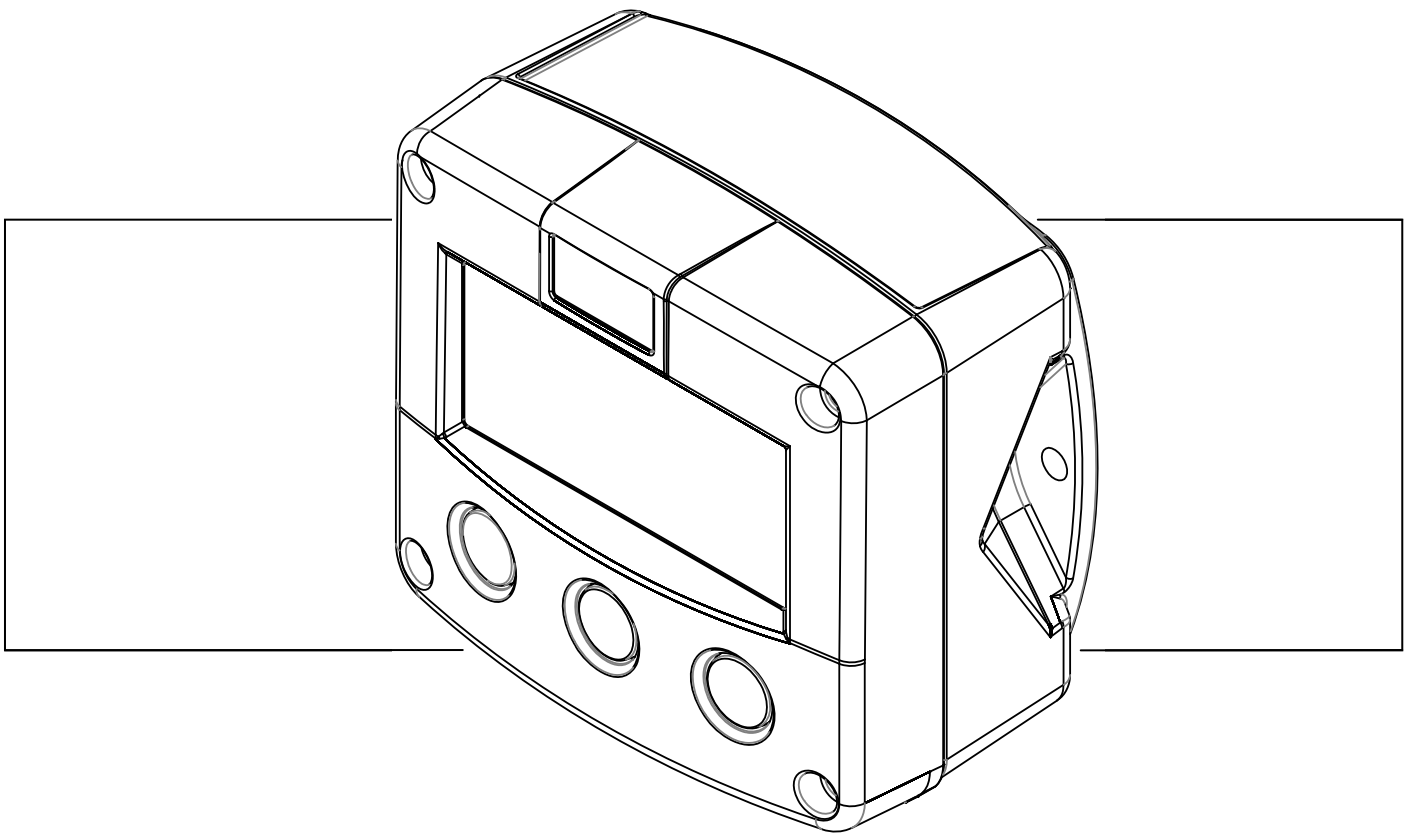


F126-A-EG-IA-TP

FLOW COMPUTER FOR CORRECTED GAS VOLUME



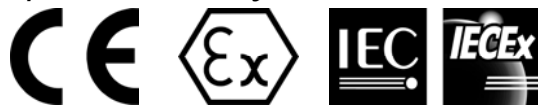
Signal input flowmeter - type A: (0)4-20mA

Signal input pressure - type IA: (0)4-20mA

Signal input temperature - type TP: PT100 2- or 3 wire

Signal output: 0/4-20mA / 0-10V ref. corrected flowrate

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 F126-A-EG 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 F126-A-EG 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 F126-A-EG 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 F126-A-EG 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 F126-A-EG 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 F126-A-EG 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 F126-A-EG 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.

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Software version	:	02.04.xx
Manual	:	HF126AEN_EG_IA_TP_v0501_04
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1. INTRODUCTION

1.1. SYSTEM DESCRIPTION OF THE F126-A-EG

Functions and features

The flowrate / totalizer model F126-A-EG-IA-TP is a microprocessor driven instrument designed for the calculation of corrected gas volume using flow equations. The unit displays compensated flowrate / total, line temperature and pressure.

This product has been designed with a focus on:

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

Flowmeter and sensor inputs

For gas applications, one flowmeter, one temperature and one pressure sensor have to be connected to the F126-A-EG-TP-IA. This manual describes the unit with an analog (0)4-20mA input for the flowmeter "-A version". Other input versions are available to process pulse or 0-10V flowmeter signals. The pressure sensor required is a (0)4-20mA signal; alternatively, a 0-10V sensor input can be supplied. The temperature sensor requires a 2-wire or 3-wire PT100 element; alternatively, a (0)4-20mA or 0-10V sensor input can be supplied.

To power the sensors, several options are available.

Standard output

- Configurable linear (0)4-20mA or 0-10V analog output with 10-bits resolution mirroring the actual flowrate at standard conditions. Flowrate levels as well as the minimum and maximum signal output can be tuned.

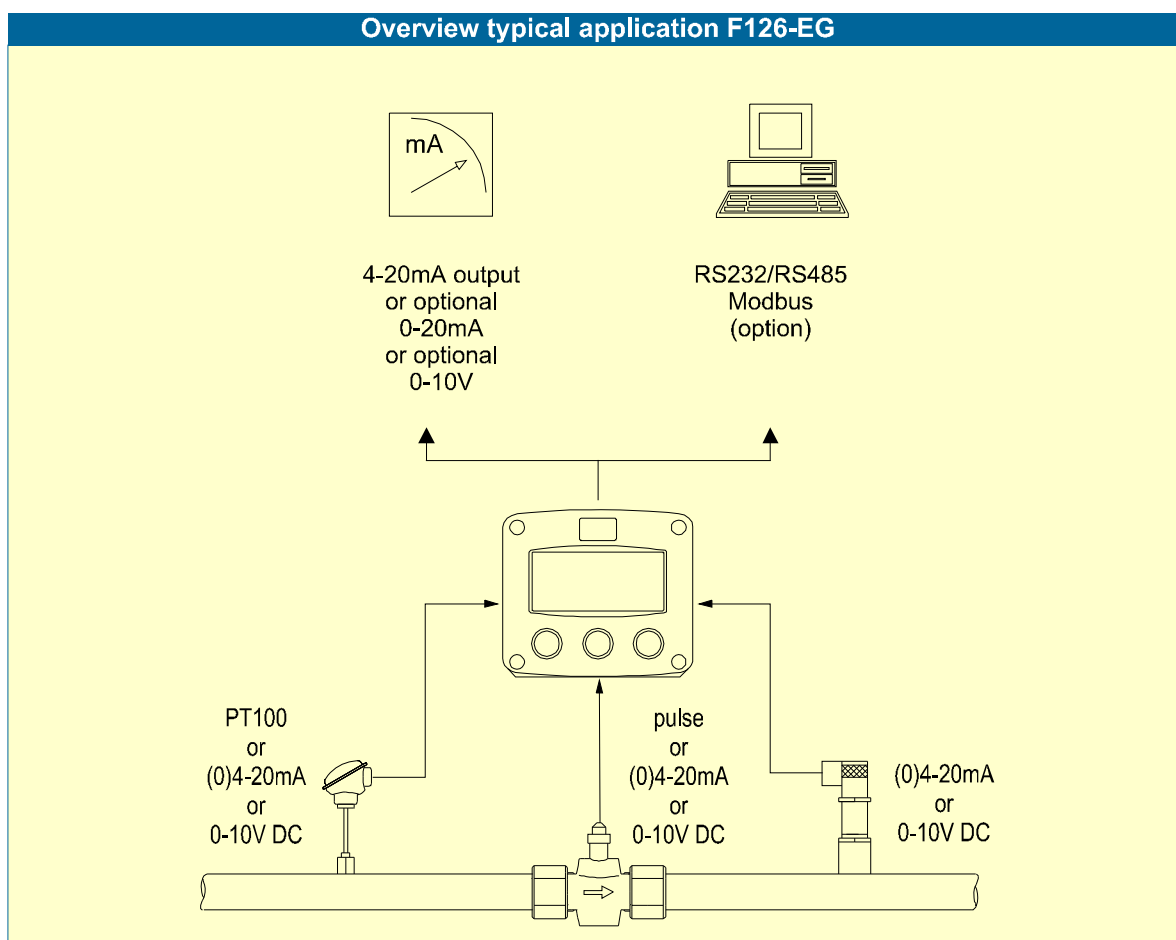


Fig. 1: Typical application for the F126-A-EG.

HF126AEN_EG_IA_TP_v0501_04

Configuration of the unit

The F126-A-EG was designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F126-A-EG according to your specific requirements. SETUP includes several important features, such as Span, measurement units, signal selection etc. All settings are stored in EEPROM memory and will not get lost in case of power break-down or empty battery.

To extend the battery-life time (option), please make use of the power-management functions as described in chapter 3.2.3.

Display information

The unit has a large transreflective LCD with all kinds of symbols and digits to display measuring units, status information, trend-indication and key-word messages.

Flowrate and totals can be displayed either with the small 8mm digits or with the 17mm digits.

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

Options

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

2. OPERATIONAL

2.1. GENERAL



The F126-A-EG 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 F126-A-EG. This instruction is meant for users / operators.

2.2. CONTROL PANEL

The following keys are available:

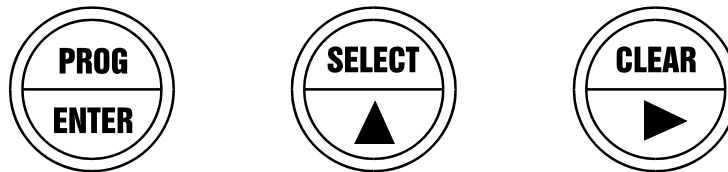


Fig. 2: Control Panel.

Functions of the keys



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



This key is used to SELECT accumulated total. 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 F126-A-EG will always act function at Operator level. The information displayed is dependant up on the SETUP-settings. The signal generated by the connected flowmeter are measured by the F126-A-EG 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 calculated flowrate / total or calculated flowrate**
This is the main display information of the F126-A-EG. After selecting any other information, it will always return to this main display automatically.
Total is displayed at the upper-line of the display and flowrate and the bottom line.
Possibly, only flowrate will be displayed with the large 17mm digits; do press the SELECT-key to read the total.
When "-----" is shown, then the flowrate value is too high to be displayed. The arrows \blacktriangleleft \blacktriangleright indicate the increase / decrease of the flowrate trend.
- **Clear total**
The value for total can be re-initialized. To do so, press CLEAR twice. After pressing CLEAR once, the flashing text "PUSH CLEAR" is displayed. To avoid re-initialization in this stage, press an other key as CLEAR or wait for 20 seconds.
Re-initialization of total DOES NOT influence the accumulated total.
- **Display calculated 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.
- **Display line pressure**
After pressing SELECT, the actual measured pressure is displayed.
- **Display line temperature**
After pressing SELECT, the actual measured temperature is displayed.
- **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. 4: 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 F126-A-EG 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

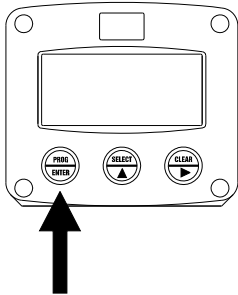
3.2.1. GENERAL

Configuration of the F126-A-EG is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows \blacktriangleleft \blacktriangleright 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 F126-A-EG remains fully operational.



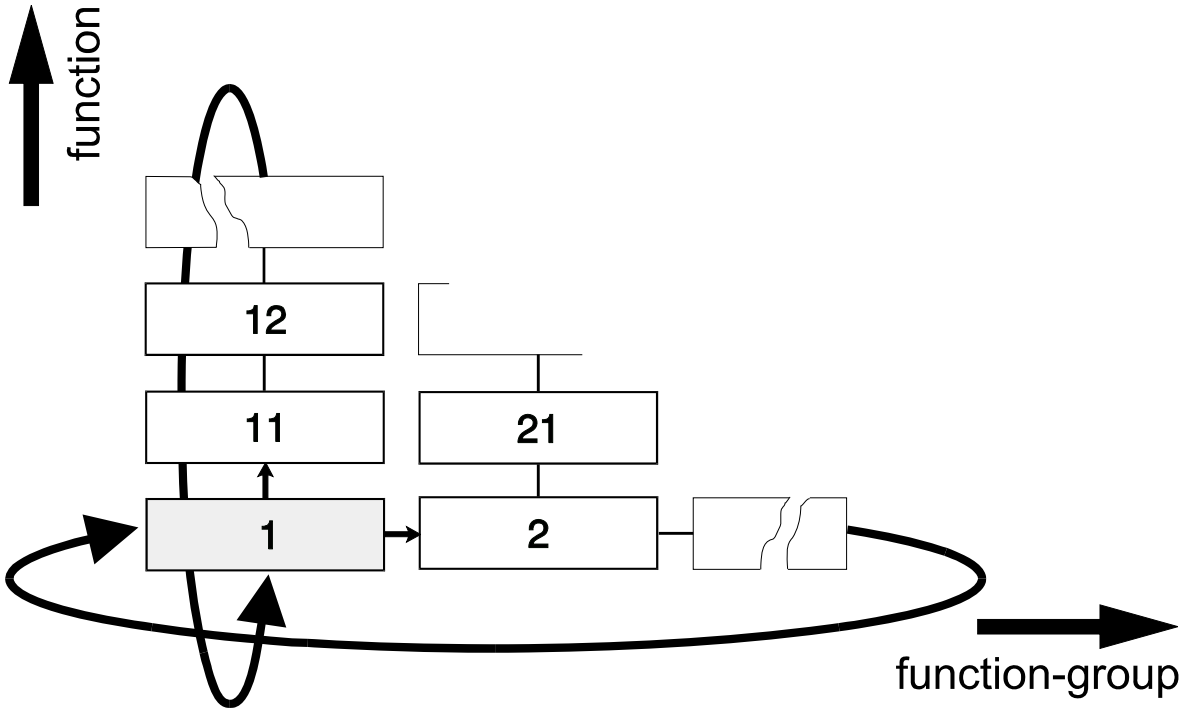
Note: A password may be required to enter SETUP. Without this password access to SETUP is denied.

To enter SETUP-level:



Press  for 7 seconds

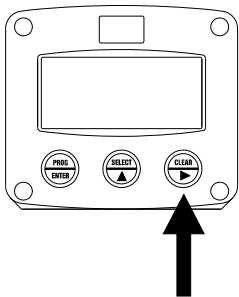
Matrix structure SETUP-level:



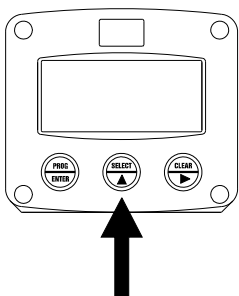
SCROLLING THROUGH SETUP-LEVEL

Selection function-group and function:

SETUP is divided into several function groups and functions.



Select function-group with



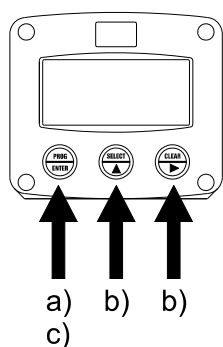
Select function with









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



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



To change or a select a value or value:



- a) press  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.

When the new value is not valid, the increase sign  or decrease-sign  will be displayed while you are programming.

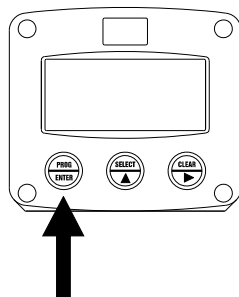
When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for three seconds: the PROG-procedure will be left automatically and the former value reinstated.



Note !

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

To return to OPERATOR-level:



Press  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		
	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		
	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	POWER MANAGEMENT		
	31	LCD UPDATE	fast - 1 sec - 3 sec - 15 sec - 30 sec - off
	32	BATTERY MODE	operational - shelf
4	FLOWMETER		
	41	FORMULA	interpolation, square root
	42	FILTER	00 - 99
	43	CUT-OFF	0.0 - 99.9%
	44	CALIBRATE LOW	(0)4mA
	45	CALIBRATE HIGH	20mA
5	TEMPERATURE		
	51	DISPLAY	°C - °F - K
	52	NR. OF WIRES	2 - 3
	53	FILTER	1 - 99
6	PRESSURE		
	61	UNIT	mbar - bar- psi - no unit
	62	SPAN	0.000001 - 9,999,999 unit
	63	DECIMALS SPAN	0 - 6
	64	OFF-SET	0.000 - 9,999.999 unit
	65	FILTER	1 - 99
	66	CALIBRATE LOW	default - calibrate - calibrate set
	67	CALIBRATE HIGH	default - calibrate - calibrate set
7	FORMULA		
	71	EQUATIONS TYPE	EG - (fixed)
	72	NORMAL TEMPERAT.	0.000 - 9,999.999
	73	NORMAL PRESSURE	0.000 - 9,999.999
	74	NORMAL COMPRESS.	0 - 9,999,999
	75	COMPRESSIBILITY	0 - 9,999,999
8	ANALOG		
	81	OUTPUT	disable - enable
	82	4mA / 0V	0000.000 - 9,999,999
	83	20mA / 10V	0000.000 - 9,999,999
	84	CUT-OFF	0.0 - 9.9%
	85	TUNE MIN - 4mA / 0V	0 - 9,999
	86	TUNE MAX- 20mA / 10V	0 - 9,999
	87	FILTER	00 - 99
9	COMMUNICATION		
	91	SPEED / BAUDRATE	1200 - 2400 - 4800 - 9600
	92	ADDRESS	1 - 255
	93	MODE	rtu - off
A	OTHERS		
	A1	TYPE / MODEL	
	A2	SOFTWARE VERSION	
	A3	SERIAL NO.	
	A4	PASSWORD	0000 - 9999
	A5	TAGNUMBER	0000000 - 9999999

3.2.3. EXPLANATION SETUP-FUNCTIONS

1 - TOTAL	
MEASUREMENT UNIT 11	<p>SETUP - 11 determines the measurement unit for total and accumulated total. 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 and accumulated total the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">000000 - 111111.1 - 2222.22 - 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. <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> <p>Example 2 Calculating the Span. <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÷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>
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	
<p>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: <i>these settings also influence the analog output.</i></p>	
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 the 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 - POWER MANAGEMENT

When used with the internal battery option, the user may hold the concern of reliable measurement over a long period of time. The F126-A-EG has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:

LCD NEW 31

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; the input signal will be processed normally as well as the output-signals. The following can be selected:

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

Example Battery life-time

battery life-time with a FAST update: about 2 years.

battery life-time with a 1 sec update: about 5 years.

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

BATTERY-MODE 32

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



Note !

4 - FLOWMETER

SIGNAL 41

The F126-A-EG can process the 4-20mA signal in two ways:

- Interpolation: the signal is processed linear

$$R = S \times I$$

- Square root: for differential pressure

$$R = S \sqrt{I}$$

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 42

The analog output signal of a flowmeter does mirror the actual flow. This signal is measured several times a second by the F126-A-EG. 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 (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:



Note !

4 - FLOWMETER (CONTINUED)					
FILTER 43		<p>This function is used to stabilize the analog output signal. The output value is update every 0.1 second. With the help of this digital filter a more stable but less actual reading can be obtained.</p> <p>The filter principal is based on three input values: the filter level (01-99), the last analog output value and the last average value. The higher the filter level, the longer the response time on a value change will be. Below, several filter levels with 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
CUT-OFF 44		<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 41)	SPAN (setup 13/24)	REQUIRED CUT-OFF	CUT-OFF (setup 43)	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 45		<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. 			



4 - FLOWMETER (CONTINUED)

TUNE MAX / 20MA 46

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.

- *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!*

After pressing PROG, three settings can be selected:

- 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.



5 - TEMPERATURE

Conversion formula's temperature units:

$$xK = (x-273,15)^{\circ}C = (9/5x-459,67)^{\circ}F$$

$$x^{\circ}C = (x+273,15)K = 9/5x+32^{\circ}F$$

$$x^{\circ}F = 5/9(x-32)^{\circ}C = 5/9(x+459,67)K$$

DISPLAY UNIT 51	SETUP - 51 determines the displayed unit for the Operator The following units can be selected: °C - °F - K			
NO. OF WIRES 52	Do select here the number of wires of the two PT100 elements - two or three.			
FILTER 53	The output signal of a sensor does mirror the actual temperature. This signal is measured several times a second. The value measured is a "snap-shot" of the real temperature as it will be fluctuating. 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 (10-99), 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.			
FILTER VALUE	RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE. TIME IN SECONDS			
	50% INFLUENCE	75% INFLUENCE	90% INFLUENCE	99% INFLUENCE
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

6 - PRESSURE				
MEASURING UNIT 61	SETUP - 61 determines the measurement unit for pressure. The following units can be selected: mbar - bar - psi - no unit			
SPAN 62	With this setting, the measurement range of the (0)4-20mA pressure sensor is determined according the selected measurement unit (setting 62). See also setting 64 - decimals span. Example Calculating the span for pressure. <i>Let us assume that the sensor generates the minimum signal (e.g. 4mA) at a pressure of 2.5 bar and the maximum signal (e.g. 20mA) is generated at 50 bar. Than the span is 47.5 bar.</i> <i>Enter for SETUP - 63: "0004750" if decimals for span are two.</i>			
DECIMALS SPAN 63	Accordinging setting 63, the number of decimals for span have to be set.			
OFFSET 64	Calculations are based on absolute pressures. The flow computer must know the measured pressure at minimum signal. (2.5 bar in above example) <ul style="list-style-type: none"> • When using a gauge type pressure indicator enter an offset to compensate environmental pressure (e.g. air pressure, 1.013 bar) • When working with a "fixed" pressure, enter the fixed line pressure here and make sure that the span is set to zero. Value to be entered: 0.000 - 9,999.999 unit.			
FILTER 65	The analog output signal of a sensor does mirror the actual pressure. This signal is measured several times a second. The value measured is a "snap-shot" of the real temperature 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 (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.			
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
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
50	8.8 seconds	17 seconds	29 seconds	57 seconds
99	17 seconds	34 seconds	57 seconds	114 seconds
CALIBRATE LOW 66	With this setting it is possible to calibrate the input value for (0)4mA. For explanation: read setting 45.			
CALIBRATE HIGH 67	With this setting it is possible to calibrate the input value for 20mA. For explanation: read setting 46.			

7 - FORMULA

EQUATIONS TYPE 71	<p>This display function describes the supplied equations. The supplied Model is the F126-A-EG. “EG” stands for Equations Gas - flow computer for corrected gas volume.</p> <p>The formula used:</p> $Q_{\text{normal}} = Q * (P / P_{\text{normal}}) * (T_{\text{normal}} / T) * (C_{\text{normal}} / C)$ <p>where</p> <ul style="list-style-type: none"> Q_{normal} = calculated volume at normal conditions Q = measured volume P = line pressure P_{normal} = normal pressure T_{normal} = normal temperature T = line temperature C_{normal} = normal compressibility factor C = compressibility
NORMAL TEMPERATURE 72	Enter here the reference temperature T_{normal} in degrees Kelvin (K). In most applications, the gas volume has to be calculated at 0°C which is 273,15 K.
NORMAL PRESSURE 73	Enter here the reference pressure P_{normal} in the selected pressure unit. In most applications, the volume has to be calculated at 1.013 Bar.
NORMAL COMPRESSIBILITY FACTOR 74	Enter here the compressibility factor for the gas at reference conditions.
COMPRESSIBILITY FACTOR 75	Enter here the compressibility factor for the gas at operating conditions. The C factor indicates how different a “real” gas behaves from an “ideal” gas which exactly obeys the “general gas law” ($P \times V / T = \text{constant}$) where the C factor is 1. If SETUP 74 or 75 is set to zero: the compressibility factor is disabled.

8 - ANALOG OUTPUT

<p>A linear analog (0)4-20mA or 0-10V signal is generated according to the flowrate with a 10 bits resolution. The settings for flowrate (SETUP - 2) influence the analog output directly. The relationship between rate and analog output is set with the following functions:</p>	
DISABLE / ENABLE 81	<p>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.</p>
MINIMUM FLOWRATE 82	<p>Enter here the flowrate at which the output should generate the minimum signal (0/4mA or 0V) - in most applications at flowrate "zero". The number of decimals displayed depend upon SETUP 23. The time and measuring units (L/min for example) are dependant upon SETUP 21 and 22 but are not displayed.</p>
MAXIMUM FLOWRATE 83	<p>Enter here the flowrate at which the output should generate the maximum signal (20mA or 10V) - in most applications at maximum flow. The number of decimals displayed depend upon SETUP 23. The time and measuring units (L/min for example) are dependant upon SETUP 21 and 22 but can not be displayed.</p>

8 - ANALOG OUTPUT (CONTINUED)

CUT-OFF 84	<p>To ignore leakage of the flow for example, a low flow cut-off can be set as a percentage of the full range of 16mA, 20mA or 10V. When the flow is less than the required rate, the current will be the minimum signal (0/4mA or 10V). Examples:</p>			
4mA (SETUP 82)	20mA (SETUP 83)	CUT-OFF (SETUP 84)	REQUIRED RATE	OUTPUT
0 L/min	100 L/min	2%	$(100-0)*2\% = 2.0 \text{ L/min}$	$4+(16*2\%) = 4.32\text{mA}$
20 L/min	800 L/min	3.5%	$(800-20)*3.5\% = 27.3 \text{ L/min}$	$4+(16*3.5\%) = 4.56\text{mA}$
TUNE MIN / 4MA 85	<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> <p style="text-align: center;">Before tuning the signal, be sure that the analog signal is not being used for any application!</p> <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 flowrate for example!</p>			
TUNE MAX / 20MA 86	<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> <p style="text-align: center;">Before tuning the signal, be sure that the analog signal is not being used for any application!</p> <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 flowrate for example!</p>			
FILTER 87	<p>This function is used to stabilize the analog output signal. The output value is updated every 0.1 second. With the help of this digital filter a more stable but less precise reading can be obtained. The filter principal is based on three input values: the filter level (01-99), the last analog output value and the last average value. The higher the filter level, the longer the response time on a value change will be. Below, several filter levels with their response times are indicated:</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	0.1 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



9 - COMMUNICATION

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

BAUDRATE 91	For external control, following communication speeds can be selected: 1200 - 2400 - 4800 - 9600 baud
BUS ADDRESS 92	For communication purposes, a unique identity can be attributed to every F126-A-EG. This address can vary from 1-255.
MODE 93	The communication is executed according Modbus protocol RTU mode. With OFF, the communication is disabled.

A - OTHERS

TYPE OF MODEL A1	For support and maintenance it is important to have information about the characteristics of the F126-A-EG. 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 A2	For support and maintenance it is important to have information about the characteristics of the F126-A-EG. 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 A3	For support and maintenance it is important to have information about the characteristics of the F126-A-EG. 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.
TAGNUMBER A5	For identification of the unit and communication purposes, a unique tagnumber of maximum 7 digits can be entered.

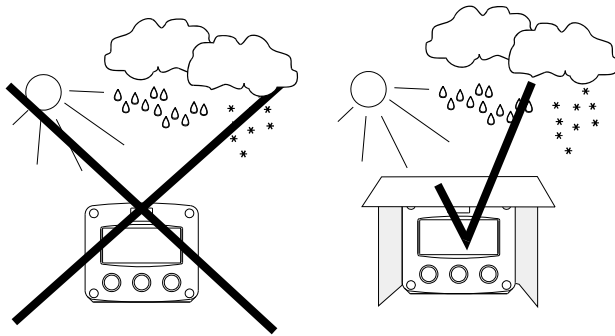
4. INSTALLATION



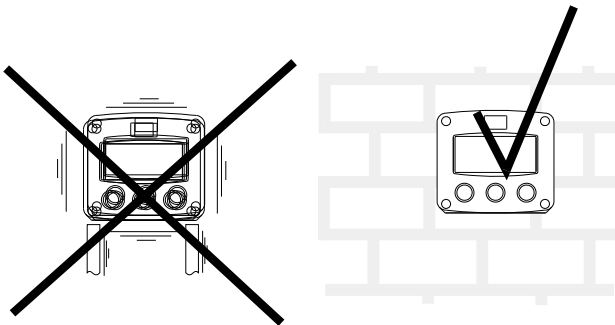
4.1. GENERAL DIRECTIONS

- 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 F126-A-EG 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 F126-A-EG on a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE
Aluminum enclosures:

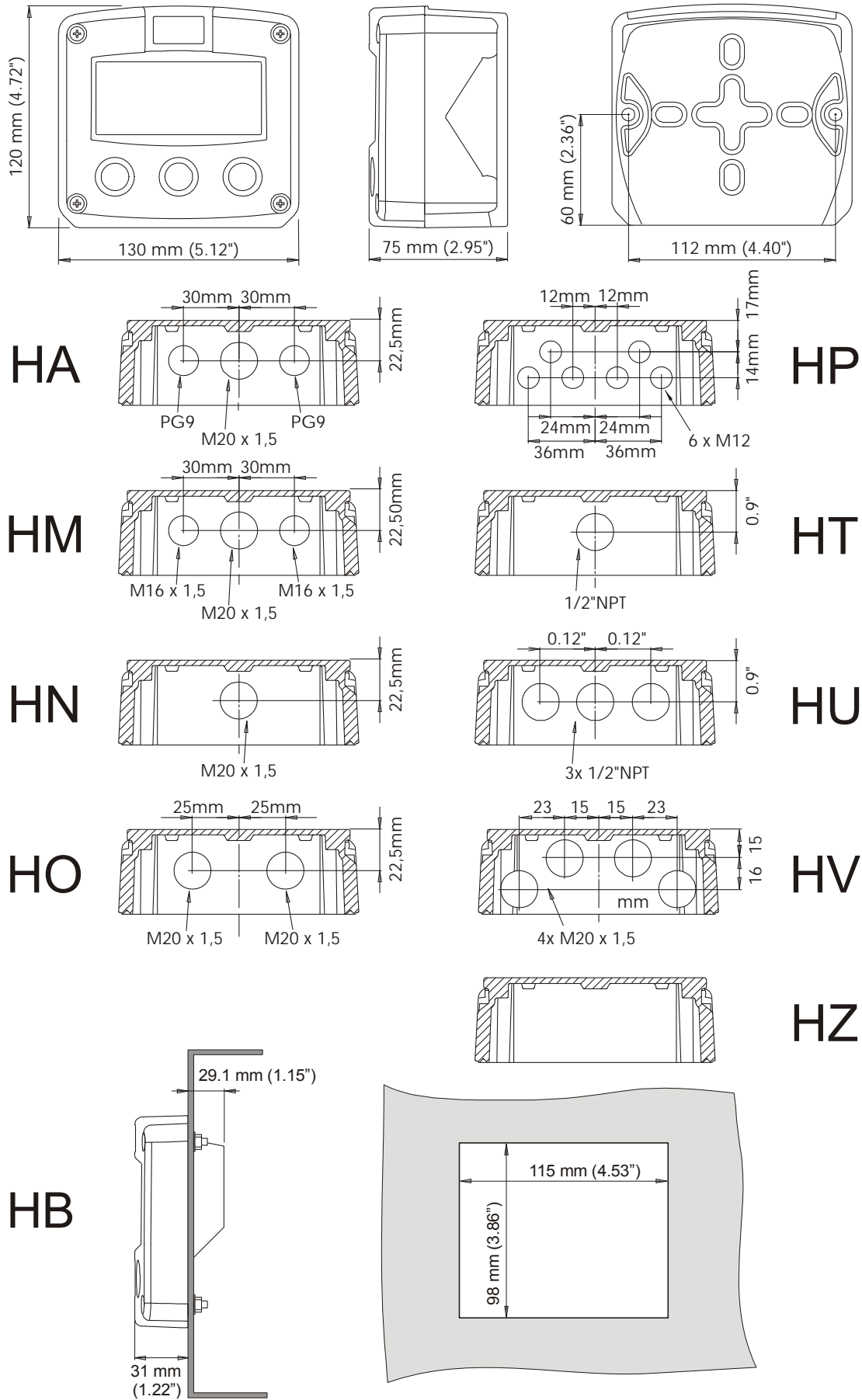
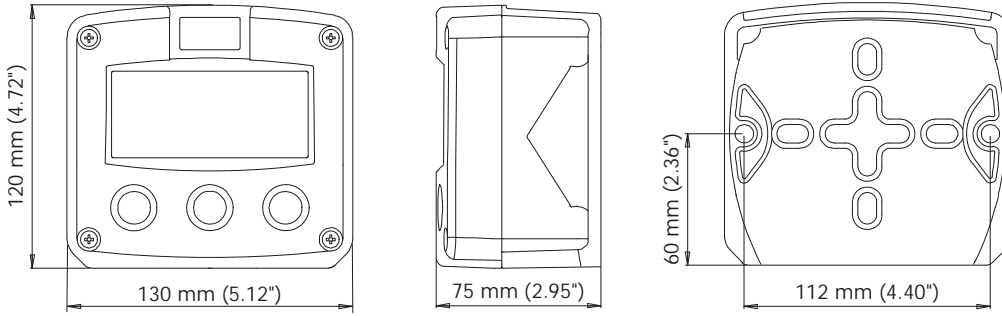
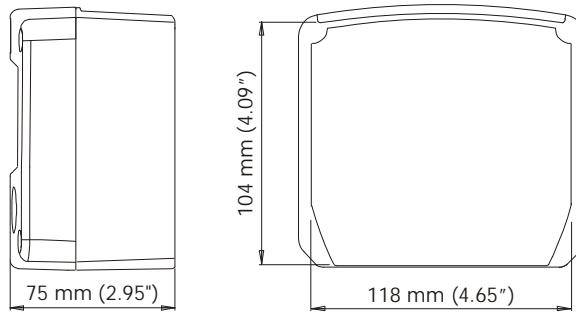


Fig. 5: Dimensions aluminum enclosures.

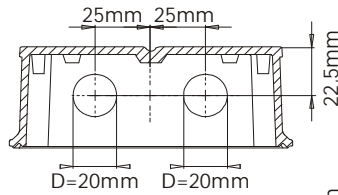
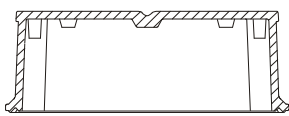
GRP enclosures:



HK back box:
(flat bottom)

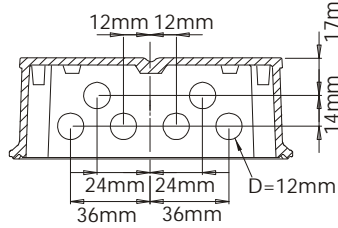
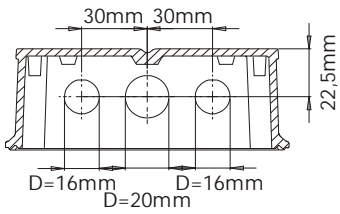


HD
HK



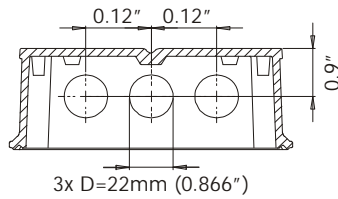
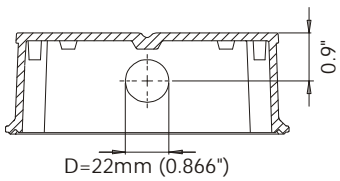
HG

HE



HH

HF



HJ

HC

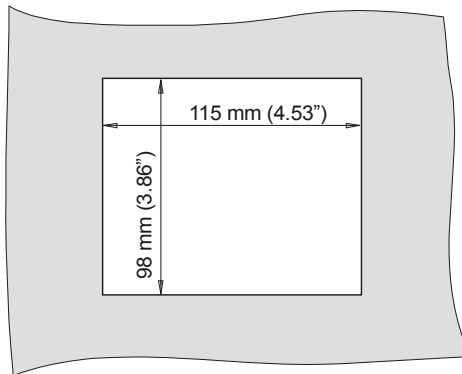
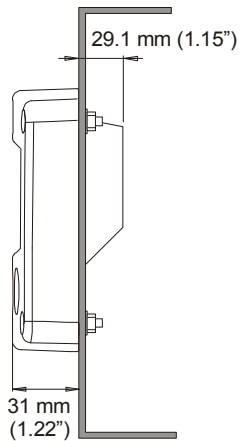


Fig. 6: Dimensions GRP enclosures.

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 F126-A-EG 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.

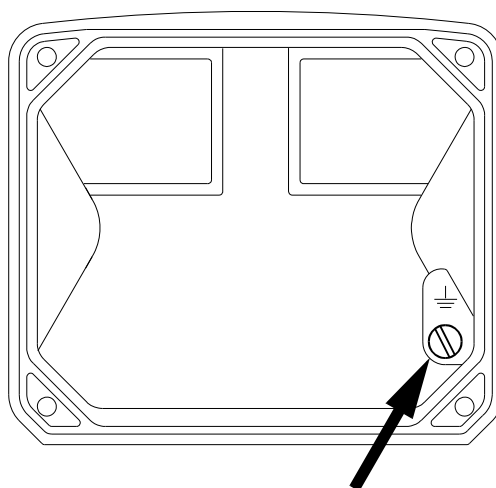


Fig. 7: Grounding aluminum enclosure with type PM 115-230V AC.

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 and 14 provide a limited supply voltage of 3.2 V DC. This is not suitable to power analog sensors.

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

With this option, a real power supply for the sensor is available. The sensors 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 (type PD) or on the right hand (type PF / PM) as indicated:

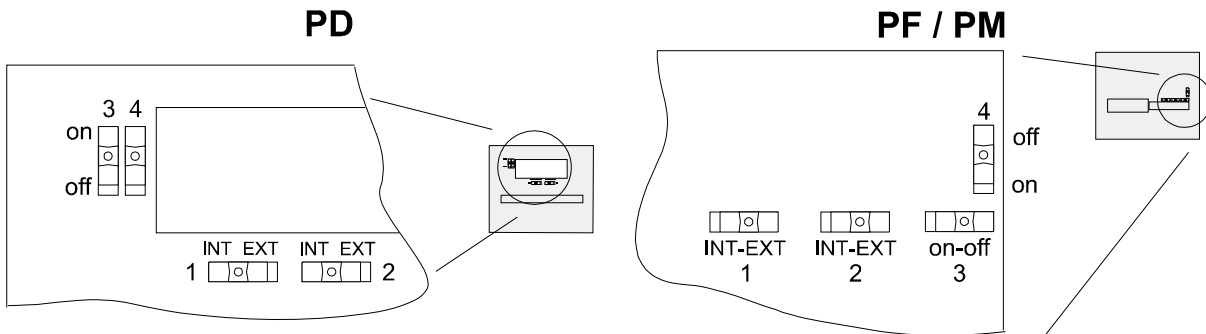


Fig. 8: switch position voltage selection (type PD, PF and PM).

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
off	on	12 V DC
on	off	12 V DC
off	off	23 V DC

- Function switch 1:** voltage selection sensor A (flow) - terminal 11.
- Function switch 2:** voltage selection sensor B (temperature) - 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:

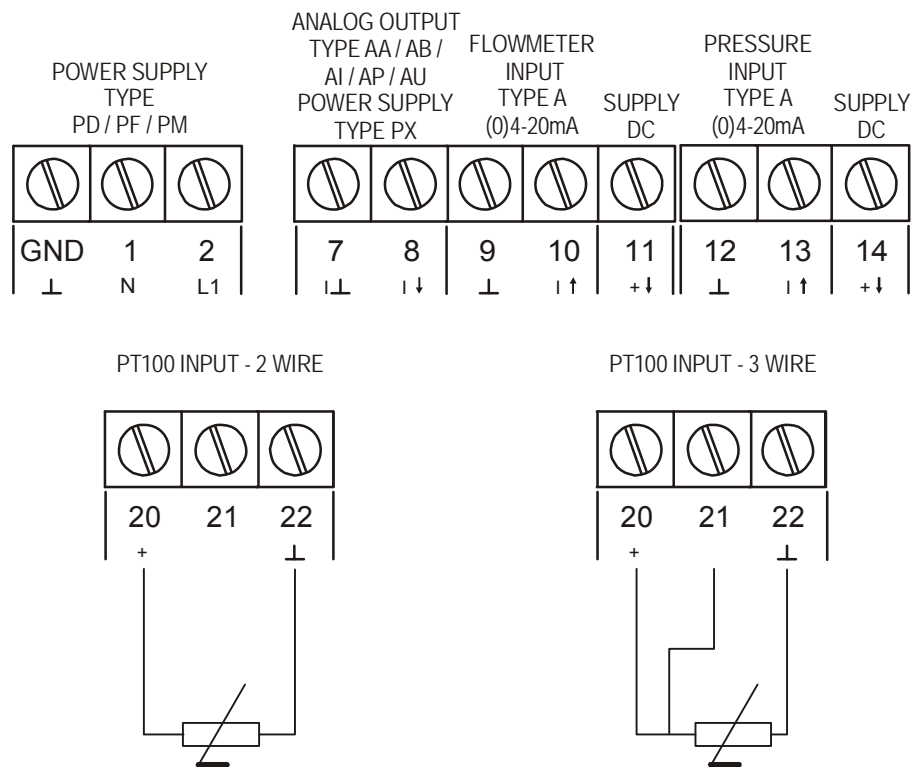


Fig. 9 Overview terminal connectors F126-A-EG-IA-TP and most options.

REMARKS TERMINAL CONNECTORS:

Terminal GND- 01- 02: Power Supply - 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. 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	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



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

Note !

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 8) :

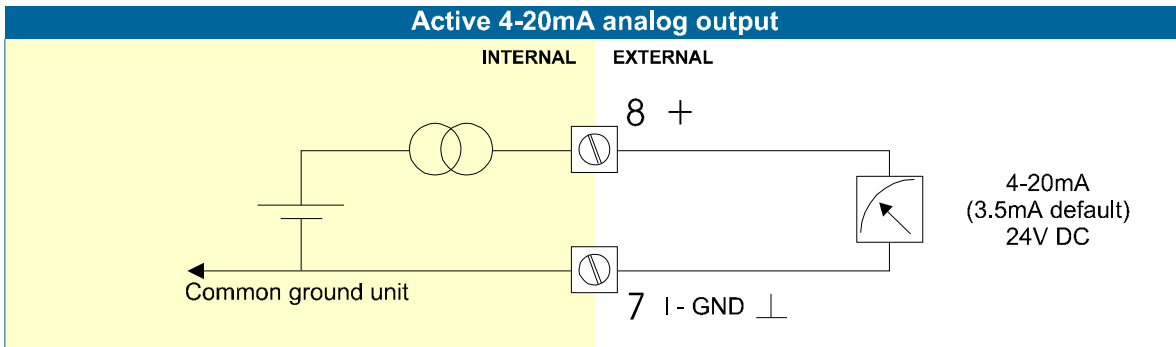
An analog output signal proportional to the flowrate is available as standard.

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.

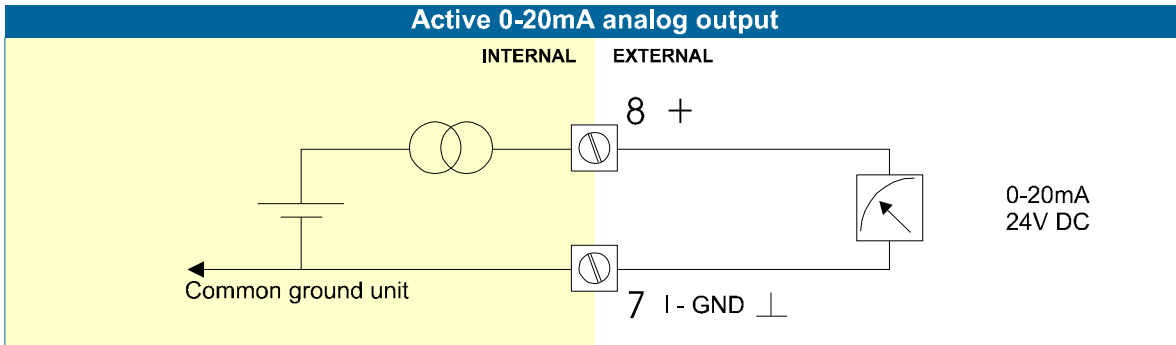
Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD / PF / PM).



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.

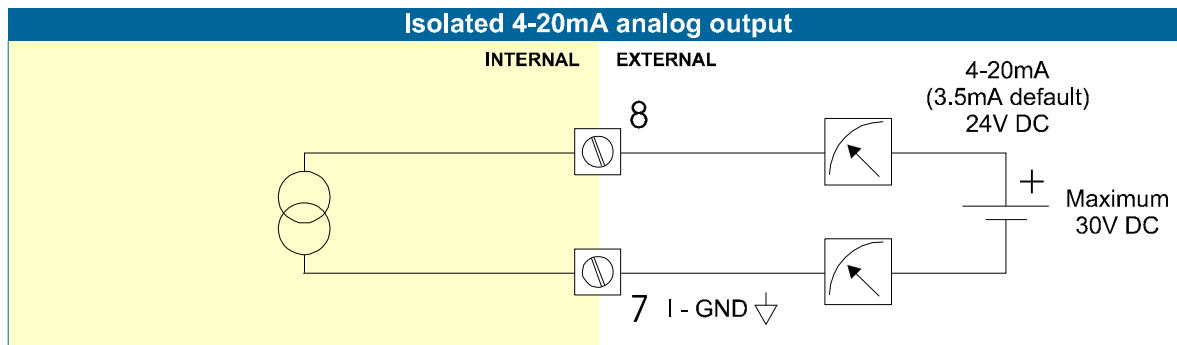
Type AI:

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.

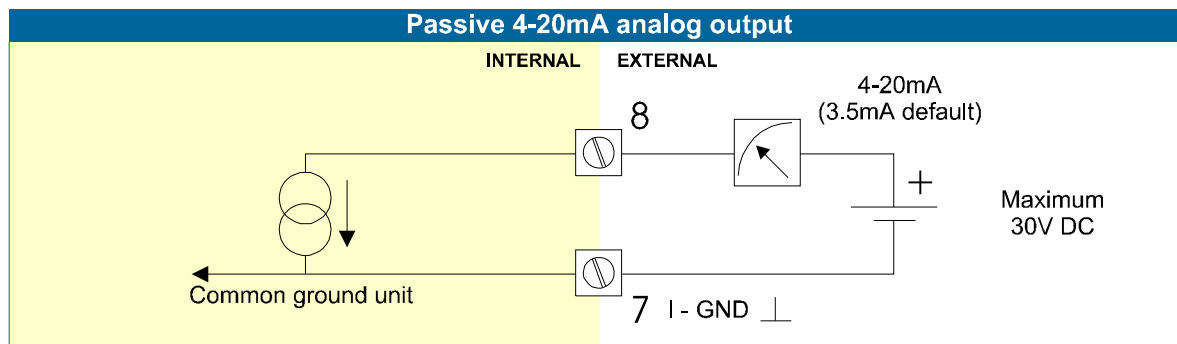
This option can be used with a battery powered unit but the life time of the battery is about 2 -3 years.



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.

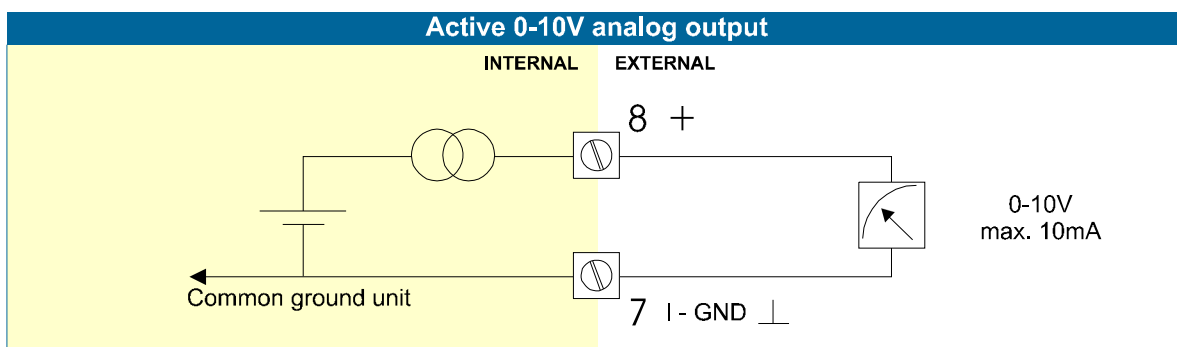
Max. driving capacity 1000 Ohm. This output does loop power the unit as well (type PX).



Type AU:

A 0-10VDC signal proportional to the flowrate is available with this option.

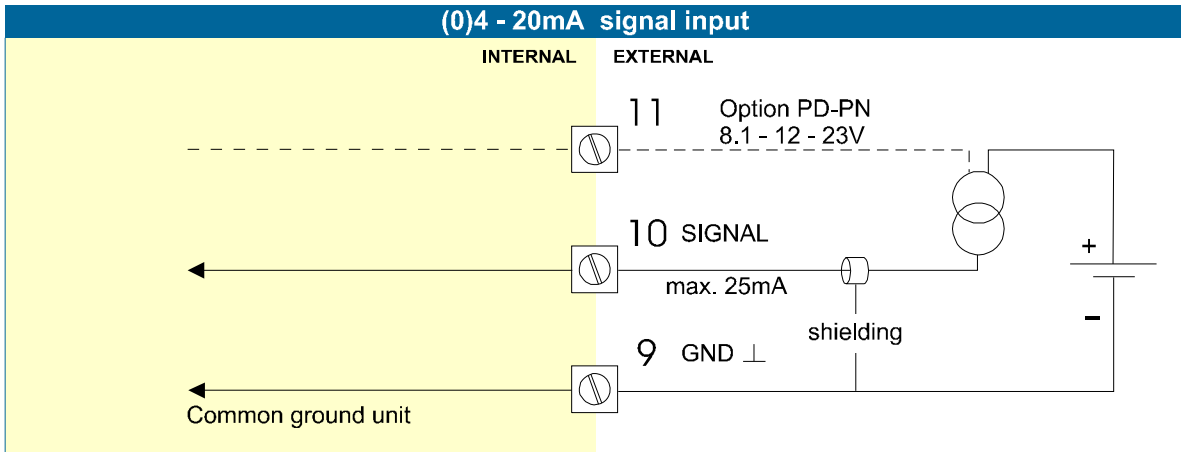
Max. load 10mA @ 10VDC. (Requires power supply type PD / PF / PM).



Terminal 09-11; Flowmeter input:

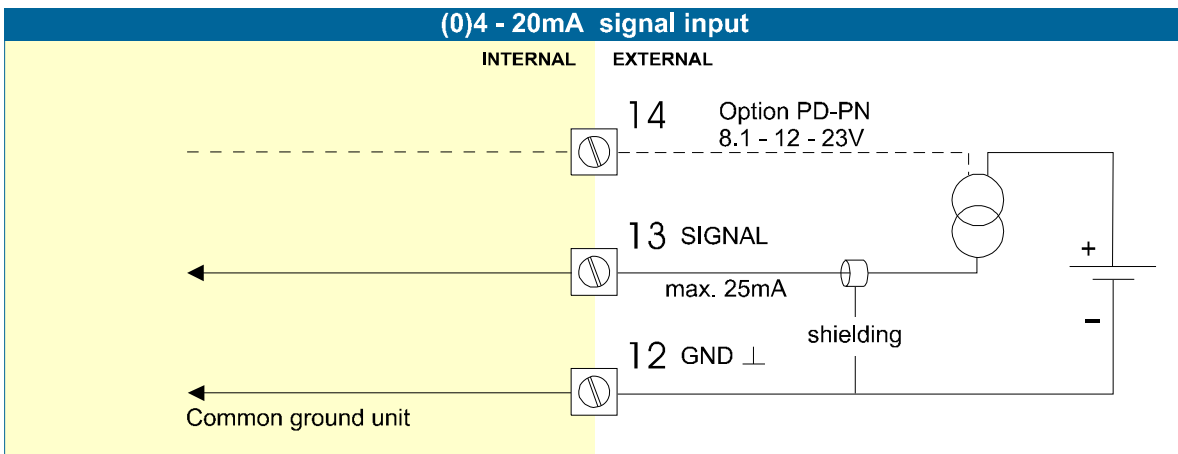
The F126-A-EG requires a (0)4-20mA flowmeter signal which will be processed 4 times a second with a 14 bits accuracy. The input is not isolated.

For Intrinsically safe applications: please read chapter 5.



Terminal 12-13; Pressure input (0)4-20mA:

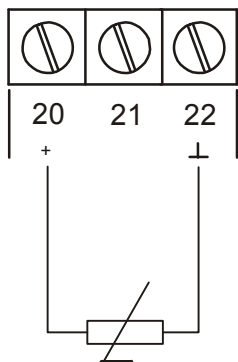
The F126-A-EG-IA-TP requires a (0)4-20mA signal for pressure which will be processed 4 times a second with a 14 bits accuracy. The input is not isolated.



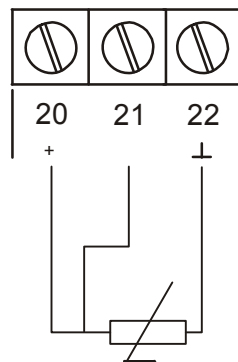
Terminal 20-22; Temperature input TP - PT100:

Two types of PT100 elements can be connected to the F126-A-EG-IA-TP: 2 or 3-wire.

PT100 INPUT - 2 WIRE



PT100 INPUT - 3 WIRE



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.

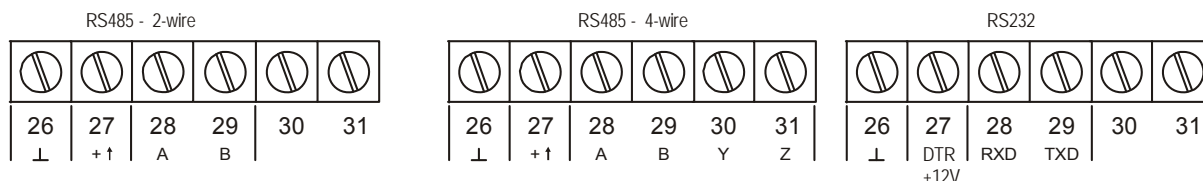


Fig. 10: Overview terminal connectors communication option.

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.

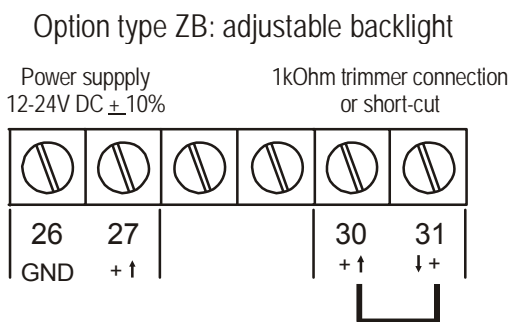


Fig. 11: Overview terminal connectors backlight option.

5. INTRINSICALLY SAFE APPLICATIONS

5.1. GENERAL INFORMATION AND INSTRUCTIONS



Caution !

Cautions

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



Safety Instructions

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



Note !

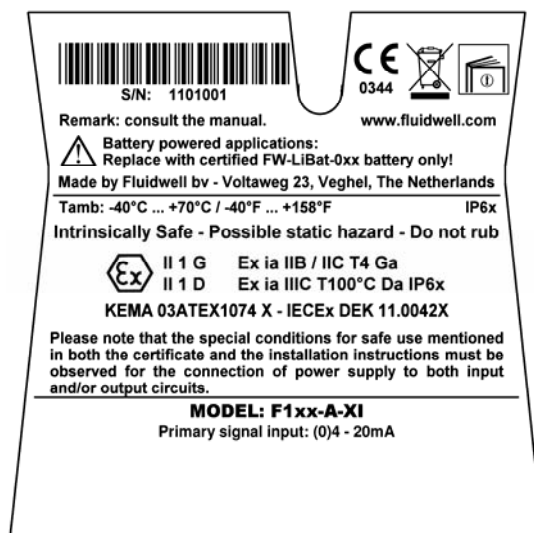
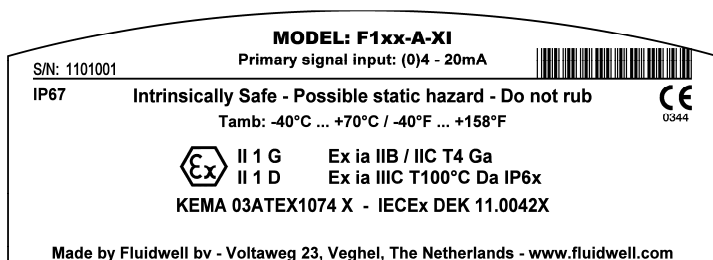
Please Note

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

Label information (inside and outside the enclosure)

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

For details on usage see the separate “Fluidwell F1...-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.

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 F126-A-EG-IA-TP-XI:

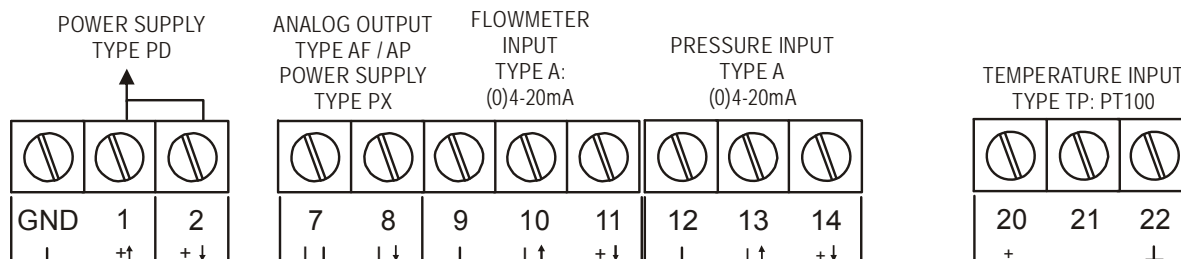


Fig. 12: Overview of Intrinsically Safe terminal connectors and options.

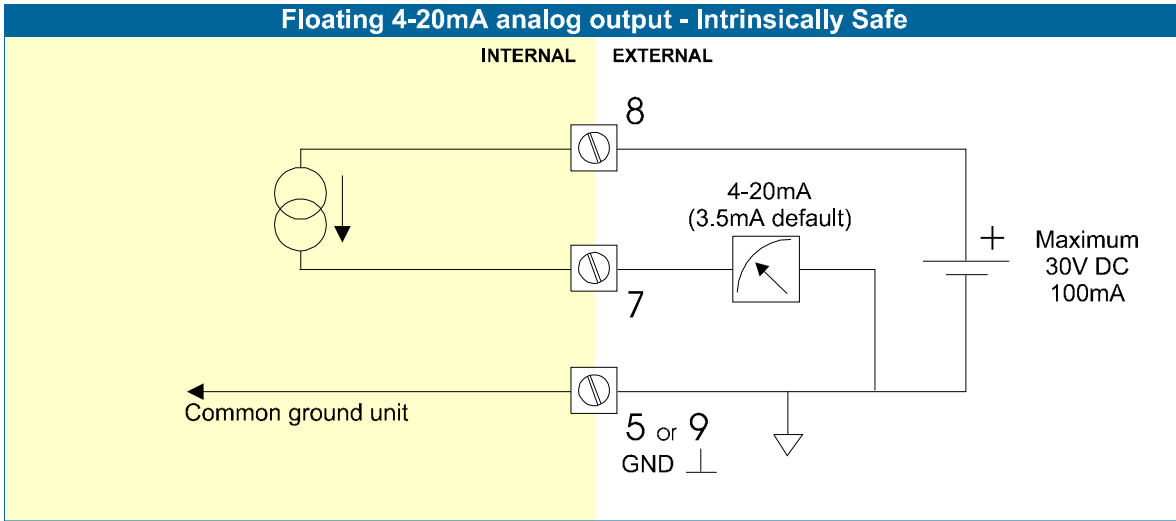
Explanation Intrinsically Safe options:

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 @ 30VDC.



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

TYPE	SENSOR SUPPLY (TERMINAL 11 AND 14)	Terminal			
		GND	01	02	
PD-XI	Input voltage: 8-30V DC	= input voltage	L-	L+	output voltage is according the input voltage; internally linked with terminal 01.

Terminal 02 and 11: these terminals offer the same voltage as connected to terminal 01.

5.3 CONFIGURATION EXAMPLES

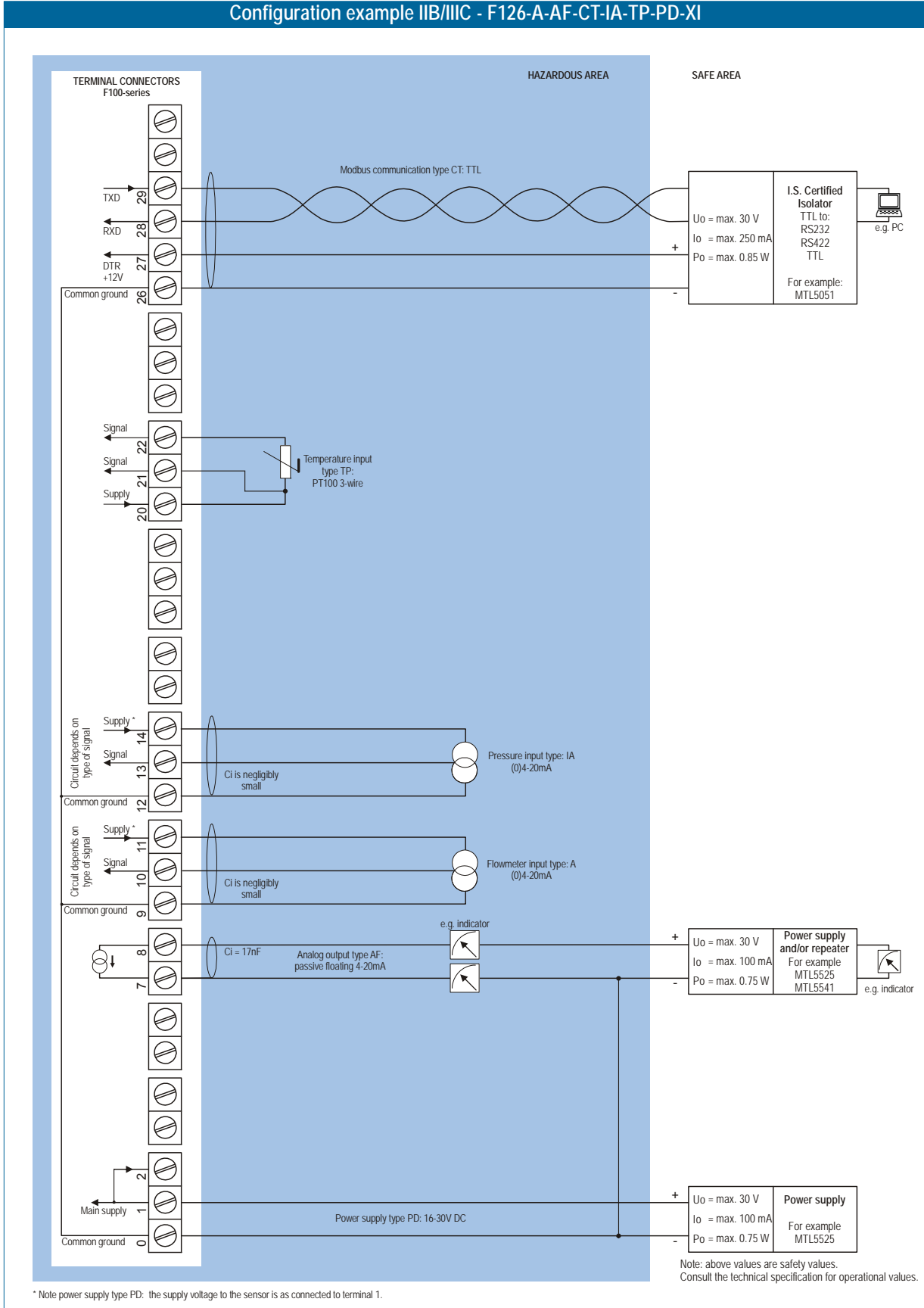


Fig. 13: Configuration example Intrinsically Safe

Configuration example IIB/IIIC and IIC - F126-A-AP-(CT)-IA-TP-PD-XI

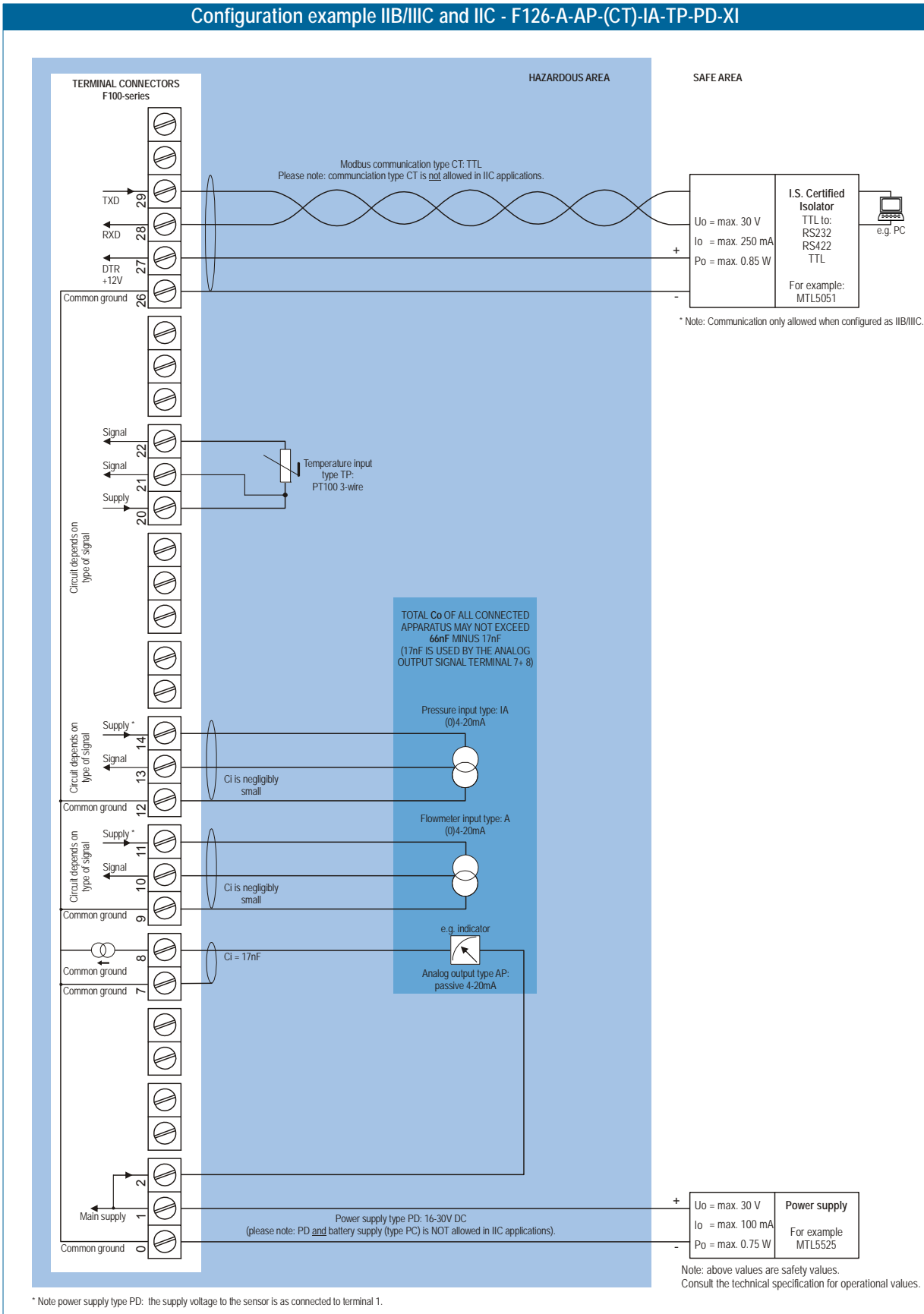


Fig. 14: Configuration example Intrinsically Safe.

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.



Caution !

Safety instructions for hazardous areas

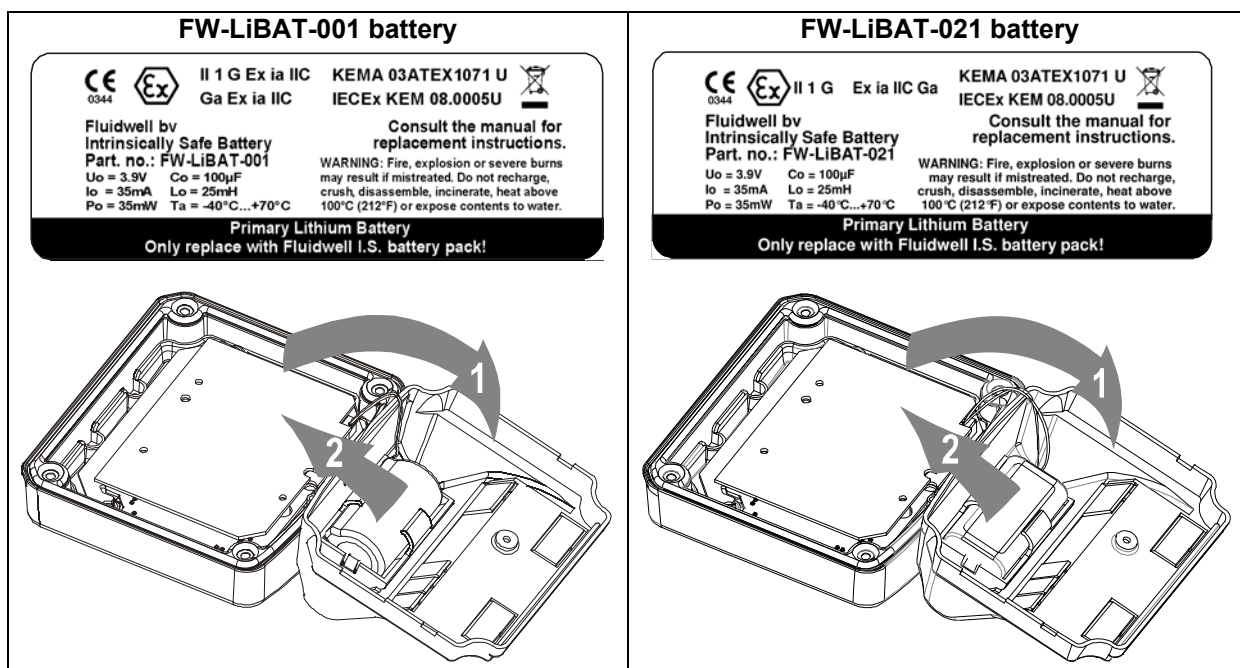
- Verify the correct battery is supplied: **Only batteries with indicated Ex label are certified for replacement and use in hazardous areas.** Batteries for use in safe areas have no Ex label. **DO NOT EXCHANGE:** Using the wrong type of battery can pose a SERIOUS RISK.
- **For use in hazardous areas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

Battery replacement procedure



Note !

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



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 F126-A-EG 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 F126-A-EG does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is customers responsibility to take all precautions to dehumidify the internal atmosphere of the F126-A-EG in such a way that no condensation will occur, for example by placing dry silica-gel in the casing just before closing the enclosure.

Furthermore, is required to replace or dry the silica gel from time to time as advised by the silica gel supplier.

Battery life-time:

It is influenced by several issues as:

- Input frequency: the higher the frequency the shorter the battery life-time.
- Display update: fast display update has major influence; SETUP 51.
- Pulse output and communication.
- Low temperatures; the available power will be less due to battery chemistry.



Note !

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 re-enter any subsequent Span 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.
Option 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
Aluminium 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 HV	Drilling: 4x M20
Type HZ	No drilling.
GRP enclosures	
Type HD	No drilling.
Type HE	Drilling: 2x 16mm (0.63") – 1x 20mm (0.78").
Type HF	Drilling: 1x 22mm (0.87").
Type HG	Drilling: 2x 20mm (0.78").
Type HJ	Drilling: 3x 22mm (0.87").
Type HH	Drilling: 6x 12mm (0.47").
Type HK	Flat bottom - no drilling.
ABS enclosure	
Type HS	Silicone free ABS enclosure with EPDM and PE gaskets. UV-resistant polyester keypad. (no drilling)


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

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 compatibil.	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.

Temperature	
Type TP	2 or 3 wire PT100.
Standard	range: -100°C to +200°C (-148°F to 392°F) - accuracy 0.1 °C (0.18°F).
Update time	four times a second.
Note	The linearity is internally compensated.
Type ZV	range: -200°C to +800°C (-328°F to 1832°F) - accuracy 0.5 °C (0.9°F).
Type TA	(0)4-20mA - with signal calibration feature at any current within the range.
Type TU	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 @ 20mA.
Load impedance	3kOhm
Note	For signal type TA and TU: external power to sensor required; e.g. Type PD.

Pressure	
Type IA	(0)4-20mA - with signal calibration feature. Resolution: 14 bit.
Type IU	0-10 V, 0-5 V, 1-5 V - with signal calibration feature. Resolution: 14 bit.
Accuracy	0.05%. Low level cut-off programmable.
Span	0.000010 - 9,999,999 with variable decimal position.
Off-set	0.000 - 9,999.999 unit
Update time	Four times a second.
Voltage drop	2.5 Volt @ 20mA.
Load impedance	3kOhm
Note	For signal type IA and IU: external power to sensor required; e.g. type PD.

OUTPUTS

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

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"> • compensated total and/or compensated flowrate. • compensated total and compensated accumulated total. • line pressure. • line temperature. • compensated total can be reset to zero by pressing the CLEAR-key twice.

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

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

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

Line temperature	
Digits	6 digits.
Units	°C, °F or K
Decimals	1
Normal temperature	default: 273.15 K - any temperature can be set.

Line pressure	
Digits	6 digits.
Units	mbar, bar, PSI, no-unit
Decimals	1
Normal pressure	default: 1.013 bar - any pressure can be set.

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F126-A-EG is going to be installed or while it is in operation.

Analog output does not function properly:

Check:

- SETUP 81 - is the function enabled?
- SETUP 82 / 83: are the flow-levels programmed correctly?
- connection of the external power-supply according specification.
- SETUP 27 - when 4mA should be generated as soon as the flowrate is zero, it might take this time worst case. To get a quick response, decrease this time according to you desired response time.

The password is unknown:

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

ALARM

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

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

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

0003: error 1 and error 2 occurred simultaneously

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

Remarks:

- Below, an overview of the F126-A-EG specific variables; other common variables are described in the standard table.
- All numbers are decimal numbers, unless otherwise noted.
- 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 F126-A-EG - SETUP-LEVEL:				
VAR	DESCRIPTION	BYTES	VALUE	REMARKS
TOTAL				
32 (20h)	unit	1	0=L 1=m3 2=kg 3=lb 4=gal 5=usgal 6=bbbl 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				
48 (30h)	unit	1	0=mL 1=L 2=m3 3=mg 4=g 5=kg 6=ton 7=gal 8=bbbl 9=lb 10=cf 11=rev (revolutions for RPM) 12=none 13=scf 14=NM3 15=NL 16=p	
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
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				
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 (4mA)	1	0=default 1=calibrate 2=cal set	
103 (67h)	calibration high (20mA)	1	0=default 1=calibrate 2=cal set	
TEMPERATURE				
144 (08Dh)	No. of wires	1	0= 2 wires 1= 3 wires	
99 (063h)	filter	1	0....99	
528 (210h)	display	1	0= °C 1= °F 2= K	

VAR	DESCRIPTION	BYTES	VALUE	REMARKS
PRESSURE				
544 (220h)	unit	1	0=mbar 1=bar 2=psi 3=no unit	
546 (222h)	span	3	1....9,999,999	
549 (225h)	decimals span	1	0...6	
550 (226h)	offset	3	0.000....9,999.999	unit as var544 step 0.001
90 (5Ah)	calibration low (4mA)	1	0=default 1=calibrate 2=cal set	
91 (5Bh)	calibration high (20mA)	1	0=default 1=calibrate 2=cal set	
89 (59h)	filter	1	0....99	
FORMULA				
537 (219h)	normal temperature	3	0.00....99,999.99	step: 0.01 K
555 (229h)	normal pressure	3	0.000....9,999.999	unit as var544 step 0.001
227 (E3h)	compressibility	3	0....9,999,999	
40 (28h)	normal compress.	3	0....9,999,999	
ANALOG OUTPUT				
112 (70h)	analog output	1	0=disable 1=enable	
113 (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	
117 (7Fh)	filter	1	0....99	
OTHERS				
01 (1h)	Model	2		read only!
06 (6h)	Software version	2		read only!
02 (2h)	Serial number	4		read only!
168 (A8h)	password	2	xxxx	read only!
170 AAh	tagnumber	3	0..9999999	Other vars: see standard table

OTHER F126-A-EG VARIABLES FOR COMMUNICATION**TOTAL** - variable number 566 (236h) – 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.

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: Impossible.

When reading or writing total or accumulated total it should be noted that the used values are given including the decimals. This means 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 $10^{-(total\ decimals)}$

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

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

Write flowrate: Impossible.

TEMPERATURE - variable number 540 (21Ch) – 4 bytes

Read temperature: possible.

Write temperature: Not possible.

Pressure - variable number 556 (22Ch) – 4 bytes

Read pressure: possible.

Write pressure: Not possible.

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NOTES

Left blank intentionally.

LIST OF CONFIGURATION SETTINGS			
SETTING	DEFAULT	DATE :	DATE :
1 - TOTAL			
11 unit	L		
12 decimals	0000000		
13 span	000001 /sec	/sec	/sec
14 decimals span	0		
2 - FLOWRATE			
21 unit	L		
22 time unit	/min		
23 decimals	0000000		
24 span	000001 /min		
25 decimals span	0		
3 - POWER MANAGEMENT			
31 LCD-new	1 sec.		
32 mode	operational		

SETTING	DEFAULT	DATE :	DATE :
4 - FLOWMETER			
41 formula	interpolation		
42 filter	01 (off)		
43 cut-off %	00.0%		
44 calibrate low-(0)4mA	default		
45 calibrate high-20mA	default		
5 - TEMPERATURE			
51 display unit	°C		
52 nr. of wires	3		
53 filter	01 (off)		
6 - PRESSURE			
61 unit	BAR		
62 span	00001600		
63 decimals span	0		
64 off-set	0.000 BAR	unit	unit
65 filter	01 (off)		
66 calibrate low-(0)4mA	default		
67 calibrate high-20mA	default		
7 - FORMULA			
72 normal temperature	0 K	K	K
73 normal pressure	0.000 BAR		
74 normal compressibility	0		
75 compressibility	0		
8 - ANALOG OUTPUT			
81 output	disabled		
82 min. flowrate 4-mA	0000000		
83 max. flowrate 20mA	9999999		
84 cut off percentage	0.0%		
85 tune min - 4mA	0208		
86 tune max - 20mA	6656		
87 filter	01 (off)		
9 - COMMUNICATION			
91 baud-rate	2400		
92 address	1		
93 mode	BUS-ASC		
A - OTHERS			
A4 password	0000		
A5 tagnumber	0000000		

