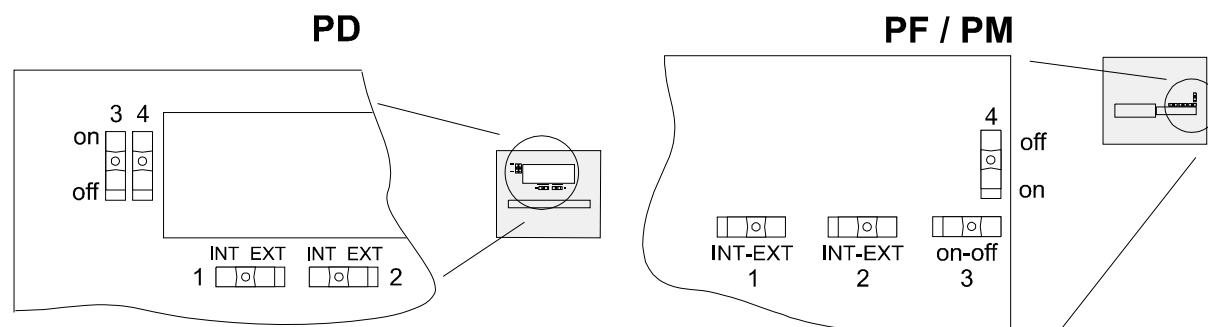


Fig. 9: Switch setting sensor supply voltage.

Switch positions

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

SENSOR B	
SWITCH 2	VOLTAGE
internal	3.2 V DC
external	switch 3+4

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: voltage selection sensor B - terminal 14.

Function switch 3+4: the combination of these switches determine the voltage as indicated. Do move switch 1 and / or switch 2 to the OFF position to enable the selected voltage with switch 3+4.

4.4.3. TERMINAL CONNECTORS

For *Intrinsically Safe* applications: read chapter 5.

The following terminal connectors are available:

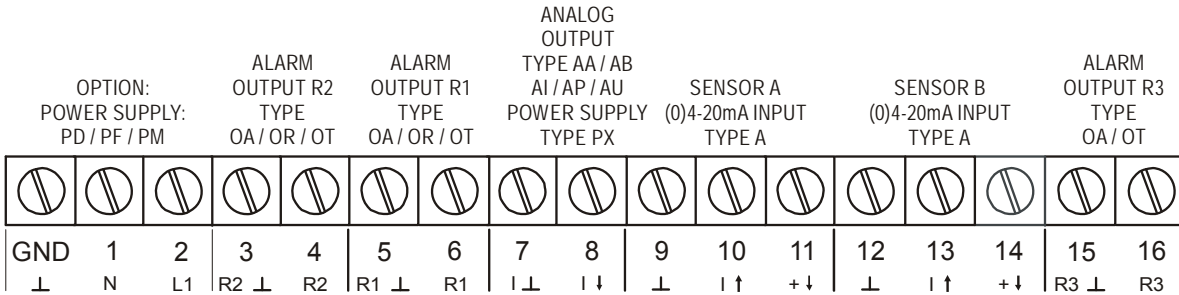


Fig. 10: Overview of terminal connectors standard configuration F114-A and options.

REMARKS: TERMINAL CONNECTORS:

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

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

◇=option

For *Intrinsically Safe* applications: read chapter 5.

Terminal 03-04; alarm output R2:

This output is an alarm output according setup B2.

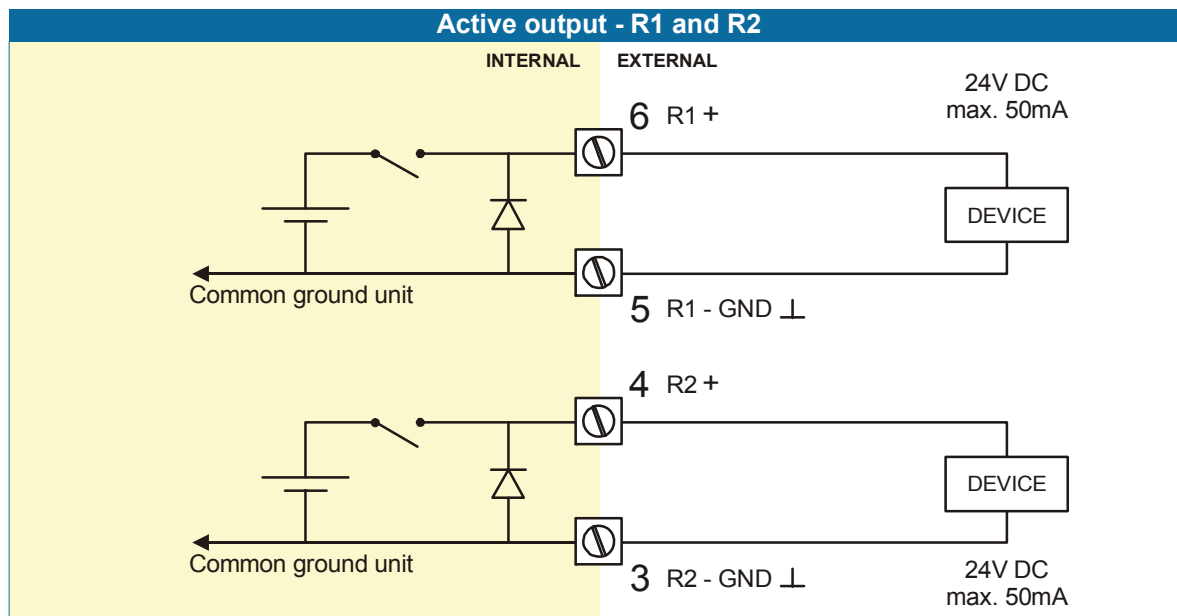
Terminal 05-06; alarm output R1:

This output is an alarm output according setup B1.

Type OA:

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

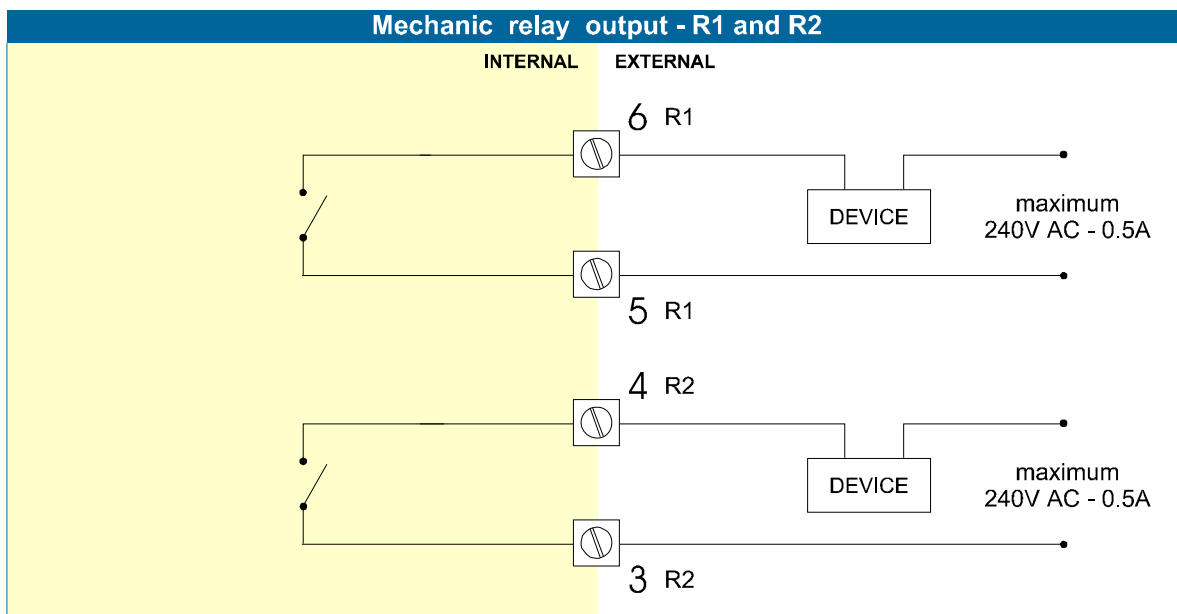
Max. driving capacity 50mA@24V per output. (Requires power supply type PD / PF / PM).



Type OR:

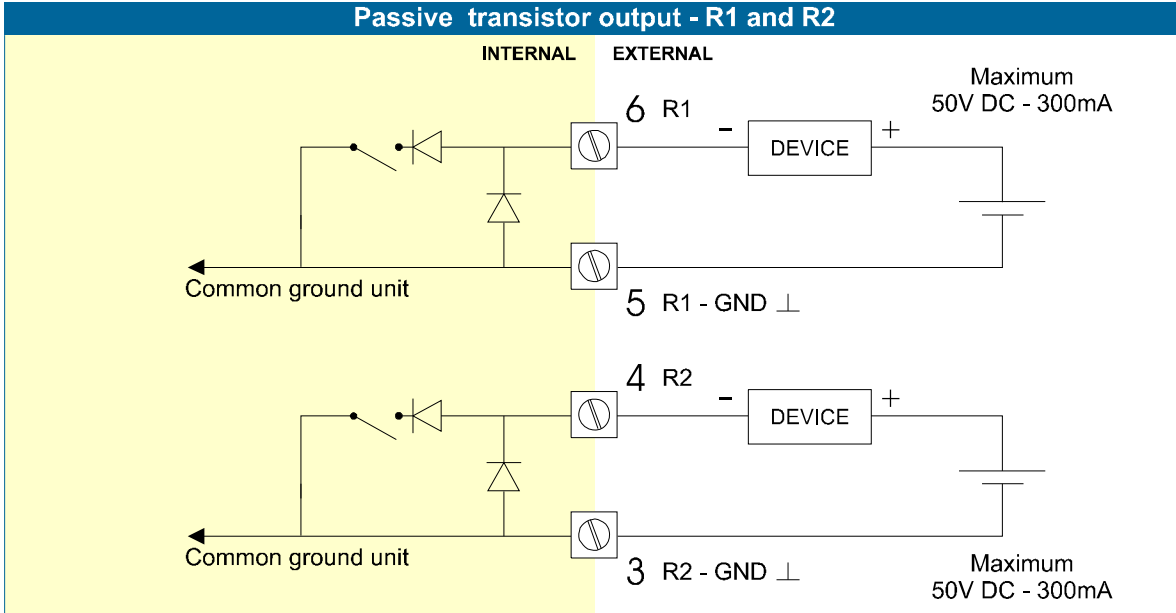
A mechanical relay output ratio alarm output is available with this option.

Max. switch power 240V 0,5A per output. (Requires power supply type PF / PM).



Type OT:

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



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

Connect an external power supply of 8-30VDC to these terminals or a 4-20mA loop. Do connect the "-" to terminal 7 and the "+" to terminal 8. When power is applied to these terminals, the (optional) internal battery will be disabled / enabled automatically to extend the battery life time.



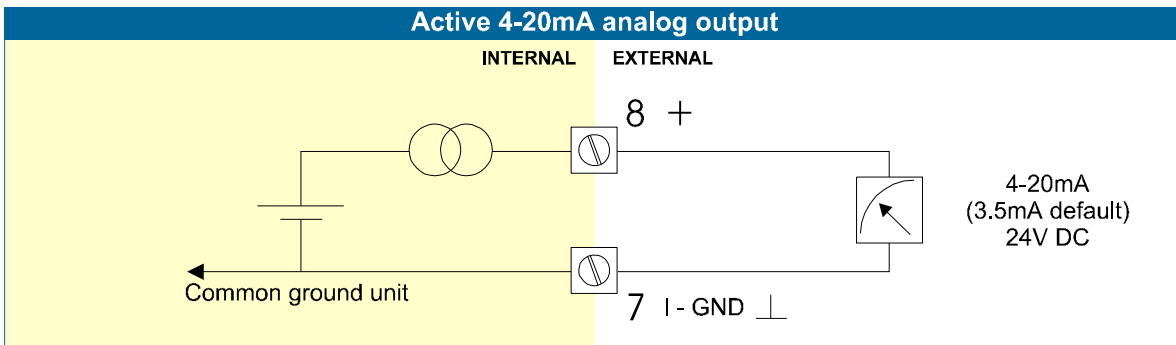
Caution ! Only valid for standard passive output type AP!

Terminal 07-08 analog output (SETUP 7) :

An analog output signal proportional to the ratio, flowrate A or flowrate B is available as standard.

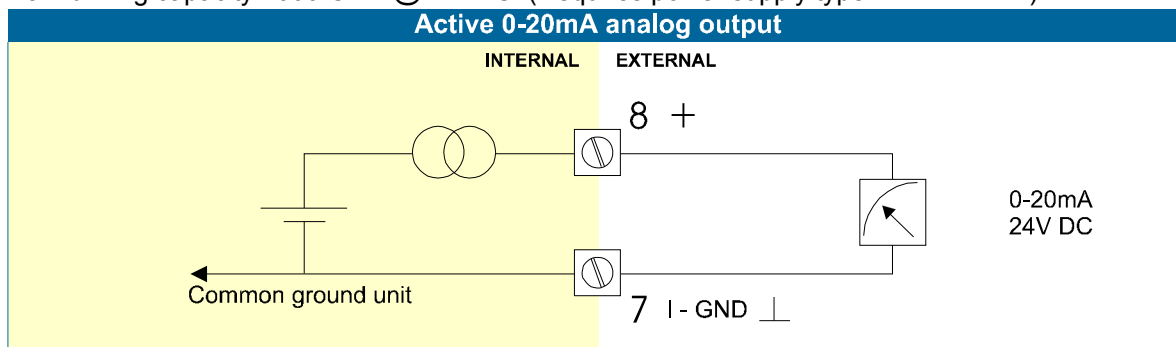
Type AA:

An active 4-20mA signal proportional to the ratio 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:

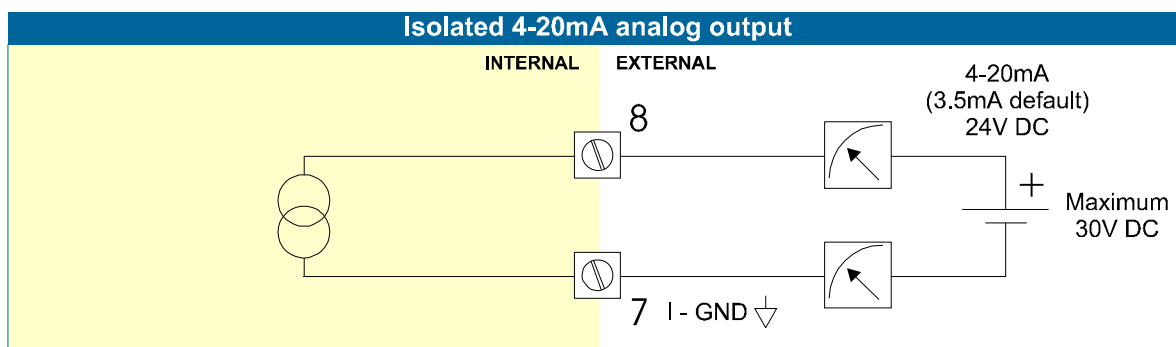
An active 0-20mA signal proportional to the ratio or flowrate is available with this option. Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD / PF / PM).

**Type AF:**

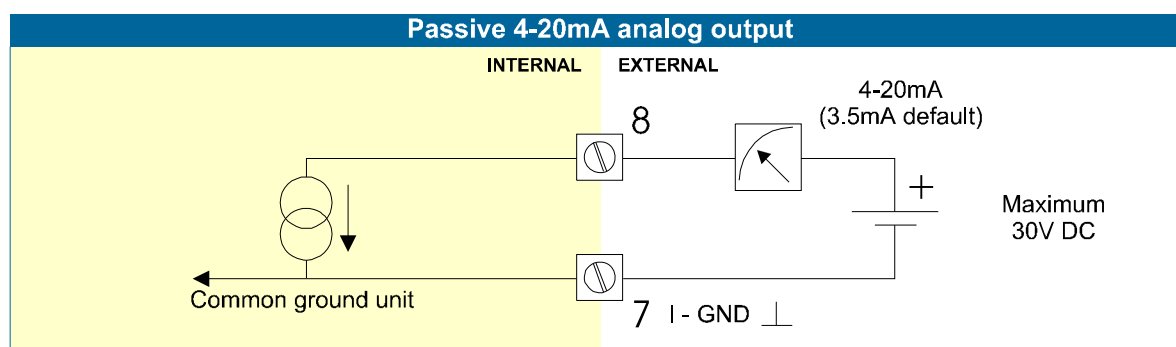
For the Intrinsically Safe floating 4-20mA signal: please read Chapter 5.

Type AI:

An isolated 4-20mA signal proportional to the ratio or 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.

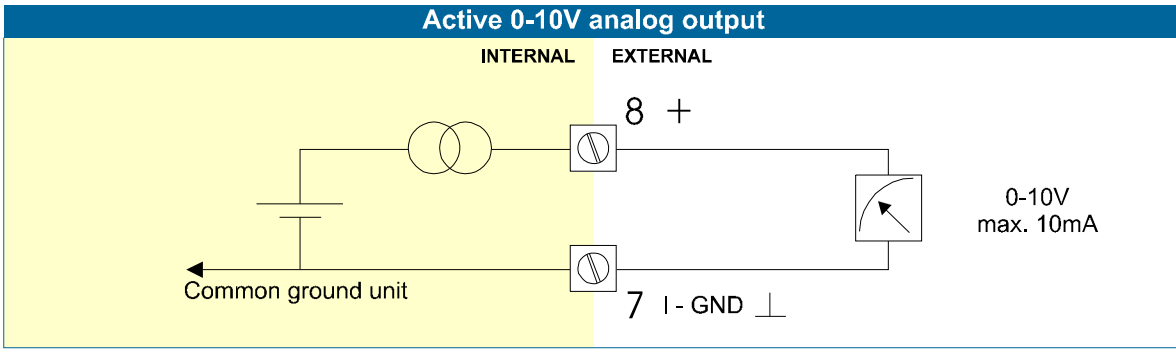
**Type AP:**

A passive 4-20mA signal proportional to the ratio or 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:

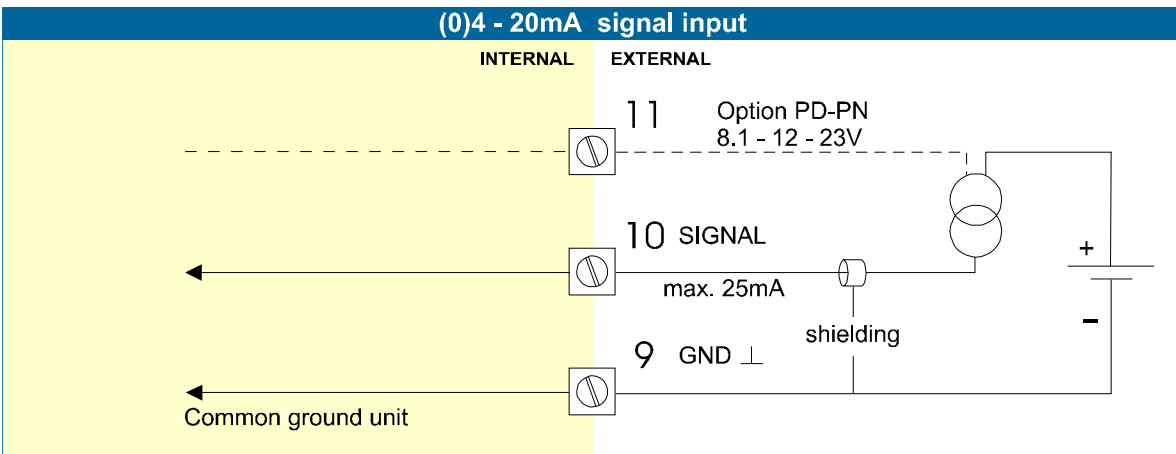
A 0-10VDC signal proportional to the ratio or flowrate is available with this option.
 Max. load 10mA @ 10VDC. (Requires power supply type PD / PF / PM).



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

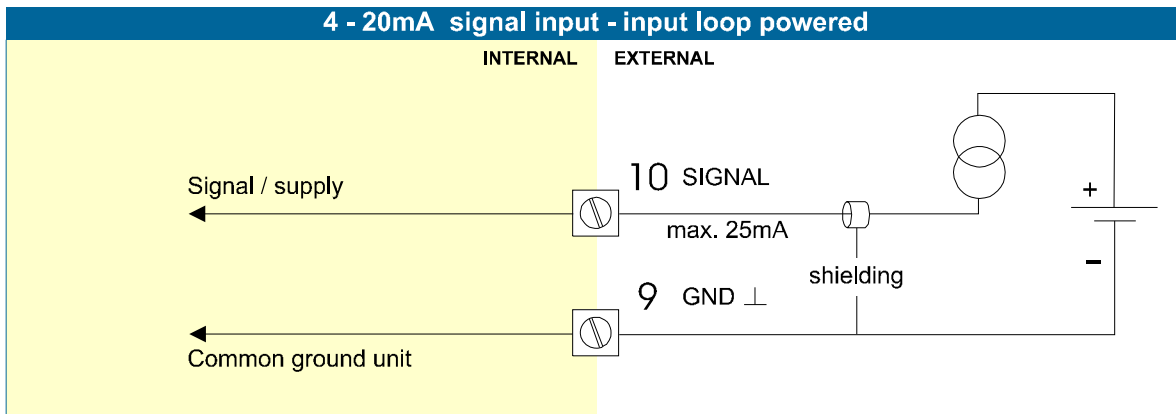
The F111-A requires a (0)4-20mA flowmeter signal which will be processed 4 times a second with a 14 bits accuracy. The input is not isolated.

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



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

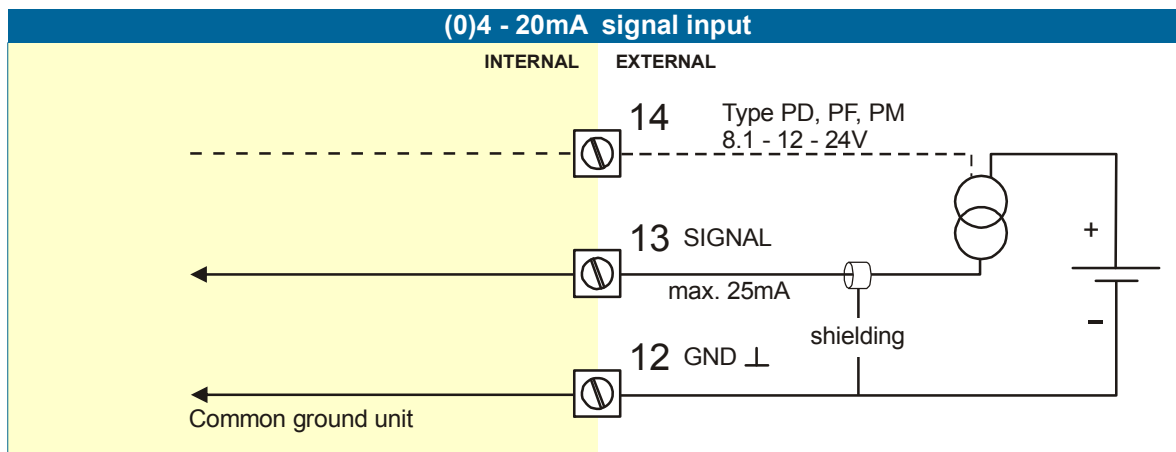
The F111-A-PL requires a 4-20mA flowmeter signal which has a double function: The signal will be processed 4 times a second with a 14 bits accuracy and the unit will be powered from the sensor signal (input loop powered). The input is not isolated and not intrinsically safe.



Terminal 12-14; Flowmeter input B:

The F114-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: please read chapter 5.



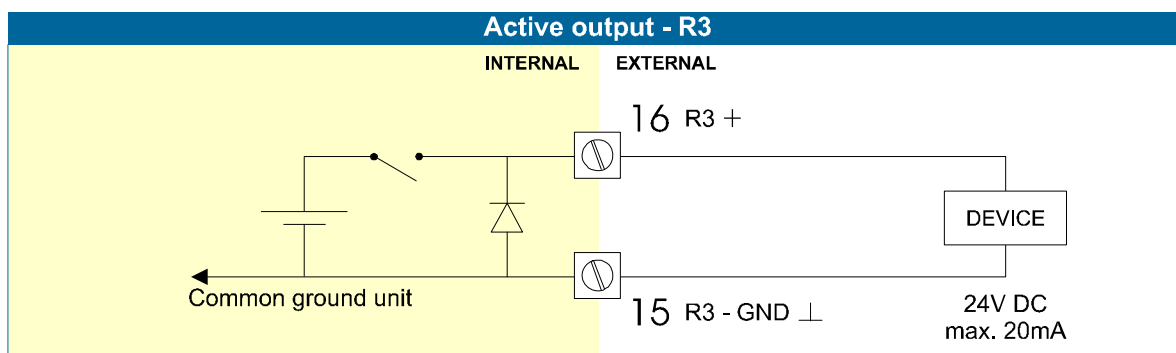
Terminal 15-16; alarm output R3:

This output is an alarm output according setup B3.

Type OA:

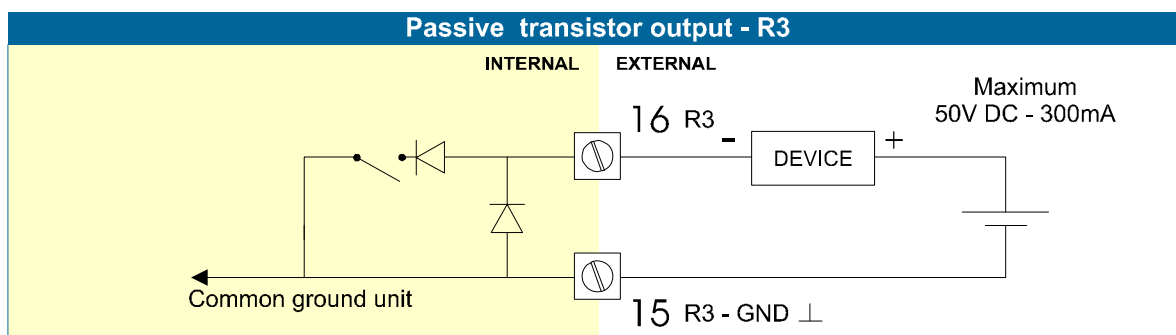
An active 24V DC ratio or flowrate alarm output is available with this option.

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 (option)

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

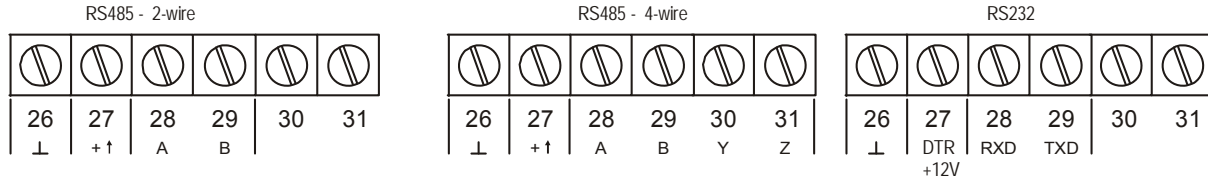


Fig. 11: Overview terminal connectors communication option.

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

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



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

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



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

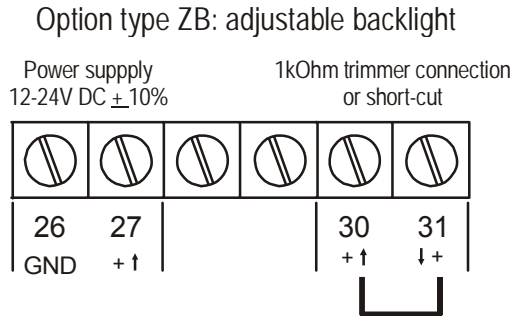


Fig. 12: Overview terminal connectors backlight option.

5. INTRINSICALLY SAFE APPLICATIONS

5.1. GENERAL INFORMATION AND INSTRUCTIONS



Cautions

- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- This device may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the cabinet has been opened (danger of electric shock). The housing may only be opened by trained personnel.
- To maintain the degree of protection of at least IP65 in accordance with IEC 60529, certified cable entries in accordance with IEC 61241-0 must be used and correctly installed. Unused openings must be closed with suitable blanking elements.
- When the enclosure of the Indicator is made of aluminum alloy, when used in a potentially explosive atmosphere requiring apparatus of equipment protection level Ga and Da, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.
- Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.



Safety Instructions

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



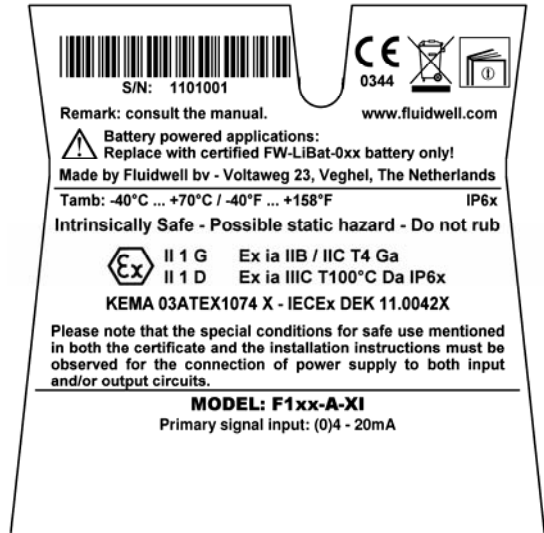
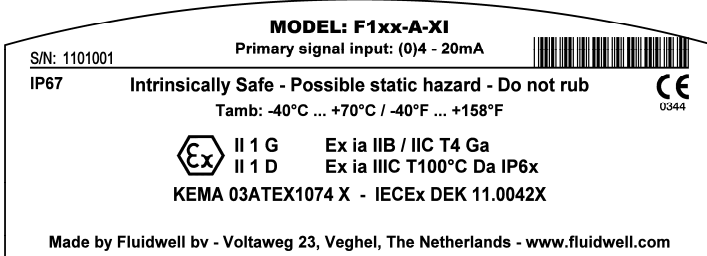
Please Note

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

Label information (inside and outside the enclosure)

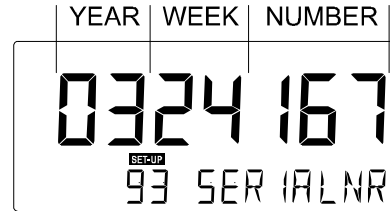
Indicated labels on the back cover (below) and on the inside cover (right) show the type labels for intrinsically safe certified units.

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



Serial number and year of production

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



5.2. TERMINAL CONNECTORS INTRINSICALLY SAFE APPLICATIONS

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



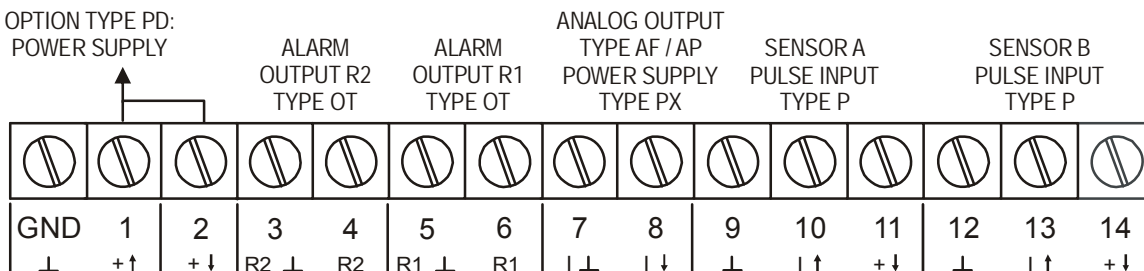
Note !

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

5.2. TERMINAL CONNECTORS INTRINSICALLY SAFE APPLICATIONS:

Terminal connectors F114-A-XI:



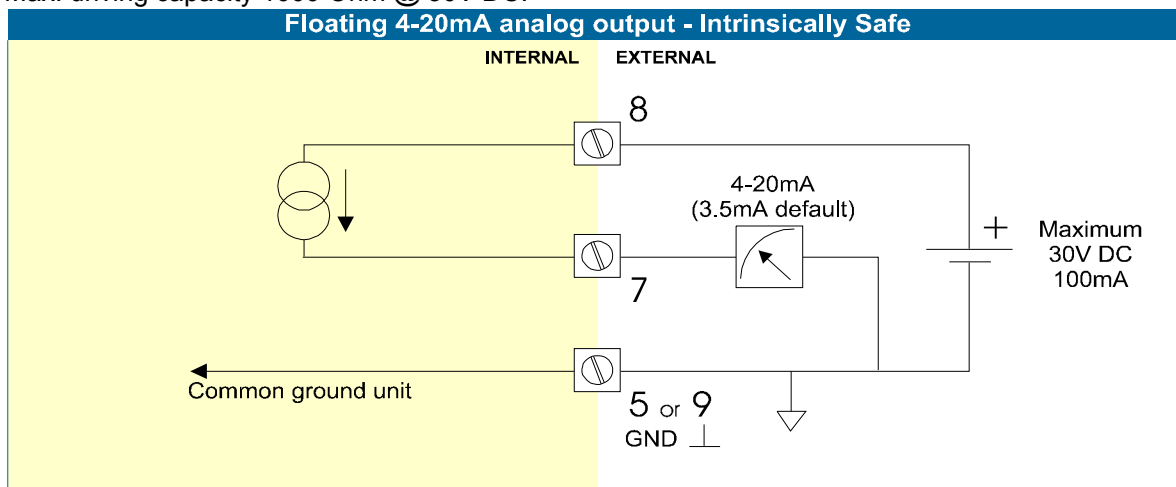
Explanation Intrinsically Safe options:

Option 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.



Note !

Note! It is required to link the minus from the analog output - terminal 7 - with a ground terminal of the unit, e.g. terminal 5 or 9.

Option PD - Intrinsically Safe power supply and sensor supply - Terminal GND- 01, 11 and 14.

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

Terminal 02: this terminal offers the same voltage as connected to terminal 01.

Terminal 11 and 14: these terminals offer a 3.2V or 8.1V to power the sensor.

This voltage is selected with the switch(es) inside the enclosure. First, remove the terminals after which the internal plastic cover can be removed.

Switch position terminal 11		Switch position terminal 14	
SWITCH 1	VOLTAGE	SWITCH 1	VOLTAGE
on	8.1 V DC	on	8.1 V DC
off	3.2 V DC	off	3.2 V DC

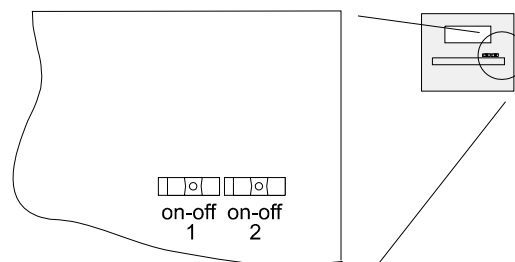


Fig. 13: Switch position voltage selection option PD-XI.

5.3. CONFIGURATION EXAMPLES INTRINSICALLY SAFE APPLICATIONS

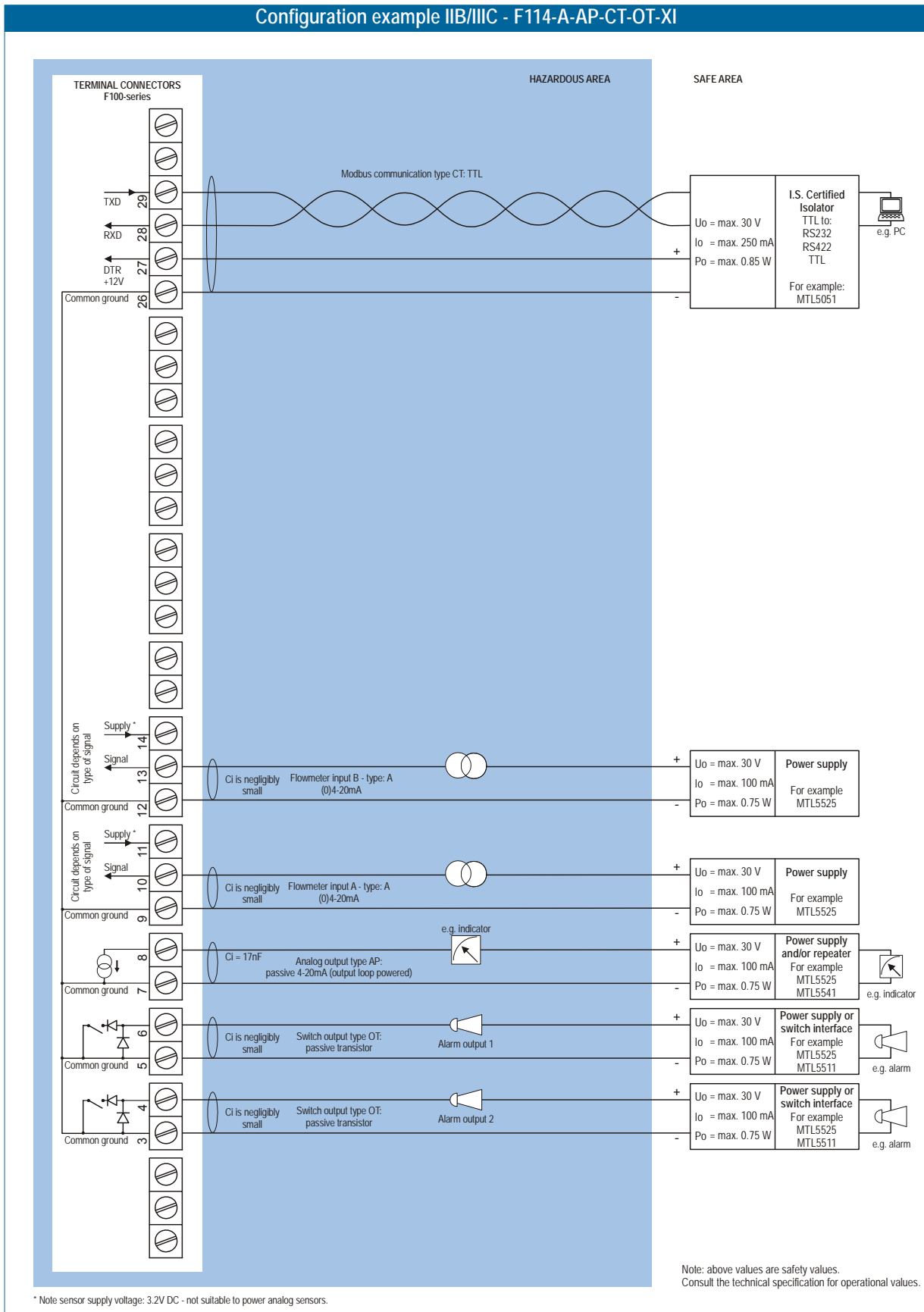


Fig. 14: Configuration example 1 Intrinsically Safe.

Configuration example IIB/IIC and IIC - F114-A-AP-(CT)-OT-PD-XI

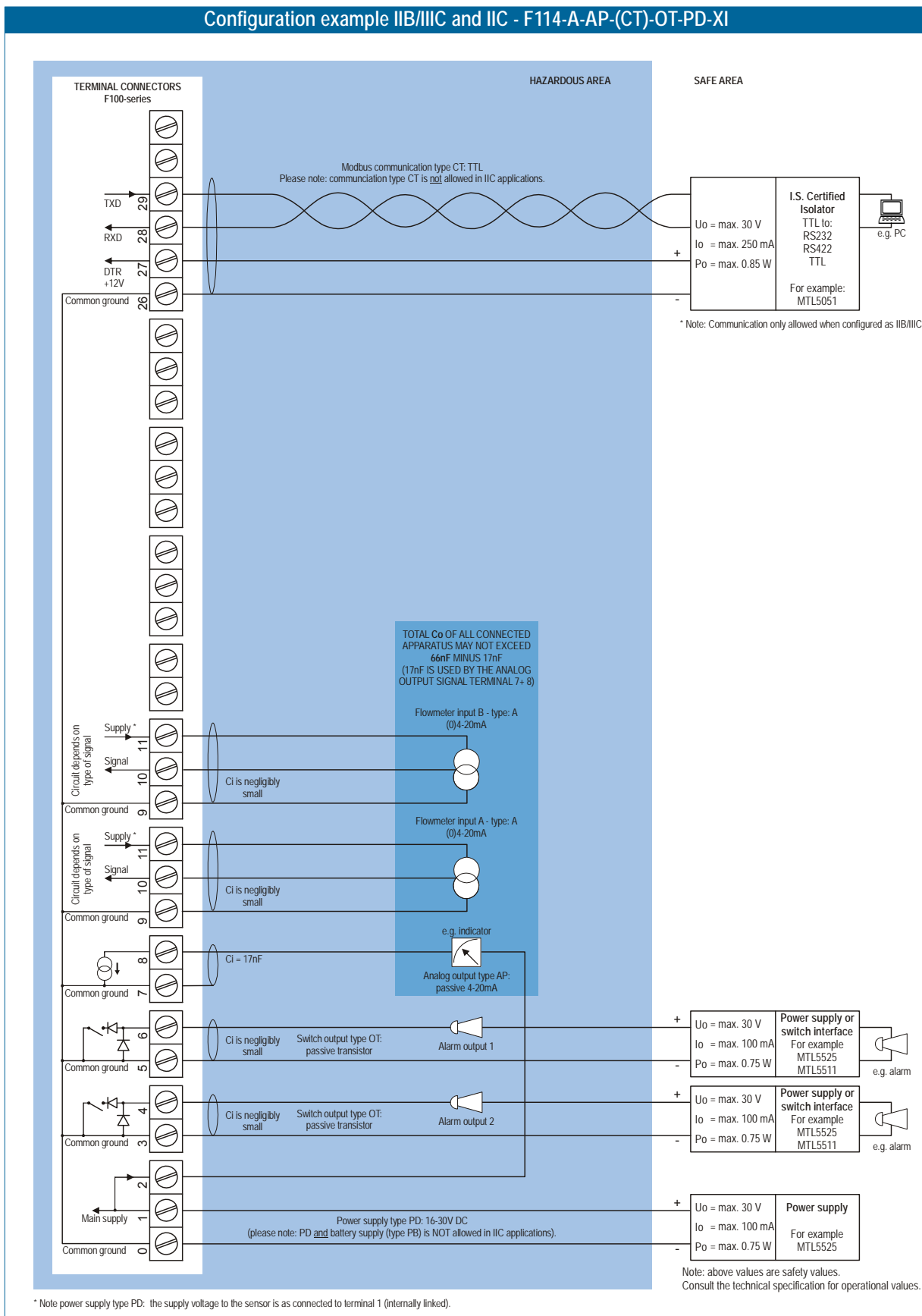


Fig. 15: Configuration example 2 Intrinsically Safe.

5.4 BATTERY REPLACEMENT INSTRUCTIONS

**Safety Instructions**

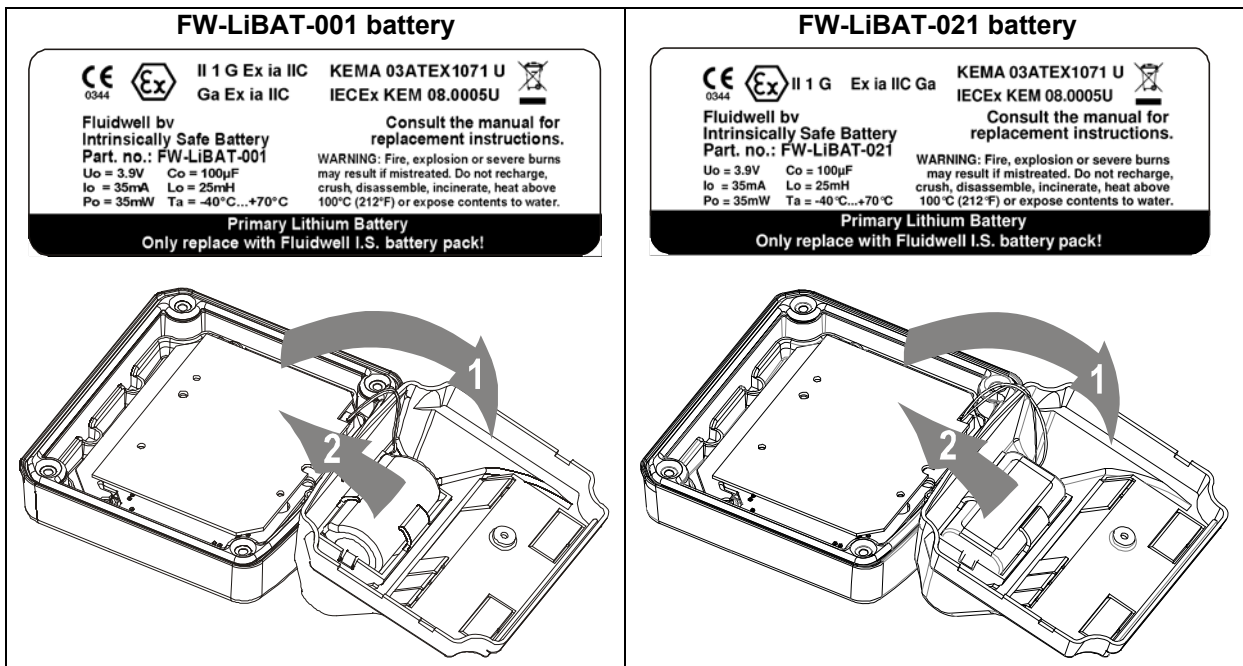
- **Fire, explosion or severe burns may result if mistreated.** Do not recharge, crush, disassemble, incinerate, heat above 100°C (212°F) or expose contents to water.
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained personnel authorized by 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 type batteries (manufactured by Fluidwell bv) only.**

Battery replacement procedure

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



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

6. MAINTENANCE

6.1. GENERAL DIRECTIONS



Caution !

- *Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.*
- *The F110-U 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 F114-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 F114-A in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.

Battery life-time:

It is influenced by several issues :

- Type of sensor: read chapter 3.2.3. NPN and PNP inputs consume more energy than coil inputs.
- Input frequency: the higher the frequency, the shorter the battery life-time.
- Flowrate calculation: the lower number of pulses (SETUP 26) the shorter the battery life-time.
- Analog output signal; be sure that an external power supply is connected or that the function is disabled if not in use; or else it will have a major influence on the battery life-time (SETUP A1).
- Display update: fast display update uses significantly more power; SETUP 81.
- Pulse output and communications .
- Low temperatures; the available power will be less due to battery chemistry.



Note !

Note: *It is strongly advised to disable unused functions.*

Check periodically:

- The condition of the casing, cable glands and front panel.
- The input/output wiring for reliability and aging symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the flowmeter might be necessary. Do not forget to re-enter any subsequent K-factor alterations.
- The indication for low-battery.
- Clean the casing with soapy-water. Do not use any aggressive solvents as these might damage the coating.

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	Transflective LCD with green LED backlight. Good readings in full sunlight and darkness. Note: only available for safe area applications. Power requirements: 12-24V DC + 10% or type PD, PF, PM. Power consumption max. 1 Watt.

Enclosures	
General	Die-cast aluminum or GRP (Glassfibre Reinforced Polyamide) enclosure with Polycarbonate window, silicone and EPDM gaskets. UV stabilized and flame retardant material.
Control Keys	Three industrial micro-switch keys. UV-stabilized silicone keypad.
Painting	Aluminum enclosure only: UV-resistant 2-component industrial painting.
Panel-mount enclosures	Dimensions: 130 x 120 x 60mm (5.10" x 4.72" x 2.38") – LxHxD.
Classification	IP65 / NEMA4X
Panel cut-out	115 x 98mm (4.53" x 3.86") LxH.
Type HC	GRP panel-mount enclosure
Type HB	Aluminum panel-mount enclosure
Field/wall-mount enclosures	Dimensions: 130 x 120 x 75mm (5.10" x 4.72" x 2.95") – LxHxD.
Classification	IP67 / NEMA4X
Aluminum enclosures	
Type HA	Drilling: 2x PG9 – 1x M20.
Type HM	Drilling: 2x M16 – 1x M20.
Type HN	Drilling: 1x M20.
Type HO	Drilling: 2x M20.
Type HP	Drilling: 6x M12.
Type HT	Drilling: 1x ½"NPT.
Type HU	Drilling: 3x ½"NPT.
Type HZ	No drilling.
GRP enclosures	
Type HD	No drilling.
Type HE	Drilling: 2x 16mm (0.63") – 1x 20mm (0.78").
Type HF	Drilling: 1x 22mm (0.87").
Type HG	Drilling: 2x 20mm (0.78").
Type HH	Drilling: 6x 12mm (0.47").
Option ZS	Silicone free ABS enclosure with EPDM and PE gaskets. UV-resistant polyester keypad. Note: this option comes with type HD only.


Operating temperature	
Operational	-40°C to +80°C (-40°F to +176°F)
Intrinsically Safe	-40°C to +70°C (-40°F to +158°F)

Power supply	
Type PB	Lithium battery - life-time depends upon settings - up to 5 years.
Type PC	Intrinsically Safe lithium battery - life-time depends upon settings - up to 5 years.
Type PD	8-24V AC / DC ± 10%. Power consumption max. 10 Watt. Intrinsically safe: 16-30V DC; power consumption max. 0.75 Watt.
Type PF	24V AC / DC + 10%. Power consumption max. 15 Watt.
Type PL	Input loop powered from sensor signal 4-20mA (type A, non IS).
Type PM	115-230V AC ± 10%. Power consumption max. 15 Watt.
Type PX	Output loop powered: 8-30V DC. Power consumption max. 0.5 Watt.
Note PF / PM	The total consumption of the sensors, backlight and outputs may not exceed 400mA@24V.
Note I.S. applications	For intrinsically safe applications, consult the safety values in the certificate.

Sensor excitation	
Type PB / PC / PX	3.2V DC for pulse signals and 1.2V DC for coil pick-up. Note: This is not a real sensor supply. Only suitable for pulse sensors with a very low power consumption like coils (sine wave) and reed-switches.
Type PD	1.2 - 3.2 - 8.2 - 12 and 24V DC - max. 50mA@24V DC
Type PD-XI	Intrinsically safe: Pulse signals: 1.2 - 3.2 - 8.2 - max. 7mA@8.2V DC. Analog signals: the sensor supply voltage is according to the power supply voltage connected to terminal 1. Also terminal 2 offers the same voltage.
Type PF / PM	1.2 - 3.2 - 8.2 - 12 and 24V DC - max. 400mA@24V DC.

Terminal connections	
Type:	Removable plug-in terminal strip. Wire max. 1.5mm ² and 2.5mm ² (Type PM / PF)

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

Hazardous area (option)	
Intrinsically safe Type XI	ATEX approval:  II 1 G Ex ia IIB/IIC T4 Ga II 1 D Ex ia IIIC T100°C Da IP6x IECEx approval: Ex ia IIB/IIC T4 Ga Ex ia IIIC T100°C Da IP6x
Explosion proof Type XD/XF	ATEX approval ref.: <EX> II 2 GD EEx d IIB T5. Weight appr. 15kg. Dimensions of enclosure: 350 x 250 x 200mm (13.7" x 9.9" x 7.9") LxHxD.

Environment	
Electromagnetic compatibility	Compliant ref: EN 61326 (1997), EN 61010-1 (1993).

INPUTS

Flowmeter	
Type P	Coil/sine wave (minimum 20mVp-p or 80mVp-p - sensitivity selectable), NPN/PNP, open collector, reed-switch, Namur, active pulse signals 8 - 12 and 24V.
Frequency	Minimum 0 Hz - maximum 7 kHz for total and flowrate. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-Factor	0.000010 - 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.
Type A	(0)4-20mA - with signal calibration feature at any current within the range.
Type U	0-10 V - with signal calibration feature at any voltage within the range.
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 and U: external power to sensor is required; e.g. Type PD.

OUTPUTS

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

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

OPERATIONAL

Operator functions	
Displayed functions	<ul style="list-style-type: none"> ratio 1: __ or as %. total A (this function can be disabled). flowrate A (this function can be disabled). total B (this function can be disabled). flowrate B (this function can be disabled). alarm value's low - high - low-low and high-high ratio (this function can be disabled). alarm value's can be entered (this function can be disabled) total can be reset to zero by pressing the CLEAR-key twice.

Ratio	
Digits	5 digits.
Units	1: __ or %.
Decimals	0 - 1 - 2 or 3.

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

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

Alarm values	
Digits	7 digits.
Units	According to selection for ratio.
Decimals	According to selection for ratio.
Time units	According to selection for ratio.
Type of alarm	low, high, low-low or high-high ratio alarm. Includes alarm ignore time and configurable alarm outputs.

APPENDIX B: PROBLEM SOLVING

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

Analog output does not function properly:

Check:

- SETUP B1 - is the function enabled?
- SETUP B3 / B4: are the flow-levels programmed correctly?
- connection of the external power-supply according to the specification.

Flowrate displays "0 / zero" while there is flow (total is counting):

Check:

- SETUP 22 / 24 and 41 / 42: are the Span and time unit correct?

The pass code is unknown:

If the pass code is not 1234, there is only one possibility left: call your supplier.

ALARM

When the alarm flag starts to blink an internal alarm condition has occurred. Press the "select button" several times to display the 5-digit error code. The codes are:

0001: irrecoverable display-data error: data on the display might be corrupted.

0002: irrecoverable data-storage error: the programming cycle might have gone wrong: check programmed values.

0003: error 1 and error 2 occurred simultaneously

The alarm condition will almost certainly be handled internally and if all mentioned values still appear correct, no intervention by the operator is needed. If the alarm occurs more often or stays active for a longer time, please contact your supplier.

APPENDIX C: COMMUNICATION VARIABLES

Not fully implemented yet.

Remarks:

- Below, an overview of the F114-A specific variables; other common variables are described in the standard table.
- All numbers are decimal numbers, unless otherwise noted.
- The following variables of the standard table (var00-var30) are not valid for this product and will be responded with value 1: var00, 03-05, 07,08, 16-22, 24, 26-29.

CONFIGURATION VARIABLES F114-A - SETUP-LEVEL:				
VAR	DESCRIPTION	BYTES	VALUE	REMARKS
TOTAL A				
32 (20h)	unit	1	0=L 1=m3 2=kg 3=lb 4=gal 5=usgal 6=bbl 7=none	
33 (21h)	decimals	1	0...3	
34 (22h)	span	3	1....9.999.999	S 0000001 up to S 0000009 is allowed when decs < 6! (VAR37)
37 (25h)	decimals Span	1	0...6	
FLOWRATE A				
48 (30h)	unit	1	0=mL 1=L 2=m3 3=mg 4=g 5=kg 6=ton 7=gal 8=bbl 9=lb 10=cf 11=rev (revolutions for RPM) 12=none	
49 (31h)	time unit	1	0=sec 1=min 2=hour 3=day	
50 (32h)	decimals	1	0...1	
51 (33h)	span	3	1....9.999.999	S 0000001 up to S 0000009 is allowed when decs < 6! (VAR54)
54 (36h)	decimals span	1	0...6	

VAR	DESCRIPTION	BYTES	VALUE	REMARKS
TOTAL B				
40 (28h)	span	3	1....9.999.999	S 0000001 up to S 0000009 is allowed when decs < 6! (VAR37)
43 (2Bh)	decimals Span	1	0...6	
FLOWRATE B				
227 (E3h)	span	3	1....9.999.999	S 0000001 up to S 0000009 is allowed when decs < 6! (VAR54)
230 (E6h)	decimals span	1	0...6	
DISPLAY				
64 (40h)	display function	1	0=total 1=flowrate	
68 (44h)	set flowrate monitor	1	0=operator level 1=SETUP level	
POWERMANAGEMENT				
80 (50h)	LCD update time	1	0=fast 1=1sec 2=3sec 3=15sec 4=30sec 5=off	
81 (51h)	power-mode battery	1	0=operational 1=shelf	
FLOWMETER A				
98 (62h)	formula	1	0=linear 1=square root	
99 (63h)	filter	1	0....99	
100 (64h)	cut-off	2	0....999	steps of 0.1%
102 (66h)	calibration low (0)4mA	1	0=default 1=calibrate 2=cal set	
103 (67h)	calibration high 20mA	1	0=default 1=calibrate 2=cal set	
FLOWMETER B				
182 (B6h)	formula	1	0=linear 1=square root	
183 (B7h)	Filter	1	0....99	
184 (B8h)	cut-off	2	0....999	steps of 0.1%
186 (BAh)	Calibration low (0)4mA	1	0=default 1=calibrate 2=cal set	
187 (BBh)	calibration high 20mA	1	0=default 1=calibrate 2=cal set	

VAR	DESCRIPTION	BYTES	VALUE	REMARKS
ANALOG OUTPUT				
112 (70h)	analog output	1	0=disable 1=enable	
116 (71h)	minimum rate	3	0..9999999	unit, time, decimals acc. var48-50
116 (74h)	maximum rate	3	0..9999999	unit, time, decimals acc. var48-50
119 (77h)	cut off percentage	1	0..99	steps of 0.1%
120 (78h)	tune minimum rate	2	0..9999	
122 (7Ah)	tune maximum rate	2	0..9999	
99 (63h)	filter	1	0....99	
OTHERS				
168 (A8h)	pass code	2	xxxx	read only!
170 AAh	tagnumber	3	0..9999999	Other vars: see standard table

OTHER F114-A VARIABLES FOR COMMUNICATION

0x052 – 4b	Ratio (ref. 2.1, 2.2, 2.3, 5.2)
0x23C – 4b	Flow rate A (ref. 2.1, 2.2, 2.3)
0x236 – 6b	Total A (ref. 1.1, 1.2)
0x24C – 4b	Flow Rate B (ref. 2.1, 2.2, 2.3)
0x436 – 6b	Total B (ref. 1.1, 1.2)

TOTAL – 6 bytes

Read total: The value of total read using communication 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.

Example: read var. 566 for total:

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

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NOTES

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LIST OF CONFIGURATION SETTINGS			
SETTING	DEFAULT	DATE :	DATE :
1 - TOTAL A			
	Enter your settings here		
11 unit	L		
12 decimals	0000000		
13 span	000001 /sec	/sec	/sec
14 decimals span	0		
2 - FLOWRATE A			
21 unit	L		
22 time unit	/min		
23 decimals	0000000		
24 span	000001 /min		
25 decimals span	0		
3 - TOTAL B			
31 span	000001 /sec	/sec	/sec
32 decimals span	0		
4 - FLOWRATE B			
41 span	000001 /min		
42 decimals span	0		
5 - RATIO			
51 ratio	b/a		
52 function	1-		
53 decimals ratio	0		
54 filter	01		
6 - ALARM			
	Enter your settings here		
61 flow zero	default		
62 alarm value low-low	0		
63 alarm value low	0		
64 alarm value high	0		
65 alarm value high-high	0		
66 delay time alarm low-low	0.0 sec		
67 delay time alarm low	0.0 sec		
68 delay time alarm high	0.0 sec		
69 delay time alarm high-high	0.0 sec		

SETTING	DEFAULT	DATE :	DATE :
7 - DISPLAY			
71 function	disabled		
72 alarm set	operator level		
8 - POWER MANAGEMENT			
81 LCD-new	1 sec.		
82 mode	operational		
9 - FLOWMETER - A			
91 formula	interpolation		
92 filter	01 (off)		
93 cut-off %	00.0%		
94 calibrat. low-(0)4mA	default		
95 calibrat. high-20mA	default		
A - FLOWMETER - B			
A1 formula	interpolation		
A2 filter	01 (off)		
A3 cut-off %	00.0%		
A4 calibrat. low-(0)4mA	default		
A5 calibrat. high-20mA	default		
B - ANALOG OUTPUT			
B1 output	disabled		
B2 input selection	ratio		
B3 min. flowrate 4-mA	0000000		
B4 max. flowrate 20mA	9999999		
B5 tune min - 4mA	0208		
B6 tune max - 20mA	6656		
C - RELAY OUTPUT			
C1 relay 1	off		
C2 relay 2	off		
C3 relay 3	off		
C4 relay 4	off		
D - COMMUNICATION			
D1 baud-rate	2400		
D2 address	1		
D3 mode	BUS-RTU		
E - OTHERS			
E4 pass code	0000		
E5 tagnumber	0000000		

