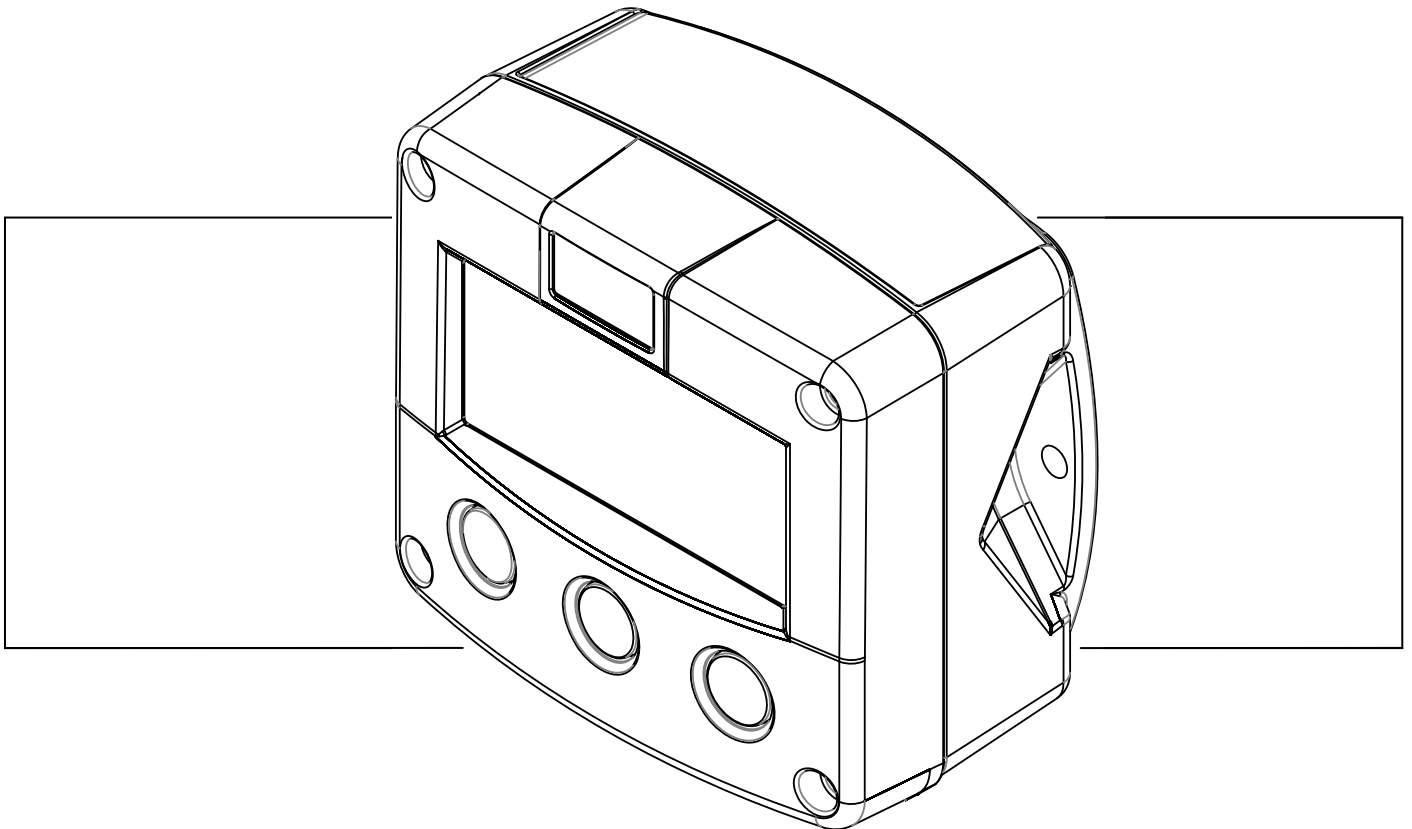


# *F130-A*

*BATCH-CONTROLLER*



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

*Status inputs: start and stop.*

*Signal outputs: two control outputs for two stage control, or one control output and pulse output ref. total.*

*Options: Intrinsically Safe, Modbus communication.*





## SAFETY INSTRUCTIONS

- *Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.*
- *LIFE SUPPORT APPLICATIONS: The F130-A is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.*
- *Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.*
- *This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).*
- *Do connect a proper grounding to the aluminum casing (type HA/HU) as indicated if the F130-A has been supplied with the 115-230V AC power-supply type PM. The green/yellow wire between the back-casing and removable terminal-block may never be removed.*
- *Intrinsically Safe applications: follow the instructions as mentioned in Chapter 5 and consult "Fluidwell F1...-XI - Documentation for Intrinsic Safety".*



## DISPOSAL

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

## SAFETY RULES AND PRECAUTIONARY MEASURES

- The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and the procedures as described in this manual are not followed.
- Modifications of the F130-A implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Installation, use, maintenance and servicing of this equipment must be carried out by authorized technicians.
- Check the mains voltage and information on the manufacturer's plate before installing the unit.
- Check all connections, settings and technical specifications of the various peripheral devices with the F130-A supplied.
- Open the casing only if all leads are free of potential.
- Never touch the electronic components (ESD sensitivity).
- Never expose the system to heavier conditions than allowed according to the casing classification (see manufacture's plate and chapter 4.2.).
- If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
- The local labor and safety laws and regulations must be adhered to.

## ABOUT THE OPERATION MANUAL

This operation manual is divided into two main sections:

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

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

**A hazardous situation may occur if the F130-A is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this operating manual indicated by the pictograms:**



A "**warning**" indicates actions or procedures which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the F130-A or connected instruments.



Caution !

A "**caution**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the F130-A or connected instruments.



Note !

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

|                  |   |                                 |
|------------------|---|---------------------------------|
| Hardware version | : | 02.01.xx                        |
| Software version | : | 02.01.xx                        |
| Manual           | : | HF130AEN_v0501_04               |
| © Copyright 2011 | : | Fluidwell bv - The Netherlands. |

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# 1. INTRODUCTION

## 1.1. SYSTEM DESCRIPTION OF THE F130-A

### Functions and features

The batch controller model F130-A is a microprocessor driven instrument designed for batching and filling of small batch sizes up to large quantities as well as displaying the total and accumulated total. This product has been designed with a focus on:

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

### Flowmeter input

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

One flowmeter with a (0)4-20mA output can be connected to the F130-A. To power the sensor, several options are available.

### Standard outputs

- Two transistor or relay outputs: for two-stage control or one stage control with pulse output. The configurable pulse output offers a scaled pulse mirroring a certain totalised quantity. Maximum frequency 60Hz.; the pulse length can be set from 7,8msec up to 2 seconds.

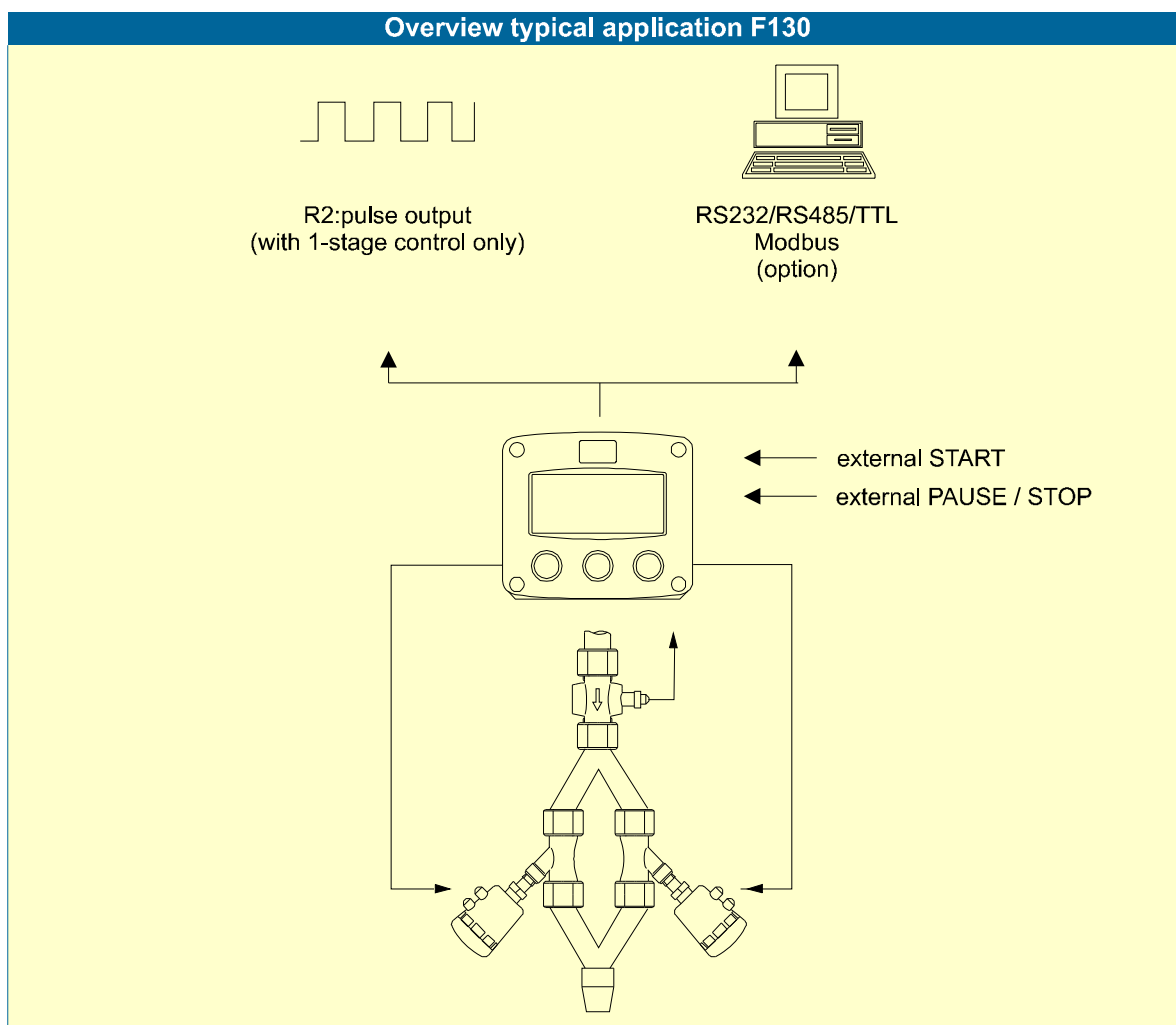


Fig. 1: Typical application for the F130-A.

**Configuration of the unit**

The F130-A was designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F130-A according to your specific requirements. SETUP includes several important features, such as Span, measurement units, signal selection etc. All settings are stored in EEPROM memory and will not be lost in the event of power failure or a drained battery.

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

**Display information**

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

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

**Options**

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

## 2. OPERATIONAL

### 2.1. GENERAL



- *The F130-A may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.*

This chapter describes the daily use of the F130-A. This instruction is meant for users / operators.

### 2.2. CONTROL PANEL

The following keys are available:



Fig. 2: Control Panel.

#### Functions of the keys



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



This key is used to START the batch process.  
The arrow-key ▲ is used to increase a value after PROG has been pressed or to configure the unit; please read chapter 3.



Press STOP to "PAUSE" the batch process. When this key is pressed twice, the process is completely finished and can't be continued.  
STOP is also used to select Total and accumulated total.  
After PROG has been pressed, the arrow-key ► is used to select a value

**2.3. OPERATOR INFORMATION AND FUNCTIONS**

In general, the F130-A will always function at Operator level. The information displayed is dependant upon the SETUP-settings. The signal generated by the connected flowmeter is measured by the F130-A in the background, whichever screen refresh rate setting is chosen. After pressing a key, the display will be updated very quickly during a 30 second period, after which it will slow-down again.

▪ **To enter a batch quantity**

To change the PRESET-value, following procedure must be followed:

- 1) press PROG: the word "PROGRAM" will be flashing,
- 2) use ▸ to select the digits and ▲ to increase that value,
- 3) set the new PRESET-value by pressing ENTER.



Fig. 3: Example display information during programming preset value.

When data is altered but ENTER has not been pressed yet, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER during three seconds: the former value will be reinstated. The PRESET-value can be used time after time till a new value is programmed.



*Please note that alterations will only be set after ENTER has been pressed!*

▪ **Batch maximum**

When you program a new value which is not valid - the batch size is too large - the decrease-sign ▼ will be displayed while you are programming; the new value will not be accepted!

▪ **Starting up the batch process**

The batch process can only be started up when "READY" is displayed. The batch process is started-up by pressing the START-key. Depending on the SETUP-settings, one or two relays will be switched. The arrows at the display indicate if the ACTUAL-value is / was counting up or down.

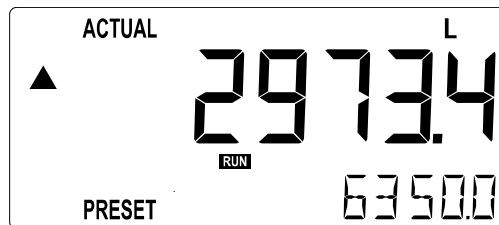


Fig. 4: Example display information during and at the end of the process.



- **Interrupting and ending the batch process**

When STOP is pressed once, the batch process will be temporarily interrupted; the actual values are not lost. At the display, the word "PAUSE" will be flashing. From this stage, the batch process can be resumed with the START-key.

The process can be ended entirely at all times by pressing STOP twice in which case the actual values are "lost" and the system returns to steady state: the batch can not be resumed.

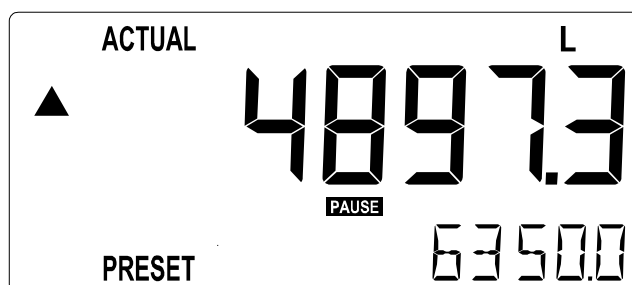


Fig. 5: Example display information when interrupted.

**After batching, following functions are available:**

- **Clear total**

The value for total can be re-initialized. To do so, select Total and press PROG followed by STOP - STOP. After pressing STOP once, the flashing text "PUSH STOP" is displayed. To avoid re-initialization at this stage, press another key than STOP or wait for 20 seconds. Re-initialization of total DOES NOT influence the accumulated total.

- **Display accumulated total**

When the STOP-key is pressed, total and accumulated total are displayed. The accumulated total cannot be re-initialized. The value will count up to 99,999,999,999. The unit and number of decimals are displayed according to the configuration settings for preset.

- **Low-battery alarm**

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

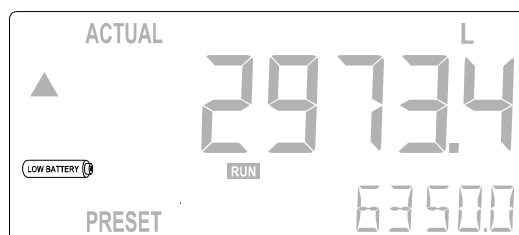


Fig. 6: Example of low-battery alarm.

- **Alarm 01-03**

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

### 3. CONFIGURATION

#### 3.1. INTRODUCTION

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



- *Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.*
- *The F130-A may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Ensure that the measuring system is correctly wired up according to the wiring diagrams. The housing may only be opened by trained personnel.*
- *Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.*

#### 3.2. PROGRAMMING SETUP-LEVEL

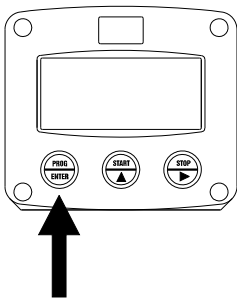
##### 3.2.1. GENERAL

Configuration of the F130-A is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows  $\blacktriangle$  will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically. SETUP can be reached at all times while the F130-A remains fully operational.



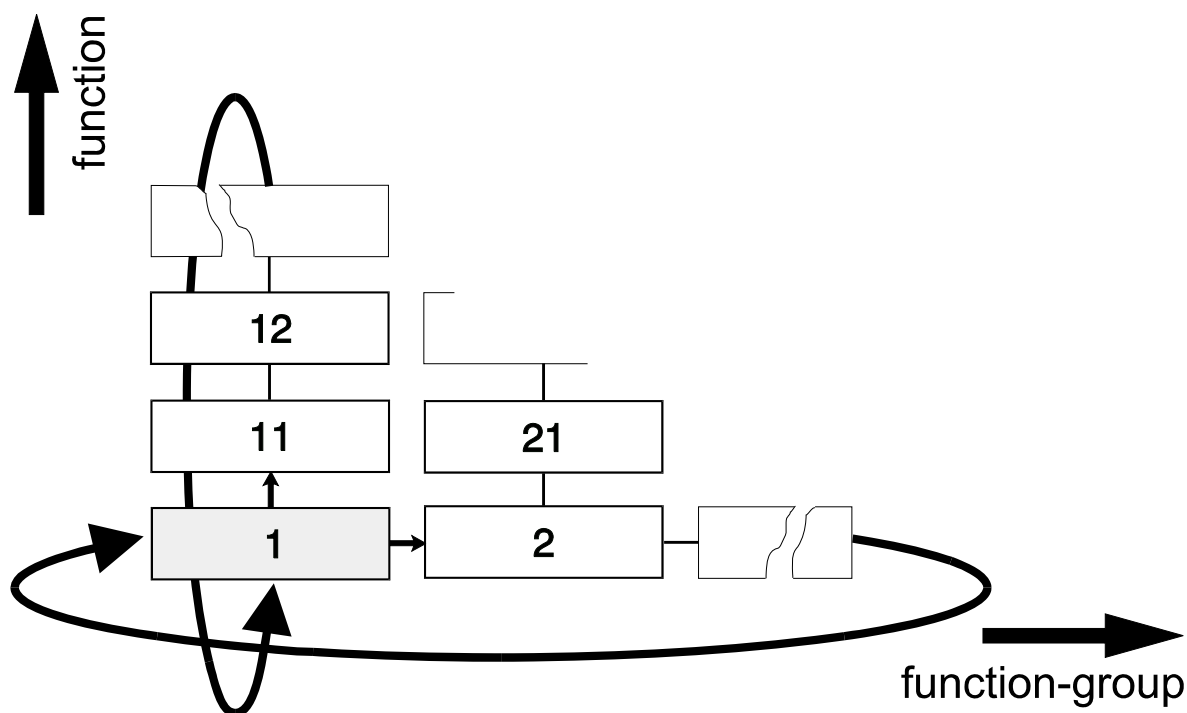
**Note:** A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.

To enter SETUP-level:



Press  for 7 seconds

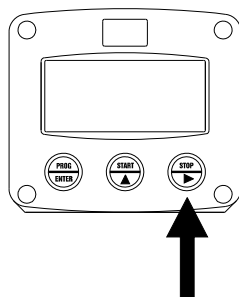
## Matrix structure SETUP-level:



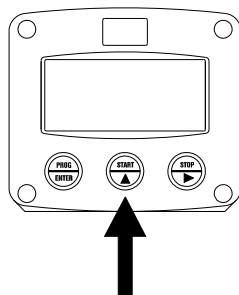
## SCROLLING THROUGH SETUP-LEVEL

## Selection of function-group and function:

SETUP is divided into several function groups and functions.



Select function-group with



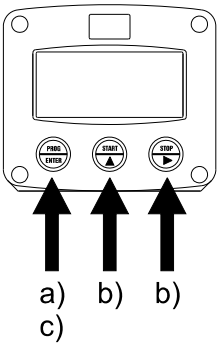
Select function with









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



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



To change or select a value:



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

To change a value, use  to select the digits and  to increase that value.

To select a setting, both  and  can be used.

If the new value is invalid, the increase sign  or decrease-sign  will be displayed while you are programming.

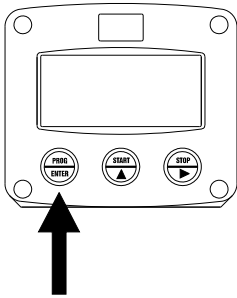
When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for three seconds: the PROG-procedure will be left automatically and the former value reinstated.



Note !

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

To return to OPERATOR-level:



Press  for 3 seconds

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

## 3.2.2. OVERVIEW FUNCTIONS SETUP LEVEL

| <b>SETUP FUNCTIONS AND VARIABLES</b> |                         |                   |  |
|--------------------------------------|-------------------------|-------------------|--|
| <b>1</b>                             | <b>PRESET</b>           |                   |  |
|                                      | 11                      | UNIT              | L - m3 - kg - lb - GAL - USGAL - bbl - no unit |
|                                      | 12                      | DECIMALS          | 0 - 1 - 2 - 3 (Ref: displayed value)           |
|                                      | 13                      | SPAN              | 0.000001 - 9,999,999 unit/second               |
|                                      | 14                      | DECIMALS SPAN     | 0 - 6  |
|                                      | 15                      | BATCH MAXIMUM     | X,XXX,XXX quantity                             |
| <b>2</b>                             | <b>OVERRUN</b>          |                   |  |
|                                      | 21                      | OVERRUN           | disable - enable                               |
|                                      | 22                      | TIME              | 0.1 - 999.9 seconds                            |
| <b>3</b>                             | <b>DISPLAY</b>          |                   |  |
|                                      | 31                      | DISPLAY           | increase - decrease                            |
| <b>4</b>                             | <b>POWER MANAGEMENT</b> |                   |  |
|                                      | 41                      | LCD UPDATE        | fast - 1 sec - 3 sec - 15 sec - 30 sec - off   |
|                                      | 42                      | BATTERY MODE      | operational - shelf                            |
| <b>5</b>                             | <b>FLOWMETER</b>        |                   |  |
|                                      | 51                      | FORMULA           | interpolation, square root                     |
|                                      | 52                      | FILTER            | 00 - 99  |
|                                      | 53                      | CUT-OFF           | 0.0 - 99.9%                                    |
|                                      | 54                      | CALIBRATE LOW     | (0)4mA   |
|                                      | 55                      | CALIBRATE HIGH    | 20mA   |
| <b>6</b>                             | <b>RELAYS</b>           |                   |  |
|                                      | 61                      | RELAYS            | 1-step / 2-step                                |
|                                      | 62                      | PRECLOSE          | X,XXX,XXX quantity                             |
|                                      | 63                      | PERIOD TIME       | 0 - 250  |
|                                      | 64                      | IMPULSE PER       | X,XXX,XXX quantity                             |
|                                      | 65                      | IMPULSE ACCORDING | total - batch                                  |
| <b>7</b>                             | <b>COMMUNICATION</b>    |                   |  |
|                                      | 71                      | SPEED / BAUDRATE  | 1200 - 2400 - 4800 - 9600                      |
|                                      | 72                      | ADDRESS           | 1 - 255  |
|                                      | 73                      | MODE              | ASCII - rtu - off                              |
| <b>8</b>                             | <b>OTHERS</b>           |                   |  |
|                                      | 81                      | TYPE / MODEL      |  |
|                                      | 82                      | SOFTWARE VERSION  |  |
|                                      | 83                      | SERIAL NO.        |  |
|                                      | 84                      | PASSWORD          | 0000 - 9999                                    |
|                                      | 85                      | TAGNUMBER         | 0000000 - 9999999                              |

## 3.2.3. EXPLANATION OF SETUP-FUNCTIONS

| <b>1 - PRESET</b>              |   |
|--------------------------------|---|
| <b>MEASUREMENT UNIT<br/>11</b> | <p>SETUP - 11 determines the measurement unit for preset, total, accumulated total and pulse output. The following units can be selected:</p> <p style="text-align: center;">L - m3 - kg - lb. - GAL - USGAL - bbl - _ (no unit).</p> <p>Alteration of the measurement unit will have consequences for operator and SETUP-level values.<br/>Please note that the K-factor has to be adapted as well; the calculation is not done automatically.</p>   |
| <b>DECIMALS<br/>12</b>         | <p>The decimal point determines for preset, total, accumulated total and pulse output the number of digits following the decimal point.<br/>The following can be selected:</p> <p style="text-align: center;">000000 - 111111.1 - 22222.22 - 3333.333</p>   |
| <b>SPAN<br/>13</b>             | <p>With the span, the flowmeter signal is converted to a quantity. The <b>span for Preset</b> is determined on the basis of the measurement unit (setting 11) and the <b>flowrate per second</b> at 20mA.<br/>Enter the span in whole numbers (decimals are set with SETUP 14). The more accurate the span, the more accurate the functioning of the system will be.</p> <p><b>Example 1: Calculating the span for Preset.</b><br/><i>Let us assume that the flowmeter generates 20mA at a flowrate of 2,481.3 Liters/minute and the selected unit is "cubic meters / m3".<br/>The rate per second is <math>2,481.3 \div 60</math> is 41.355 L/sec. This is 0.041355 m3/sec., which is the span.<br/>Enter for SETUP - 13: "041355" and for SETUP - 14 - decimals span "6".</i></p> <p><b>Example 2: Calculating the span for Preset</b><br/><i>Let us assume that the flowmeter generates 20mA at a rate of 652.31 USGAL per hour, the selected unit is barrels.<br/>There are 42 gallons in one barrel; so the rate is <math>652.31/42</math> is 15.53119 barrels/hour. This is 0.0043142 barrels/second, which is the span.<br/>Enter for SETUP - 13: "004314" and for SETUP - 14 "6".</i></p> |
| <b>DECIMALS SPAN<br/>14</b>    | <p>This setting determines the number of decimals for the Span (SETUP 13). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>Please note that this function influences the accuracy of the Span indirectly.<br/>This setting has NO influence on the displayed number of digits for preset (SETUP 12)!</p>   |
| <b>BATCH MAXIMUM<br/>15</b>    | <p>This function limits the operator to enter a new preset-value which is more as the entered batch maximum.</p>  |

## 2 - OVERRUN

Overrun can occur at the end of the batch process, as a result of slowness of a valve / pump. Consequently, the accuracy is less. With this function, the F130-A analyses the actual overrun characteristic after every batch. This information is used to correct the overrun automatically.

|                           |   |
|---------------------------|---|
| <b>OVERRUN</b><br>21      | For an accurate overrun correction, it is necessary that the flow meter meets certain technical demands, such as "high resolution" and shows no "false" overrun due to a slow update time.<br>Do not enable this function if the flow meter does not meet these technical demands.  |
| <b>OVERRUN TIME</b><br>22 | The overrun characteristic of the system will be analyzed during a certain time after the batch. In this way, false signal generated through leakage are eliminated.<br>Enter here the expected time needed by the system to stop a batch. It is advisable to provide extra time in order to avoid an incorrect overrun correction or false leakage alarms.<br><i>Note that the next batch can only be started after elapsing of this overrun time!</i><br>The minimum overrun time is 0.1 second, maximum 999.9 seconds. |

## 3 - DISPLAY

|                      |   |
|----------------------|---|
| <b>DISPLAY</b><br>31 | The large 17mm digits can be set to display the actual batched quantity (increase) OR to display the remaining quantity to be batched (decrease). |
|----------------------|---|

## 4 - POWER MANAGEMENT

When used with the internal battery option (type PB / PC), the user can expect reliable measurement over a long period of time. The F130-A has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:

|                           |   |
|---------------------------|---|
| <b>LCD NEW</b><br>41      | The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display update, it is <b>strongly advised</b> to select a slow refresh rate. Please understand that NO information will be lost; the input signal will be processed and the output signals will be generated in the normal way. The following can be selected:<br><br>Fast - 1 sec - 3 sec - 15 sec - 30 sec - off.<br><br><b>Example 3: Battery life-time</b><br><i>battery life-time with a FAST update: about 3 years.</i><br><i>battery life-time with a 1 sec update: about 5 years.</i><br><br><b>Note:</b> after a button has been pressed by the operator - the display refresh rate will always switch to FAST for 30 seconds. When "OFF" is selected, the display will be switched off after 30 seconds and will be switched on as soon as a button has been pressed. |
| <b>BATTERY-MODE</b><br>42 | The unit has two modes: operational or shelf.<br>After "shelf" has been selected, the unit can be stored for several years; it will not count pulses, the display is switched off but all settings and totals are stored. In this mode, power consumption is extremely low.<br>To wake up the unit again, press the SELECT-key twice.   |



Note !

## 5 - FLOWMETER

|                     |   |
|---------------------|---|
| <b>SIGNAL</b><br>51 | <p>The F130-A can process the 4-20mA signal in two ways:</p> <ul style="list-style-type: none"> <li>▪ Interpolation: the signal is processed linear</li> </ul> $\mathbf{R = S \times I}$ <ul style="list-style-type: none"> <li>▪ Square root: for differential pressure</li> </ul> $\mathbf{R = S \sqrt{I}}$ <p>where:</p> <p>R = Rate: the calculated flowrate<br/>                 S = Span: the maximum flowrate at 20mA. The span is programmed with setting 24 for flowrate and with setting 13 for total.<br/>                 I = Input: the scaled analog value; in these formulas value 0 (zero) for (0)4mA and value 1 (one) for 20mA.</p> |
|---------------------|---|

|                     |  |
|---------------------|--|
| <b>FILTER</b><br>52 | <p>The analog output signal of a flowmeter does mirror the actual flow. This signal is measured several times a second by the F130-A. The value measured is a "snap-shot" of the real flow as it will be fluctuating. With the help of this digital filter a stable and accurate reading can be obtained while the filter level can be set to a desired value.</p> <p>The filter principal is based on three input values: the filter level (01-99), the last measured analog value and the last average value. The higher the filter level, the longer the response time on a value change will be. Below, several filter levels with there response times are indicated:</p> |
|---------------------|--|



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

Continued next page >>>



## 5 - FLOWMETER (CONTINUED)

|                               |   |                     |                                   |   |
|-------------------------------|---|---------------------|-----------------------------------|---|
| <b>CUT-OFF<br/>53</b>         | <p>To ignore e.g. leakage of the flow or vibration, a low-flow cut-off can be set as percentage over the full range of 16mA (or 20mA / 10V). When the analog value is less then required with this setting, the signal will be ignored.</p> <p>The cut-off value can be programmed is the range 0.0 - 99.9%.</p> <p><b>Examples:</b></p>  |                     |                                   |   |
| FUNCTION<br>(setup 51)        | SPAN<br>(setup<br>13/24)  | REQUIRED<br>CUT-OFF | CUT-OFF<br>(setup 53)             | REQUIRED OUTPUT   |
| interpolation                 | 450 L/min   | 25 L/min            | $25/450 \times 100\% = 5.5\%$     | $16\text{mA} \times 5.5\% + 4\text{mA} = 4.88\text{mA}$ |
| square root                   | 450 L/min   | 25 L/min            | $(25/450)^2 \times 100\% = 0.3\%$ | $16\text{mA} \times 0.3\% + 4\text{mA} = 4.05\text{mA}$ |
| <b>TUNE MIN / 4MA<br/>54</b>  | <p>With this setting it is possible to calibrate the input value for (0)4mA as the signal from the flowmeter might not be exact 4.0 mA (or 0.0 mA) at flowrate zero.</p> <p>This function will measure the real output value at flow zero.</p> <ul style="list-style-type: none"> <li>▪ <i>Warning: be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!</i></li> </ul> <p>After pressing PROG, three settings can be selected:</p> <ul style="list-style-type: none"> <li>▪ CALIBRATE: with this setting, the input will be calibrated with the actual "(0)4mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be more than the calibrated value before the signal will be processed.</li> <li>▪ DEFAULT: with this setting, the manufactures value is re-installed.</li> <li>▪ CAL SET: to select the last calibrated value.</li> </ul> |                     |                                   |   |
| <b>TUNE MAX / 20MA<br/>55</b> | <p>With this setting it is possible to calibrate the input value for 20mA as the signal from the flowmeter might not be exact 20.0 mA at maximum flowrate.</p> <p>This function will measure the real output value at maximum flowrate.</p> <ul style="list-style-type: none"> <li>▪ <i>Warning: be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!</i></li> </ul> <p>After pressing PROG, three settings can be selected:</p> <ul style="list-style-type: none"> <li>▪ CALIBRATE: with this setting, the input will be calibrated with the actual "20mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be less than the calibrated value for a reliable measurement.</li> <li>▪ DEFAULT: with this setting, the manufactures value is re-installed.</li> <li>▪ CAL SET: to select the last calibrated value.</li> </ul>               |                     |                                   |   |



## 6 - RELAY OUTPUT

Two outputs are available to control relays or small valves. Output 2 can also be used as pulse output according the batch total (actual) or accumulated total.

### 1-STEP / 2-STEP 61

With this setting, the function of relay is  
*Select "2-step" to executed batches with a two-stage valve.*  
*Select "1-step" to be able to use relay 2 as pulse output relay.*

### PRECLOSE QUANTITY 62

According to the setting 61 - 2-step, relay two will be used to control a valve for the batch process.  
 If the product is batched in two steps, the switch-off-moment for relay 2 has to be set. The switch moment is based on the remaining quantity before the end of batch.  
 If the preclose quantity is set to zero, it will switch simultaneously with relay 1.

### PERIOD TIME PULSE OUTPUT 63

According to the setting 61 - 1-step, relay 2 can be used as a scaled pulse output.  
 The period time determines the time that the transistor or relay will be switched; in other words the pulse length. The minimum time between the pulses is as long as the period time.  
 One period is approx. 7.8 msec. If the value selected is "zero", the pulse output is disabled. The maximum value is 255 periods.  
**Note:** *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 reduces again, 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 it's range*

| NUMBER OF PERIODS | PERIOD TIME    | MAX. FREQUENCY |
|-------------------|----------------|----------------|
| 0                 | disabled       | disabled       |
| 1                 | 0,0078 seconds | 64 Hz.         |
| 2                 | 0,0156 seconds | 32 Hz.         |
| 3                 | 0,0234 seconds | 21 Hz.         |
| 64                | 0,5000 seconds | 1 Hz.          |
| 255               | 1,9922 seconds | 0.25 Hz.       |

### PULSE PER 64

According to the measurement unit settings for preset, a scaled pulse will be generated every X-quantity. Enter this quantity here while taking the displayed decimal position and measuring unit into account.

### PULSE ACCORDING ACC. TOTAL / BATCH 65

With this function, it is determined if a pulse will be generated according the quantity batched or according accumulated total.  
 With setting "batch" the pulse generator will be set to zero when a new batch is started up.



Note !

## 7 - COMMUNICATION (OPTIONAL)

|   |  |
|---|--|
| The functions described below deal with hardware that is not part of the standard delivery. Programming of these functions does not have any effect if this hardware has not been installed. Consult Appendix C and the Modbus communication protocol description for a detailed explanation. |  |
| <b>BAUDRATE</b><br>71   | For external control, the following communication speeds can be selected:<br><br>1200 - 2400 - 4800 - 9600 baud    |
| <b>BUS ADDRESS</b><br>72  | For communication purposes, a unique identity can be attributed to every F130-A. This address can vary from 1-255. |
| <b>MODE</b><br>73   | The communication protocol is Modbus ASCII or RTU mode. Select OFF, to disable this communication function.        |

## 8 - OTHERS

|                               |   |
|-------------------------------|---|
| <b>TYPE OF MODEL</b><br>81    | For support and maintenance it is important to have information about the characteristics of the F130-A.<br>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. |
| <b>VERSION SOFTWARE</b><br>82 | For support and maintenance it is important to have information about the characteristics of the F130-A.<br>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. |
| <b>SERIAL NUMBER</b><br>83    | For support and maintenance it is important to have information about the characteristics of the F130-A.<br>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. |
| <b>PASS CODE</b><br>84        | All SETUP-values can be pass code protected.<br>This protection is disabled with value 0000 (zero).<br>Up to and including 4 digits can be programmed, for example 1234.  |
| <b>TAGNUMBER</b><br>85        | For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.  |

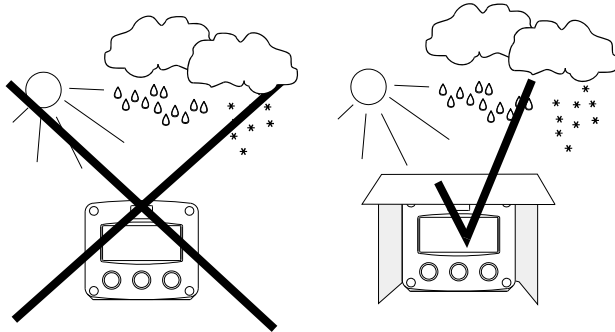
## 4. INSTALLATION



### 4.1. GENERAL DIRECTIONS

- Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- The F130-A may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.
- Take careful notice of the " Safety rules, instructions and precautionary measures " at the front of this manual.

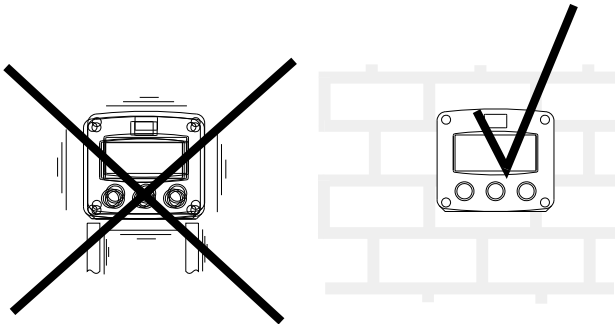
### 4.2. INSTALLATION / SURROUNDING CONDITIONS



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

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

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



Mount the F130-A on a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE

Aluminum enclosures:

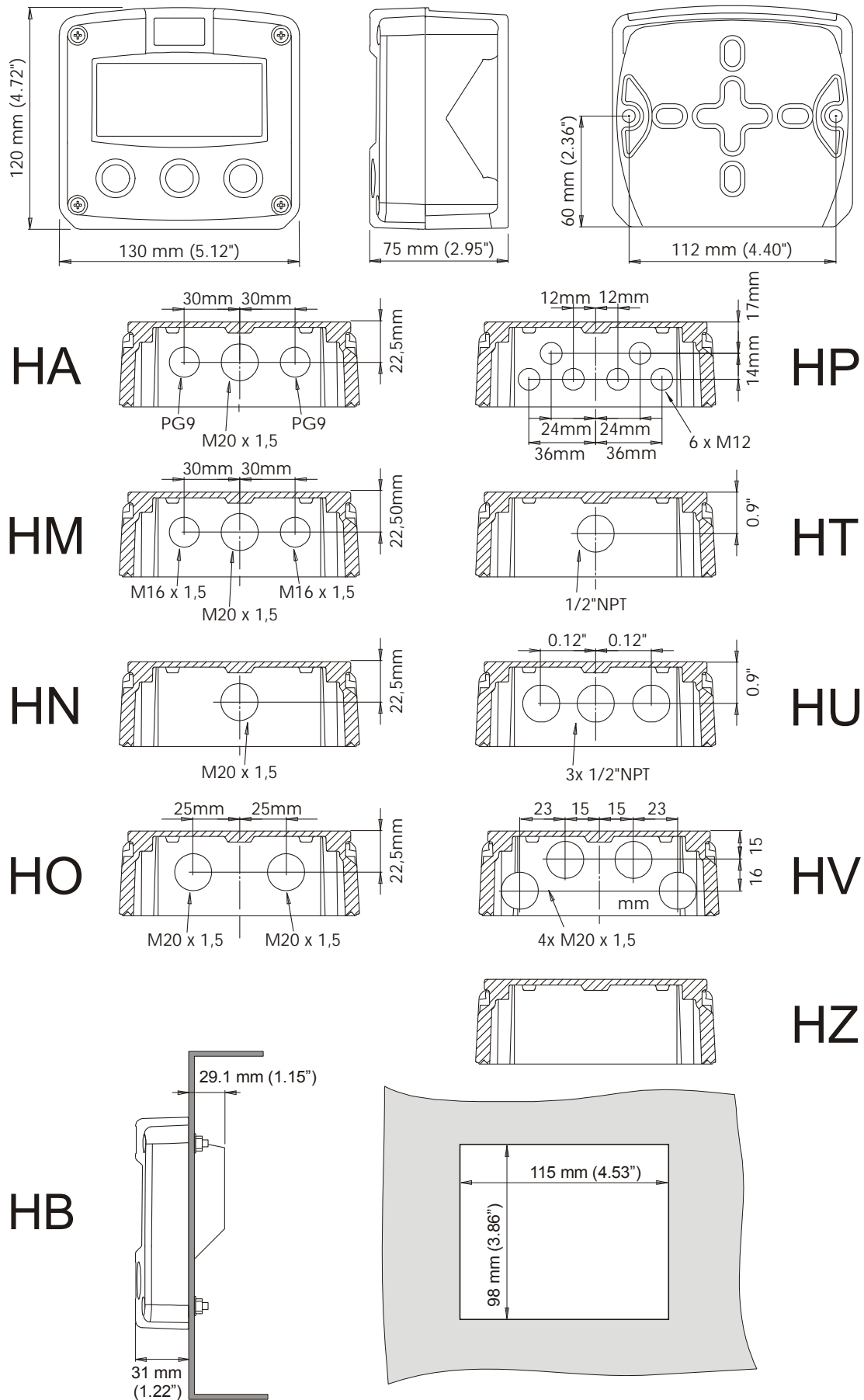
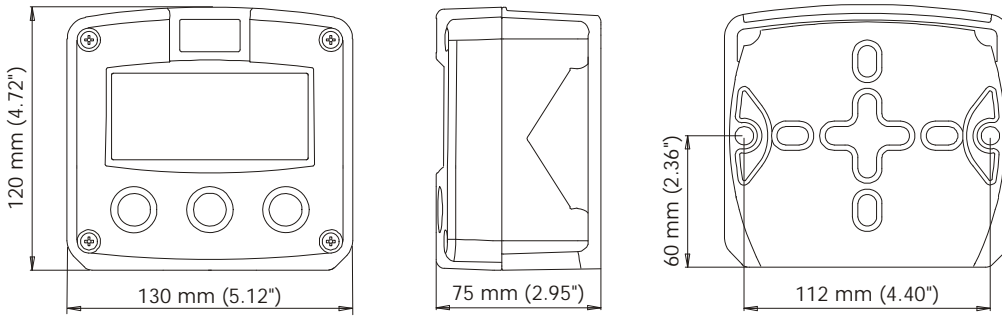
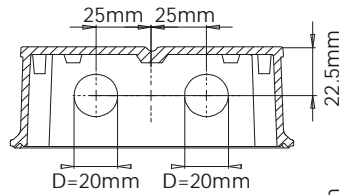
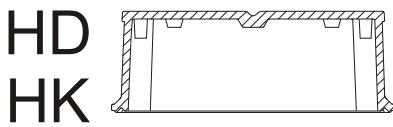
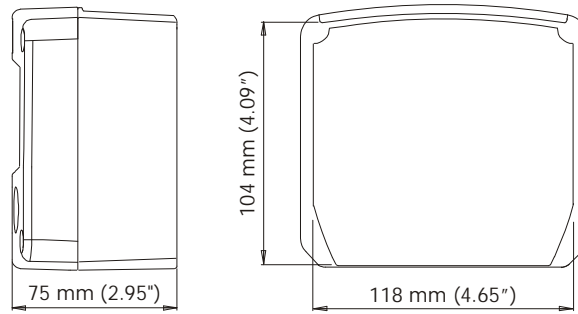


Fig. 7: Dimensions aluminum enclosures.

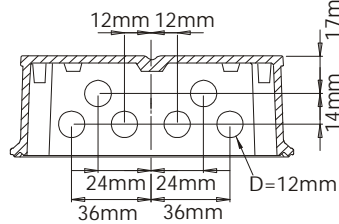
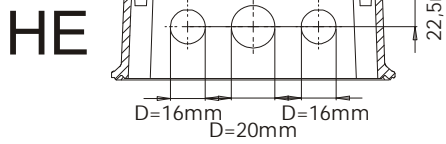
GRP enclosures:



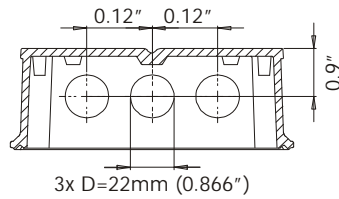
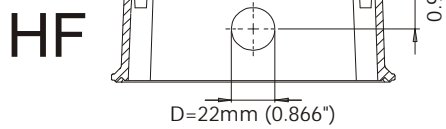
HK back box:  
(flat bottom)



HG



HH



HJ

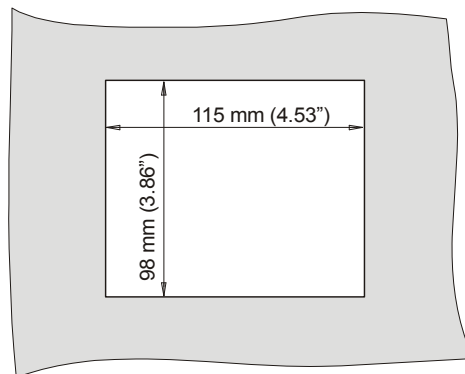
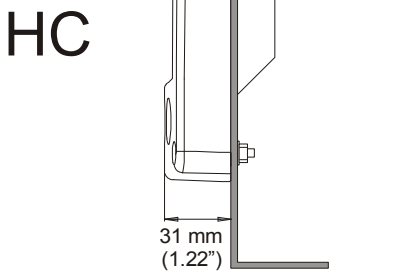


Fig. 8: Dimensions GRP enclosures.

## 4.4. INSTALLING THE HARDWARE



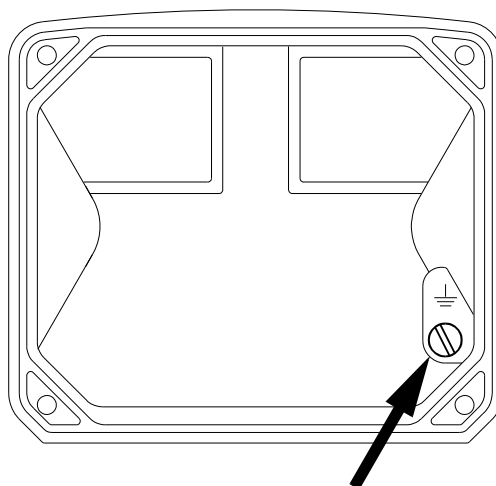
### 4.4.1. INTRODUCTION

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



#### Aluminum enclosures

- When installed in an aluminum enclosure and a potentially explosive atmosphere requiring apparatus of equipment protection level Ga and Da, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.
- Do ground the aluminum enclosure properly as indicated, if the F130-A has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-casing and removable terminal-block may never be removed.



*Fig. 9: Grounding aluminum enclosure with type PM 115-230V AC.*

#### FOR INSTALLATION, PAY EMPHATIC ATTENTION TO:

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

4.4.2. VOLTAGE SELECTION SENSOR SUPPLY

For **Intrinsically Safe** applications: read chapter 5.

**Type PB / PX: Battery powered and output loop-powered applications:**

Terminal 11 provides a limited supply voltage of 3.2 V DC for the signal output of the flowmeter.



**Note:** This voltage MAY NOT be used to power the flowmeters electronics, converters etc, as it will not provide adequate sustained power ! All energy used by the flowmeters pick-up will directly influence the battery life-time.

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

With this option, a real power supply for the sensor is available. The flowmeter can be powered with 8.2 - 12 or 24 V DC (max. 50mA@24V). The voltage is selected by the three switches inside the enclosure.



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

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

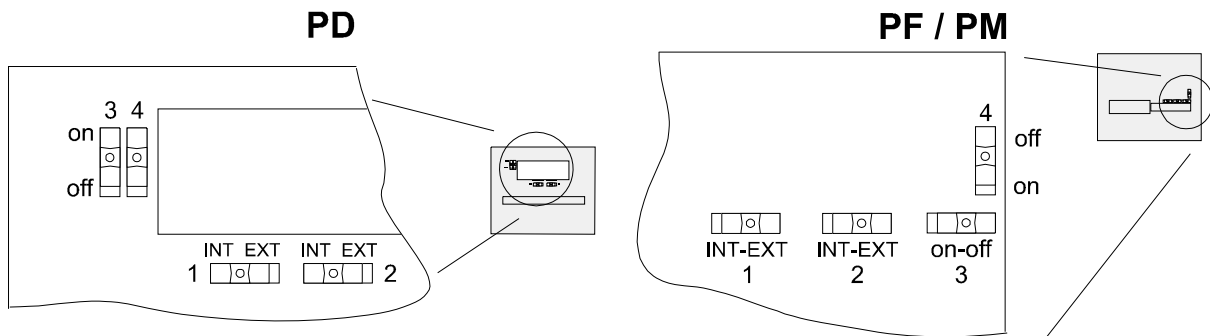


Fig. 10: switch position voltage selection (type PD / PF / PM).

**Switch positions**

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

| SENSOR B |         |
|----------|---------|
| SWITCH 2 | VOLTAGE |
|          |         |
|          |         |

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

- Function switch 1:** voltage selection sensor A - terminal 11.
- Function switch 2:** not available for this Model.
- Function switch 3+4:** the combination of these switches determine the voltage as indicated. If switch 1 and 2 are both set to position OFF than the selected voltage with switch 3+4 is valid for both sensors.



#### 4.4.3. TERMINAL CONNECTORS

For *Intrinsically Safe* applications: read chapter 5.

The following terminal connectors are available:

| OPTION:<br>POWER SUPPLY:<br>Type PD / PF / PM |   |    | TWO-STAGE or<br>PULSE OUTPUT<br>TYPE<br>OA / OR / OT |    | BATCH<br>OUTPUT<br>TYPE<br>OA / OR / OT |    | POWER SUPPLY<br>8-24V AC/DC<br>Type PX |    | FLOWMETER<br>INPUT<br>TYPE A<br>(0)4-20mA |    | SENSOR<br>SUPPLY<br>DC |    | START INPUT |    | STOP INPUT |      |
|---|---|----|--|----|---|----|--|----|---|----|------------------------|----|-------------|----|------------|------|
|   |   |    |  |    |   |    |  |    |   |    |                        |    |             |    |            |      |
| GND   | 1 | 2  | 3  | 4  | 5                                       | 6  | 7                                      | 8  | 9   | 10 | 11                     | 12 | 13          | 14 | 15         | 16   |
| ⊥   | N | L1 | R2 ⊥   | R2 | R1 ⊥                                    | R1 | ⊥                                      | +↑ | ⊥   | ↑  | +↓                     | ⊥  | START       |    | ⊥          | STOP |

Fig. 11: Overview of terminal connectors standard configuration F130-A and options.

#### REMARKS: TERMINAL CONNECTORS:

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

| TYPE                 | SENSOR SUPPLY       | Terminal |    |    | backlight | TYPE AA | TYPE AU | type OA | type OR |
|----------------------|---------------------|----------|----|----|-----------|---------|---------|---------|---------|
|                      |                     | GND      | 01 | 02 |           |         |         |         |         |
| PD 8-24V AC          | 8,2-12-24V max 50mA |          | AC | AC |           | ◇       | ◇       | ◇       |         |
| PD 8-30V DC          | 8,2-12-24V max 50mA | L-       | L+ |    |           | ◇       | ◇       | ◇       |         |
| PF 24V AC ± 15%      | 8,2-12-24V max 50mA |          | AC | AC |           | ◇       | ◇       |         | ◇       |
| PF 24V DC ± 15%      | 8,2-12-24V max 50mA | L-       | L+ |    |           | ◇       | ◇       |         | ◇       |
| PM 115-230V AC ± 15% | 8,2-12-24V max 50mA | EARTH    | AC | AC |           | ◇       | ◇       | ◇       | ◇       |

Φ = standard ◇ = type

For *Intrinsically Safe* applications: read chapter 5.

#### Terminal 3-4; transistor or relay output R2:

This output is available to drive a low-power device (e.g. relays) to control the batch process.

Relay 1 is switched-on during the whole process while relay 2 can be used for two-step control or as pulse output.

In case of a pulse output function: the maximum pulse frequency of this output is 60Hz.

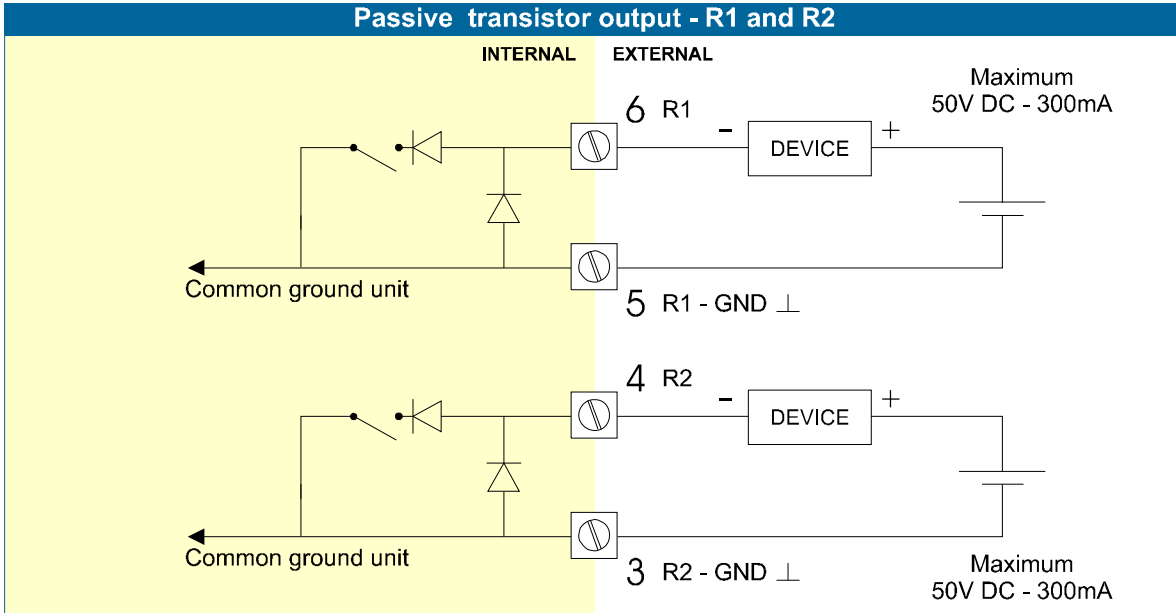
#### Terminal 05-06; transistor or relay output R1:

This output is available to drive a low-power device (e.g. relays) to control the batch process.

Relay 1 is switched-on during the whole batch process.

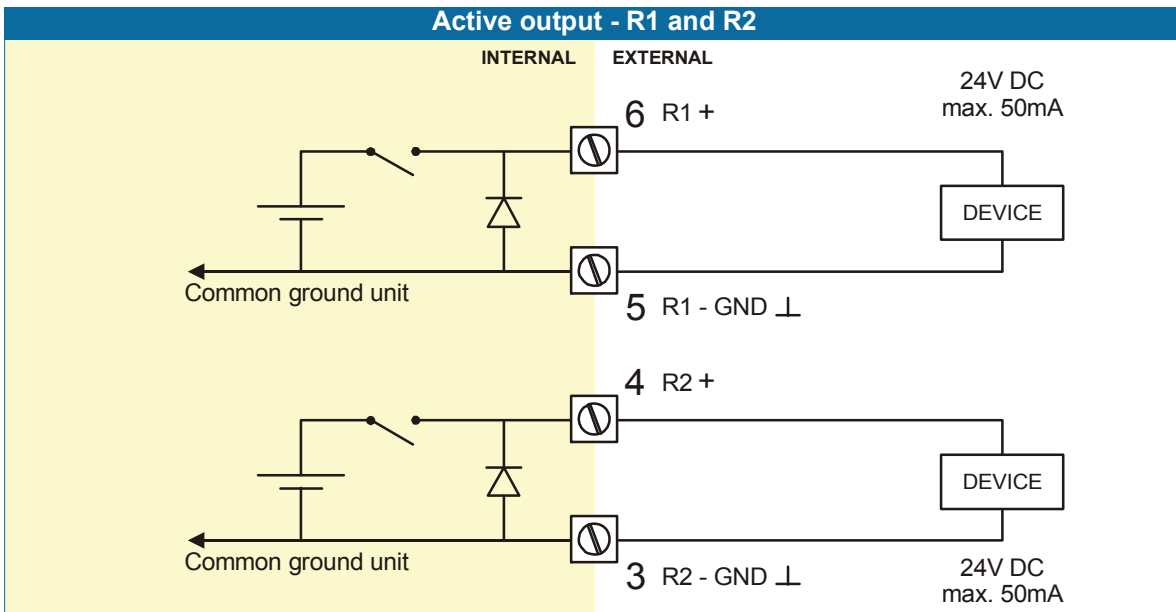
**Type OT:**

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



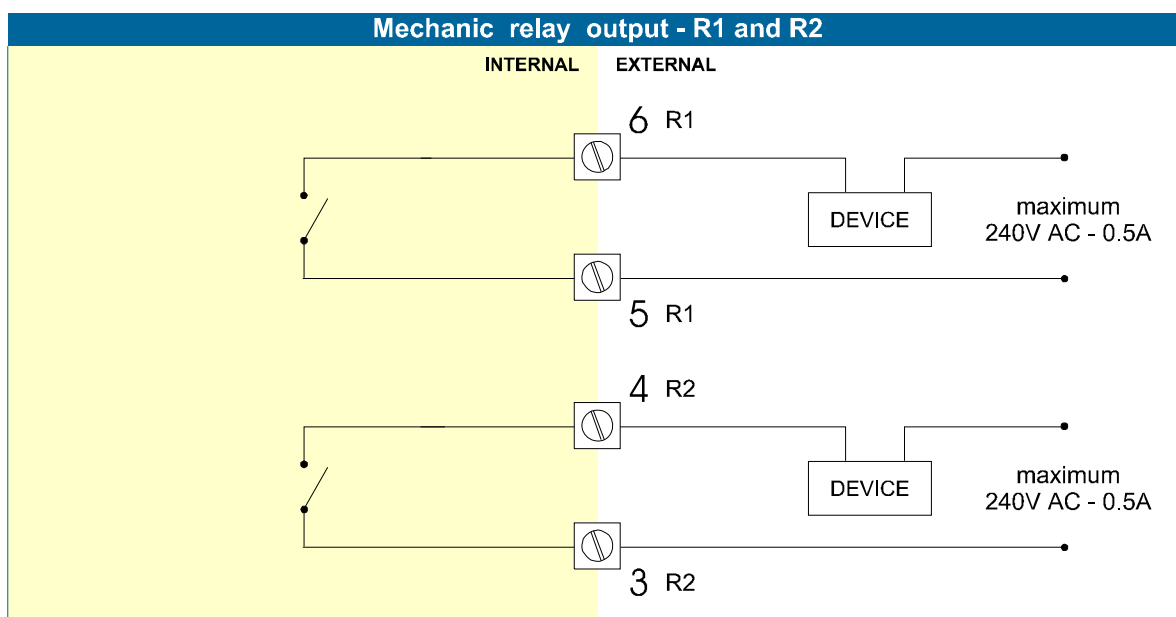
**Type OA:**

An active 24V DC signal according to the functions R1 and R2 is available with this option. Max. driving capacity 50mA@24V DC per output. (Requires power supply type PD / PF / PM).



**Type OR: :**

A mechanical relay output according the functions R1 and R2 is available with this option.  
Max. switch power 240V-0,5A per output. (Requires power supply type PF / PM).

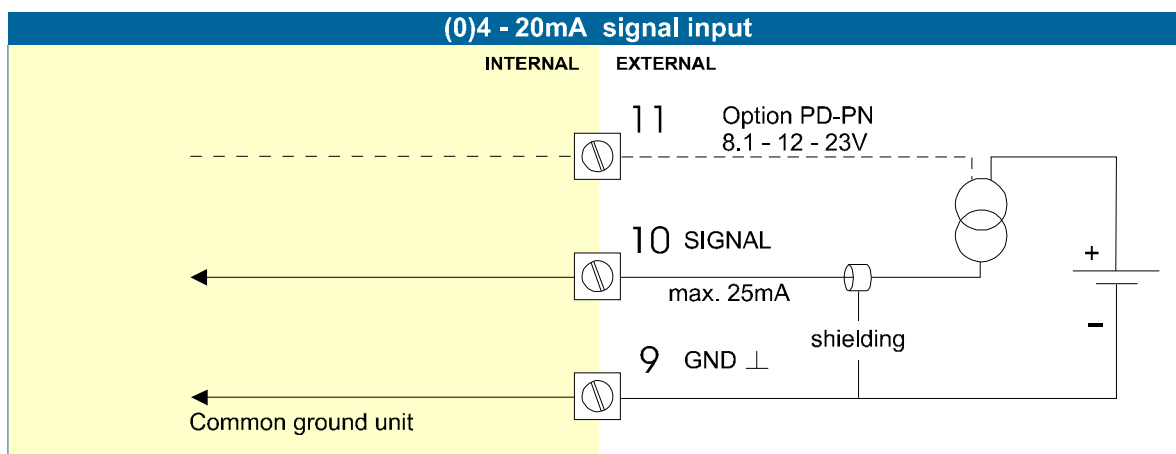
**Terminal 07-08; basic POWER SUPPLY - type PX:**

Connect an external power supply of 8-24 volts AC or 8-30VDC to these terminals or a 4-20mA loop. For a DC supply: connect the "-" to terminal 7 and the "+" to terminal 8. When power is applied to these terminals, the (optional) internal battery will be disabled / enabled automatically to extend the battery life time. (Only valid for standard passive output).

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

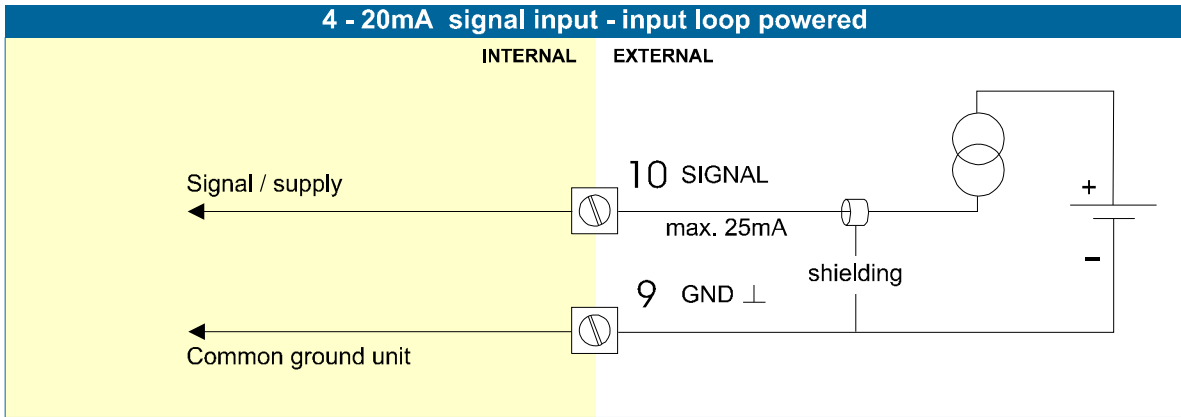
The F130-A requires a (0)4-20mA flowmeter signal which will be processed 4 times a second with a 14 bits accuracy. The input is not isolated.

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



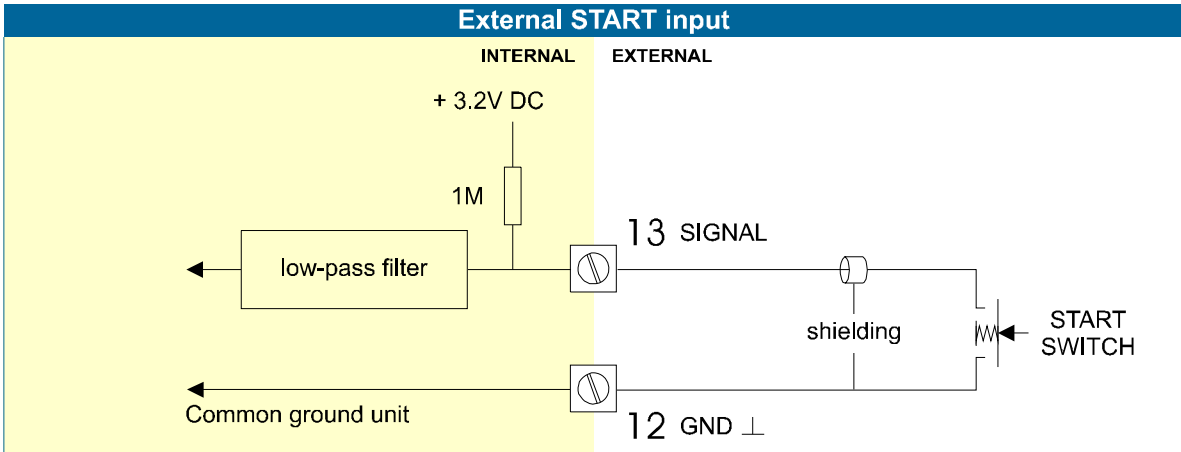
**Terminal 09-10: Type A-PL – Flowmeter input / power supply:**

The F130-A-PL requires a 4-20mA flowmeter signal which has a double function:  
 The signal will be processed 4 times a second with a 14 bits accuracy and the unit will be powered from the sensor signal (input loop powered). The input is not isolated and not intrinsically safe.



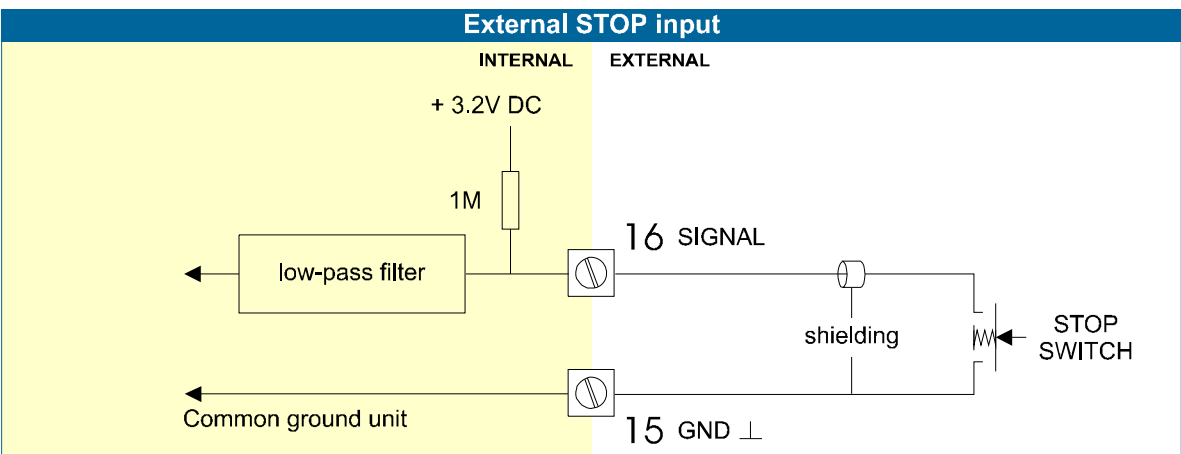
**Terminal 12-13; external START:**

With this function, the batch controller can be started with an external switch. The input must be switched with a potential free contact to the GND-terminal number 12 for at least 0.3 seconds.



**Terminal 15-16; external STOP:**

With this function, the batch controller can be interrupted or cancelled with an external switch. The input must be switched once for interruption or switch twice for cancellation with a potential free contact to the GND-terminal number 15 for at least 0.3 seconds.



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

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

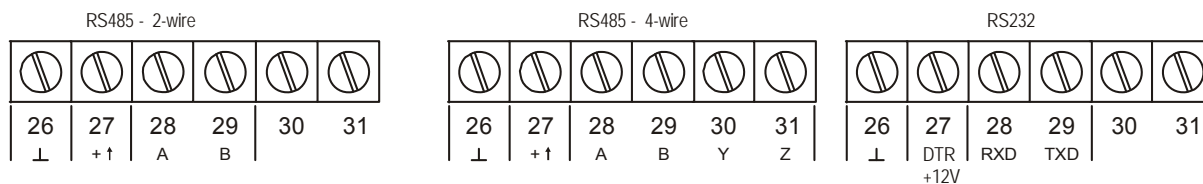


Fig. 12: Overview terminal connectors communication option.

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

**Terminal 26-31: backlight option - type ZB:**

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

Note: Intrinsically Safe as well as 4-wire RS485 communication is not possible in combination with option ZB.

Option type ZB: adjustable backlight

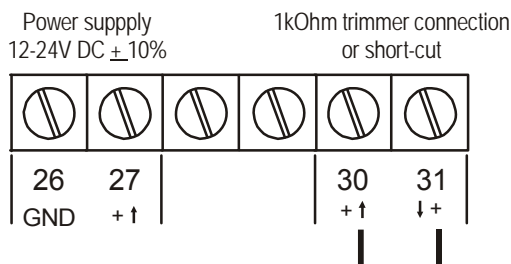


Fig. 13: Overview terminal connectors backlight option.

## 5. INTRINSICALLY SAFE APPLICATIONS

### 5.1. GENERAL INFORMATION AND INSTRUCTIONS



Caution !

#### Cautions

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



#### Safety Instructions

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



Note !

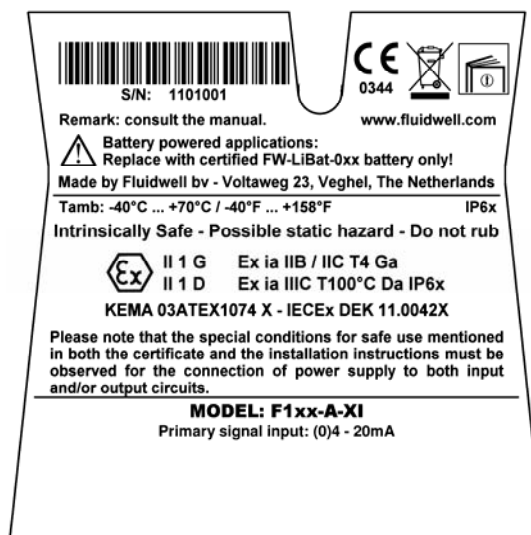
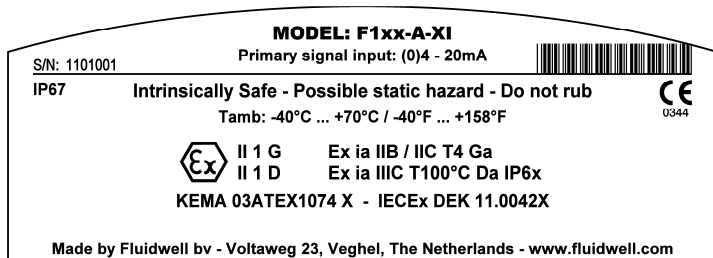
#### Please Note

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

**Label information (inside and outside the enclosure)**

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

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



**Serial number and year of production**

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



**5.2. TERMINAL CONNECTORS INTRINSICALLY SAFE APPLICATIONS**



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

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

- The indicator is either supplied by
  - the internal supply (option -PC); or
  - the external supply connected to terminals 0 and 1 (option -PD); or
  - the circuit supply connected to terminals 7 and 8 (option -AP);
 The maximum values for any of those circuits are those as defined for group IIB/IIIC;
- No other active external intrinsically safe circuits may be connected to the indicator, with exception of circuits connected to terminals 3 and 4 and/or terminals 5 and 6; the maximum values for any of those circuits are those as defined for group IIB/IIIC

**Terminal connectors F130-A-XI:**

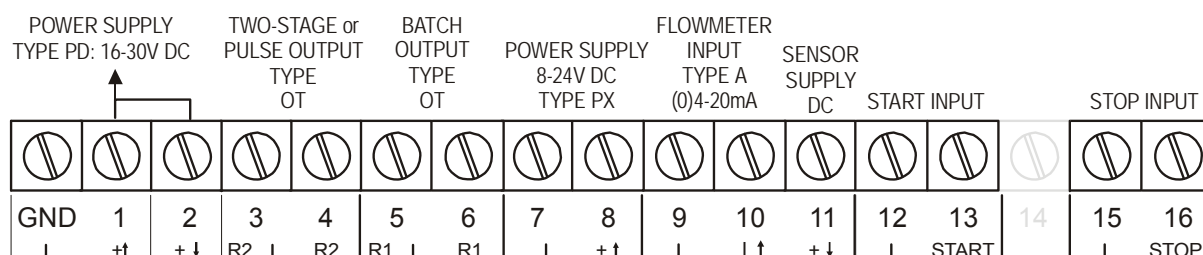


Fig. 14: Overview terminal connectors XI - Intrinsically Safe applications.

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

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

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

5.3 CONFIGURATION EXAMPLES

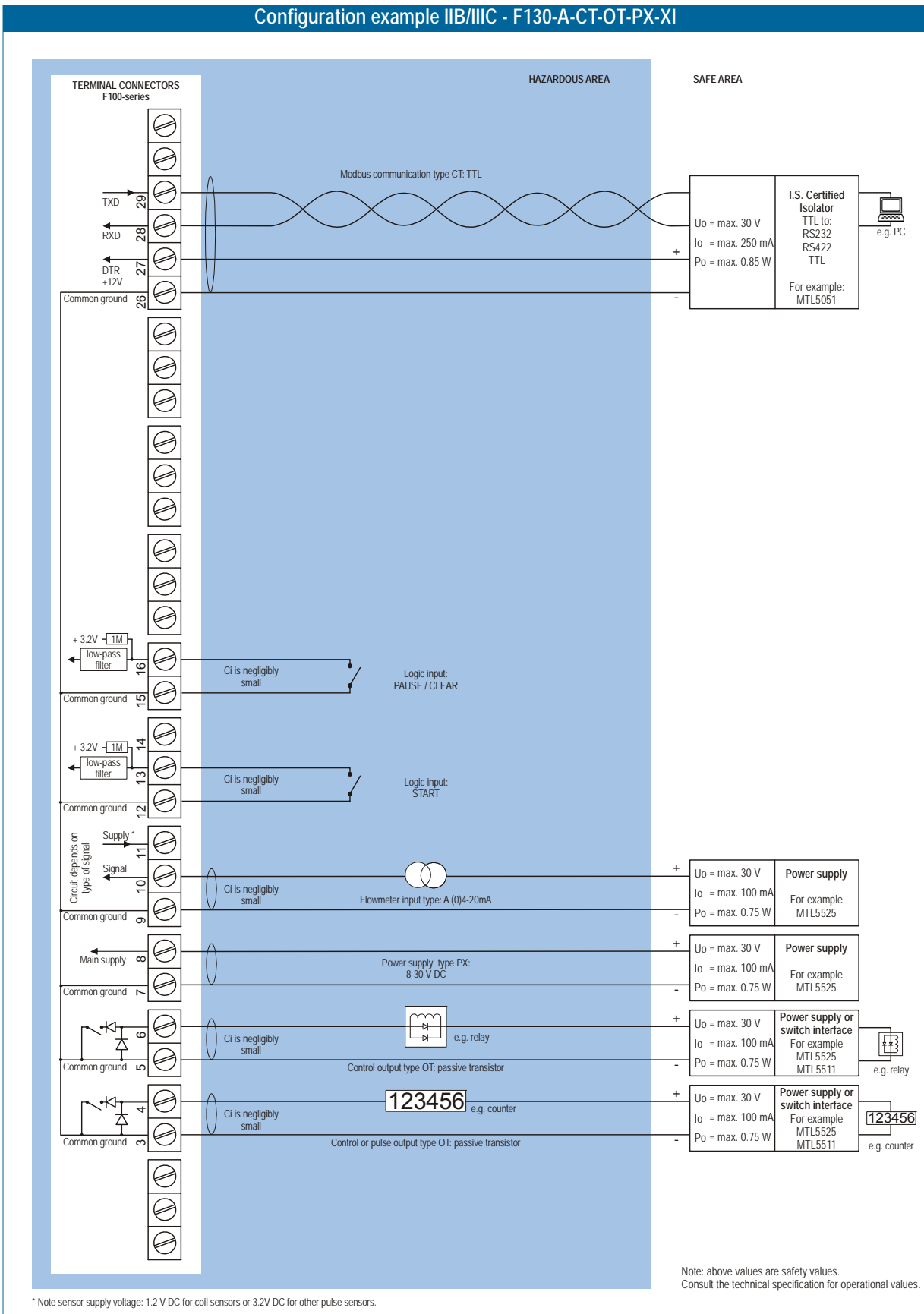


Fig. 13: Configuration example 1 Intrinsically Safe



Configuration example IIB/IIC and IIC - F130-A-(CT)-OT-PD-XI

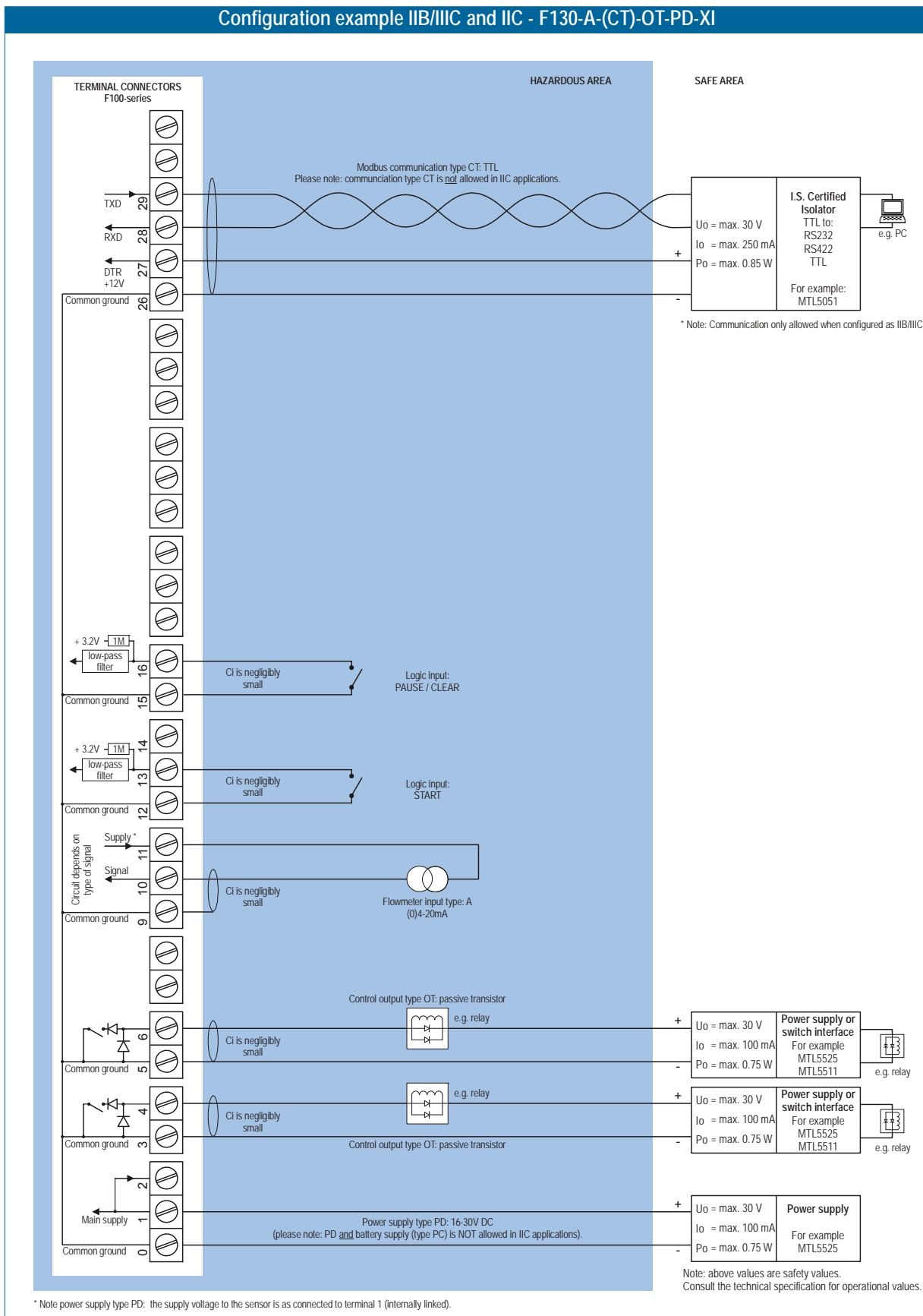


Fig. 14: Configuration example 2 Intrinsically Safe

## 5.4 BATTERY REPLACEMENT INSTRUCTIONS



### Safety Instructions

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



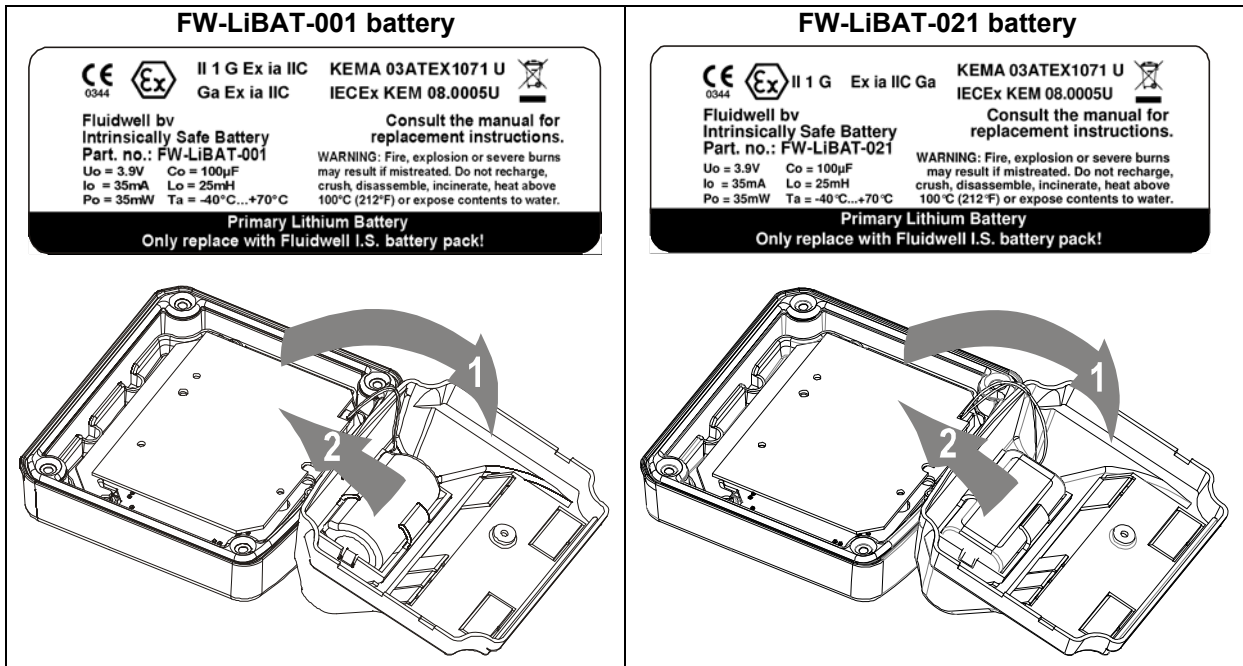
### Safety instructions for hazardous areas

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

### Battery replacement procedure



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



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

## 6. MAINTENANCE

### 6.1. GENERAL DIRECTIONS



Caution !

- *Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.*
- *The F130-A may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.*
- *Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.*

The F130-A does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the users responsibility to take all precautions to dehumidify the internal atmosphere of the F130-A in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.

#### **Battery life-time:**

It is influenced by several issues :

- Display update: fast display update uses significantly more power; SETUP 51.
- Pulse output and communications .
- Low temperatures; the available power will be less due to battery chemistry.



Note !

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

#### **Check periodically:**

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

## APPENDIX A: TECHNICAL SPECIFICATION

### GENERAL

| Display      |  |
|--------------|--|
| Type         | High intensity reflective numeric and alphanumeric LCD, UV-resistant.  |
| Digits       | Seven 17mm (0.67") and eleven 8mm (0.31"). Various symbols and measuring units.  |
| Refresh rate | User definable: 8 times/sec - 30 secs.   |
| Type ZB      | Transflective LCD with green LED backlight. Good readings in full sunlight and darkness.<br>Note: only available for safe area applications.<br>Power requirements: 12-24V DC + 10% or type PD, PF, PM. Power consumption max. 1 Watt. |

| Enclosures                  |  |
|-----------------------------|--|
| General                     | Die-cast aluminum or GRP (Glassfibre Reinforced Polyamide) enclosure with Polycarbonate window, silicone and EPDM gaskets. UV stabilized and flame retardant material. |
| Control Keys                | Three industrial micro-switch keys. UV-stabilized silicone keypad.   |
| Painting                    | Aluminum enclosure only: UV-resistant 2-component industrial painting.   |
| Panel-mount enclosures      | Dimensions: 130 x 120 x 60mm (5.10" x 4.72" x 2.38") – LxHxD.  |
| Classification              | IP65 / NEMA4X  |
| Panel cut-out               | 115 x 98mm (4.53" x 3.86") LxH.  |
| Type HC                     | GRP panel-mount enclosure  |
| Type HB                     | Aluminum panel-mount enclosure   |
| Field/wall-mount enclosures | Dimensions: 130 x 120 x 75mm (5.10" x 4.72" x 2.95") – LxHxD.  |
| Classification              | IP67 / NEMA4X  |
| Aluminium enclosures        |  |
| Type HA                     | Drilling: 2x PG9 – 1x M20.   |
| Type HM                     | Drilling: 2x M16 – 1x M20.   |
| Type HN                     | Drilling: 1x M20.  |
| Type HO                     | Drilling: 2x M20.  |
| Type HP                     | Drilling: 6x M12.  |
| Type HT                     | Drilling: 1x ½"NPT.  |
| Type HU                     | Drilling: 3x ½"NPT.  |
| Type HV                     | Drilling: 4x M20   |
| Type HZ                     | No drilling.   |
| GRP enclosures              |  |
| Type HD                     | No drilling.   |
| Type HE                     | Drilling: 2x 16mm (0.63") – 1x 20mm (0.78").   |
| Type HF                     | Drilling: 1x 22mm (0.87").   |
| Type HG                     | Drilling: 2x 20mm (0.78").   |
| Type HJ                     | Drilling: 3x 22mm (0.87").   |
| Type HH                     | Drilling: 6x 12mm (0.47").   |
| Type HK                     | Flat bottom - no drilling.   |
| ABS enclosure               |  |
| Type HS                     | Silicone free ABS enclosure with EPDM and PE gaskets. UV-resistant polyester keypad.<br>(no drilling)  |


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

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

| Sensor excitation |   |
|-------------------|---|
| Type PB / PC / PX | Supply voltage: 3.2V DC for pulse signals and 1.2V DC for coil pick-up. |
| Type PD           | Sensor supply voltage 8 - 12 and 24V DC - max. 50mA@24V DC              |
| Type PF / PM      | Sensor supply voltage 8 - 12 and 24V DC - max. 100mA@24V DC             |

| Terminal connections |   |
|----------------------|---|
| Type:                | Removable plug-in terminal strip. Wire max. 1.5mm <sup>2</sup> and 2.5mm <sup>2</sup> |

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

| Hazardous area (optional)     |   |
|-------------------------------|---|
| Intrinsically safe<br>Type XI | <b>ATEX approval:</b><br> II 1 G Ex ia IIB/IIC T4 Ga<br>II 1 D Ex ia IIIC T100°C Da IP6x<br><br><b>IECEX approval:</b><br>Ex ia IIB/IIC T4 Ga<br>Ex ia IIIC T100°C Da IP6x |
| Explosion proof<br>Type XD/XF | ATEX approval ref: II 2 EEx d IIB T5. Weight appr. 20kg.<br>Dimensions of enclosure: 278 x 358 x 270mm (10.94" x 14.09" x 10.63") LxHxD.  |

| Environment                   |  |
|-------------------------------|--|
| Electromagnetic compatibility | Compliant ref: EN 61326 (1997), EN 61010-1 (1993), NAMUR NE21 (1998) |

## INPUTS

| Flowmeter       |   |
|-----------------|---|
| Type P          | Coil/sine wave (minimum 20mVpp or 80mVpp - sensitivity selectable), NPN/PNP, open collector, reed-switch, Namur, active pulse signals 8 - 12 and 24V.   |
| Frequency       | Minimum 0 Hz - maximum 7 kHz for total and flowrate.<br>Maximum frequency depends on signal type and internal low-pass filter.<br>E.g. Reed switch with low-pass filter: max. frequency 120 Hz. |
| K-Factor        | 0.000010 - 9,999,999 with variable decimal position.  |
| Low-pass filter | Available for all pulse signals.  |
| Type A          | (0)4-20mA - with signal calibration feature. Resolution: 14 bit.  |
| Type U          | 0-10 V, 0-5 V, 1-5 V - with signal calibration feature. Resolution: 14 bit.   |
| Accuracy        | 0.05%. Low level cut-off programmable.  |
| Span            | 0.000010 - 9,999,999 with variable decimal position.  |
| Update time     | Four times a second.  |
| Voltage drop    | 2.5 Volt.   |
| Load impedance  | 3kOhm   |
| Relationship    | Linear and square root calculation.   |
| Note            | For signal type A and U: external power to sensor is required; e.g. type PD.  |

## OUTPUTS

| Transistor outputs |  |
|--------------------|--|
| Function           | User defined: batch process two stage control or scaled pulse output acc. batch or acc. total. |
| Pulse output       | Max. frequency 60Hz. Pulse length user definable between 7,8msec up to 2 seconds.              |
| Type OT            | two passive transistor outputs - not isolated. Load max. 50V DC - 300mA                        |
| Type OA            | Active 24V DC output; max. 50mA per output (requires type PD or PM).                           |
| Type OR            | Mechanic relay output; max. switch power 230V AC - 0,5A (requires type PD or PM).              |

| Communication option |  |
|----------------------|--|
| Type                 | RS232 or RS485 (2-wire or 4-wire).                           |
| Protocol             | Modbus ASCII / RTU   |
| Speed                | 1200 - 2400 - 4800 - 9600 baud                               |
| Addressing           | maximum 255 addresses.                                       |
| Functions            | reading display information, reading / writing all settings. |

**OPERATIONAL**

| Operator functions    |   |
|-----------------------|---|
| Functions             | <ul style="list-style-type: none"> <li>enter a preset value,</li> <li>start / interrupt and stop the batch process,</li> <li>total can be reset to zero.</li> </ul> |
| Displayed information | <ul style="list-style-type: none"> <li>preset value,</li> <li>running batch total or remaining quantity,</li> <li>total and accumulated total.</li> </ul>           |

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

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

## APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F130-A is going to be installed or while it is in operation.

### Flowmeter does not work properly

Check:

- Settings for span SETUP - 13 - 14, 24 - 25
- Did you re-calibrate the 4-20mA input in a proper way? You can remove the re-calibration with the default setting. SETUP 75-76
- Flowmeter, wiring and connection of terminal connectors (par. 4.4.4.),
- Power supply of flowmeter (par. 4.4.4.).

### Overrun correction does not function properly

Check:

- SETUP 31 - disable/enable; is the function enabled?
- SETUP 32 - overrun time; is this time long enough to measure the real overrun quantity?

### Pulse output does not function:

Check:

- SETUP 81 - pulse per "x" quantity; is the value programmed reasonable and will the maximum output be under 20Hz?
- SETUP 82 - impulse width; is the external device able to recognize the selected pulse width and frequency?

### The pass code is unknown:

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

### ALARM

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

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

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

0003: error 1 and error 2 occurred simultaneously

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

## APPENDIX C: COMMUNICATION VARIABLES

### Remarks:

- Below, an overview of the F130-A specific variables; other common variables are described in the standard table.
- All numbers are decimal numbers, unless otherwise noted.
- The following variables of the standard table (var00-var30) are not valid for this product and will be responded with value 1: var00, 03-05, 07,08, 16-22, 24, 26-29.

| CONFIGURATION VARIABLES F130-A - SETUP-LEVEL: |                         |       |   |   |
|---|-------------------------|-------|---|---|
| VAR   | DESCRIPTION             | BYTES | VALUE   | REMARKS   |
| <b>PRESET / TOTAL</b>                         |                         |       |   |   |
| 32<br>(20h)                                   | unit                    | 1     | 0=L<br>1=m3<br>2=kg<br>3=lb<br>4=gal<br>5=usgal<br>6=bbbl<br>7=none |   |
| 33<br>(21h)                                   | decimals                | 1     | 0...3   |   |
| 34<br>(22h)                                   | span                    | 3     | 1....9.999.999  | S 0000001 up to S 0000009 is allowed when decs < 6! (VAR37) |
| 37<br>(25h)                                   | decimals Span           | 1     | 0...6   |   |
| 218<br>DAh                                    | batch maximum           | 3     | 0-9,999,999   | decimals: see 33 (21h)                                      |
| <b>OVERRUN</b>                                |                         |       |   |   |
| 192<br>(C0h)                                  | overrun time            | 2     | 1...9,999   | steps of 0.1 second   |
| 194<br>(C2h)                                  | disable/enable overrun  | 1     | 0=disable<br>1=enable   |   |
| <b>DISPLAY</b>                                |                         |       |   |   |
| 195<br>(C3h)                                  | increase / decrease     | 1     | 0=decrease<br>1=increase  |   |
| <b>POWERMANAGEMENT</b>                        |                         |       |   |   |
| 80<br>(50h)                                   | LCD update time         | 1     | 0=fast<br>1=1sec<br>2=3sec<br>3=15sec<br>4=30sec<br>5=off           |   |
| 81<br>(51h)                                   | power-mode battery      | 1     | 0=operational<br>1=shelf  |   |
| <b>FLOWMETER</b>                              |                         |       |   |   |
| 98<br>(62h)                                   | formula                 | 1     | 0=linear<br>1=square root   |   |
| 99<br>(63h)                                   | filter                  | 1     | 0....99   |   |
| 100<br>(64h)                                  | cut-off                 | 2     | 0....999  | steps of 0.1%   |
| 102<br>(66h)                                  | calibration low (4mA)   | 1     | 0=default<br>1=calibrate<br>2=cal set                               |   |
| 103<br>(67h)                                  | calibration high (20mA) | 1     | 0=default<br>1=calibrate<br>2=cal set                               |   |



| VAR                       | DESCRIPTION   | BYTES | VALUE  | REMARKS   |
|---------------------------|---|-------|--|---|
| <b>RELAYS</b>             |   |       |  |   |
| 196<br>(C4h)              | 1-step / 2-step   | 1     | 0=1-step<br>1=2-step   |   |
| 197<br>(C5h)              | preclose quantity   | 3     | 0-9,999,999  | decimals: see 33 (21h)  |
| 128<br>(80h)              | impulse width   | 1     | 0=off<br>1=short<br>2=long   |   |
| 129<br>(81h)              | pulse per X quantity  | 3     | 1..9999999   | unit, decimals acc. var32 -33   |
| <b>OTHERS</b>             |   |       |  |   |
| 168<br>(A8h)              | pass code   | 2     | xxxx   | read only!  |
| 170<br>AAh                | tagnumber   | 3     | 0..9999999   | Other vars: see standard table  |
| <b>BATCH MODE</b>         |   |       |  |   |
| 223<br>DFh                | batch mode  | 1     | 1 = Batch running<br>2 = Batch pausing<br>4 = Batch finished<br>8 = Batch in<br>overtime | read only   |
| <b>BATCH KEYLOCK</b>      |   |       |  |   |
| 154<br>9Ah                | Batch keylock   | 2     | Range:<br>0000h..FFFFh   | steps of 0.1 second   |
| <b>BATCH KEYLOCK MASK</b> |   |       |  |   |
| 156<br>9Ch                | Batch Keylock mask<br>keys set are not<br>detected  | 1     | Key 1: 0x01<br>Key 2: 0x02<br>Key 3: 0x04  | bitfield  |
| <b>BATCH COMMAND</b>      |   |       |  |   |
| 157<br>9Dh                | Batch Command<br>Read out returns<br>last executed<br>command entered<br>through<br>communication | 1     | Commands:<br>1 = Start<br>2 = Pause<br>3 = Stop<br>4 = Release                           | Before a new batch can be<br>initiated through communication,<br>the release command must be<br>send. This way, when combined<br>with the Keylock, overwriting of<br>batch information (total/preset)<br>data can be prevented. |
| <b>PRESET</b>             |   |       |  |   |
| 200<br>(C8h)              | preset quantity   | 3     | 0-9,999,999  | decimals: see 33 (21h)  |

**OTHER F130-A VARIABLES FOR COMMUNICATION**

**ACTUAL - variable number 208 (DOh) – 6 bytes**

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

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

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

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

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

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

Write acc. total: Not possible.

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

**Example: read var. 566 for total:**

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

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## LIST OF CONFIGURATION SETTINGS

| SETTING                     | DEFAULT                  | DATE :   | DATE :   |
|-----------------------------|--------------------------|----------|----------|
| <b>1 - PRESET</b>           | Enter your settings here |          |          |
| 11 unit                     | L                        |          |          |
| 12 decimals                 | 0000000                  |          |          |
| 13 span                     | 0000001 unit/sec         | unit/sec | unit/sec |
| 14 decimals span            | 0                        |          |          |
| 15 max. batch size          | 0                        |          |          |
| <b>2 - OVERRUN</b>          |                          |          |          |
| 21 overrun                  | disabled                 |          |          |
| 22 overrun quantity         | 0 L                      |          |          |
| <b>3 - DISPLAY</b>          |                          |          |          |
| 31 display                  | increase                 |          |          |
| <b>4 - POWER MANAGEMENT</b> |                          |          |          |
| 41 LCD-new                  | 1 sec.                   |          |          |
| 42 mode                     | operational              |          |          |
| <b>5 - FLOWMETER</b>        |                          |          |          |
| 51 formula                  | interpolation            |          |          |
| 52 filter                   | 01 (off)                 |          |          |
| 53 cut-off %                | 00.0%                    |          |          |
| 54 calibrat. low-(0)4mA     | default                  |          |          |
| 55 calibrat. high-20mA      | default                  |          |          |
| <b>6 - RELAY OUTPUT</b>     |                          |          |          |
| 61 relays                   | 1-step                   |          |          |
| 62 preclose quantity        | 0                        |          |          |
| 63 impulse width            | 010 periods              |          |          |
| 64 pulse per                | 0001000                  |          |          |
| 65 pulse according          | batch                    |          |          |
| <b>7 - COMMUNICATION</b>    |                          |          |          |
| 71 baud-rate                | 2400                     |          |          |
| 72 address                  | 1                        |          |          |
| 73 mode                     | BUS-ASC                  |          |          |
| <b>8 - OTHERS</b>           |                          |          |          |
| 84 pass code                | 0000                     |          |          |
| 85 tagnumber                | 0000000                  |          |          |

