E126-P-EL

EXPLOSION PROOF FLOWCOMPUTER FOR LIQUID

Temperature compensation for corrected liquid volume

Signal input:	***flowmeter - type P: pulse, Namur and coil***
	temperature - type TP: PT100 2-, 3- or 4-wire
	temperature - type TA: (0)4-20mA
Signal output:	***analog - 4-20mA ref. corrected flowrate***
	pulse - Scaled pulse ref. corrected Total
Remote control:	***external reset with clear-lock***
Options:	***Modbus Communication***
	USB Communication

C US

FM APPROVED

E-Series - Explosion proof indicators for hazardous areas.
More info: www.fluidwell.com/eseries.

SAFETY INSTRUCTIONS

- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- LIFE SUPPORT APPLICATIONS: The E126-P-EL 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 E126-P-EL, the installer has to discharge himself by touching a well-grounded object.
- The E126-P-EL must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).
- Do connect a proper grounding to the housing as indicated if the E126-P-EL is used on a ship, truck or other application with no ground. The earth lead between the housing and the removable terminal-block may never be removed.

DISPOSAL OF ELECTRONIC WASTE

- At the end of its life this product should be disposed of according to the (inter)national regulations regarding waste electronic equipment. If a battery is installed 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 E126-P-EL 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 E126-P-EL.
- Check all connections, settings and technical specifications of the various peripheral devices with the E126-P-EL supplied.
- Never open the enclosure in hazardous areas while connected to power supplying or consuming devices other than the internal battery supply.
- Open the E126-P-EL only if all leads are free of potential.
- Never touch the electronic components (ESD sensitivity).
- Never expose the system to heavier conditions than allowed according to the enclosure classification (see manufacture's plate and chapter 4.2.).
- If the operator detects errors or danger, 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 E126-P-EL is described in chapter 2 “Operational”. 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 E126-P-EL as well as most of the options available. For additional information, please contact your supplier.

A hazardous situation may occur if the E126-P-EL 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 E126-P-EL or connected instruments.

A "**caution !**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the E126-P-EL or connected instruments

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

WARRANTY AND TECHNICAL SUPPORT

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

Hardware version	: 13.03.xx
Software version	: 03.07.xx
Manual	: FW-E126-P-EL-M_v0203_03_EN.docx
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CONTENTS MANUAL

1 INTRODUCTION

1.1 SYSTEM DESCRIPTION OF THE E126-P-EL

Functions and features
The flow computer model E126-P-EL is an explosion proof microprocessor driven instrument for the calculation of compensated volumetric flow or mass flow for liquid applications using flow equations.

This product has been designed with a focus on:

- User-friendliness: operation through the glass without removing the cover.
- Good readings in full sunlight and darkness through a bright backlight.
- Mounting flexibility: multiple solutions for sensor mounting, including 1” NPT or M25 bottom entry as well as suitable for wall or pipe mount applications.
- Ruggedness for harsh surrounding: not just designed to be explosion proof.
- Usability: wide operational temperature, high ingress protection rating and international certification.
- Installation friendly design: spacious cabling area, plug and play cable connection and easy removable electronic module.
- Aluminum enclosure with high quality industrial two component coating.
- Stainless steel 316L enclosure available for offshore applications.
- Ability to process any type of sensor signal,
- Multiple power supply options to suit any application, including long-life battery supply.
- Configurable pulse and analog signal outputs and optional communication outputs.

Flowmeter and temperature inputs
This manual describes the E126-P-EL with a pulse type input from the flowmeter.
One flowmeter with a passive or active pulse, NAMUR or coil signal output can be connected to the E126-P-EL. To power the sensor, several options are available.

For the temperature input, there are options available for a PT100 input (type TP) and a 4-20mA input (type TA).

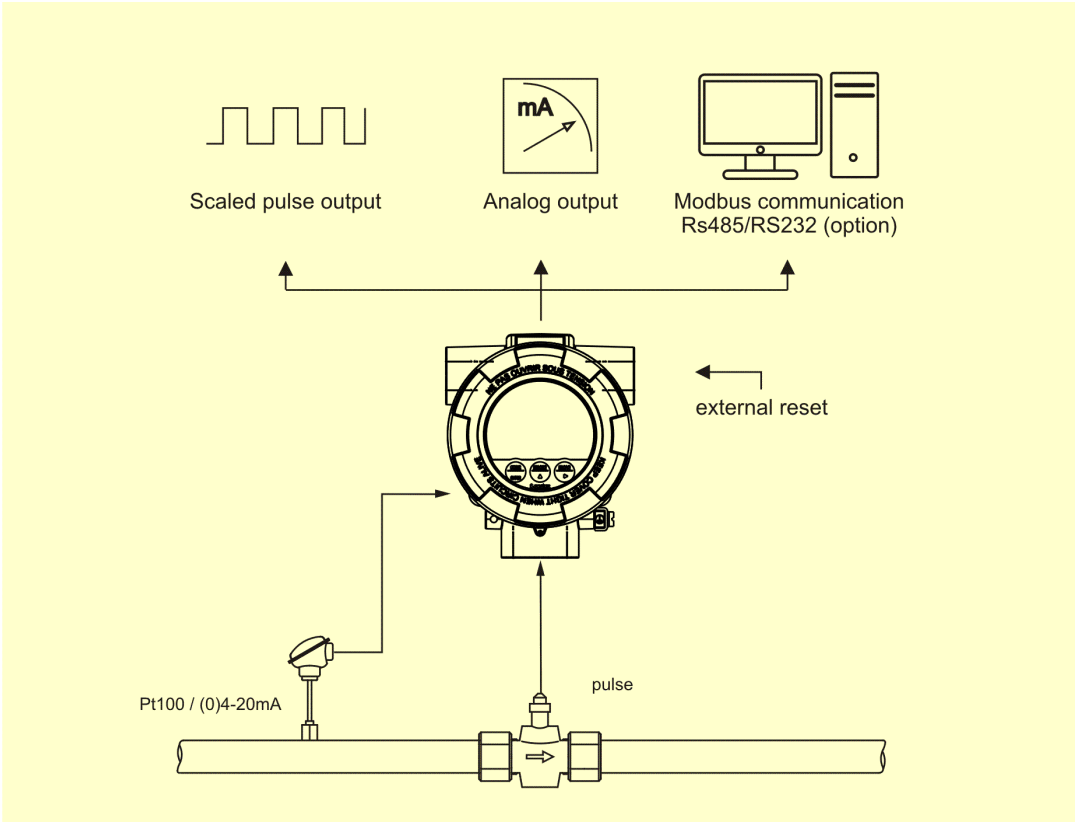


Fig. 1: Typical application for the E126-P-EL

Standard outputs

- Configurable pulse output to transmit pulses representing a certain compensated total quantity. The pulse length can be set as desired with a maximum frequency of 500Hz.
- Unscaled frequency output for retransmission of the incoming pulses as robust square wave forms.
- Configurable linear 4-20mA isolated analog output with 12-bits resolution representing the actual compensated flowrate. Flowrate levels as well as the minimum and maximum signal output can be tuned.

Configuration

The E126-P-EL has been designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your E126-P-EL according to your specific requirements.
It includes several important features, such as K-Factor, measurement units, signal selection etc.
All settings are stored in an EEPROM memory and will not be lost in the event of a power failure or a drained battery.
To extend the battery-life time, please use of the power-management functions as described in chapter 3.

Display information

The E126-P-EL has a large LCD with all kinds of symbols and digits to display measurement units, status information, trend-indication and key-word messages.
Flowrate and totals can be displayed either with the 11 small 7mm (0.28”) digits or with the 7 large 12mm (0.47”) digits. Additionally, the E126-P-EL has an analog speedometer to show the actual compensated flowrate.

Backlight

A backlight is standard available. The intensity can be set as desired (externally powered only).
The backlight can even be used in battery powered applications: it will be switched on, at a fixed intensity, during a limited period of time and will switch off automatically, 3 seconds after a key touch.

For loop powered applications only, the backlight will not come on because of limited power.

Options

The following options are available: full Modbus communication RS232/485 or USB (also battery powered), mechanical relay outputs, power- and sensor-supply options.

2 OPERATIONAL

2.1 GENERAL INFORMATION

This chapter describes the daily use of the E126-P-EL. This instruction is meant for users / operators.

- The E126-P-EL 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.

2.2 CONTROL PANEL

The optical keys are operated through the glass. The following keys are available:

Fig. 2: Control panel, optical keys

Functions of the keys

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

SELECT-key
This key is used to SELECT the displayed information, like accumulated total and flowrate.

CLEAR-key
This key is used to CLEAR the value of total.
The CLEAR-key also provides access to historical day totals.

Use of optical keys
The optical keys are designed to operate stable and will not be activated when the glass surface is not clean. However, keep the glass surface clean to avoid false key activations (false activations reduce battery lifetime). Also do not mount objects within 100mm in the front of the product (shiny surfaces could cause false activations). It is not necessary to touch the glass for activation. Activating by touching the clean glass surface normally also works fine, but in case of detection problems try not to touch the glass.

Unlock / lock optical keys
To prevent any undesired operation of the optical keys and to save battery power, an automatic key-lock function is implemented. This function can be disabled at SETUP-menu Others.

When the optical keys are locked, the key lock symbol is shown at the top of the display as shown below.

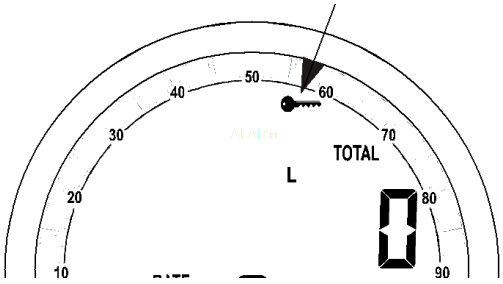


Fig. 3: Control panel, disable optical keys

To unlock the optical keys, the operator need to 'activate' the keys by pressing any of the keys for about 1 to 2 seconds. After activation, the backlight will light up (if enabled) and the display will hint the following sequence of keys for the operator to briefly touch after each other:

PROG – SELECT – CLEAR

When the sequence is successfully executed, the optical keys will be unlocked and the key lock symbol will disappear.

The optical keys are automatically locked after 30 seconds of inactivity. However, to lock the optical keys manually, touch the PROG and CLEAR key simultaneously for 3 seconds.

Enable or disable optical keys with on-off switch

Directly below the optical keys an on-off switch is located to enable or disable the optical keys. Move this switch to the right to enable or to the left to disable the optical keys. When the optical keys are disabled the key lock symbol will appear in the display and operation of the unit can only be performed with the mechanical push buttons.

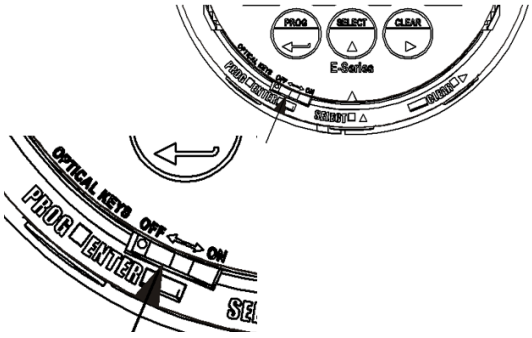


Fig. 4: Control panel, ON/OFF optical keys

Note !

For battery powered applications it is recommended to switch off the optical keys when possible to save on power consumption significantly.

Push button operation

Next to the three optical keys also three push buttons are available when the cover is removed. Make sure the key lock is active before removing the cover to prevent unwanted actions.

On the side of the collar of the display three black mechanical push buttons are present in the same order as the optical keys, PROG – SELECT – CLEAR. They operate in the same manner as the optical keys, and when pressed, the optical keys are disabled for 30 seconds to prevent any interference.

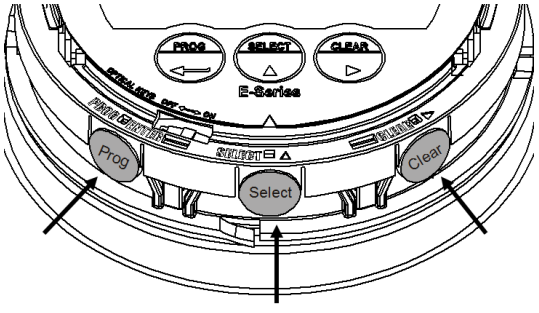


Fig. 5: Control panel, Push button operation

2.3 OPERATOR INFORMATION AND FUNCTIONS

Note !

Check the key lock and unlock before operation
Unlock the optical keys as described before.

By default, the E126-P-EL will act at Operator level. The information displayed is dependent upon the SETUP-settings. Signals generated by the connected flowmeter and sensors are measured by the E126-P-EL in the background. The display values are however updated depending on the selected refresh rate. After pressing a key, the display will be refreshed 8 times per second, after 30 seconds it will return to the selected setting.

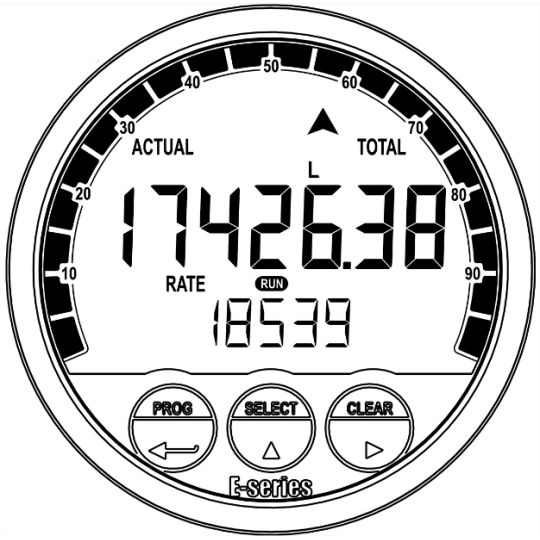


Fig. 6: Example of display information during process

For the Operator, the following functions are available:

Display process values
On the main screen, the primary process values of the E126-P-EL are shown. By default, Total is shown on the upper-line of the display and Flowrate on the bottom line.
In the configuration settings for Display, this can be changed to show only Flowrate on the large 12mm digits or to show Total and Accumulated Total simultaneously. When Flowrate is shown, the arrows ▲▼ indicate the trend (increase or decrease) of the flowrate.
By pressing the SELECT-key, the operator can scroll through the screens showing the various process values. After 30 seconds of inactivity, the display will automatically return to the main screen.

The following table shows the available information:

Display information	SETUP-item **FUNCTION**		
	Total	**Flowrate**	**Acc. Total**
MAIN SCREEN	Total * Flowrate	Flowrate	Total * Acc. Total
SCREEN 1	Total * Acc. Total	Total * Acc. Total	Total * Flowrate
SCREEN 2 **	Current day total		
SCREEN 3 **	Previous day total		
SCREEN 4	Line Temperature		

* *When total is shown on the display, it can be cleared by pressing the CLEAR-key twice.*
** *Available when daily totals are enabled in SETUP-menu Display.*

Note !

- *All totals and flowrate values shown on the display represent normal or standard values (i.e. temperature compensated)*
- *When the toggle function is enabled in the SETUP-menu Display, temperature information is shown on the bottom line of the main screen, alternating with the normal information shown on the display.*

Clear total
The value for Total can be cleared and reset to zero. This action does not influence the value of Accumulated Total or Current Day Total.
To clear Total, press the CLEAR-key when Total is shown on the display and the display will show the flashing text “PUSH CLEAR”. When the CLEAR-key is pressed a second time, Total is set to zero. To avoid clearing Total at this point, press the PROG- or SELECT-key or wait for 20 seconds.


Note !

- *If the ‘Total CLEAR password’ is set in the configuration settings for Total, the operator is asked to enter the password before the “PUSH CLEAR” text is shown. The correct password needs to be entered before Total can be cleared. (See paragraph 3.2.3.)*
- *The IB option (external reset) allows clearing of total via an external pushbutton. This clear action operates in parallel with the clear action via the control panel but does not require any extra confirmation or password. When the external connection is permanently closed, Total still counts but the ”Clear Total” function via the control panel is disabled.*

Display flowrate
Internally, the flowrate is calculated up to 8 times a second, To obtain a readable value, the flowrate shown on the display is updated once every second. Flowrate is shown, based on the configuration settings for Flowrate, with the configured number of decimals. The configured unit and time unit are indicated on the bottom line of the display.

When “-------“ is shown, the flowrate value is too high to be displayed. The arrows ▲ and ▼ indicate the trend (increase or decrease) of the flowrate.

Display line temperature
Several times a second, the input value of the temperature sensor is measured. Temperature is calculated based on the configuration settings for Temperature and shown on the display with the configured number of decimals and (display) unit.

Display total and accumulated total
A resettable Total and non-resettable Accumulated Total are available. The Total value can count up to 9.999.999 before rolling over to zero; the Accumulated total can count up to 99.999.999.999 before rolling over.
The unit and number of decimals are displayed according to the configuration settings for Total.

Display current day total and previous day total
Two additional non-resettable totals are available: Current Day Total and Previous Day Total. These totals are shown in the same unit and decimals as set in the configuration settings for Total.

At a specific time of day, the Current Day Total is copied to the Previous Day Total after which the measurement of Current Day Total is restarted (reset to zero). The moment at which this action is performed is called 'contract hour'. The contract hour can be configured in the configuration settings for Total in steps of 1 hour.


Note !

- *‘Current Day Total’ is often referred to as ‘Daily Total’.*
- *The Current Day Total shows the quantity that is measured since last contract hour, and is a ‘running’ value.*
- *The Previous Day Total shows the total quantity that was measured the day before, and is a ‘fixed’ value.*
- *Both Current Day Total and Previous Day Total cannot be reset manually.*

Display historical day totals
Besides directly reviewing the Current Day Total and Previous Day Total, a list of the last 15 Previous Day Totals can be reviewed. To enter the list, press the CLEAR-key for 3 seconds. Use the SELECT- and CLEAR-key to scroll up and down through the list of Previous Day Totals. The number that is displayed on the left side of the bottom line indicates the age of the shown Previous Day Total, in days. Note that the entry with age ‘00’ represents the (running) Current Day Total.

To return to the main display information again, press the PROG-key during 3 seconds or wait for 3 minutes.

Display speedometer flowrate
Along the edge of the display, a percentage based impression of the actual flowrate is shown. The speedometer consists of 20 segments which run from 0 to 100% in increments of 5%. This function can be enabled or disabled in the SETUP-menu Display.

2.4 OPERATOR ALARMS

Low-battery alarm (Type PB only)
During operation the battery voltage drops. When the battery voltage becomes too low, the battery indicator comes on to show that the operation and indication become less reliable. When the battery indicator is on, install a fresh and new battery (as soon as possible) to keep a reliable operation and indication.

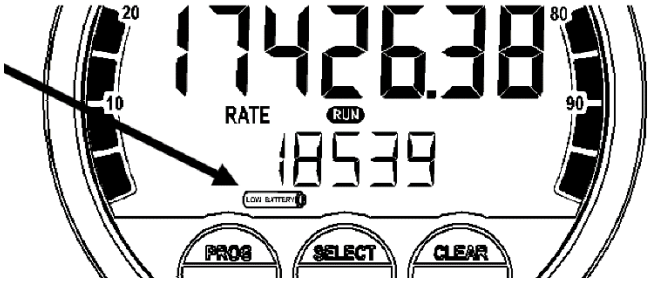


Fig. 7: Example of low-battery alarm

Range error
As soon as the input value of the temperature sensor is out of the calibrated measurement range, e.g. because of a wire break or a faulty sensor, the alarm indicator shows, and ‘range error’ is shown on the temperature screen. When the SELECT-key is pressed a few times, the exact alarm code is shown in the alarm display.

Alarm
When an internal alarm condition occurs, the alarm-flag is shown on the display.
After pressing the SELECT-key several times, the display will show the alarm code.
Please see Appendix B: Problem solving for an explanation of the available alarm codes.

3 CONFIGURATION

3.1 INTRODUCTION

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

Caution !

- Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this manual before carrying out its instructions.
- The E126-P-EL 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 authorized personnel.
- Take careful notice of the “Safety rules, instructions and precautionary measures” in the front of this manual.

3.2 PROGRAMMING SETUP-LEVEL

WARNING

Changing the settings of the E126-P-EL may have an influence on the current operation of the device, even when SETUP-level is still active.

Make sure that the unit is not being used for any application when altering the settings.

Note !

Be aware that the optical keys may be locked and will not function.

Unlock the optical keys as described before.

3.2.1 ENTERING SETUP-LEVEL

Configuration of the E126-P-EL is done at SETUP-level, which can be reached at all times while the E126-P-EL remains fully operational. At SETUP-level the display will deactivate the RUN indicator and activate the SETUP indicator.

Use the control panel to access SETUP-level

PROG-key
To enter SETUP-level, press the PROG-key for 7 seconds at OPERATOR-level.
During this time, the symbol will be displayed.
When SETUP-level is entered, a password might be required to continue. You can enter the password by following the procedure for programming values as described in the following paragraphs.

Note !

A password may be required to enter SETUP.

Without this password access to SETUP is denied.

3.2.2 NAVIGATING THROUGH SETUP-LEVEL

Each function has a unique menu-number, which is displayed below the SETUP indicator at the bottom of the display. The menu-number is a combination of two figures, e.g. 1.2. The first number indicates the function-group and the second number indicates the function. Additionally, each function and function-group is expressed with a keyword.

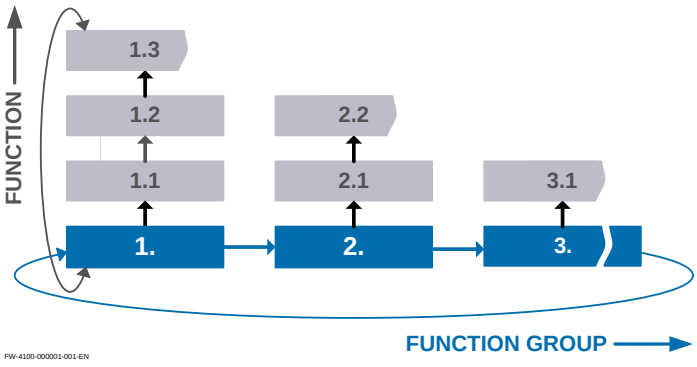


Fig. 8: SETUP matrix structure

Use the control panel to navigate through SETUP-level

PROG-key
When a function is selected, this key is used to start the programming sequence. When only a function group is selected (and no function), this key is used to scroll back a function group (e.g. 3 → 2 → 1 → 3).

SELECT-key
This key is used to select the next function in the list (e.g. 1 → 1.1 → 1.2 → 1). When the top of the list is reached, it will wrap around and return to the function group selection.

CLEAR-key
This key is used to select the previous function in the list (e.g. 1.2 → 1.1 → 1 → 2). When the bottom of the list is reached, it will return to the function group selection. When only a function group is selected (and no function), this key is used to scroll to the next function group. (e.g. 1 → 2 → 3 → 1).

3.2.3 PROGRAMMING SEQUENCE

After selecting a function at SETUP-level, a new value can be programmed using the control panel. A function either contains a value (a number with optionally a decimal point, e.g. 123.45) or a list with items (e.g. Disable – Enable).

For each function that needs to change, navigate to that function and follow the steps indicated below. During the programming sequence, the display will deactivate the SETUP indicator and activate the PROGRAM indicator.


Note !

When programming new values, alterations will only be set after the PROG-key has been pressed to confirm the new value! (STEP 3)

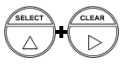
Step 1: Starting the programming sequence

PROG-key
When a function is selected at SETUP-level, this key is used to start the programming sequence.

Step 2a: Changing a value

SELECT-key
This key is used to increment the selected digit or to select de next position of the decimal point.
When the entered value is out of range, the increase sign ▲ or decrease-sign ▼ will be displayed while you are programming. If this value is confirmed by pressing the PROG-key, the value will be brought within a valid range automatically.

CLEAR-key
This key is used to select the next digit. If a decimal point can be set, this will be included in the sequence as well (e.g. [decimal point] → digit 1 → digit 2→ digit 3 → [decimal point].
Note that the selected decimal point is flashing when is can be changed. When no decimal point is selected, all available decimals will be flashing on the display to indicate this when the sequence reaches the decimal point.



SELECT-key + **CLEAR**-key
The combination of the SELECT-key and CLEAR-key is used to select a negative value. When a value can also be entered as a negative number, pressing the SELECT-key and CLEAR-key simultaneously will toggle the '–' (minus) sign on and off.

Step 2b: Changing the selected item in a list

SELECT-key
This key is used to select the next item in the list (e.g. Disable → Enable).
At the end of the list, the selection will wrap around to the first selection.

CLEAR-key
This key is used to select the previous item in the list (e.g. Enable → Disable).
At the bottom of the list, the selection will wrap around to the last selection.

Step 3: Finishing the programming sequence

PROG-key
During the programming sequence, this key is used to confirm the new value and return to SETUP-level. To cancel the operation, either press the PROG-key for 3 seconds or wait for 20 seconds: the programming sequence is cancelled and the former value is reinstated.

3.2.4 RETURNING TO OPERATOR-LEVEL

When all settings are configured correctly, the unit can be returned to OPERATE-level.
Please keep a record of all settings for later reference.

Use the control panel to return to OPERATE-level

PROG-key
In order to return to the operator level, press the PROG-key for three seconds.
When no keys are pressed for 2 minutes, SETUP-level will be left automatically.

3.3 OVERVIEW FUNCTIONS SETUP-LEVEL

All settings of the E126-P-EL can be set via the control panel. As an alternative, you can also use the Remote Configuration Software which you can find on our website or through your supplier. Depending on the type of communication interface your device has, you might need a specific communication cable, which is available through your supplier.

3.3.1 OVERVIEW FUNCTIONS SETUP-LEVEL


Note !

*The available settings for menu 5: Temperature depend on the ordered type of temperature input. This is indicated by **type TP** for PT100 and **type TA** for 4-20mA.*

1	**TOTAL**		
	1.1	UNIT	L – m3 – US gal – I gal – cf – oil bbl – kg – ton – US ton – lb – (none)
	1.2	DECIMALS	0 – 0.1 – 0.02 – 0.003
	1.3	K-FACTOR	AUTO, 0.000010 – 9999999
	1.4	FACTOR-X	x1 – x10 – x100 – x1000
	1.5	CLEAR PASSWORD	000 – 999
	1.6	CONTRACT HOUR	00:00 (24h format)
	1.7	CURRENT DAY TOTAL	xxxxxxx
	1.8	PREVIOUS DAY TOTAL	xxxxxxx
2	**FLOWRATE**		
	2.1	UNIT	mL – L – m3 – US gal – I gal – cf – Oil bbl – nL – nm3 – scf – mg – g – kg – ton – lb – US ton – rev – P – (none)
	2.2	TIME	/sec – /min – /hour – /day
	2.3	DECIMALS	0 – 0.1 – 0.02 – 0.003
	2.4	K-FACTOR	AUTO, 0.000010 – 9999999
	2.5	FILTER	1 – 99
	2.6	PERIOD	0.1 – 99.9 seconds
3	**DISPLAY**		
	3.1	FUNCTION	total – flowrate – acc. total
	3.2	DAY TOTALS	off – operate – hidden
	3.3	TOGGLE	enable – disable
	3.4	LCD NEW	fast – 1 sec – 3 sec – 15 sec – 30 sec – off
	3.5	BACKLIGHT (brightness)	0% – 20% – 40% – 60% – 80% – 100%
	3.6	BARGRAPH	enable – disable
	3.7	RATESPAN	0.000 – 9999999
4	**FLOWMETER**		
	4.1	SIGNAL	NPN – NPN_LP – REED – REED_LP – PNP – PNP_LP – NAMUR – Coil_Hi – Coil_Lo – Act_8.2 (8.2V DC) – Act_24 (24V DC)
	4.2	UNITS	hand – auto-vol – auto-mas
	4.3	UNIT	Auto-vol: L – m3 – US GAL – IGAL – cf – oil bbl Auto mas: kg – ton – US ton – lb
	4.4	K-FACTOR	0.000010 – 9999999
5	**TEMPERATURE – *TYPE TP: PT100***		
	5.1	DISPLAY	°C – °F – K
	5.2	NO. OF WIRES	2 – 3 – 4
	5.3	FILTER	1 – 99
5	**TEMPERATURE – *TYPE TA: 4-20mA***		
	5.1	DISPLAY	°C – °F – K
	5.2	SPAN	0.00000 – 999999 K
	5.3	OFFSET	0.01 – 9999.99 K
	5.4	FILTER	1 – 99

	5.5	CALIB-LOW	default – calibrate – calibrate set
	5.6	CALIB-HIGH	default – calibrate – calibrate set
6	**FORMULA**		
	6.1	EQUATIONS TYPE	EL (fixed)
	6.2	THERMAL EXP.COEFFICIENT	0.000 – 9999.999 (*10^{-6} / K)
	6.3	T-NORMAL (temperature)	0.00 – 9999.99 K
7	**ANALOG**		
	7.1	OUTPUT	enable – disable
	7.2	RATE-MIN (4mA)	0.000 – 9999999
	7.3	RATE-MAX (20mA)	0.000 – 9999999
	7.4	CUT-OFF	0.0 – 9.9%
	7.5	TUNE-MIN (4mA)	0000 – 9999
	7.6	TUNE-MAX (20mA)	0000 – 9999
	7.7	FILTER	1 – 99
8	**PULSE**		
	8.1	MODE	disable – scaled – retrans
	8.2	WIDTH	0.000 – 9.999 sec
	8.3	AMOUNT	0000.000 – 9999999
9	**COM-MODB**		
	9.1	SPEED	1200 – 2400 – 4800 – 9600 – 9600HP – 19200 – 38400
	9.2	ADDRESS	001 – 247
	9.3	MODE	off – bus asc – bus rtu
	9.4	DATABITS	8 bits – 7 bits
	9.5	PARITY	none – even – odd
10	**OTHERS**		
	10.1	MODEL	E126-P-EL
	10.2	SOFTWARE VERSION	xx.xx.xx
	10.3	SERIAL NO	xxxxxxx
	10.4	TIME	HH:MM:SS
	10.5	PASSWORD	0000 – 9999
	10.6	KEY LOCK	enable – disable
	10.7	TAG NO	0000000 – 9999999

3.3.2 EXPLANATION OF SETUP-MENU 1 – TOTAL

- First setup the flowmeter at SETUP-menu 4 - Flowmeter. It has a direct influence on the settings for Total.
- Change of the type of flowmeter unit (SETUP 4.2 and SETUP 4.3) will cause the Total unit to jump to the default setting of the new flowmeter unit type.
- When a different unit is selected, the actual total values are NOT recalculated!

1	**TOTAL**	
1.1	UNIT	This setting determines the measurement unit for (accumulated) total and the scaled pulse output. The measurement units which are available, are controlled from the UNITS which are selected in the flowmeter menu. AUTO-VOL: L – m3 – US gal – I gal – cf – Oil bbl – nL – nm3; AUTO-MAS: kg – ton – US ton – lb; HAND: l – m3 – US gal – I gal – cf – Oil bbl – kg – ton – US ton – lb – nL – nm3 – ---- (no unit).
1.2	DECIMALS	The decimal point determines for Total and accumulated Total the number of digits following the decimal point. The following can be selected: 0, 0.1, 0.02, 0.003
		**The next menu item can be modified only if the automatic unit conversion in SETUP 4.2, Flowmeter-units, is set to Hand. Else, the display will show "AUTO".**
1.3	K-FACTOR	With the Total K-Factor, the flowmeter pulse signals are converted to a total unit. The Total K-Factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 1.1). The more accurate the Total K-Factor, the more accurate the functioning of the system will be.  *After pressing PROG, the decimal point will be flashing. The decimal position can be changed now by pressing the ▲-key.*
1.4	FACTOR-X	This setting determines the multiplication factor of Total and Accumulated Total and is also applicable to the Current and Previous Day Totals. This functions allows to show up to 3 digits more of the Total/accumulated Total. The amount shown is a rounded number. The following can be selected: x1 – x10 – x100 – x1000
1.5	CLEAR PASSWORD	Clearing Total by the Operator can be password protected. This protection is disabled with value 000 (zero). A 3 digit password can be programmed, for example 123.
1.6	CONTRACT HOUR	The contract hour can be set in steps of 1 hour to any hour of the day. When the system clock reaches the time set in the contract hour, the Current Day Total is copied to the Previous Day Total, after which the measurement of the Current Day Total is restarted (reset to zero).  ***Without** type ZL – Data logging, the clock will be interrupted in case of a power-down. When the unit is powered up again, the display will immediately ask the operator to enter the correct system time. Without an initialized clock, all measurements and calculations are performed as normal. However, when the Daily Total feature is enabled, the detection of contract hour and updating the Current and Previous Day Totals will not be done at the correct time.*
1.7	CURRENT DAY-TOTAL	This setting shows the amount of product totalized, since the last contract hour. This a 'running' totalizer and cannot be reset to zero.

1.8	PREVIOUS DAY-TOTAL	This setting shows the amount of product totalized, before the last contract hour. This totalizer cannot be reset to zero. See chapter 2 for information on reviewing more historical day totals.

3.3.3 EXPLANATION OF SETUP-MENU 2 – FLOWRATE

- First setup the flowmeter at SETUP-menu 4 - Flowmeter. It has a direct influence on the settings for Flowrate.
- Change of the type of flowmeter unit (SETUP 4.2 and SETUP 4.3) will cause the flowrate unit to jump to the default setting of the new flowmeter unit type.
- Changes to SETUP 2.1 Unit, SETUP 2.2 Time unit and SETUP 2.3 Decimals have an effect on the analog output settings of SETUP 6.2 Rate Min and SETUP 6.3 Rate Max and the display setting of SETUP 3.5 Ratespan.
  Therefore it is best practice to first determine the required settings for the flowrate!

2	**FLOWRATE**	
2.1	UNIT	This setting determines the measurement unit for flowrate. The flowrate unit that can be chosen depends on the type of flowmeter unit (volumetric or mass) set at SETUP 4.2. The following can be selected: AUTO-VOL: mL - L - m3 - US GAL - I GAL - cf - Oil bbl - nL - nm3 - scf AUTO-MAS: mg - g - kg - ton - lb - US ton Hand: mL - L - m3 - US GAL - I GAL - cf - Oil bbl - nL - nm3 - scf - mg - g - kg - ton - lb - US ton - rev - P - ---- (no unit)
2.2	TIME	The flowrate can be calculated per /sec - /min - /hour - /day.
2.3	DECIMALS	This setting determines for flowrate the number of decimals. The following can be selected: 0, 0.1, 0.02, 0.003
		**The next menu item can be modified only if the automatic unit conversion in SETUP 4.2, Flowmeter-units, is set to Hand. Else, the display will show "AUTO".**
2.4	K-FACTOR 	With the Flowrate K-factor, the flowmeter pulse signals are converted to a flowrate unit. The Flowrate K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 2.1). The more accurate the K-factor, the more accurate the functioning of the system will be. *After pressing PROG, the decimal point will be flashing. The decimal position can be changed now by pressing the ▲-key.*
2.5	FILTER	This setting is used to stabilize the flow rate reading. With the help of this digital filter a more stable but less actual reading can be obtained. The filter principal is based on three input values: the filter level (01-99), the last calculated flow rate and the last average value. The higher the filter level, the longer the response time on a value change will be. In practice it is best to use trial and error to find the best setting for your application.
2.6	PERIOD 	This setting is used to calculate the flow rate by counting the number of pulses within a certain time, for example 1 second. The longer the time the more accurate the flow rate will be. ▪ *This setting does influence the update time for the analog output directly. If the output response is too slow, decrease the number of pulses.* ▪ *The shorter the update time, the higher the power consumption of the unit will be (important for battery powered applications).*

3.3.4 EXPLANATION OF SETUP-MENU 3 - DISPLAY

3	DISPLAY	
3.1	FUNCTION	This setting determines which information is shown on the main screen. The function can be set to indicate **total, flowrate** or **accumulated total**. • When “total” is selected, total is displayed with the large 12mm (0.47”) digits and flowrate is displayed with the 7 mm (0.28”) digits simultaneously. • When “flowrate” is selected, only flowrate will be displayed with the large 12mm (0.47”) digits together with its measuring unit. • When "accumulated total" is selected, total is displayed with the large digits and accumulated total is displayed with the small digits simultaneously. • When SELECT is pressed on the main screen, the operator can scroll through the various process values. See chapter 2 for more information on operator information and functions.
3.2	DAY TOTALS	A basic data log function is available to register Current Day Total and Previous Day Total. This function sets the availability at operator level: • **Off**: Current Day Total and Previous Day Total are not available. • **Operator**: Current Day Total and Previous Day Total are available at operator level by pressing the SELECT key several times. At SETUP-level, they can be reviewed at SETUP 1.7 and SETUP 1.8. • **Hidden**: Current Day Total and Previous Day Total are only available at SETUP 1.7 and SETUP 1.8. Note ! *When this function is enabled, a list of the last 15 historical day totals is available and can be reviewed from operator level.* *Please see paragraph 2.3 for more information.*
3.3	TOGGLE	By enabling the display toggle function, temperature information is shown on the main screen (see chapter 2), alternating with the normal information shown on the bottom line of the display. The following can be selected: enable – disable
	Note !	*When battery powered, the user can expect reliable measurement over a long period of time. The E126-P-EL has several smart power management functions to extend the (optional) battery life time significantly next to permanently disabling the optical keys. The following functions can be set:*
3.4	LCD NEW	The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display refresh rate, it is strongly advised to select a slow refresh rate. Please understand that NO information will be lost; every pulse will be counted and output signals are generated in the normal way. The following can be selected: FAST – 1 sec – 3 sec – 15 sec – 30 sec – OFF When “off” is selected the display will switch off automatically. When an update rate other than “fast” is selected, pressing a key will switch the update rate to “fast” for 30 seconds. After this time, the display will return to the configured update rate (or switch off). 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 temporarily turn on after touching one of the keys and turn off automatically after 30 seconds.*

3.5	BACKLIGHT	The unit is provided with a backlight. The backlight brightness can be adjusted from off (0) to a 100% in steps of 20%. The following can be selected: 0% - 20% - 40% - 60% - 80% - 100% For battery powered units the brightness is not adjustable. Note ! *When the unit is only loop powered it cannot make use of the backlight. In that case an external supply is required.*
3.6	BARGRAPH	The unit has a speedometer display which offers a quick impression of the actual flow rate. This graph on the display can be switched on or off. The following can be selected: enable – disable
3.7	RATESPAN	With Ratespan the range of the speedometer can be set. The display shows 0 – 100 with 20 blocks so each block is 5% of the 100% range set here. The following can be selected: 0000000 – 9999999 Note ! *The number of decimals displayed depends upon SETUP 2.3.*

3.3.5 EXPLANATION OF SETUP-MENU 4 – FLOWMETER

To simplify the configuration of the Flowmeter, total and flow rate settings, the E126-P-EL is equipped with an automatic unit conversion feature. This avoids different K-Factor calculations for Total and Flowrate and all configuration it done inside the Flowmeter menu. To use the automatic unit conversion, you only need to enter the (average) K-Factor and the related measurement unit. These can be found on the test/calibration certificate that came with your flowmeter.

For a detailed description and tutorials on the automatic unit conversion function, please refer to our website or your supplier.

To setup the automatic unit conversion, follow this procedure:

- SETUP 4.1: Select the correct type of flow meter signal
- SETUP 4.2: Select the type of measurement unit used on the certificate: volume or mass
- SETUP 4.3: Select the measuring unit according to the certificate
- SETUP 4.4: Enter the (average) K-factor shown on the certificate.
- SETUP 1.1: Select the desired measuring units for (accumulated) Total.
- SETUP 2.1: Select the desired measuring units for Flow rate

The automatic unit conversion can handle either volume or mass units. For measurement units which are not supported, for example ‘revolutions’ or the use of volume and mass units simultaneously, the automatic unit conversion can be set to ‘Hand’, allowing total and flowrate to be configured independently.

Example: Calculating the K-factor.
To manually calculate the K-factor to enter for total or flowrate, follow this example:

Assume that the flowmeter generates 65.231 pulses per US gallon and the required measurement unit is cubic foot / ft^3. A cubic foot consists of 7.48052 gallon which implies 487.9618 pulses per cubic feet. So, the K-Factor to enter is 487.9618.

4	FLOWMETER					
4.1	SIGNAL Note !	The E126-P-EL is able to handle several types of input signal. The type of flowmeter pickup / signal is selected with SETUP 4.1. The settings with LP are used to apply a build-in low-pass filter. See also chapter. 4.4. *The selections "Active pulse input" offer a pulse detection level of 50% of the selected voltage.*				
	TYPE OF SIGNAL	EXPLANATION		RESISTANCE	FREQ. / mVpp	REMARK
	NPN	NPN input		100 kΩ pull-up	max. 6 kHz.	(open collector)
	NPN - LP	NPN input with low pass filter		100 kΩ pull-up	max. 2.2 kHz.	(open collector) less sensitive
	REED	Reed-switch input		1 MΩ pull-up	max. 1.2k Hz.	
	REED - LP	Reed-switch input with low pass filter		1 MΩ pull-up	max. 120 Hz.	Less sensitive
	PNP	PNP input		51 kΩ pull-down	max. 6 kHz.	
	PNP - LP	PNP input with low pass filter		51 kΩ pull-down	max. 700 Hz.	Less sensitive
	NAMUR	NAMUR input		820 Ω pull-down	max. 4 kHz.	External power required
	COIL HI	High sensitive coil input		-	min. 20 mVpp.	Sensitive for interference!
	COIL HI (option ZF)				min. 10 mVpp.	
	COIL HI (option ZG)				min. 5 mVpp.	
	COIL LO	Low sensitive coil input		-	min. 90 mVpp	Normal sensitivity
	8-1 DC	Active pulse input detection level 3.9 Vdc		3k9 Ω pull-down	max. 10 kHz.	External power required
	24 DC	Active pulse input detection level 11 Vdc		3 k Ω pull-down	max. 10 kHz.	External power required
4.2	UNITS	With this setting the automatic unit conversion is enabled for volumetric flows or mass flows. When Hand is selected, the automatic unit conversion is disabled. The following can be selected: AUTO-VOL, AUTO-MASS, HAND				
	WARNING	**To make use of the automatic unit conversion, Total and Flowrate must have a convertible unit. If this is not possible, HAND should be chosen. This will cause SETUP 4.3 and SETUP 4.4 to disappear and the unit, K-factor and K-factor decimals must be specifically set at SETUP-menu 1 – Total and SETUP-menu 2 – Flowrate.**				
4.3	K-FACTOR UNIT Note !	SETUP 4.3 determines the measurement unit for the flowmeter. With automatic unit conversion, the units for Total and Flowrate are derived from this setting. The following can be selected: L – m3 – US GAL – IGAL – cf – oil bbl – kg – ton – US ton – lb • *Changing the type of flowmeter unit (volumetric or mass) causes the settings of the Total (SETUP 1.1) and Flowrate (SETUP 2.1) to automatically change to the default unit of that type.* • *Change of the flowmeter unit will not change the amount displayed for Total and accumulated Total.*				
4.4	K-FACTOR Note !	With the K-factor, the flowmeter pulse signals are converted to a quantity. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 4.3), for example per cubic meter. The more accurate the K-factor, the more accurate the functioning of the system will be. *After pressing PROG, the decimal point will be flashing. The decimal position can be changed now by pressing the ▲-key.*				

3.3.6 EXPLANATION OF SETUP-MENU 5 - TEMPERATURE

Note !

It is possible to work with a "fixed" line temperature value for the calculations:

- *This feature requires Type TA: 4-20mA input*
- *Enter the fixed line temperature for offset (SETUP 5.3) and set span to zero (SETUP 5.2).*
- *When no temperature sensor is connected, calibrate the low input value at SETUP 5.5 manually to remove the range error alarm.*

5	**TEMPERATURE – *Type TP: PT100 input***				
5.1	DISPLAY	This setting is used to program the temperature unit which is shown to the operator. This setting does not influence the actual calculations. The following can be selected: °C – °F – K			
5.2	NO. OF WIRES	This setting is used to program the number of wires for the PT100 sensors. The following can be selected: 2 – 3 – 4			
5.3	FILTER	This setting is used to stabilize the temperature reading. With the help of this digital filter a more stable but less actual reading can be obtained. The filter principal is based on three input values: the filter level (01-99), the last calculated temperature and the last average value. The higher the filter level, the longer the response time on a value change will be. In practice it is best to use trial and error to find the best setting for your application.			
	FILTER VALUE	RESONSE TIME ON STEP CHANGE OF PT100 INPUT VALUE (% OF END VALUE)			
		50%	75%	90%	99%
	01	filter disabled	filter disabled	filter disabled	filter disabled
	10	7 sec	14 sec	22 sec	44 sec
	20	14 sec	28 sec	45 sec	90 sec
	30	21 sec	41 sec	68 sec	136 sec
	50	35 sec	69 sec	114 sec	228 sec
	75	52 sec	104 sec	172 sec	344 sec
	99	69 sec	137 sec	227 sec	454 sec

5	**TEMPERATURE – *Type TA: 4-20mA input***	
5.1	DISPLAY	This setting is used to program the temperature unit which is shown to the operator. This setting does not influence the actual calculations. The following can be selected: °C – °F – K
5.2	SPAN	With this setting, the measurement range of the (0)4-20mA temperature sensor is determined in Kelvin (K). The value can range from 0.00000 – 999999. **Example Calculating the span for temperature.** The sensor generates: • minimum signal (4mA) at a temperature of - 100°C (173.15 K) • maximum signal (20mA) at a temperature of 250°C (523.15K) Then the span should be set at (523.15 – 173.15 =) 350.00 K. Note ! *After pressing PROG, the decimal point will be flashing. The decimal position can be changed now by pressing the ▲-key.*
5.3	OFFSET	Calculations are based on temperature values in Kelvin (K). The flow computer needs to know the measured temperature at minimum signal. In above example "173.15 K" must be entered. The value can range from 0.00 – 9,999.99 with two fixed decimals.

<table>
<tr><td>5.4</td><td>FILTER</td><td colspan="4">This setting is used to stabilize the temperature reading. With the help of this digital filter a more stable but less actual reading can be obtained. The filter principal is based on three input values: the filter level (1-99), the last calculated temperature and the last average value. The higher the filter level, the longer the response time on a value change will be. In practice it is best to use trial and error to find the best setting for your application.</td></tr>
<tr><td rowspan="9"></td><td rowspan="2">FILTER VALUE</td><td colspan="4">RESONSE TIME ON STEP CHANGE OF TEMP. INPUT VALUE (% OF END VALUE)</td></tr>
<tr><td>50%</td><td>75%</td><td>90%</td><td>99%</td></tr>
<tr><td>01</td><td>filter disabled</td><td>filter disabled</td><td>filter disabled</td><td>filter disabled</td></tr>
<tr><td>10</td><td>7 sec</td><td>14 sec</td><td>22 sec</td><td>44 sec</td></tr>
<tr><td>20</td><td>14 sec</td><td>28 sec</td><td>45 sec</td><td>90 sec</td></tr>
<tr><td>30</td><td>21 sec</td><td>41 sec</td><td>68 sec</td><td>136 sec</td></tr>
<tr><td>50</td><td>35 sec</td><td>69 sec</td><td>114 sec</td><td>228 sec</td></tr>
<tr><td>75</td><td>52 sec</td><td>104 sec</td><td>172 sec</td><td>344 sec</td></tr>
<tr><td>99</td><td>69 sec</td><td>137 sec</td><td>227 sec</td><td>454 sec</td></tr>
<tr><td>5.5</td><td>CALIBRATE LOW
 
</td><td colspan="4">This setting is used to calibrate the input value for (0)4mA as the signal from the temperature sensor might not be exact 4.0 mA (or 0.0 mA) at minimum temperature. This function will measure the real output value at minimum temperature.
Be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!
After pressing PROG, three settings can be selected:
▪ CALIB: with this setting, the input will be calibrated with the actual "(0)4mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be more than the calibrated value before the signal will be processed.
▪ DEFAULT: with this setting, the manufacturers value is re-installed.
▪ CAL SET: to select the last calibrated value.</td></tr>
<tr><td>5.6</td><td>CALIBRATE HIGH
 
</td><td colspan="4">This setting is used to calibrate the input value for 20mA as the signal from the temperature sensor might not be exact 20.0 mA at maximum temperature. This function will measure the real output value at maximum temperature.
Be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!
After pressing PROG, three settings can be selected:
▪ CALIB: with this setting, the input will be calibrated with the actual "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 manufacturers value is re-installed.
▪ CAL SET: to select the last calibrated value.</td></tr>
</table>

3.3.7 EXPLANATION OF SETUP-MENU 6 – FORMULA

6	FORMULA	
6.1	EQUATIONS TYPE	This setting shows the formula. The type EL stands for Equations Liquid - flow computer for corrected liquid volume. The formula used: $\mathbf{Q_{normal} = Q * (1 + \alpha (T_{normal}))}$ Q_{normal} = calculated volume at reference conditions Q = measured volume α = thermal expansion coefficient T_{normal} = reference temperature T = line temperature
6.2	THERMAL EXPANSION COEFFICIENT	Program here the thermal expansion coefficient α in $*10^{-6}$ / K for the liquid used. The value to be entered must be multiplied with 1,000,000. Internally, it calculates with factor times 10^{-6}. The decimal position is fixed. With the default value of 0000.000 the volume correction is disabled. **Examples: Calculation of the thermal expansion coefficient** • α for water is 0.00031 per K. Enter: 0310.000 • α for petrol is 0.00110 per K. Enter: 1100.000
6.3	T-NORMAL (TEMPERATURE)	Program here the reference temperature T_{normal} with two decimals in Kelvin (K). In most applications, the liquid volume is calculated at 0°C which is 273.15K. The temperature compensation is disabled with value zero (0).

3.3.8 EXPLANATION OF SETUP-MENU 7 - ANALOG OUTPUT

An analog 4-20mA signal is generated according to the compensated flowrate with a 12 bits resolution. The settings for Flowrate (SETUP-menu 2) influence the analog output directly and should be configured first. The relationship between rate and analog output is set with the following functions.

7	ANALOG OUTPUT	
7.1	OUTPUT Note !	If the analog output is not used, it can be disabled to minimize power consumption to safe battery life. When the output is disabled, a current of about 2mA will be generated and the unit can still be supplied from this signal (provided a power supply is connected). The following can be selected: enable – disable *While powering-up the loop, the initial current is approx. 2mA. When the output is enabled, it can take a few seconds before the correct current is generated.*
7.2	RATE-MIN (4mA) Note !	Enter here the flowrate at which the output should generate the minimum signal (4mA) – in most applications at flowrate “0”. The number of decimals displayed depend upon SETUP 2.3. The time and measuring units (L/min for example) are dependent upon SETUP 2.1 and SETUP 2.2 and are displayed during editing. *If desired, you can program the analog output 'up-side-down'. The* 4mA *represents the maximum flow rate.* *For example do enter 800 L/min.*
7.3	RATE-MAX (20mA) Note !	Enter here the flowrate-at which the output should generate the maximum signal (20mA) – in most applications at maximum flow. The number of decimals displayed depend upon SETUP 2.3. The time and measuring units (L/min for example) are dependent upon SETUP 2.1 and SETUP 2.2 and are displayed during editing. *If desired, you can program the analog output 'up-side-down'. The 20*mA *represents the minimum flow rate.* *For example do enter 0 L/min.*

<table>
<tr><td>7.4</td><td>CUT-OFF</td><td colspan="5">A low flow cut-off can be set as a percentage of the full range of 16mA, e.g. to ignore leakage.
When the flow is less than the required rate, the current will be the minimum signal (4mA). Example:</td></tr>
<tr><td></td><td></td><td>RATE-MIN
4mA</td><td>RATE-MAX
20mA</td><td>CUT-OFF
%</td><td>REQUIRED RATE</td><td>OUTPUT</td></tr>
<tr><td></td><td></td><td>0 L/min</td><td>100 L/min</td><td>2%</td><td>(100-0)*2% = 2.0 L/min</td><td>4+(16*2%) = 4.32mA</td></tr>
<tr><td></td><td></td><td>20 L/min</td><td>800 L/min</td><td>3.5%</td><td>(800-20)*3.5%= 27.3 L/min</td><td>4+(16*3.5%)=4.56mA</td></tr>
<tr><td>7.5</td><td>TUNE MIN (4mA)
 
</td><td colspan="5">The initial minimum analog output value is 4mA. However, this value might differ slightly due to ambient influences such as temperature for example. The 4mA value can be tuned precisely with this setting.
Before tuning the signal, be sure that the analog signal is not being used for any application!
After pressing PROG, the current will be about 4mA. The current can be increased / decreased with the arrow-keys and is directly active. Press PROG to store the new value.</td></tr>
<tr><td>7.6</td><td>TUNE MAX (20mA)
 
</td><td colspan="5">The initial maximum analog output value is 20mA. However, this value might differ slightly due to ambient influences such as temperature for example. The 20mA value can be tuned precisely with this setting.
Before tuning the signal, be sure that the analog signal is not being used for any application!
After pressing PROG, the current will be about 20mA. The current can be increased / decreased with the arrow-keys and is directly active. Press PROG to store the new value.</td></tr>
<tr><td>7.7</td><td>FILTER</td><td colspan="5">This function is used to stabilize the analog output signal.
The output value is updated 8 times per 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.</td></tr>
<tr><td></td><td rowspan="2">FILTER VALUE</td><td colspan="4">RESONSE TIME ON STEP CHANGE OF ANALOG VALUE (% OF END VALUE)</td></tr>
<tr><td></td><td>50%</td><td>75%</td><td>90%</td><td>99%</td></tr>
<tr><td></td><td>01</td><td>filter disabled</td><td>filter disabled</td><td>filter disabled</td><td>filter disabled</td></tr>
<tr><td></td><td>02</td><td>0.1 sec</td><td>0.2 sec</td><td>0.4 sec</td><td>0.7 sec</td></tr>
<tr><td></td><td>03</td><td>0.2 sec</td><td>0.4 sec</td><td>0.6 sec</td><td>1.2 sec</td></tr>
<tr><td></td><td>05</td><td>0.4 sec</td><td>0.7 sec</td><td>1.1 sec</td><td>2.1 sec</td></tr>
<tr><td></td><td>10</td><td>0.7 sec</td><td>1.4 sec</td><td>2.2 sec</td><td>4.4 sec</td></tr>
<tr><td></td><td>20</td><td>1.4 sec</td><td>2.8 sec</td><td>4.5 sec</td><td>9.0 sec</td></tr>
<tr><td></td><td>30</td><td>2.1 sec</td><td>4 sec</td><td>7 sec</td><td>14 sec</td></tr>
<tr><td></td><td>50</td><td>3.5 sec</td><td>7 sec</td><td>11 sec</td><td>23 sec</td></tr>
<tr><td></td><td>75</td><td>5.2 sec</td><td>10 sec</td><td>17 sec</td><td>34 sec</td></tr>
<tr><td></td><td>99</td><td>6.9 sec</td><td>14 sec</td><td>23 sec</td><td>45 sec</td></tr>
</table>

3.3.9 EXPLANATION OF SETUP-MENU 8 – PULSE

The pulse output menu configures the behavior of the digital output signals. As standard, one transistor output is available (Type OT): D1. Its function is based on the selected mode at SETUP 8.1.
Optionally, one relay output is available (Type OR): D5. The output functionality of this output corresponds to the functionality of output D1.

- *The digital (transistor) output D1 has a maximum frequency of 500Hz.*
- *Be sure that the output frequency of the optional digital (relay) output D5 does not exceed 0.5Hz, else the relay life time and reliability will be reduced significantly.*

8	PULSE OUTPUT	
8.1	MODE	The following modes of operation are available for the digital outputs: • **Disabled:** the output is switched-off. • **Scaled: e**very time the compensated accumulated total has increased with the AMOUNT set at SETUP 8.3, a pulse will be sent on the output with the WIDTH set at SETUP 8.2. • **Retransmit:** the unscaled incoming pulse from the flowmeter is retransmitted on the output. Note ! *The **retransmit mode** is often used when sinus / non-square wave input signals are present (e.g. coil signals) that need to be transmitted as robust square wave forms.*
	Note !	*When "retransmit" is selected, SETUP 8.2 and SETUP 8.3 will disappear.*
8.2	WIDTH	When scaled pulse output is selected, the pulse width determines the time that the output will be active; in other words the pulse duration. The pulse width is set in milliseconds in the range 0.001 – 9.999 sec. The value "zero" will disable the pulse output. Note ! *The scaled pulse signal always has a 50% duty cycle, hence the minimum time between the pulses is equal to the pulse width setting. If the frequency should go out of range – when the flowrate increases for example – an internal buffer will be used to "store the missed pulses": As soon as the flowrate slows down, the buffer will be "emptied".* *It might be that pulses will be missed due to a buffer-overflow, so it is advised to program this setting within its range!*
8.3	AMOUNT	One pulse is generated every X-quantity measured. If for example you want 100 pulses per gallon: do enter 0.01 GAL (this means one pulse every 0.01 GAL, so 100 pulses per gallon). Note ! *After pressing PROG, the decimal point will be flashing. The decimal position can be changed now by pressing the ▲-key.*

3.3.10 EXPLANATION OF SETUP-MENU 9 - COMMUNICATION (OPTION)

The E126-P-EL can optionally be equipped with a communication interface using the Modbus protocol (Type CB/CH/CU). Please consult Appendix C for a more detailed explanation of the protocol, data types and available registers.

9	COM-MODB	
9.1	SPEED	This setting is used to set the baud rate and should match the speed used on the communications bus. The following communication speeds can be selected: 1200 – 2400 – 4800 – 9600 – 9600HP – 19200 – 38400 Note ! *Communication speeds from 9600HP and upwards are more power consuming. When used with battery power, it is advised to set the speed at 9600 or lower.*
9.2	ADDRESS	This setting is used to configure the bus address of your device on the communications bus. This address can vary from 001-247.
9.3	MODE	This setting is used to configure the Modbus communication mode of your device on the communications bus. The following modes can be selected: ASCII –RTU – OFF
9.4	DATABITS	This setting is used to configure the number of data bits and should match the number used on the communications bus. Select 8 bit for Modbus RTU and 7 or 8 bits for Modbus ASCII.
9.5	PARITY	This setting is used to configure the parity mode and should match the parity mode used on the communications bus. Available settings are ODD – EVEN – NONE

3.3.11 EXPLANATION OF SETUP-MENU 10 – OTHERS

10	OTHERS	
10.1	MODEL	For support and maintenance it is important to have information about the characteristics of the E126-P-EL. 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.
10.2	SOFTWARE VERSION	
10.3	SERIAL NO.	
10.4	TIME	This setting can show and set the system clock. The system clock is used by the Daily Total feature to detect that the contract hour (SETUP 1.6) is reached. The format is HH.MM.SS in 24 hour notation.  Note ! *The accuracy of the system clock is limited and in case of a power-down, the clock will be interrupted as well. When the unit is powered up again and the Daily Total feature is enabled, the display will immediately ask the operator to enter the correct system time.*  Caution ! **Without an initialized clock, all measurements and calculations are performed as normal.** **However, when the Daily Total feature is enabled, the detection of contract hour and updating the Current and Previous Day Totals will not be done at the correct time.**
10.5	PASSWORD	All SETUP values can be password protected. This protection is disabled with value 0000 (zero). A 4 digit password can be programmed, for example 1234.
10.6	KEY LOCK	To avoid undesired use of the optical keyboard it can be locked automatically after 30 seconds by enabling this function.  Caution ! **In battery supplied applications, activation of the keyboard can trigger the backlight to come on. Since regular false triggers can wear out the battery quite quickly, it is advised to leave the keyboard lock function enabled so the backlight only comes on when any of the optical keys is detected for at least 1 second. The keyboard lock function also uses less battery power.**
10.7	TAG-NO	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

Caution !

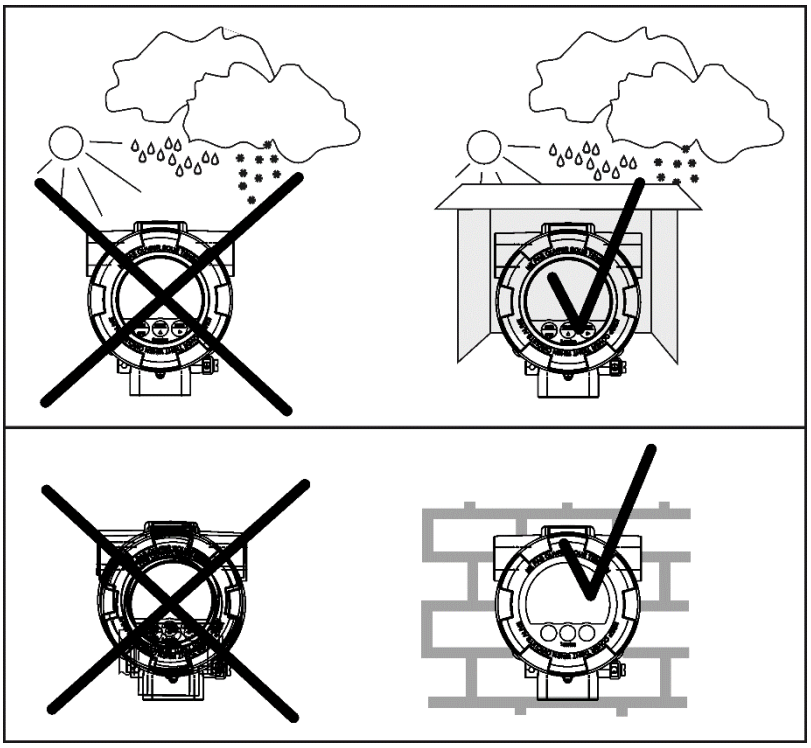
Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.

The E126-P-EL 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 IP66 / IP67 / TYPE 4X casing should NEVER be exposed to strongly varying (weather) conditions.

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 E126-P-EL on a solid structure to avoid vibrations.

Relative humidity:	< 90% RH
Outdoor use:	suitable for outdoor use
IP and NEMA rating:	IP66, IP67 and NEMA Type 4X
Supply voltage fluctuation:	+/- 10% unless stated otherwise
Means of protection:	Class I
Over-voltage category:	II
Pollution degree:	2 (internal environment), 3 (external environment)
Ambient temperature:	-40 °C to +70 °C, -40 °F to + 158 °F
Altitude:	up to 2000 m

4.3 MECHANICAL INSTALLATION

SPECIAL CONDITIONS FOR SAFE USE

- The painted aluminum enclosure shall be installed in such a way that danger of ignition due to electrostatic discharge is avoided.
- Possible electrostatic hazard – clean only with a moist cloth. Use only in fixed installations and do not place in areas with rapid airflow.

4.3.1 DIMENSIONS – ENCLOSURE

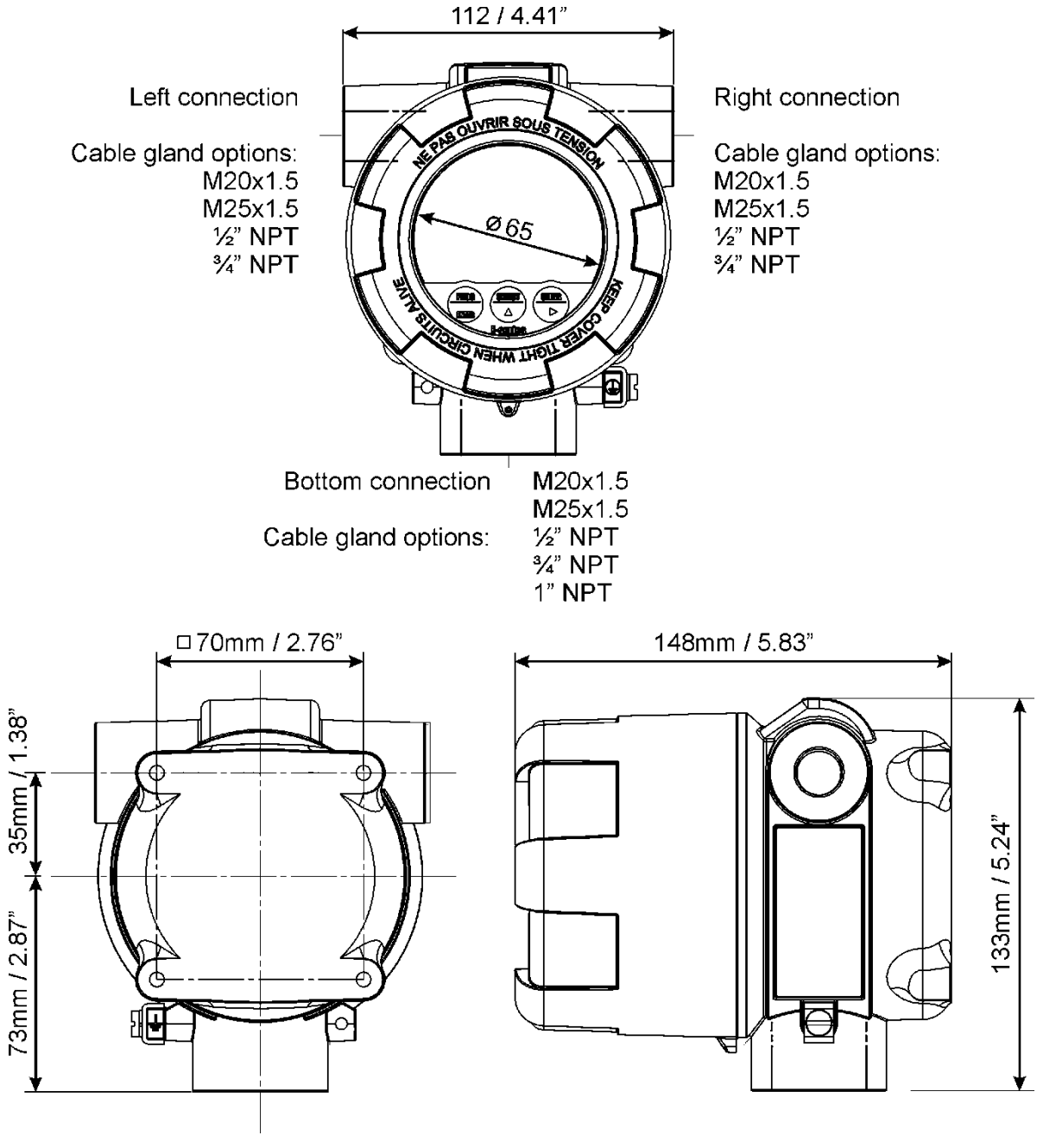


Fig. 9: Dimensions – Aluminum / Stainless Steel enclosures.

4.3.2 MOUNTING

Note !

The display inside the enclosure can be installed in four positions:
0°; 90°; 180°; 270°, so the enclosure can be installed in four positions.

The enclosure can be installed on a wall by using the mounting plate (accessory) or pipe mounted with the bracket and hose clamps (accessory).

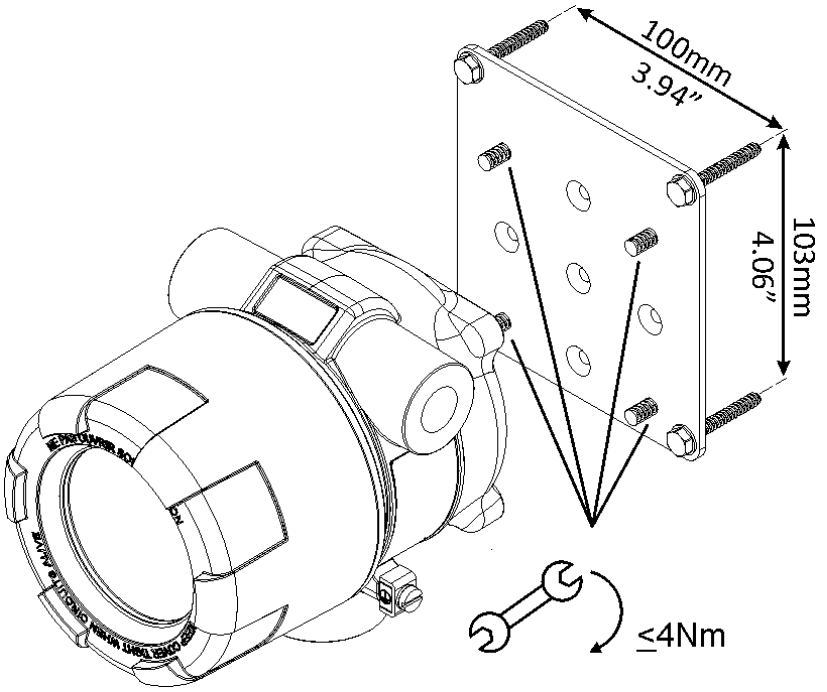


Fig. 10: Installation – Plate mounted

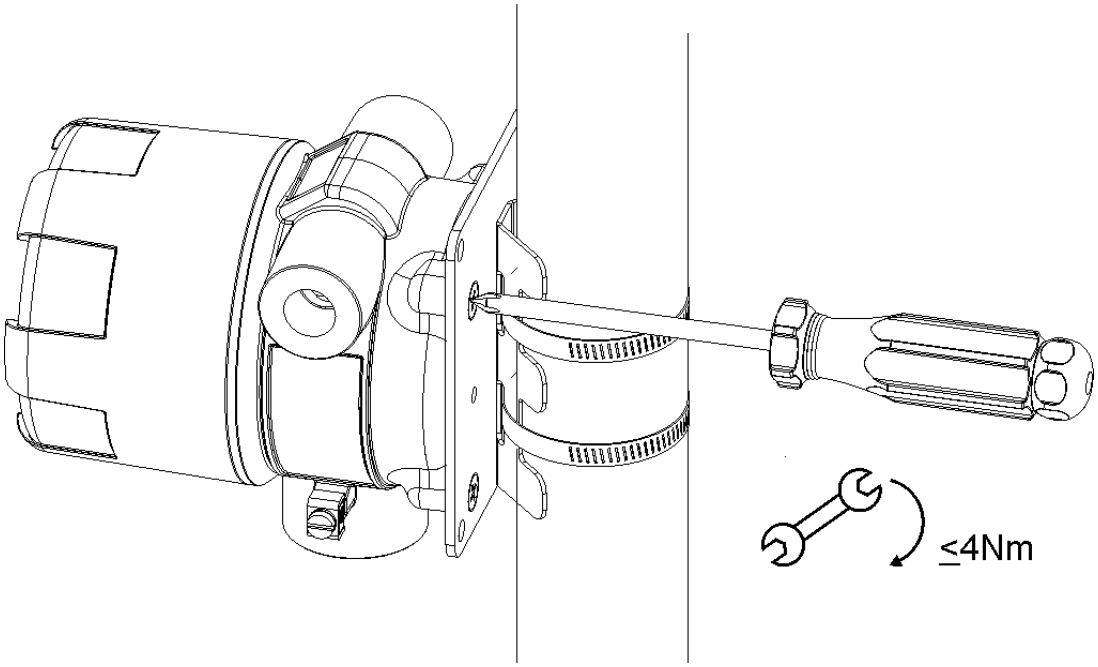


Fig. 11: Installation – Pipe mounted

4.3.3 SEALING CONDUITS / ENCLOSURE

- For FM Group A,B,C,D : “SEAL ALL CONDUIT ENTRIES WITHIN 18 INCHES”.
- For CSA group B,C,D: “SEAL ALL CONDUIT ENTRIES WITHIN 18 INCHES”.
- For CSA group A: “FOR GROUP A SEAL AT ENCLOSURE WALL”

4.3.4 FLAMEPROOF JOINTS

- Clause 5: EN/IEC 60079-1:2007 (Use certified / Ex d cable glands).
- All flameproof joints are designed for:
  - Volume 500 < V ≤ 2000 cm³;
  - Group IIC enclosures.

There are 4 types of joints between inner and outside of the E-type enclosure which are flameproof:

1. The cement between glass and cover (length ≥10mm)
2. Thread between body/cover M100x1.5 (Tolerance 6g/6H min. 8 full threads engaged)
3. Thread for conduit opening left and right:
   - M20 x 1.5, M25 x 1.5, (for metric: Tolerance 6g/6H min. 8 full threads engaged);
   - ½ NPT, ¾ NPT. (for NPT: Tolerance ANSI/ASME B1.20.1).
4. The process opening:
   - M20 x 1.5, M25 x 1.5 (for metric: Tolerance 6g/6H min. 8 full threads engaged);
   - ½ NPT, ¾ NPT, 1 NPT (for NPT: Tolerance ANSI/ASME B1.20.1);
   - All NPT threads (cable entry openings) are in accordance with ANSI/ASME B1.20.1.
   - All Metric threads (cable entry openings, thread between body and cover and threaded holes for feed thru capacitors) are in accordance with fit class 6g/6H (ISO 965-1 + 965-3).

When installed according to this manual, this product will meet the directives and standards as listed in Appendix A of this manual.

4.3.5 CONNECTION TO OTHER ENCLOSURES

The E-series can be connected to another Ex d enclosure following the compulsory conditions below:

- The part which is used for the connection between the two volumes must be Ex d certified;
- The connected enclosure must be Ex d certified with its own electrical equipment inside (i.e. pickup coil or other sensors);
- For the short cylinder version, the volume of empty space inside this added volume must not represent more than 13,5 cm³;
- There may be no generation of heat in the added enclosure;
- There may be no added electrical energy in the added enclosure; any energy which comes from the E-series is already taken into account in the E-series certificate.

4.4 ELECTRICAL INSTALLATION

DO NOT OPEN AN INSTALLED ENCLOSURE WHEN CIRCUITS ARE ALIVE.
For battery supplied equipment:
DO NOT OPEN WHEN AN EXPLOSIVE GAS ATMOSPHERE IS PRESENT.

- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the E126-P-EL, the installer has to discharge himself by touching a well-grounded object.
- The E126-P-EL must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).

- When installed in a potentially explosive atmosphere that requires apparatus of equipment protection level Gb and Db, 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 aluminum/steel is excluded.
- Do ground the aluminum / stainless steel enclosure properly with a PE wire as indicated to the Protective Earth terminal.
- The installation must comply with national requirements (e.g. in Canada, the Canadian Electrical Code, C22.1, Part 1 and in USA, the National Electrical Code, NFPA 70 and ANSI/ISA-RP 12).

- Use Ex-d cable glands with effective IP67 (TYPE4X) seals for the cables used;
- For unused cable entries fit Ex-d blind plugs with effective IP67 (TYPE4X) seals;
- Make a reliable ground connection to the metal enclosure.;
- Use only an effective screened cable for the input signal, and grounding of its screen to terminal S1 (GND) AND to the enclosure or at the sensor itself, whichever is appropriate to the application. Be careful not to create ground loops!
- Without thermal separator, the process temperature shall not exceed the specified maximum ambient temperature;
- When the enclosure temperature exceeds 70 °C / 158 °F, apply suitable cable and gland for this temperature;
- The cable entry plugs mounted into the enclosure shall comply with the requirements of the type of protection used.
- Make sure to apply proper internal and external grounding to PE terminals as indicated in below figure by the arrows.
  Use following wiring for PE terminal: Stranded conductor:4 mm², Single conductor: 6 mm².

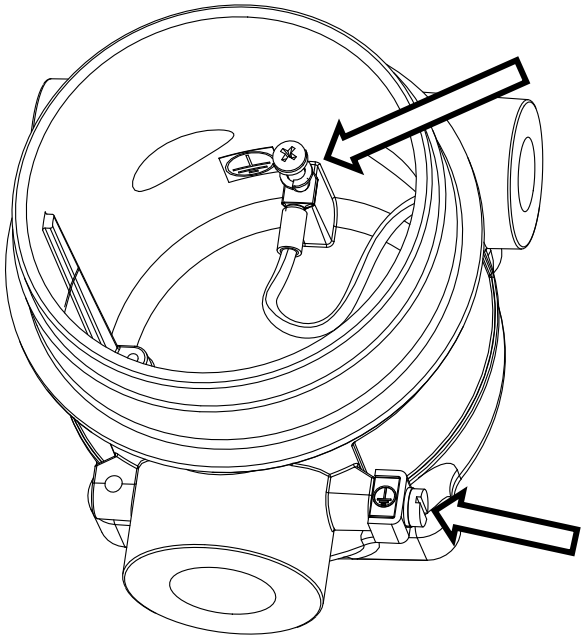


Fig. 12: Grounding enclosure

4.4.1 ELECTRICAL SAFETY

Please consult the table with environmental conditions and safety parameters shown at the beginning of this chapter.

- All wiring must be in accordance with local codes and regulations.
- In case this instrument is connected to a supply by means of a permanent connection a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.
- Except for the relay outputs R8 to R11 all connections to the unit shall be low voltage defined as “SELV” circuit per IEC 60950-1.
- The equipment shall be supplied from a “SELV” circuit defined as per IEC 60950-1.
- A suitable power supply should be considered in end-use equipment. The power supply must be in compliance with a limited-energy circuit (maximum available current of 8 A). If the power supply cannot be in compliance with a limited-energy circuit:
- For safety install an overcurrent protection device (such as fuse) with adequate breaking capacity close to the instrument.
  - Fuse type: Time-lag fuse (Approved fuse according to IEC60127-2 and/or UL248-14)
  - Fuse rating: Rated current: 5 A
- The installation must comply with national requirements (e.g. in Canada, the Canadian Electrical Code, C22.1, Part 1 and in USA, the National Electrical Code, NFPA 70, Article 500-series and ANSI/ISA-RP 12).

The following supply ratings apply for the various installed options within the E-series product. This allows for suitable selection of the power supply and overcurrent protection.
(not mentioned options implies no or neglectable influence on the ratings)

Installed option	Input	Supply Voltage range	Maximum supply current	Remark
PD	P6	24-27Vdc	110 mA	With 2xOR option
PD	P2	9-27Vdc	75 mA	Without OR option
PX	P2	9-27Vdc	50 mA	Without OR option
PB	Battery connector	Typical 3.6V. Only use Fluidwell replacements	10 mA	Without OR option
AH	A1/A2	11-27Vdc	25 mA	AH only not suitable for OR

If a combination of inputs is used, use the maximum value mentioned!

The output relay (OR option) is of type SPST and has the following contact ratings:

Load type & Voltage	Current
Maximum resistive load at 30 Vdc, 125 Vac or 250 Vac.	Max. 2 A
Maximum inductive load (for pilot duty applications) at 30 Vdc, 125 Vac or 250 Vac.	Max. 0.5 A

4.4.2 VOLTAGE SELECTION SENSOR SUPPLY

Type PB / PX – Pickup element supply
Terminal S3 provides a limited supply voltage of 3.2 V DC (coil signals 1.2V) for the signal output of the flowmeter. Output impedance is 2700 ohms, power is limited to 3.3 mW under short circuit conditions.

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 (type PB). 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: Sensor supply: 8.2V – 12V or 24 V (Vin P2 minus 1V) DC
With this option, a supply derived from the input supply becomes available. The output voltage of P3 can be adjusted by means of switches J1 and J2 on the back of the PCB (see figure 12). See the label or **Appendix A**, section **"Sensor excitation"**, for the exact ratings of terminal P3.

Note !

- 8.2V DC supply requires an input voltage of 9-27V, maximum output current: 20mA;
  12V DC supply requires an input voltage of 13-27V, maximum output current: 30mA;
  24V DC supply = V-input – 1V (max 27V), maximum output current: 75mA.
- The output is protected against overload. In case of an overload also the functionality of the E126-P-EL is affected!

The voltage is selected with the two switches at the rear of the Main Electronics Module (MEM).
The switches are located at the bottom center (type PD):

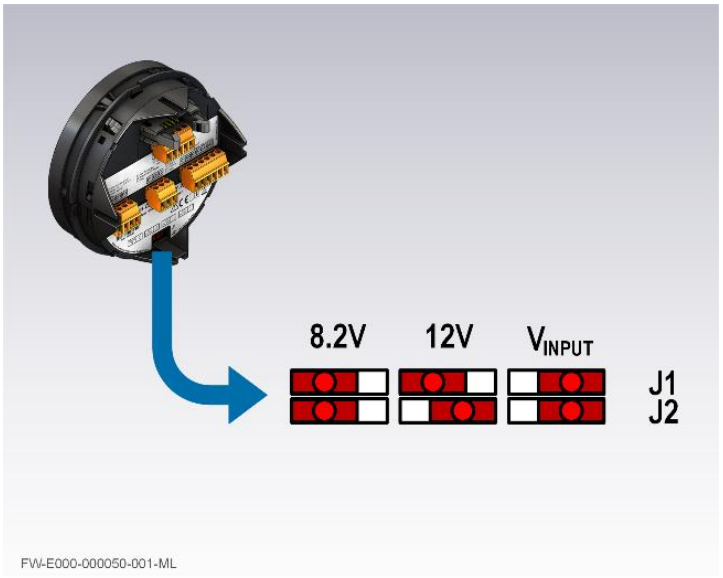


Fig. 13: Voltage selection – Sensor supply (P3)

4.5 TERMINAL CONNECTORS – MAIN ELECTRONICS MODULE

The following terminal connectors are available for the Main Electronics Module (MEM):

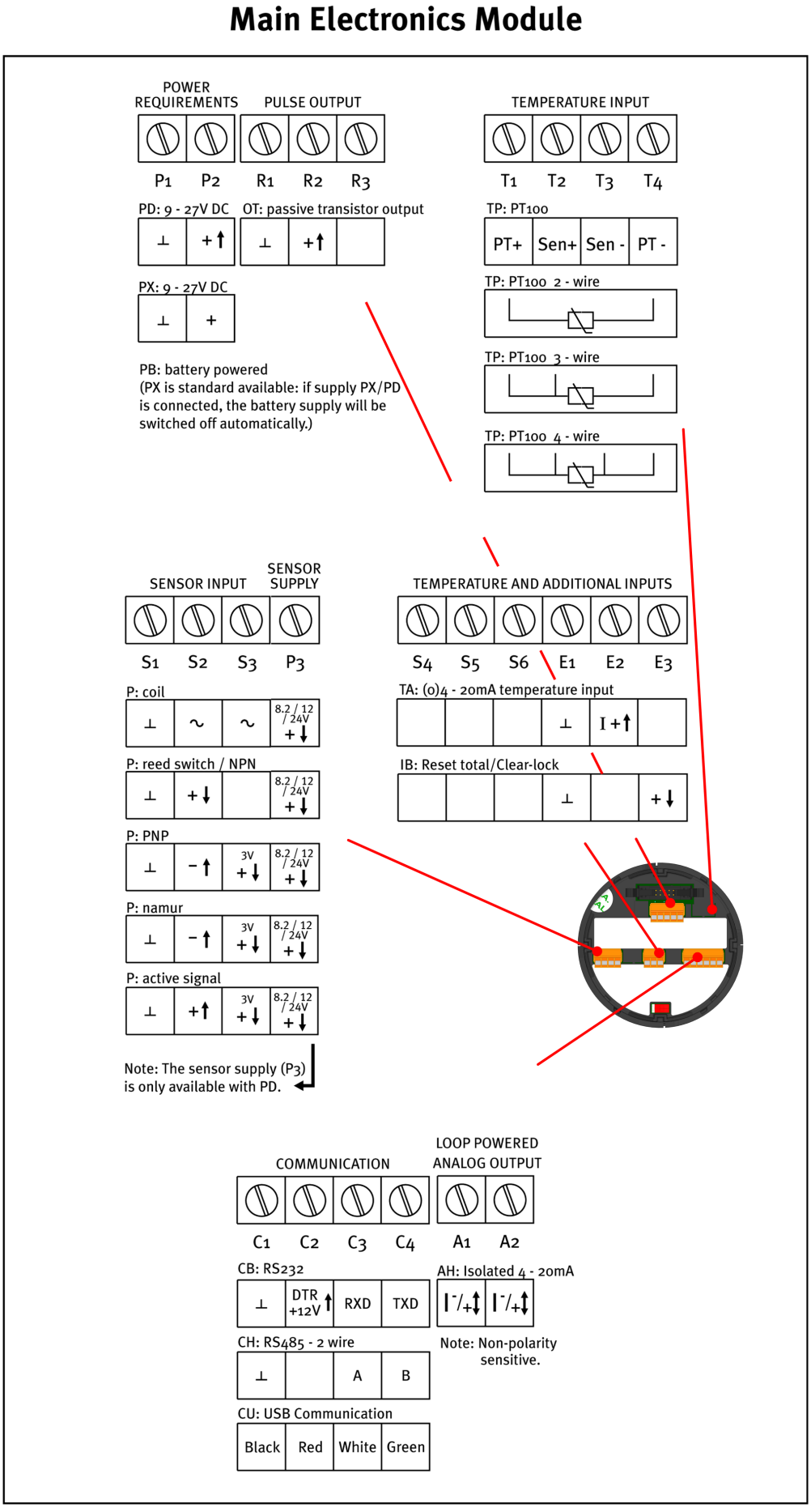


Fig. 14: Terminal connectors MEM – standard and options

The following terminal connectors are available for the option OR – Mechanical relays (RSM Relay Supply Module):

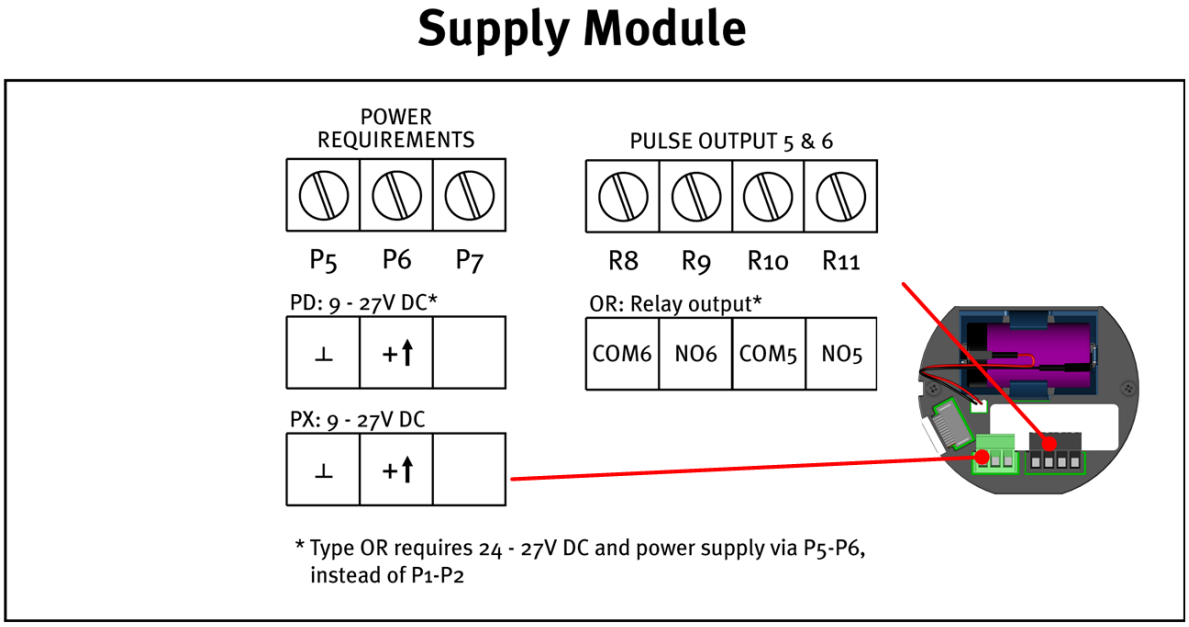


Fig. 15: Terminal connectors RSM

4.6 TERMINAL CONNECTIONS

4.6.1 TERMINAL P1-P2 AND P5-P6: POWER SUPPLY – TYPE PD/PX

Connect an external power supply of 9-27VDC to these terminals.

When power is applied to these terminals, discharge of the (optional) internal battery will be disabled. See also 4.4.2: VOLTAGE SELECTION SENSOR SUPPLY.

Power requirements for sensor supply P3:

- 8.2V sensor supply requires 9-27V;
- 12V sensor supply requires 13-27V;
- 24V = V-input – 1V (max 27V).

4.6.2 TERMINAL R1-R2 AND R10-R11: DIGITAL OUTPUTS D1 AND D5

The functionality of the digital outputs is programmed through the PULSE menu (SETUP-menu 9). See paragraph 3.3.9 for more details.

Note !

- *The digital (transistor) output D1 has a maximum frequency of 500Hz.*
- *Be sure that the output frequency of the optional digital (relay) output D5 does not exceed 0.5Hz, else the relay life time and reliability will be reduced significantly.*
- *When **retransmit mode** is selected in the PULSE MODE menu (SETUP 9.1), only Type OT output D1 (on terminals R1-R2) will retransmit the frequency of the flowmeter signal. In all other modes, Type OR output D5 will follow output D1.*

Type OT
One passive transistor output (D1) is available with a maximum pulse frequency of 500Hz. Max. driving capacity 300mA@50V DC.

Note !

With type OT:

- *Terminals R1 and R3 are common ground (GND) terminals.*
- *When **retransmit mode** is selected the minimum on and off-time is 50µs.*

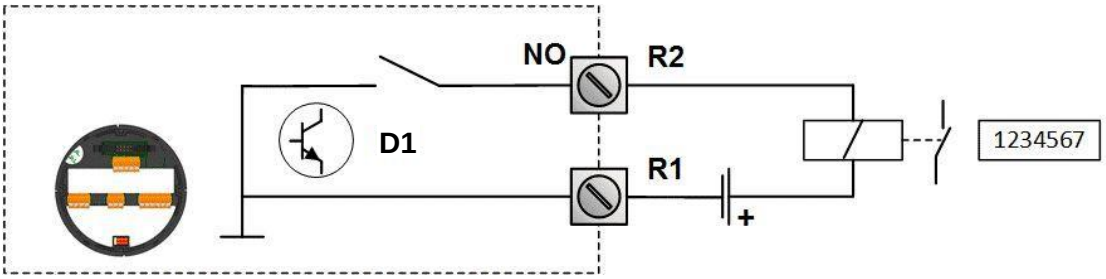


Fig. 16: Terminal connections –Transistor output D1

Type OR
One mechanical normally open relay output (D5) is available with a maximum pulse frequency of 0.5Hz. Max. switch power 240V 0.5A per output.

Note !

With type OR:

- *Use power supply terminals P5-P6.*
- *The required supply voltage is 24 - 27V DC!*
- *Be sure that the output frequency does not exceed 0.5Hz, else the relay life time and reliability will be reduced significantly.*
- *The output functionality of digital output D5 corresponds to the functionality of digital output D1.*
- ***When retransmit mode is selected, the relays are not activated.***

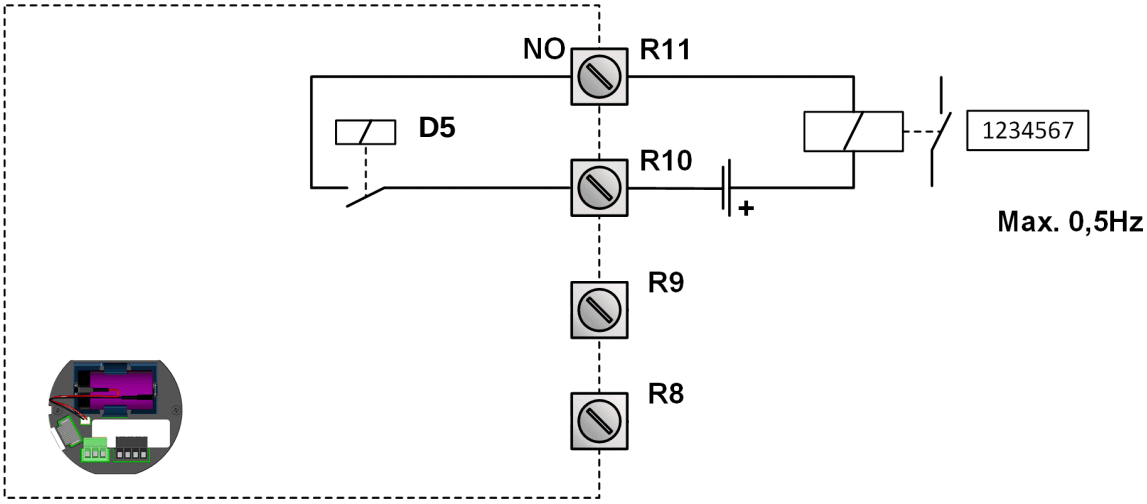


Fig. 17: Terminal connections – Mechanical relay output D5

4.6.3 TERMINAL S1-S3; FLOWMETER INPUT

Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or sine-wave (coil). The screen of the signal wire must be connected to the common ground terminal (unless earthed at the sensor itself).

The sensor output of the flowmeter should match with the selected flowmeter input signal at SETUP 4.1. See paragraph 3.3.5 for more information.

Sine-wave signal (Coil)
The E126-P-EL is suitable for use with flowmeters which have a coil output signal.
Two sensitivity levels can be selected with the SETUP-function:

- COIL LO: sensitivity 90mVpp.
- COIL HI: sensitivity 20mVpp.
- Type ZF offers for setting COIL HI: sensitivity 10mVpp.
- Type ZG offers for setting COIL HI: sensitivity 5mVpp.

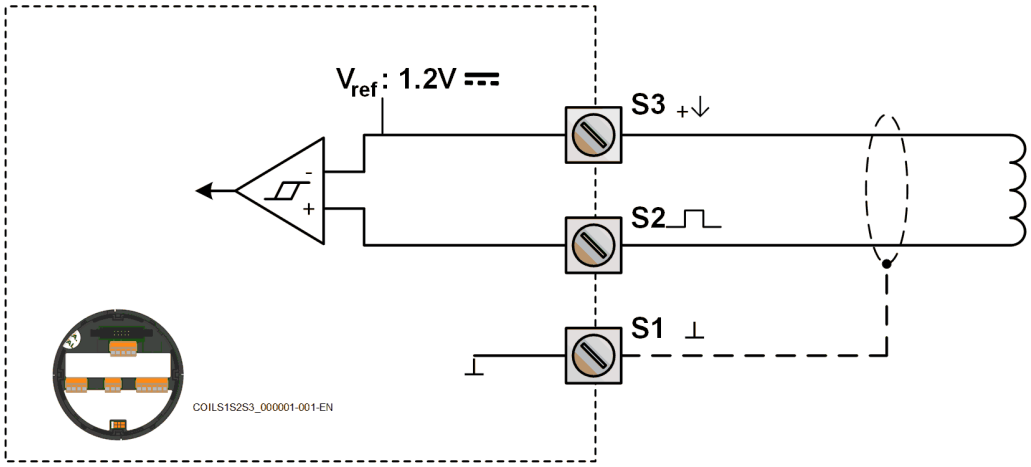


Fig. 18: Terminal connections – Coil signal input

Pulse-signal NPN / NPN-LP
The E126-P-EL is suitable for use with flowmeters which have a NPN output signal. For reliable pulse detection, the signal should be above 1.4V or below 1.0V under all circumstances. It is advised to use a sensor which is normally open and is closed for a small time (less power consumption). For better noise immunity and if no high sensor input frequencies are expected it is advised to select signal setting NPN-LP – low-pass signal noise filter which limits the maximum input frequency, to avoid pulse bounce (see paragraph 3.3.5 for more information).

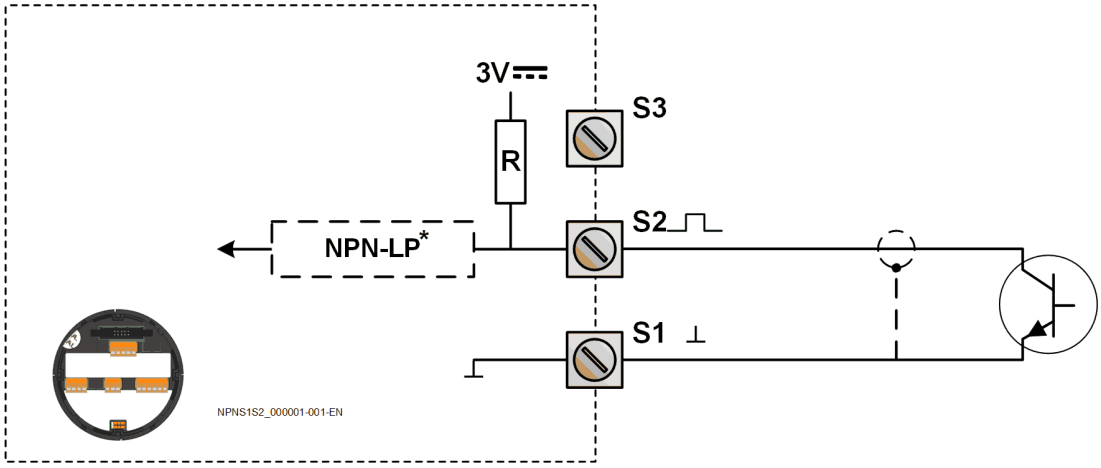


Fig. 19: Terminal connections – NPN signal input

Pulse-signal PNP / PNP-LP

The E126-P-EL is suitable for use with flowmeters which have a PNP output signal. 3.0V is offered on terminal S3 which has to be switched by the sensor to terminal S2 (SIGNAL). For reliable pulse detection, the signal should be above 1.4V or below 1.0V under all circumstances. It is advised to use a sensor which is normally open and is closed for a small time (less power consumption). For better noise immunity and if no high sensor input frequencies are expected it is advised to select signal setting PNP-LP – low-pass signal noise filter which limits the maximum input frequency, to avoid pulse bounce (see paragraph 3.3.5 for more information).

A sensor supply voltage of 8.2, 12 or 24V DC can be provided with power supply type PD.

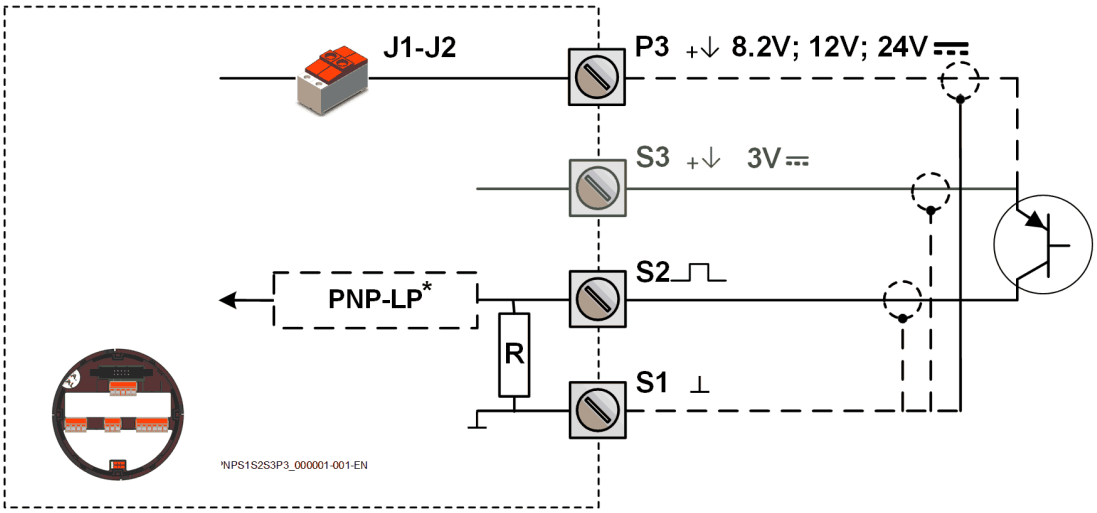


Fig. 20: Terminal connections – PNP signal input

Reed-switch

The E126-P-EL is suitable for use with flowmeters which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP – low-pass noise filter, which limits the maximum input frequency (see paragraph 3.3.5 for more information). Make sure the contact resistance of the reed switch is less than 1V@2uA=500k Ohm.

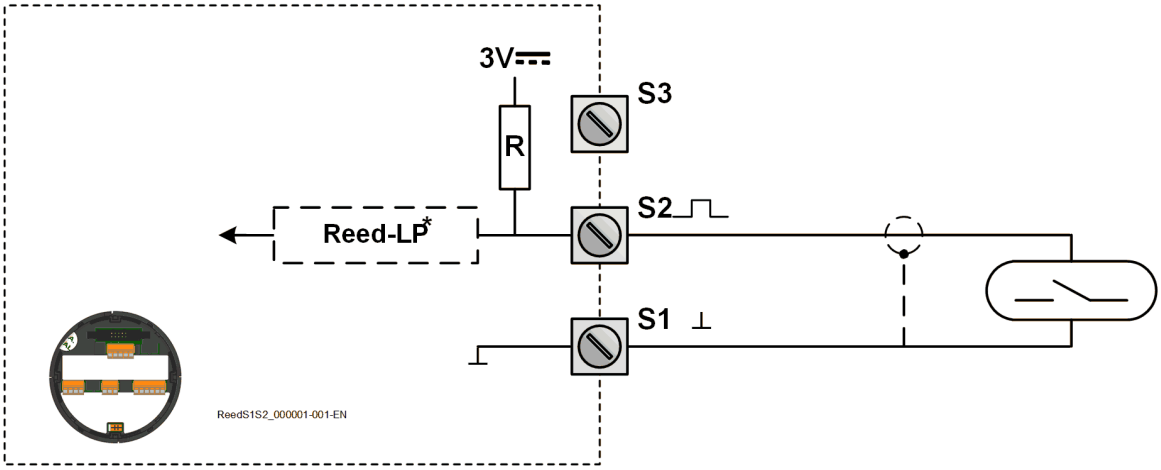


Fig. 21: Terminal connections – Reed-switch signal input

NAMUR-signal

The E126-P-EL is suitable for flowmeters with a NAMUR signal. The standard E126-P-EL-PX is not able to power the NAMUR sensor. If required the NAMUR sensor can be supplied via the 8.2V sensor supply (terminal P3), only available with power supply type PD. See paragraph 3.3.5 for more information.

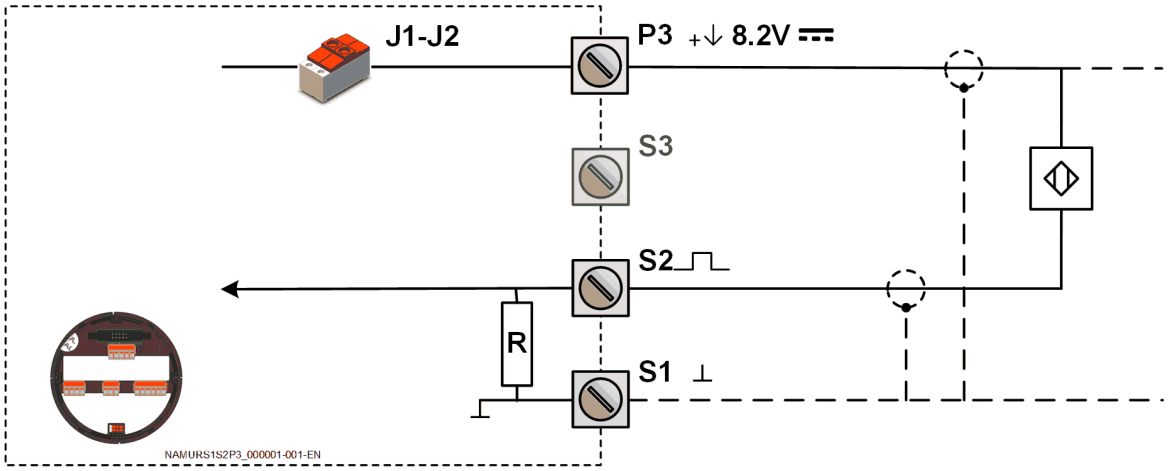


Fig. 22: Terminal connections – NAMUR signal input

Active signals 8.2V and 24V

The E126-P-EL is suitable for flowmeters with an Active signal. The detection levels are about 50% of the selected supply voltage; approximately 4V (ACT_8.1) or 12V (ACT_24). See paragraph 3.3.5 for more information.

Active signal selection may be desired in the case of power supply type PD being supplied for sensor supply.

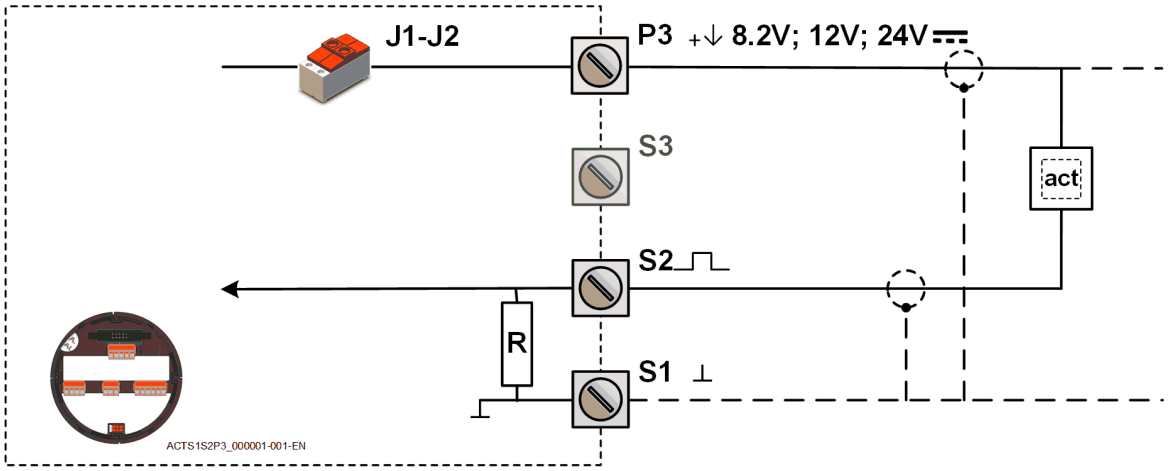


Fig. 23: Terminal connections – Active signal input

4.6.4 TERMINAL T1-T4: TEMPERATURE INPUT – TYPE TP: PT100

The E126-P-EG type TP requires a PT100 element (RTD) as temperature sensor. The E126-P-EG uses the *International Temperature Scale of 1990 Temperature vs Resistance table* (ITS-90) to calculate the measured temperature. See paragraph 3.3.6 for configuring the temperature input.

The sensor can be connected in 2, 3 or 4 wire configuration, as indicated in the figure below.

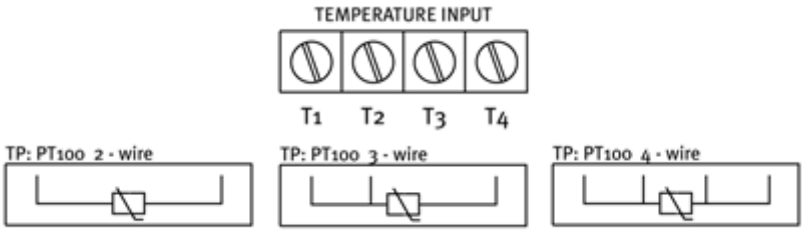


Fig. 24: Terminal connections – Type TP: PT100 (resistance) temperature input

4.6.5 TERMINAL E1-E2: TEMPERATURE INPUT – TYPE TA: (0)4-20MA

The E126-P-EL type TA requires a (0)4-20mA signal from the temperature sensor. The input is not isolated. See paragraph 3.3.6 for configuring the temperature input.

When the sensor supply voltage P3 is set to 24V, this voltage can also be used to power the temperature sensor.

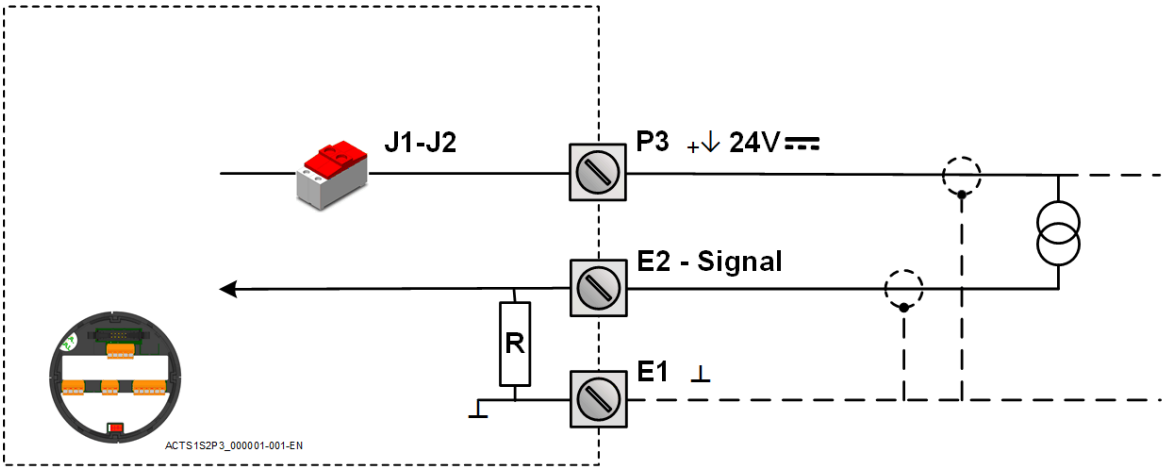


Fig. 25: Terminal connections – Type TA: (0)4-20mA temperature input (typical)

4.6.6 TERMINAL E1-E3: EXTERNAL RESET WITH CLEAR-LOCK – TYPE IB

With this function the total can be reset to zero with an external switch. The total resets at the moment a falling edge is detected (the moment the switch *closes)*.

To disable the function ”Clear Total” through the glass (IR keys - see chapter 2), keep this input closed.

Make sure the contact resistance of the switch is less than 0.8V@2uA=400k Ohm. A reset pulse should last for at least 200ms

The input must be switched with a normally open contact to GND.

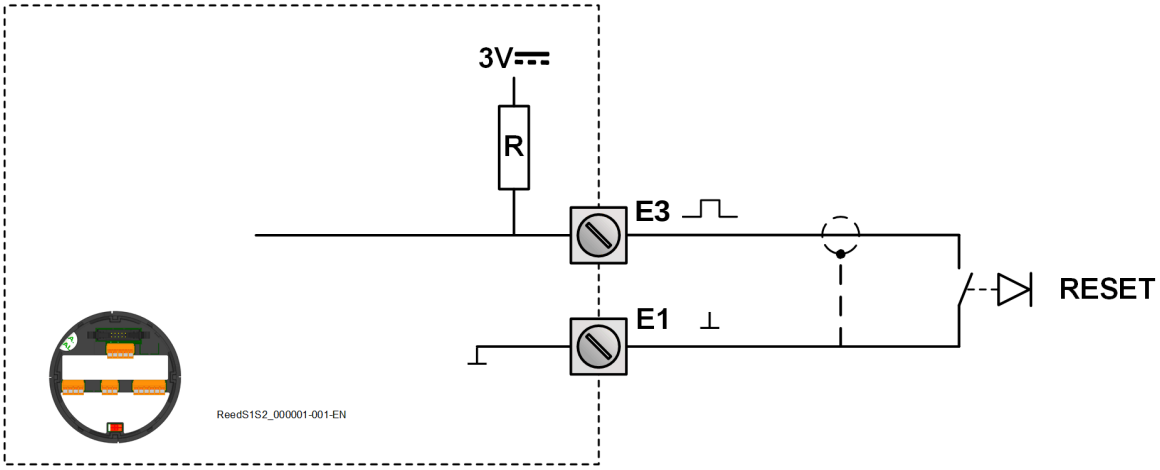
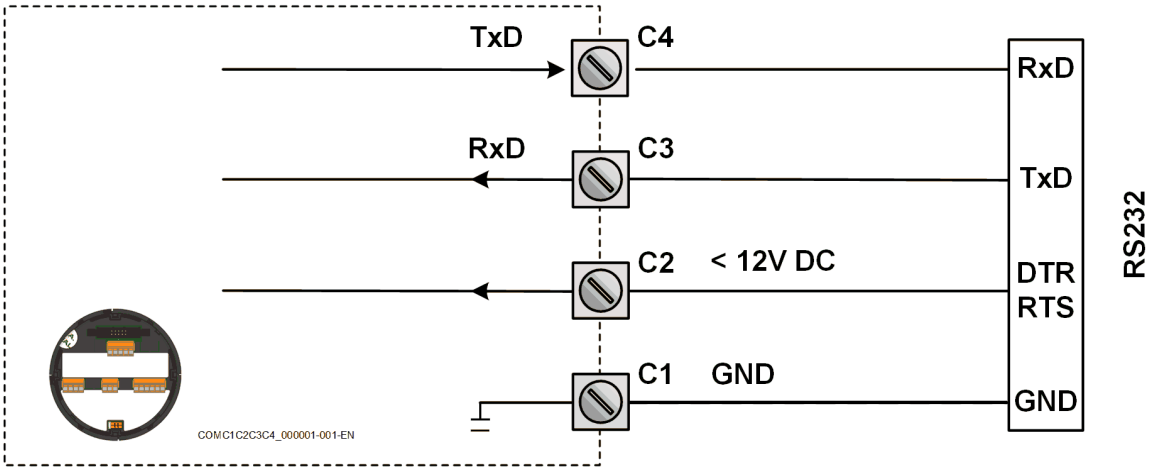


Fig. 26: Terminal connections – External reset input

4.6.7 TERMINAL C1-C4: COMMUNICATION RS232/RS485/USB (OPTION) – TYPE CB/CH/CU

Serial communications on hardware layers RS232 (length of cable max. 5 meters), RS485 (length of cable max. 1200 meters) and USB (length of cable max. 5 meters) are possible. Make sure that the hardware layer specific requirements are met to achieve reliable communication.

Read the Modbus communication protocol and Appendix C.



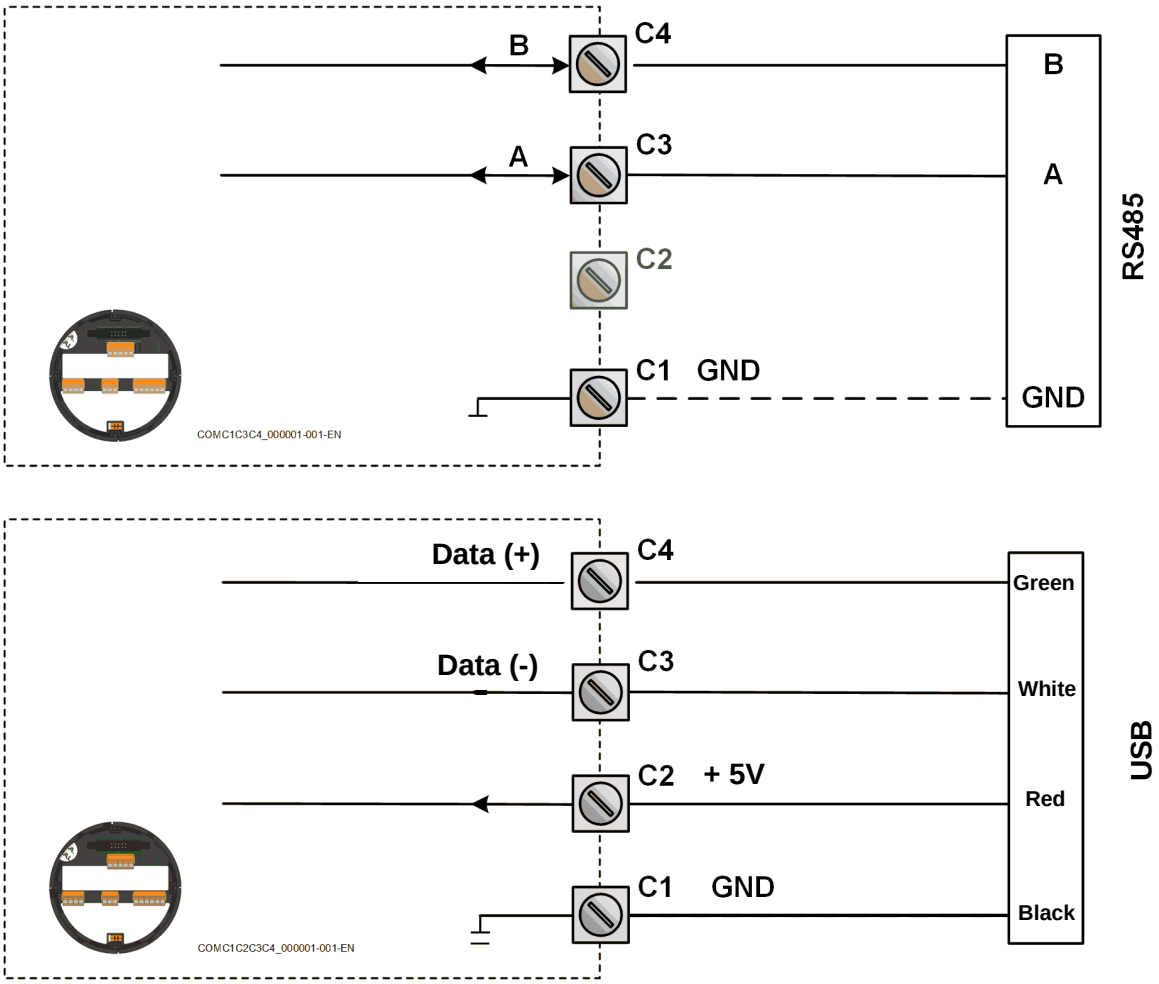


Fig. 27: Terminal connectors – Communication connector overview.

When using the RS232 communication option, terminal C2 must be used for supplying the interface. Please connect the DTR (or the RTS) signal of the interface to this terminal and set it active (current limited +12V). If no active signal is available it is possible to connect a separate supply between terminals C1 and C2 with a voltage between 6V and 10V.

4.6.8 TERMINAL A1-A2 ISOLATED ANALOG OUTPUT - TYPE AH

The flowrate proportional output (AH) is standard available. This output is an isolated 4-20mA output with the possibility to power the device via the 4-20mA loop. It is Non-polarity sensitive.

When the output is disabled, the current is by default limited to 2mA. Max. driving capacity 1000 Ohm @ 27V DC. If only powered by the loop the backlight will not be activated.

The total loop resistance may not exceed 1000 Ohm and may not be less than 330 Ohm (at 30mA). This makes that the resistance of other loop-devices in total may not exceed 670 Ohm.
E.g. 18Vdc allows 250 Ohm.

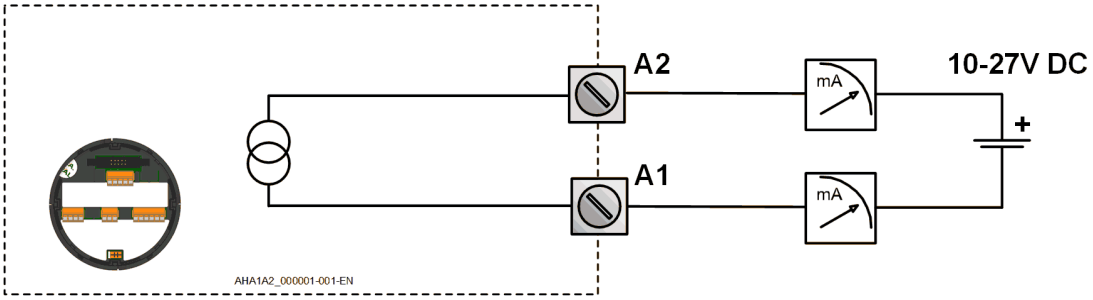


Fig. 28: Terminal connections – Isolated 4-20mA analog output

5 MAINTENANCE

5.1 GENERAL DIRECTIONS

- Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions. Take careful notice of the “Safety rules, instructions and precautionary measures” in the front of this manual.
- The E126-P-EL 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.

The E126-P-EL 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 E126-P-EL 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.

Due to incompatibility do not use silica gel in environments where Hydrogen fluoride, strong acids and strong bases are to be expected.

Battery life-time

It is strongly advised to use only necessary functions.
E.g. disable analog output signal if not in use.

It is influenced by several issues :

- Display update: fast display update uses significantly more power.
- Pulse output.
- Low temperatures; the available power will be less due to battery chemistry.
- NPN and PNP inputs consume more energy than coil inputs.
- High input frequency.
- Communication.
- Optical key activity.

Check periodically

- The condition of the enclosure, cable glands and front panel.
- The input/output wiring for reliability and aging symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the flowmeter might be necessary. Do not forget to re-enter any subsequent K-factor alterations.
- The indication for low-battery.
- Clean the enclosure with a lint-free cloth, soaked with a mild soap solution or fresh water.

5.2 INSTRUCTIONS FOR REPAIR

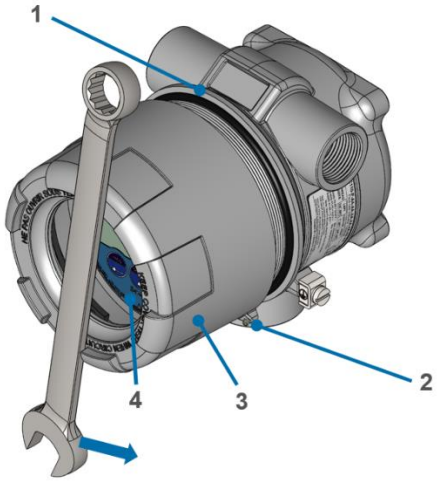
This product cannot be repaired by the user and must be replaced with an equivalent certified product. Repairs are only allowed to be carried out by the manufacturer or his authorized agent.

5.3 OPEN AND CLOSE THE E-SERIES

DO NOT OPEN AN INSTALLED ENCLOSURE WHEN CIRCUITS ARE ALIVE.
For battery supplied equipment:
DO NOT OPEN WHEN AN EXPLOSIVE GAS ATMOSPHERE IS PRESENT.

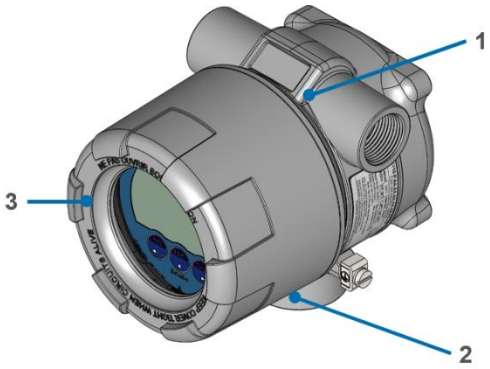
5.3.1 REMOVE THE COVER

1. Make the E-Series and the environment safe.
2. Unlock the set screw (2) to release the cover (3).
3. Use a wrench to turn the cover (3) counter-clockwise to release the cover (3).
4. Mind the Main Electronics Module (4) and carefully remove the cover (3) from the housing (1).
5. Keep the cover (3), with the glass facing upwards, in a clean and safe location.



5.3.2 INSTALL THE COVER

1. On the first two wire threads and O-ring, apply a very thin layer of the specified anti-seize compound.
2. Hold the cover (3) in the correct position for installation.
3. By hand, turn the cover (3) clockwise onto the housing (1) until the O-ring is tight to meet the required IP or TYPE protection rating.
4. Refer to chapter: Remove the cover; Lock the cover with the set screw (2) to safety the cover (3).



5.4 BATTERY REPLACEMENT – SUPPLY MODULE (IF INSTALLED)

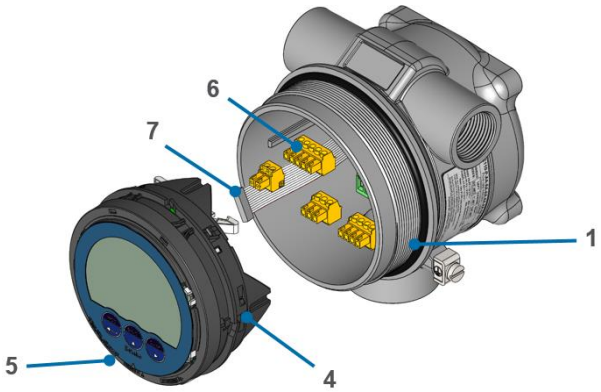
Only use batteries that are approved by the manufacturer.
Approved batteries can be ordered from your supplier.
THE USE OF UNAPPROVED BATTERIES CAN INVALIDATE EXPLOSION SAFETY.

Note !

This procedure assumes the E-Series and the environment are made safe.
This procedure assumes, the E-Series is opened..

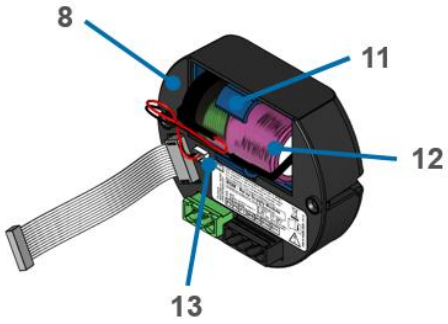
5.4.1 REMOVE THE MAIN ELECTRONICS MODULE (MEM)

1. Mind the wiring and carefully, pull to remove the MEM (4) from the housing (1).
2. Unlock and carefully disconnect the flatcable connector (7).
   Note that the MEM goes off.
3. Disconnect the connectors (6) from the MEM (4).
4. Protect the connectors (6, 7) against the ingress of contamination.
5. Keep the MEM (4) in a clean and safe location.



5.4.2 REMOVE THE BATTERY FROM THE SUPPLY MODULE (BSM OR RSM)

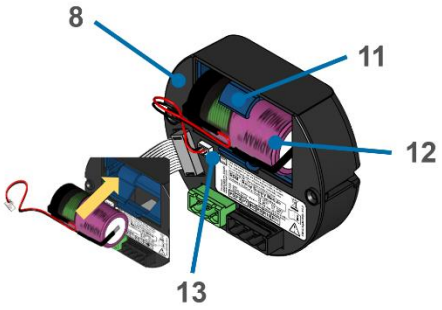
1. Disconnect the connector (13) from the Supply Module (8).
2. Carefully, remove the battery (12) from the battery holder (11).
3. As applicable discard or keep the battery (12) and the Supply Module (8) in a clean and safe location.



5.4.3 INSTALL THE BATTERY IN THE SUPPLY MODULE (BSM OR RSM)

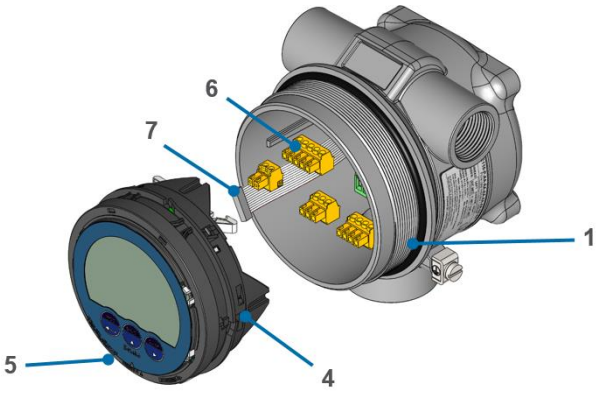
Handle the battery with care. A mistreated battery can become unsafe. Unsafe batteries can cause (serious) injury to persons.

1. Unpack the new battery (12).
2. Make sure, the new battery (12) shows no signs of damage or overheating.
3. Hold the battery (12) in the correct position for installation.
4. Carefully, install the battery (12) in the battery holder (11).
5. Carefully, install the connector (13).



5.4.4 INSTALL THE MAIN ELECTRONICS MODULE (MEM)

1. Install the connectors (6, 7) to the MEM (4).
2. Lock the flatcable connector (7) by hand and note that the MEM (4) comes on.
3. Hold the MEM (4) in the correct position for installation.
4. Mind the wiring and carefully move the MEM (4) into the housing (1).



5.4.5 TEST AND ADJUST THE E126-P-EL


Note !

This procedure assumes that the E126-P-EL is serviceable.

ACTION	RESULT	NOTICE
1. Make sure, the battery level indicator does not show.	• The battery indicator is off.	Only replace with original batteries supplied by the manufacturer.
2. At the side, press the PROG button for at least 7 seconds.	• The SETUP indicator comes on continuously. • SETUP-menu 1 is shown.	After a short period of time, the backlight goes off. This is normal behavior to save the battery power.
3. At the side, press the ► button.	• SETUP-menu 2 is shown.	
4. At the side, press the ▲ button.	• SETUP-menu 21 is shown.	
5. At the side, press and hold the PROG button for at least 3 seconds.	• The display returns to operation level and shows the RUN indicator.	The E126-P-EL is ready for daily use.
6. Install the cover.	• The cover is installed and locked.	

5.4.6 JOB CLOSE UP

1. Do a test of the optical keys to make sure the E126-P-EL is ready for daily use.
2. Remove all tools, materials and equipment from the work area.
3. Make sure, the work area is clean.
4. Dispose of the (electronic) waste in accordance with the (inter)national, the manufacturer's and the plant owner's standards and regulations.
5. For future reference, make a note in the maintenance log of the installation.
6. Ask the safety officer for permission to return the E126-P-EL into service.
7. Return the E126-P-EL into service.

6 LABEL INFORMATION

6.1 GENERAL REMARKS REGARDING THE SHOWN LABELS

Two labels will be fitted on the E-series enclosure: one showing the certification data, the other showing the thread sizes, type number, serial number and address applied.

Note !

The labels below show a typical example for recognition. For the actual data, refer to the label which is attached to your unit or refer to the Appendix A; Technical specifications.

6.2 LABEL WITH CERTIFICATION DATA

The E-series comes in temperature class T6. T6 classified versions consume 4.5 watts or less.

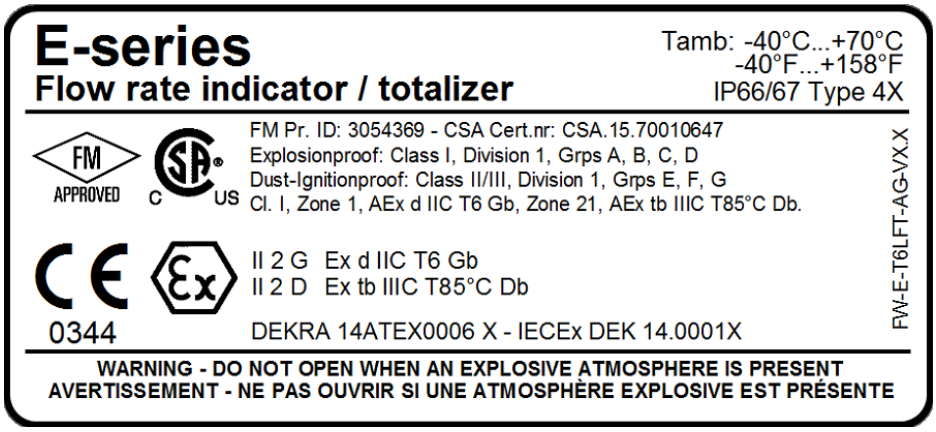


Fig. 29: External label Certification Data

6.3 LABEL WITH THREAD SIZES.

The thread sizes will be indicated on the label as per the drawings below.

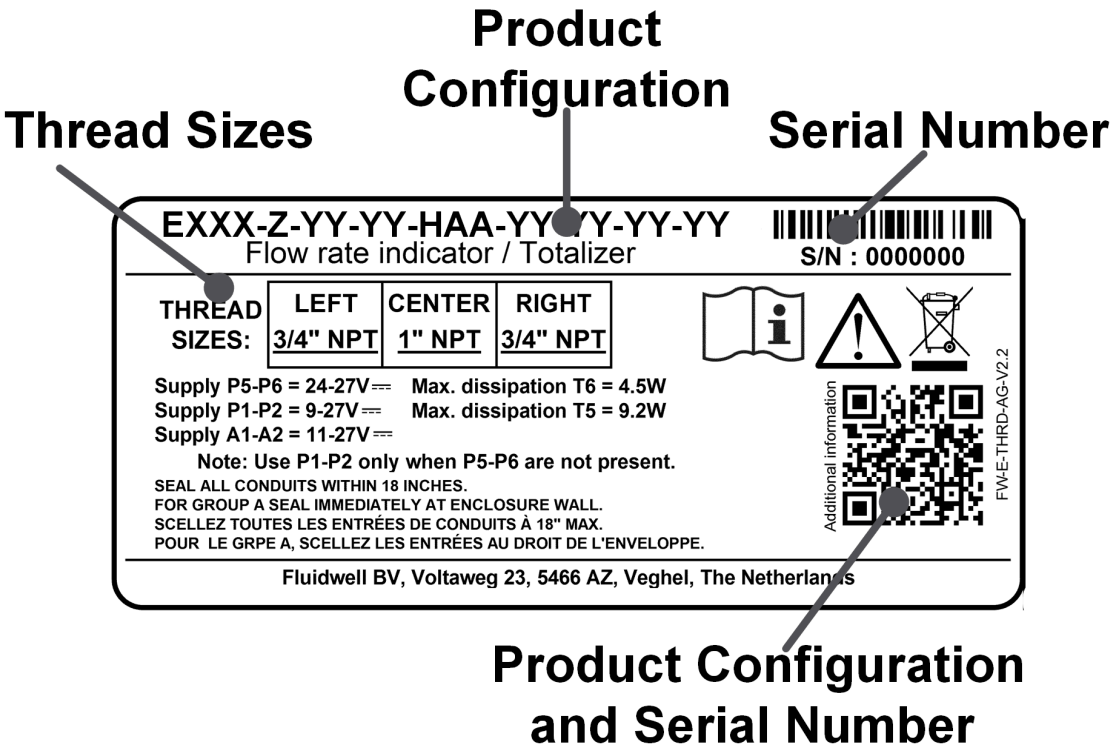


Fig. 30: Example external label Thread Sizes

6.4 INTERNAL LABELS.

Label on the main electronics module (MEM):
The labels below are to be found on the main electronics module and supply modules inside the enclosure.

Labels attached to the Main Electronics Module (MEM) (typical example):

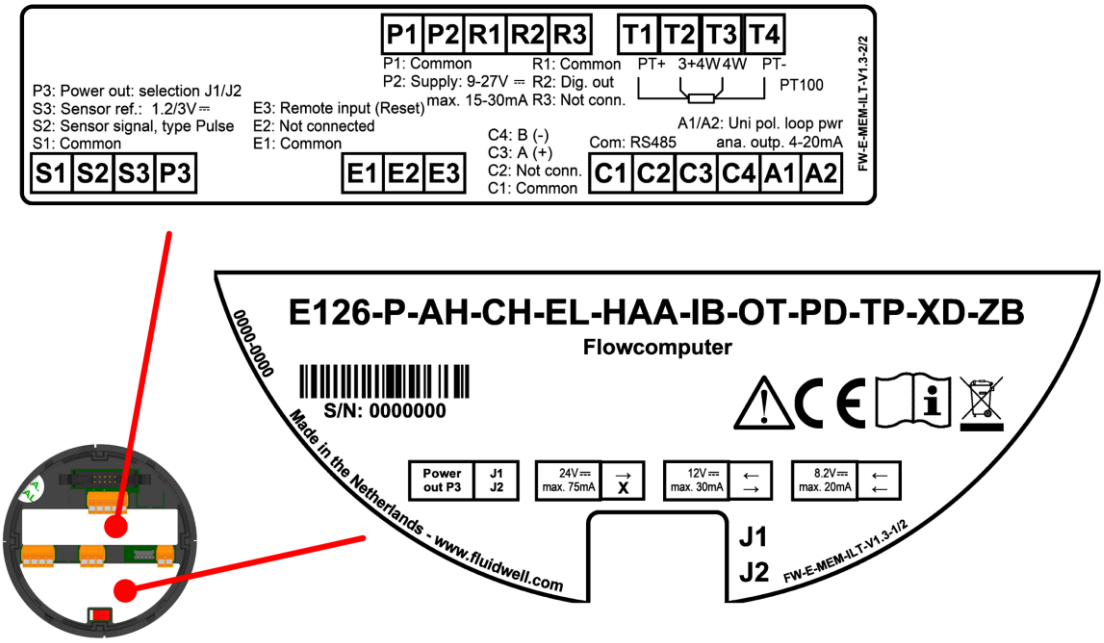


Fig. 31: Example label Main Electronic Module (MEM)

Label attached to the Basic Supply Module (BSM) – option PB.

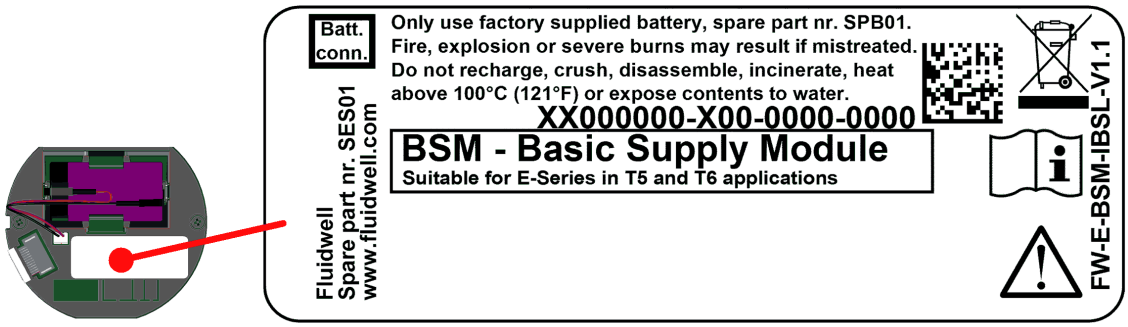


Fig. 32: Example Label Basic Supply Module (BSM)

Label attached to the Relay Supply Module (RSM) – option (PB)-OR.

Fig. 33: Example Label Relay Supply Module (RSM)

Appendix A. TECHNICAL SPECIFICATION

Display	
Type	High intensity numeric and alphanumeric LCD, UV-resistant, with bright backlight. Intensity can be adjusted via the keypad. *When battery powered, the backlight is only operational after a keypad touch to extend the battery lifetime.*
Dimensions	Ø 65 x 45mm (2.56" x 1.77").
Digits	Seven 12mm (0.47") and eleven 7mm (0.28"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec – 30 secs.
Speedometer	To indicate the actual flow rate, the bargraph runs from 0 to 100% in 20 blocks, each block is 5%.

Enclosures			
General	Aluminum or stainless steel EX-d enclosure with glass window.		
Sealing	Silicone.		
Control Keys	Three optical keys with operation through the glass front window.		
Rating	IP66 / 67 / TYPE 4X / TYPE 7 / TYPE 9.		
Type HA_	Die-cast aluminum EX d enclosure.		
Dimensions	112 x 133 x 148mm (4.41" x 5.24" x 5.83") – W x H x D.		
Weight	1300 gr.		
Type HS_	Stainless steel 316L Ex d enclosure.		
Dimensions	112 x 133 x 148mm (4.41" x 5.24" x 5.83") – W x H x D.		
Weight	3600 gr.		
Entry thread			
H_A	2 x ¾"NPT / 1 x 1"NPT	H_D	2 x ½"NPT / 1 x ¾"NPT
H_B	3 x ¾"NPT	H_G	2 x M20 / 1 x M25
H_C	2 x ½"NPT / 1 x 1"NPT	H_H	3 x M25

Operating temperature	
Ambient	-40°C to +70°C (-40°F to +158°F).

Power requirements	
Type PB	Long life Lithium battery - life-time depends upon settings and configuration - up to approx. 3 years. *The battery can power the backlight for a short time after a keypad touch but cannot power the relay output (OR) or the real sensor supply (Terminal P3).*
Type PD	9 – 27V DC. Consumption max. 4.5W (sensor excitation included). In combination with relay output (type OR): 24-27V DC.
Type PX	9 – 27V DC. Consumption max. 3W.
Type AH	Loop powered, analog output. 11 – 27V DC, Min. 2mA. Consumption max. 675mW (25mA @ 27VDC). *The loop powered analog output cannot power the backlight, mechanical relay output (OR) or the real sensor supply (Terminal P3).*

Sensor excitation	
Type AH/PB/PX	Terminal S3: 3V DC for pulse signals and 1.2V DC for coil pick-up, I_{out} max. 100µA. *This is not a real sensor supply. Only suitable for sensors with a very low power consumption like coils (sine wave) and reed-switches.*
Type PD	Terminal P3 : 8.2 / 12 / 24V DC • 8.2V DC, I_{out} max. 20mA. • 12V DC, I_{out} max. 30mA. • 24V DC, I_{out} max. 75mA (this voltage varies depending on the input supply voltage)

Terminal connections	
Type	Removable plug-in terminal strip. Wire max. 1.5 mm^2 and 2.5 mm^2.

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

Hazardous area	
ATEX	Gas : ⟨Ex⟩ II 2 G Ex d IIC T6 Gb. Dust : ⟨Ex⟩ II 2 D Ex tb IIIC T85°C Db.
IECEx	Gas : Ex d IIC T6 Gb. Dust : Ex tb IIIC T85°C Db.
CSA c-us	Class I, Division 1, Grps A, B, C, D Class II/III, Division 1, Grps E, F, G Class I, Zone 1, Aex d IIC T6/T5 Gb Zone 21, Aex tb IIIC T85°C/T100°C Db
FM	Class I, Division 1, Grps A, B, C, D Class II/III, Division 1, Grps E, F, G Class I, Zone 1, Aex d IIC T6/T5 Gb Zone 21, Aex tb IIIC T85°C/T100°C Db

Directives and Standards	
EMC	EN 61326-1; FCC 47 CFR part 15
LVD	EN/IEC 61010-1
ATEX / IECEx	EN/IEC 60079-0; EN/IEC 60079-1; EN/IEC 60079-31
CSA	CSA 22.2 No. 25, CSA 22.2 No. 30
FM	FM3600; FM3615; FM3616; FM3810
RoHS	EN 50581
IP & TYPE	EN 60529; NEMA 250

Input

Flowmeter	
Type P	Coil / sine wave (COIL-HI: 20mVpp or COIL-LO: 90mVpp sensitivity selectable), NPN, PNP, reed switch, NAMUR, active pulse signals 8 or 24V DC.
Frequency	Minimum 0Hz - maximum 10kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. E.g. reed switch with low-pass filter: max. frequency 120Hz.
K-Factor	0.000010 - 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.
Option ZF	Coil sensitivity 10mVpp.
Option ZG	Coil sensitivity 5mVpp.

Temperature	
Type TP	PT100 RTD - Range -100°C to +200°C (-148°F to 392°F).
Wires	2-, 3- or 4-wire PT100.
Update time	One time per second.
Accuracy	2-wire: +/- 0.1°C @ Ta 20°C + 0.008°/Ta °C. 3- or 4-wire: +/- 0.1°C @ Ta 20°C + 0.005°/Ta °C.
Type TA	(0)4-20mA - with signal calibration feature at any current within the range.
Accuracy	15 bit. Error 0.01% @ 20°C (Typical 25ppm/°C).
Span	0.00000 / 999,999 with variable decimal position.
Offset	0.001 - 9,999.999
Update time	One time per second.
Voltage drop	Max. 1V DC @ 20mA.
Note	External power to sensor is required; e.g. type PD.

Reset total	
General	Terminal input to reset total remotely or to lock the “clear total” button.
Type IB	Internally pulled-up switch contact - NPN.
Duration	Minimum pulse duration 100msec.

Output

Digital output	
General	Transmitting compensated accumulated total (scaled pulse) or input pulse retransmission
Frequency	Scaled: Output D1: max. 500Hz. Output D5: max. 4Hz, recommended use below 0.5Hz. Pulse length user definable between 1msec up to 10 seconds. Retransmission: Minimum pulse duration: 50µs, square wave output based on frequency of (sine wave or coil) input signal
Type OT	One passive transistor output (NPN) - not isolated. 300mA - 50V @ 25°C.
Type OR Note !	One isolated electro-mechanical relay output (NO). Maximum resistive load: 2A @ 250V AC / 30V DC. Maximum inductive load: 0,5A (pilot duty applications). • *Requires 24 - 27V DC and supplied via P5 - P6.* • *Type OT remains available.* • *Not used in pulse retransmission mode.*

Analog output	
General	Transmitting compensated flow rate.
Type AH	Galvanically isolated, loop powered 4 - 20mA output.
Supply voltage	10V (lift-off voltage) – 27V DC
Max load	700 ohm @ 24V DC (24V - 10V / 20mA)
Accuracy	12 bit. Error 0.03% @ 20°C (Typical 45ppm/°C). Can be scaled to any desired range.

Communication (option)	
Function	Reading display information, reading / writing all configuration settings and data log extraction.
Type CB	Modbus RTU - RS232
Type CH	Modbus RTU - RS485 2-wire, bus termination without resistor for low power solutions
Type CU	USB communication incl. Ex d plug
Note !	*Requires ¾"NPT or M25 side entry thread.*
Type CX	No communication, remote configuration possible with accessory cable ACE02.
Speed [baud]	1200 - 2400 - 4800 - 9600 - 9600HP - 19200 - 38400
Addressing	maximum 247 addresses.

Operational

Flow Equations	
Type EG	Compensated liquid volume.
Formula	$Q_{normal} = Q * (1 + \alpha (T_{normal} - T))$ where α = thermal expansion coefficient.

Operator functions	
Displayed information	• Compensated flow rate, total and accumulated total • Current Day total, previous day total and 15 historical day totals (compensated) • Actual line temperature • Indicating speedometer for compensated flow rate • Total can be reset to zero by pressing the CLEAR-key twice

Total	
Digits	7 digits.
Unit	L, m3, US gal, igal, cf, Oil bbl, kg, ton, US ton, lb or none.
Decimals	0 - 1 - 2 or 3.
Note !	*Total can be reset to zero.*

Daily totals	
Digits	7 digits.
Unit / decimals	According to selection for total
Contract hour	0:00 – 23:00, settable per whole hour
Current day total	Running total, started at zero after the last contract hour
Previous day total	Fixed total, copied from current day total at the last contract hour
Historical day totals	The last 15 previous day totals are stored and can be reviewed on the display
Note !	*Current day total cannot be reset to zero.*

Accumulated total	
Digits	11 digits.
Unit / decimals	According to selection for total.
Note !	Accumulated total cannot be reset to zero.

Flow rate	
Digits	7 digits.
Units	mL, L, m3, mg, g, kg, ton, US ton, US gal, igal, Oil bbl, lb, cf, rev, none, scf, nm3, nL or p.
Bargraph speedometer	20 blocks, each block is 5% of total span
Decimals	0 - 1 - 2 or 3.
Time units	/sec - /min - /hr - /day.

Temperature	
Digits	6 digits.
Units	Temperature: °C, °F or K
Decimals	1

Appendix B. PROBLEM SOLVING

In this appendix, several problems are included that can occur when the E126-P-EL is going to be installed or while it is in operation.

Flowmeter does not generate pulses
Check:

- Signal selection SETUP 4.1.
- Pulse amplitude (paragraph 4.6.3).
- Flowmeter, wiring and connection of terminal connectors (paragraph 4.6.3).
- Power supply of flowmeter (paragraph 4.4.2).

Flowmeter generates "too many pulses"
Check:

- Settings for Total and Flowrate.
- Type of signal selected with actual signal generated.
- Sensitivity of coil input.
- Proper grounding of the E126-P-EL, avoid ground loops.
- Use screened wire for flowmeter signals and connect screen to the ground input terminal of the flowmeter input.

Analog output does not function properly
Check:

- SETUP 7.1: is the function enabled?
- SETUP 7.2 / 7.3: are the flow-levels programmed correctly?
- SETUP 7.5 / 7.6: are the 4mA and 20mA tuned correctly?
- Connection of the external power-supply according to the specification.

Pulse output does not function
Check:

- SETUP 8.1 - mode: is the correct function selected?
- SETUP 8.2 - impulse width: is the external device able to recognize the selected pulse width and frequency?
- SETUP 8.3 - amount per “x” quantity: is the value programmed reasonable?

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

- SETUP 2.2 / 2.4: are the K-factor and time unit correct?
- SETUP 2.5 / 2.6: The unit has to count the number of pulses according to SETUP 2.5 within the time according to SETUP 2.6. Make sure that SETUP 2.6 is set to 10.0 seconds for example: the result is that the unit has at least 10 seconds time to measure the number of pulses according to SETUP 2.5.

The password is unknown
If the password cannot be retrieved, there is only one possibility left: call your supplier.

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

[d] 1 = display error
[d] 2 = data-storage error
[d] 4 = initialization error
[d] 16 = IO configuration error base
[d] 32 = IO configuration error interface
[d] 64 = Analog input error
[d] 128 = Automatic K-factor conversion error
[d] 256 = PT100 ADC error (type TP only)
[d] 512 = Total S-factor calculation error
[d] 1024 = TPC factor calculation error
[d] 2048 = Temperature sensor out of range error

When multiple alarms occur, the error code shown is the sum of the error codes as given above.
E.g. 0048 is a combination of error code 0016 and 0032.

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

Appendix C. MODBUS COMMUNICATION

General

The product is fitted with the Modbus communication protocol and can be equipped with various physical interfaces like RS485 and RS232 (please see device datasheet for available options).
The tables below show the various variables that can be accessed through the communication.
Currently, the function codes supported are:

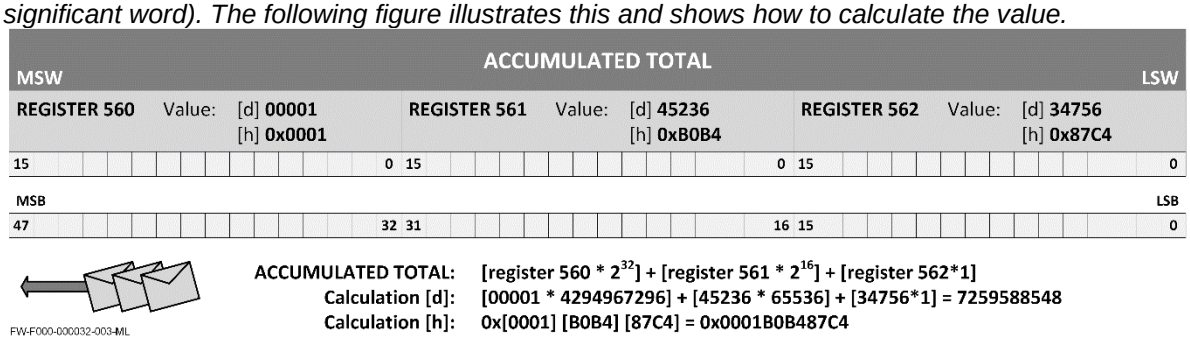
- function code 3 “Read Holding Registers” (4x references);
- function code 16 “Preset Multiple Registers” (4x references).

The tables show the Modbus PDU addresses in a decimal format, followed by its hexadecimal representation (0x0000). When the PLC address range is required (4x references are typically used by PLCs), please use the holding registers addresses.

Variables consisting of multiple registers

Several variables in the system are too big to fit in a single register and are spanned over multiple registers. Most Modbus masters support variables that span 2 or 4 registers in integer and floating point format. If your Modbus master does not support any of the formats we supply, select an integer based variable, and you can calculate the corresponding value manually, as shown in this example:

Let’s assume that variable accumulated total spans 3 registers with address 560, 561 and 562. When a transmission is done, register 560 (which represents the MSW - most significant word) arrives first, followed by register 561 in the middle and register 562 at the end (the LSW - least significant word). The following figure illustrates this and shows how to calculate the value.



Datatypes

The following datatypes are used for Modbus communication with the E126-P-EL:

DATA TYPE	NUMBER OF BYTES	NUMBER OF REGISTERS (16 BIT)	DESCRIPTION
char	1	1	8 bits ASCII character
uint16	2	1	16 bits unsigned integer
uint32	4	2	32 bits unsigned integer
int32	4	2	32 bits signed integer
uint48	6	3	48 bits unsigned integer
uint64	8	4	64 bits unsigned integer
float32	4	2	32 bits floating point
float64	8	4	64 bits floating point

Note: When reading and writing integer-type variables, values are transmitted without the decimal point. For the correct representation, please see the remarks-field in the tables below.
Note: Variables spanning multiple registers use ‘big-endian’ data representation.

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

Runtime variables of the E126-P-EL

Reading flow rate, total, accumulated total or temperature: When reading runtime variables, the given value may differ slightly from the value that is displayed on the display – this is due to the fact that the display is limited in the number of digits and may have a slower update rate.

When variables are read in integer format, the returned values are given including the decimals. For example, when two decimals are selected for total and total has a value of 123456,78 the display will show 23456,78 while communication will read a "total" of 12345678 (note that the decimals should be adapted according the setting in "total decimals" which is in this case 2).

Runtime variables of the E126-P-EL – Integer based – Individual read								
PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS		
[d] 255 [h] 0x00FF	40256	battery status	1	R	unit16	0 = unknown	1 = normal	2 = low battery
[d] 516 [h] 0x0204	40517	error status (bitfield)	1	R	uint16	[d] 0 = no error [d] 1 = display error [d] 2 = data-storage error [d] 4 = initialization error [d] 16 = IO configuration error base [d] 32 = IO configuration error interface [d] 64 = Analog input error [d] 128 = Automatic K-factor conversion error [d] 256 = PT100 ADC error (type TP only) [d] 512 = Total S-factor calculation error [d] 1024 = TPC factor calculation error [d] 2048 = Temperature sensor out of range error		
[d] 540 [h] 0x021C	40541	temperature	2	R	int32	-999.9…999.9 Representation: unit depending on variable 209		
[d] 560 [h] 0x0230	40561	accumulated total (compensated)	3	R	uint48	0.000…99999999999999 Representation: unit, decimals depending on variables 32, 33		
[d] 566 [h] 0x0236	40567	total (compensated)	3	R *	uint48	0.000…9999999999 Representation: unit, decimals depending on variables 32, 33		
[d] 572 [h] 0x023C	40573	flow rate (compensated)	2	R	uint32	0.000…9999999 Representation: unit, time, decimals depending on variables 48, 49, 50		
[d] 4864 [h] 0x1300	44865	TPC factor	2	R	uint32	0.0001…999.99999 Multiplication factor for temperature compensation		
[d] 4640 [h] 0x1220	44641	Total command register	1	R/W	uint16	Commands: 0x0102: Clear total		
* Clearing total:		Total can also be cleared by writing the correct command to the total command register, as shown above. It is also still possible to use the old method: Write a value of 0 to all the 3 registers of total in a single write action. Writing any other value will result in the reply of an error message.						
Note:		The runtime variables shown in above list must always be read or written individually, for the indicated number of registers, in 1 single action!						

Runtime variables of the E126-P-EL – Integer based – Contiguous read						
PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 6146 [h] 0x1802	46147	total (compensated)	4	R	uint64	0.000…9999999999 Representation: unit, decimals depending on variables 32, 33
[d] 6150 [h] 0x1806	46151	accumulated total (compensated)	4	R	uint64	0.000…99999999999999 Representation: unit, decimals depending on variables 32, 33
[d] 6154 [h] 0x180A	46155	flow rate (compensated)	2	R	uint32	0.000…9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
[d] 6156 [h] 0x180C	46157	current day total (compensated)	4	R	uint64	0.000…9999999999 Representation: unit, decimals depending on variables 32, 33

[d] 6160 [h] 0x1810	46161	previous day total (compensated)	4	R	uint64	0.000…9999999999 Representation: unit, decimals depending on variables 32, 33
[d] 6164 [h] 0x1814	46165	temperature	2	R	int32	-999.9…999.9 Representation: unit depending on variable 209
Note: The list of runtime variables shown above can be read as one contiguous list of registers. Unused registers return 0.						

Historical previous day totals of the E126-P-EL – Integer based – Contiguous read

The read-out of **historical previous day totals** is done via 2 INDEXED variables containing the number of decimals and the value. These 2 variables can be read as one contiguous list of 3 registers (in a single read action).
Reading is done by first selecting the right entry (day) through the index. Valid values for the index are 0…14, which correspond with the previous day totals of 1 day old through 15 days old. Indexes outside this range will result in an error being sent back.
(See the communication-section of this appendix for setting the index and its extended functionality through variable 150 and 149).

PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 5888 [h] 0x1700	45889	Previous day total decimals	1 INDEXED variable	R	unit8	0…3
[d] 5889 [h] 0x1701	45890	Previous day total	2 INDEXED variable	R	uint64	0.000…9999999999 Representation: unit depends on variable 32, decimals depends on variables 5888 (0x1700)

Runtime variables of the E126-P-EL – Floating point based 32 bit

PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 6402 [h] 0x1902	46403	total (compensated)	2	R	float32	0…9999999 Representation: unit depending on variable 32
[d] 6404 [h] 0x1904	46405	accumulated total (compensated)	2	R	float32	0…99999999999 Representation: unit depending on variable 32
[d] 6406 [h] 0x1906	46407	flow rate (compensated)	2	R	float32	0…9999999 Representation: unit and time depending on variables 48, 49
[d] 6408 [h] 0x1908	46409	current day total	2	R	float32	0…9999999 Representation: unit depends on variable 32
[d] 6410 [h] 0x190A	46411	previous day total	2	R	float32	0…9999999 Representation: unit depends on variable 32
[d] 6412 [h] 0x190C	46413	temperature	2	R	float32	-999…999 Representation: unit depending on variable 209
Note: The list of runtime variables shown above can be read as one contiguous list of registers. Unused registers return 0.						

Runtime variables of the E126-P-EL – Floating point based 64 bit

PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 6656 [h] 0x1A00	46657	total (compensated)	4	R	float64	0…9999999 Representation: unit depending on variable 32
[d] 6660 [h] 0x1A04	46661	accumulated total (compensated)	4	R	float64	0…99999999999 Representation: unit depending on variable 32
[d] 6664 [h] 0x1A08	46665	current day total	4	R	float64	0…9999999 Representation: unit depends on variable 32
[d] 6668 [h] 0x1A0C	46669	previous day total	4	R	float64	0…9999999 Representation: unit depends on variable 32
Note: The list of runtime variables shown above can be read as one contiguous list of registers. Unused registers return 0.						

Configuration variables of the E126-P-EL

Note: All configuration variables shown below must always be read or written individually, for the indicated number of registers, in 1 single action!

Total

PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 32 [h] 0x020	40033	unit	1	R/W	uint16	0=none 3=US GAL 6= OilBBL 9=lb 1=L 4= I GAL 7=kg 10=us ton 2= m^3 5=CF 8=ton
[d] 33 [h] 0x021	40034	decimals	1	R/W	uint16	0…3
[d] 34 [h] 0x022	40035	K-factor	2	R/W	uint32	0.000010…9999999 Representation: decimals, unit depending on variable 37, 32
[d] 37 [h] 0x025	40038	K-factor decimals	1	R/W	uint16	0…6
[d] 47 [h] 0x02F	40048	Multiply factor	1	R/W	uint16	0=x1 1=x10 2=x100 3=x1000
[d] 1052 [h] 0x41C	41053	clear total password	1	R/W	unit16	000 … 999 Setting 000 disables the clear total password feature.
[d] 2146 [h] 0x862	42147	Contract hour	1	R/W	uint16	0…23 Hour
[d] 2208 [h] 0x8A0	42209	Current day total	4	R	unit64	0.000…9999999999 Representation: unit, decimals depending on variables 32, 33
[d] 2216 [h] 0x8A8	42217	Previous day total	4	R	uint64	0.000…9999999999 Representation: unit, decimals depending on variables 32, 33

Flowrate

PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 48 [h] 0x030	40049	unit	1	R/W	uint16	0=none 5=I GAL 10=SCF 15=lb 1=mL 6=CF 11=mg 16=US ton 2=L 7=OilBBL 12=g 17=rev 3=m^3 8=nL 13=kg 18=P 4=US GAL 9=nm^3 14=ton
[d] 49 [h] 0x031	40050	time unit	1	R/W	uint16	0=/sec 1=/min 2=/hour 3=/day
[d] 50 [h] 0x032	40051	decimals	1	R/W	uint16	0…3
[d] 51 [h] 0x033	40052	K-factor	2	R/W	uint32	0.000010…9999999 Representation: decimals depending on variable 54
[d] 54 [h] 0x036	40055	K-factor decimals	1	R/W	uint16	0…6
[d] 62 [h] 0x03E	40063	filter	1	R/W	uint16	1...99
[d] 71 [h] 0x047	40072	period	1	R/W	uint16	0.1...99.9 sec

Display

PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 64 [h] 0x040	40065	display function	1	R/W	uint16	0=total 1=flowrate 2=acc.total
[d] 2147 [h] 0x863	42148	day totals	1	R/W	uint16	0=hidden 1=operate 2=off
[d] 42 [h] 0x02A	40043	toggle	1	R/W	uint16	0=disable 1=enable
[d] 80 [h] 0x050	40081	LCD update time	1	R/W	uint16	0= fast 2=3 sec 4=30 sec 1=1 sec 3=15 sec 5=off
[d] 67 [h] 0x043	40068	backlight brightness	1	R/W	uint16	0=off 2=40% 4=80% 1=20% 3=60% 5=100%
[d] 58 [h] 0x03A	40059	bar graph enable	1	R/W	uint16	0=disable 1=enable

[d] 59 [h] 0x03B	40060	bar graph range	2	R/W	uint32	0.001…9999999 Representation: unit, time, decimals depending on variables 48, 49, 50

Flowmeter									
PDU ADDRESS	**HOLDING REGISTER**	**VARIABLE**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**			
[d] 96 [h] 0x060	40097	flowmeter signal	1	R/W	uint16	0=NPN 1=NPN LP 2=Reed	3=Reed LP 4=PNP 5=PNP LP	6=NAMUR 7=coil hi 8= coil lo	9=act 8.2V 10=act 24V
[d] 1050 [h] 0x41A	41051	K-factor - unit	1	R/W	uint16	0=none 1=L 2= m^3	3=US GAL 4= I GAL 5=CF	6= OilBBL 7=kg 8=ton	9=lb 10=us ton
[d] 1051 [h] 0x41B	41052	K-factor - unit type	1	R/W	uint16	0=Hand	1=Volumetric	2=Mass	
[d] 1046 [h] 0x416	41047	K-factor	2	R/W	uint32	0.000010...9999999 Representation: unit, decimals depending on variable 1050, 1049			
[d] 1049 [h] 0x419	41050	K-factor decimals	1	R/W	uint16	0…6			

Temperature – type TP								
PDU ADDRESS	**HOLDING REGISTER**	**VARIABLE**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**		
[d] 209 [h] 0x0D1	40210	display	1	R/W	uint16	0=K	1=°C	2=°F
[d] 208 [h] 0x0D0	40209	number of wires	1	R/W	uint16	0=2	1=3	2=4
[d] 199 [h] 0x0C7	40200	filter	1	R/W	uint16	1…99		

Temperature – type TA								
PDU ADDRESS	**HOLDING REGISTER**	**VARIABLE**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**		
[d] 528 [h] 0x210	40529	unit	1	R/W	uint16	0=K	1=°C	2=°F
[d] 530 [h] 0x212	40531	span	2	R/W	uint32	0.00001 – 999999 K Representation: decimals depending on variable 533		
[d] 533 [h] 0x215	40534	decimals span	1	R/W	uint16	0 – 5		
[d] 534 [h] 0x216	40535	offset	2	R/W	uint32	0.01 – 9999.99 K		
[d] 183 [h] 0x0B7	40184	filter	1	R/W	uint16	1 - 99		
[d] 186 [h] 0x0BA	40187	calib-low	1	R/W	uint16	0=cal set	1=calibrate	2=default
[d] 187 [h] 0x0BB	40188	calib-high	1	R/W	uint16	0=cal set	1=calibrate	2=default

Formula Equations						
PDU ADDRESS	**HOLDING REGISTER**	**VARIABLE**	**NO. REGISTERS**	**R/W**	**TYPE**	**VALUE / REMARKS**
[d] 74 [h] 0x04A	40075	Thermal Expansion Coefficient	2	R/W	uint32	0.000…9999.999 *10^{-6} / K Representation: Fixed at 9 decimals. Multiply returned value by 10^{-9} for original value.
[d] 537 [h] 0x219	40538	T-normal (temp)	2	R/W	uint32	0.00…9999.99 K

Analog output						
PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 112 [h] 0x070	40113	analog output	1	R/W	uint16	0=disable 1=enable
[d] 113 [h] 0x071	40114	minimum rate	2	R/W	uint32	0.001…9999999 Representation: unit, time, decimals depending on variable 48, 49, 50
[d] 116 [h] 0x074	40117	maximum rate	2	R/W	uint32	0.001…9999999 Representation: unit, time, decimals depending on variable 48, 49, 50
[d] 119 [h] 0x077	40120	cut off percentage	1	R/W	uint16	0...99 Representation: 0.0 – 9.9%
[d] 120 [h] 0x078	40121	tune minimum output	1	R/W	uint16	0...9999
[d] 122 [h] 0x07A	40123	tune maximum output	1	R/W	uInt16	0...9999
[d] 127 [h] 0x07F	40128	filter	1	R/W	uint16	1...99

Pulse output						
PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 141 [h] 0x08D	40142	pulse mode	1	R/W	uint16	0=disable 1=scaled 2=retrans
[d] 128 [h] 0x080	40129	pulse time width	1	R/W	uint16	0…9999 Representation: 0.001 – 9.999 sec
[d] 130 [h] 0x082	40131	pulse per X quantity	2	R/W	uint32	1...9999999 Representation: 0.000001…9999999 depending on variables 133
[d] 133 [h] 0x085	40134	pulse quantity decimals	1	R/W	uint16	0…3

Modbus communication						
PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 144 [h] 0x090	40145	speed (baudrate)	1	R/W	uint16	0=1200 2=4800 4-9600HP 6=38400 1=2400 3=9600 5=19200
[d] 145 [h] 0x091	40146	modbus address	1	R/W	uint16	1…247
[d] 146 [h] 0x092	40147	modbus mode	1	R/W	uint16	0=off 1=RTU 2=ASCII
[d] 1271 [h] 0x4F7	41272	data bits	1	R/W	uint16	0=8 bits 1=7 bit
[d] 1272 [h] 0x4F8	41273	parity	1	R/W	uint16	0=none 1=even 2=odd
[d] 147 [h] 0x093	40148	delay	1	R/W	Uint8	0…255 ms delay between receiving a (valid) modbus command and sending the response
[d] 150 [h] 0x096	40151	index	1	R/W	uint16	0…255 used for indexed values
[d] 149 [h] 0x095	40150	index use	1	R/W	uint16	0=static 1=auto increment 2=auto decrement
[d] 25 [h] 0x019	40026	reboot	1	R/W	uint16	Returns 0 on read. Write 0xA50F for unit restart Write 0x5AF0 for factory settings

Others						
PDU ADDRESS	HOLDING REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 160 [h] 0x0A0	40161	model number	1	R	uint16	0…9999
[d] 173 [h] 0x0AD	40174	model suffix	1	R	char	A – Z Representation: ASCII character
[d] 162 [h] 0x0A2	40163	firmware version	2	R	uint32	0…999999 Representation: xx.xx.xx
[d] 165 [h] 0x0A5	40166	serial no	2	R	uint32	0…9999999 Representation: YYWWNNN
[d] 176 [h] 0x0B0	40177	local time	2	R/W	uint32	00:00:00 – 23:59:59 Representation: hh:mm:ss Stored decimal: 23:59:59 = 235959d = 0x0003.99B7
[d] 168 [h] 0x0A8	40169	password	1	R	uint16	0…9999
[d] 139 [h] 0x08B	40140	keyboard lock	1	R/W	uint16	0=disable 1=enable
[d] 170 [h] 0x0AA	40171	tag no	2	R/W	uint32	0...9999999 Representation: xxxxxxx

Appendix D. DECLARATION OF CONFORMITY

Count on us.

EU Declaration of Conformity

Fluidwell E-series indicators

Veghel, October 2017

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

EMC Directive	**2014/30/EU**	EN61000-6-2:2005; EN61000-6-3: 2007 /A1:2011; EN61326-1:2013
RoHS Directive	**2011/65/EU**	EN 50581:2012
Low Voltage Directive	**2014/35/EU**	
	For options –PM or –OR:	EN61010-1:2010
ATEX Directive	**2014/34/EU**	EN60079-0:2012; EN60079-1:2007;
	For option –XD, flame proof:	EN60079-31:2009
	Protective system: (for power consumption up till 4.5 W / 9.2 W respectively)	⟨Ex⟩ II 2 G Ex d IIC T6/T5 Gb ⟨Ex⟩ II 2 D Ex tb IIIC T85 °C/T100 °C Db
Certification	Certificates:	DEKRA 14ATEX0006 X, Issue 1
	Notified body 0344:	DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, the Netherlands.

Last two digits of the year in which the CE marking was affixed: 13.
Remark: compliance is not affected by standards EN60079-0/A11:2014, EN60079-1:2014 and EN60079-31:2014.

Fluidwell BV

I. Meij, Manager Technology

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

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USD account no: 02.20.81.771
IBAN: NL22 INGB 0022 0817 71

INDEX OF THIS MANUAL

LIST OF FIGURES E126-P-EL

Notes:

LIST OF CONFIGURATION SETTINGS				
SETTING		DEFAULT	DATE:	DATE:
1	**TOTAL**		Enter your settings here	
1.1	UNIT	L		
1.2	DECIMALS	0		
1.3	K-FACTOR	AUTO		
1.4	FACTOR-X	1		
1.5	CLEAR PASSWORD	000		
1.6	CONTRACT HOUR	00:00		
1.7	CURRENT DAY TOTAL	----		
1.8	PREVIOUS DAY TOTAL	----		
2	**FLOWRATE**			
2.1	UNIT	L		
2.2	TIME	/min		
2.3	DECIMALS	0		
2.4	K-FACTOR	AUTO		
2.5	CALCULATION	PLS 10		
2.6	CUT-OFF	30.0		
3	**DISPLAY**			
3.1	FUNCTION	total		
3.2	DAY TOTALS	off		
3.3	TOGGLE	disable		
3.4	LCD NEW	1 sec		
3.5	BACKLIGHT	100%		
3.6	BARGRAPH	enable		
3.7	RATESPAN	1000		
4	**FLOWMETER**			
4.1	SIGNAL	coil lo		
4.2	UNITS	auto-vol		
4.3	UNIT	L		
4.4	K- FACTOR	1		
5	**TEMPERATURE – *Type TP***			
5.1	DISPLAY	°C		
5.2	NO. OF WIRES	2		
5.3	FILTER	1		
5	**TEMPERATURE – *Type TA***			
5.1	DISPLAY	°C		
5.2	SPAN	100.00		
5.3	OFFSET	273.15		
5.4	FILTER	1		
5.5	CALIB-LO	default		
5.6	CALIB-HI	default		
6	**FORMULA**			
6.1	EQUATIONS TYPE	EG		
6.2	THERM.EXP.COEFFICIENT	0.00 K		
6.3	T-NORMAL (TEMP)	0.00 K		

LIST OF CONFIGURATION SETTINGS (CONT.)				
SETTING		DEFAULT	DATE:	DATE:
7	**ANALOG**			
7.1	OUTPUT	disable		
7.2	RATE-MIN (4mA)	0		
7.3	RATE-MAX (20mA)	99999		
7.4	CUT-OFF	0.0%		
7.5	TUNE-MIN (4mA)	1438		
7.6	TUNE-MAX (20mA)	5778		
7.7	FILTER	1		
8	**PULSE**			
8.1	MODE	disable		
8.2	WIDTH	0.000 sec		
8.3	AMOUNT	1000		
9	**COM MODB**			
9.1	SPEED	9600		
9.2	ADDRESS	1		
9.3	MODE	bus-rtu		
9.4	DATABITS	8 bits		
9.5	PARITY	none		
10	**OTHERS**			
10.1	MODEL	E126-P-EL		
10.2	SOFTWARE VERSION	03:_ _:_ _		
10.3	SERIAL NO	_ _ _ _ _ _ _		
10.4	TIME	00:00:00		
10.5	PASSWORD	0000		
10.6	KEY LOCK	enable		
10.7	TAG-NO	0000000		

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