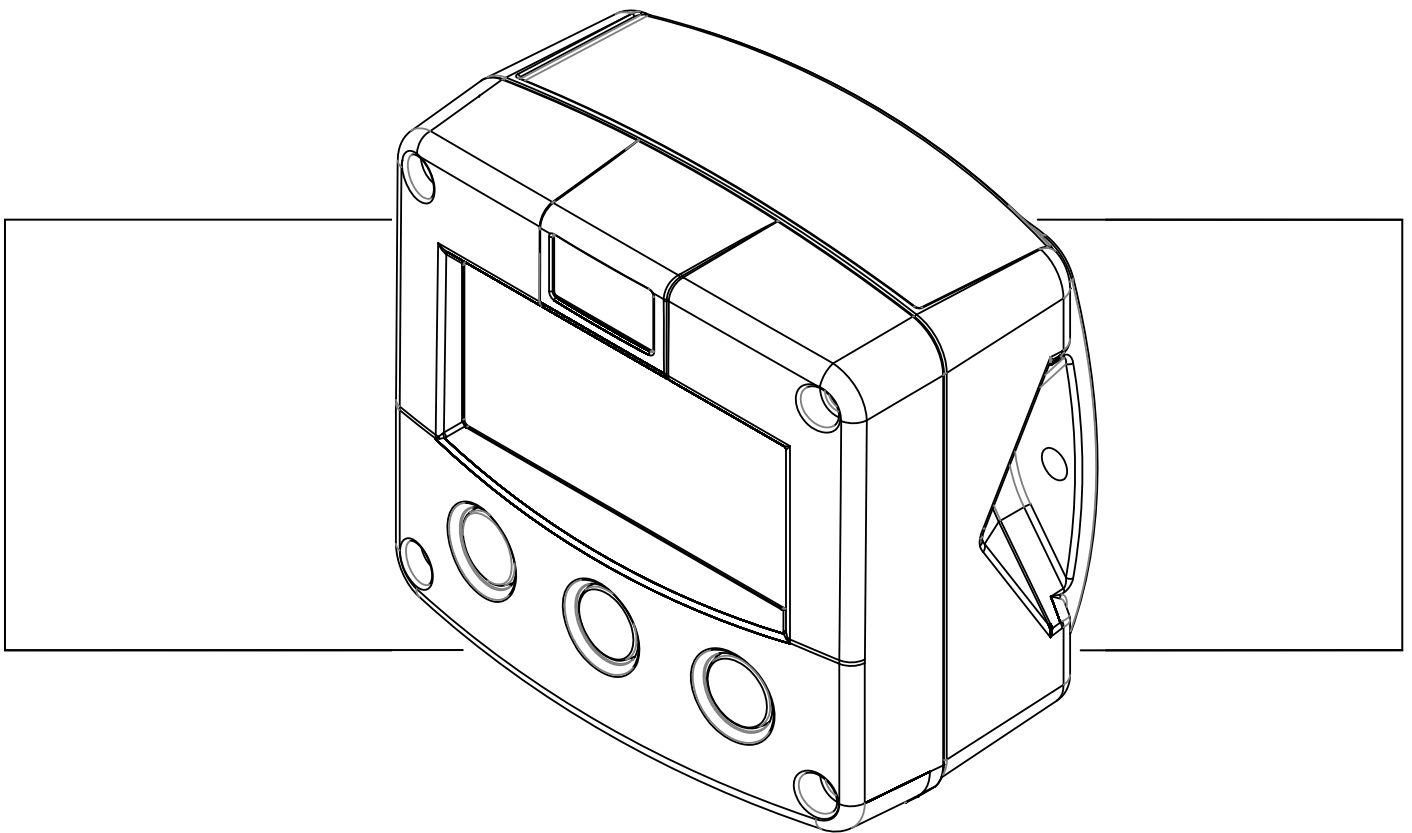


# *F195-P*

*VALVE POSITION INDICATOR VPI*

*with quadrature input / bi-directional measurement*



*Signal input flow meter: pulse, Namur and coil*

*Signal output: (0)4-20mA/ 0-10V ref. valve position*

*Signal outputs: pulse ref. total and flow direction*

*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 F195-P is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.*
- *Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.*
- *This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).*
- *Do connect a proper grounding to the aluminum casing as indicated if the F195-P 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 F195-P 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 F195-P 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 F195-P 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 F195-P 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 F195-P or connected instruments.



Note !

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

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Software version	:	02.05.xx
Manual	:	HF195PEN_v0501_04
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**Information in this manual is subject to change without prior notice. The manufacturer is not responsible for mistakes in this material or for incidental damage caused as a direct or indirect result of the delivery, performance or use of this material.**

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# 1. INTRODUCTION

## 1.1. SYSTEM DESCRIPTION OF THE F195-P

### Functions and features

The flow rate / totalizer model F195-P is a microprocessor driven instrument designed to display the position of a valve in a hydraulic system (0-100%) as well as displaying CLOSED and OPEN texts. Furthermore, flow rate and total are displayed and the position is transmitted with the analog and pulse signal outputs. This product is able to detect the flow direction and count up and down on the 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 flow meter signals,
- transmitting possibilities with analog / pulse and communication (option) outputs.

### Flow meter input

This manual describes the unit with a pulse type input from the flow meter "-P version".

One flow meter with two passive or active pulse, Namur or coil signal outputs with a phase difference of 90 or 270 degrees can be connected to the F195-P.

To power the sensors, several options are available.

### Standard outputs

- Configurable pulse output: a scaled pulse mirroring a certain totalized quantity. Maximum frequency 60Hz.; the pulse length can be set from 7,8msec up to 2 seconds,
- Negative / positive pulse output indication,
- Configurable passive linear 4-20mA analog output with 10-bits resolution mirroring the displayed percentage (position).

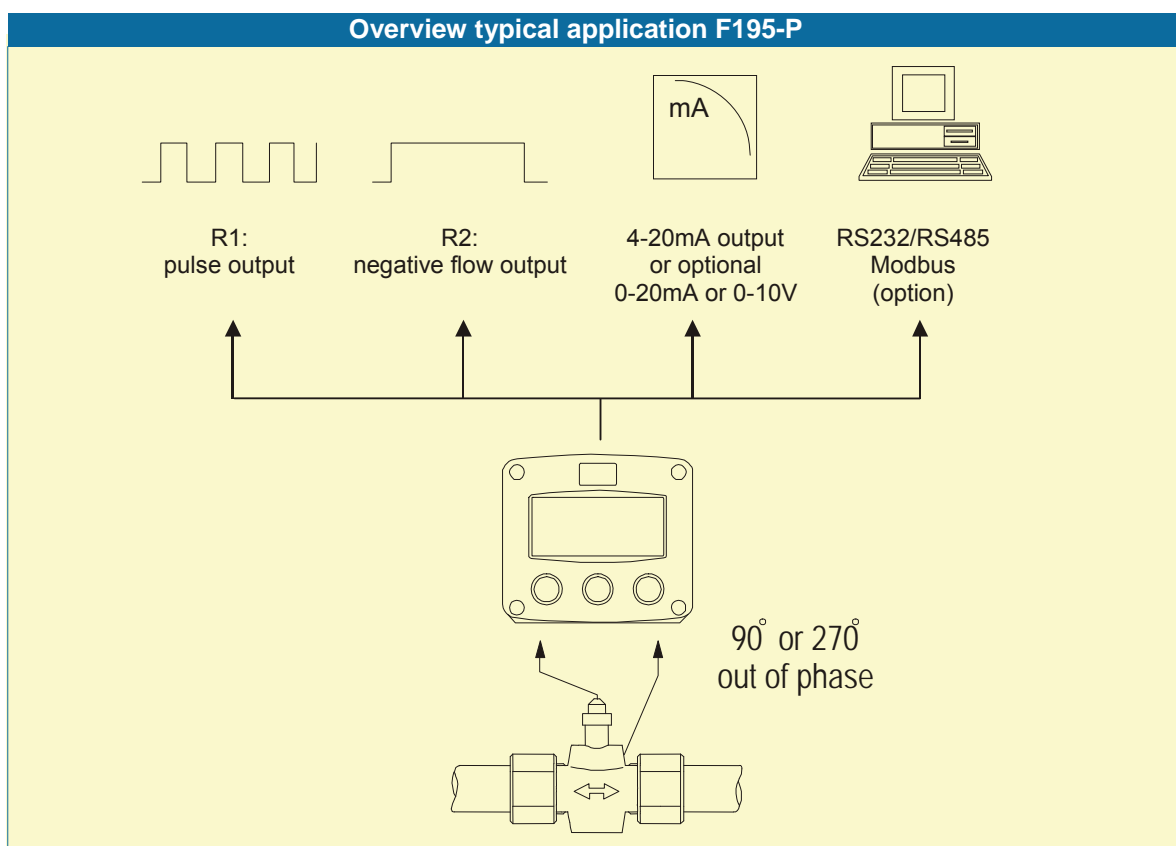


Fig. 1: Typical application of the F195-P

**Configuration of the unit**

The F195-P was designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F195-P according to your specific requirements. SETUP includes several important features, such as K-factors, 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 in EEPROM memory is made every minute.

**Options**

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

## 2. OPERATIONAL

### 2.1. GENERAL



- *The F195-P 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 F195-P. This instruction is meant for users / operators.

### 2.2. CONTROL PANEL

The following keys are available:

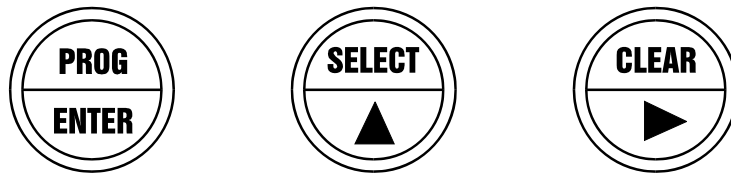


Fig. 2: Control Panel.

#### Functions of the keys



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



This key is used to SELECT accumulated total.  
The arrow-key  $\blacktriangle$  is used to increase a value after PROG has been pressed or to configure the unit; please read chapter 3.



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

2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the F1951-P will always function at Operator level. The information displayed is dependant upon the SETUP-settings. All pulses generated by the connected flow meter are measured by the F1951-P in the background, whichever screen refresh rate setting is chosen. After pressing a key, the display will be updated very quickly during a 30 second period, after which it will slow-down again.



Fig. 3: Example of display information during process.

For the Operator, the following functions are available:

- **Display percentage, total, OPEN / CLOSE**  
 This is the main display information of the F1951-P. After selecting any other information, it will always return to this main display automatically.  
 The position of the device is displayed as a per percentage with the bigger 17mm segments. Total is displayed on the bottom-line of the display where the measuring unit is displayed on the top right-hand side..  
 The arrows  $\blacktriangle$  indicate the flow direction: opening or closing.  
 Based on the configuration settings, the unit will display below a certain percentage the word "OPEN". Above a certain percentage, the word "OPEN" can be displayed. In these cases, the percentage is not shown anymore but the total might still be counting up or down.
- **Display flow rate**  
 When the SELECT-key is pressed the actual flow rate will be displayed with its measuring and time unit.
- **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. 4: Example of low-battery alarm.

- **Alarm 01-03**  
 When "alarm" is displayed, please consult Appendix B: problem solving.



### 3. CONFIGURATION

#### 3.1. INTRODUCTION

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



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 F195-P 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 F195-P 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.

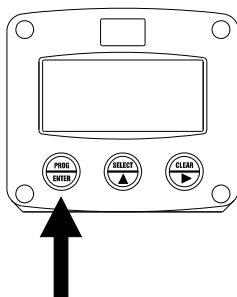
SETUP can be reached at all times while the F195-P remains fully operational.



Note !

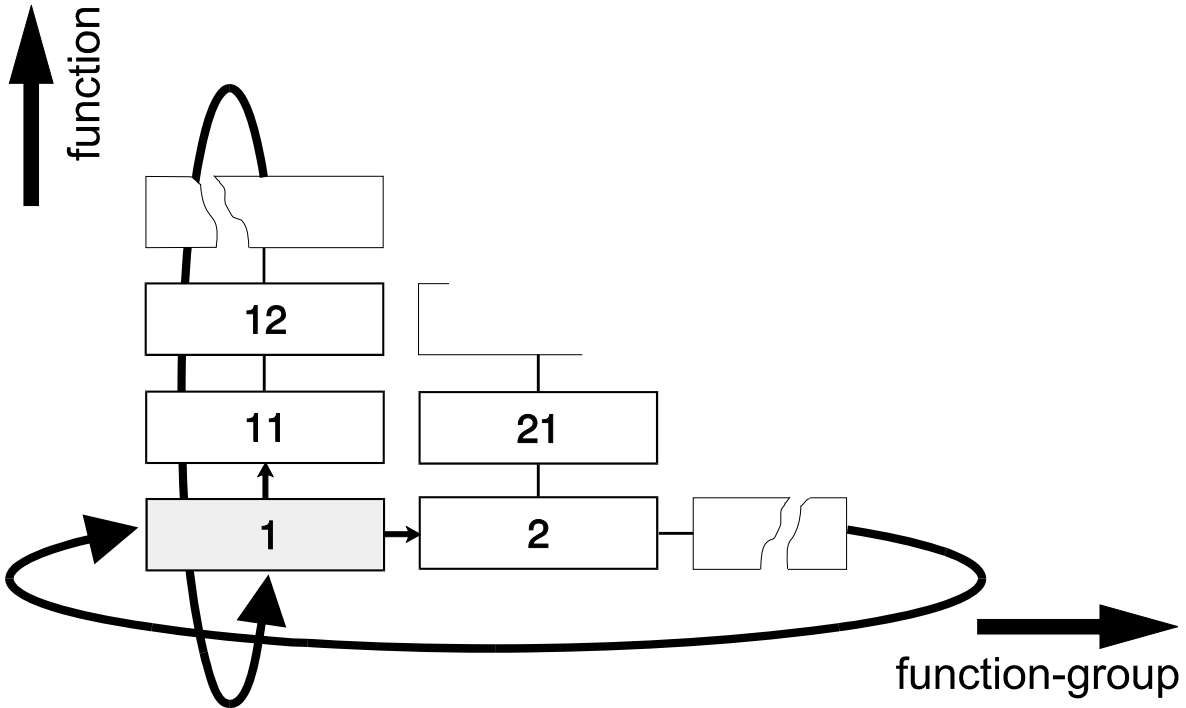
**Note:** A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.

To enter SETUP-level:



Press  for 7 seconds

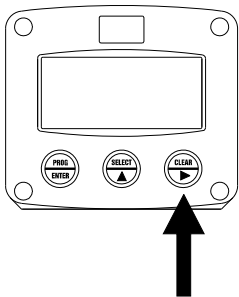
Matrix structure SETUP-level:



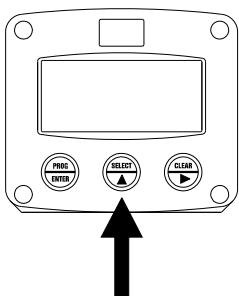
SCROLLING THROUGH SETUP-LEVEL

Selection of function-group and function:

SETUP is divided into several function groups and functions.



Select function-group with



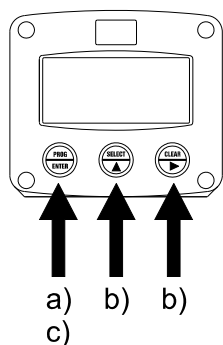
Select function with









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.

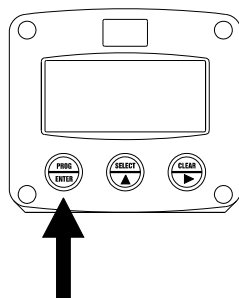
When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for three seconds: the PROG-procedure will be left automatically and the former value reinstated.



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>TOTAL</b>		
11	UNIT	L - m3 - kg - lb - GAL - USGAL - bbl - no unit	
12	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)	
13	K-FACTOR:	0.000010 - 9,999,999	
14	DECIMALS K-FACTOR	0 - 6	
<b>2</b>	<b>FLOWRATE</b>		
21	UNIT	mL - L - m3 - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm3 - NL - P	
22	TIME UNIT	sec - min - hour - day	
23	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)	
24	K-FACTOR	0.000010 - 9,999,999	
25	DECIMALS K-FACTOR	0 - 6	
26	CALCULATION	per 1 - 255 pulses	
27	CUT-OFF	0.1 - 999.9 seconds	
<b>3</b>	<b>DISPLAY</b>		
31	CAPACITY	0.001 - 9,999,999 unit	
32	CLOSED	0.00 - 99.99%	
33	OPEN	0.00 - 99.99%	
34	TOTAL SET	0.001 - 9,999,999 unit	
35	TOTAL MAX	0.001 - 9,999,999 unit	
36	AUTO RESET	0.0 - 10.0 sec	
37	SERVICE COUNTER	0 - 9,999,999 counts	
<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	SIGNAL A	nnp - nnp_lp - reed - reed_lp - pnp - pnp_lp - namur - coil_hi - coil_lo - act_8.1 - act_12 - act_24	
52	SIGNAL B	nnp - nnp_lp - reed - reed_lp - pnp - pnp_lp - namur - coil_hi - coil_lo - act_8.1 - act_12 - act_24	
53	BI-DIRECTIONAL	disable - enable	
54	PHASE	90° - 270°	
55	COUNT NEGATIVE	disable - enable	
<b>6</b>	<b>ANALOG</b>		
61	OUTPUT	disable - enable	
62	PERCENTAGE END	percentage - borders	
63	% MINIMUM	0.00 - 9,999,999%	
64	% MAXIMUM	0.00 - 9,999,999%	
65	TUNE MIN - 4mA / 0V	0 - 9,999	
66	TUNE MAX- 20mA / 10V	0 - 9,999	
67	FILTER	00 - 99	
<b>7</b>	<b>IMPULSE</b>		
71	PERIOD TIME	0 - 250	
72	IMPULSE PER	X,XXX,XXX quantity	
<b>8</b>	<b>COMMUNICATION</b>		
81	SPEED / BAUDRATE	1200 - 2400 - 4800 - 9600	
82	ADDRESS	1 - 255	
83	MODE	RTU - off	
<b>9</b>	<b>OTHERS</b>		
91	TYPE / MODEL	F195-P	
92	SOFTWARE VERSION		
93	SERIAL NO.		
94	PASS CODE	0000 - 9999	
95	TAGNUMBER	0000000 - 9999999	

## 3.2.3. EXPLANATION OF SETUP-FUNCTIONS

1 - TOTAL	
<b>MEASUREMENT UNIT 11</b>	<p>SETUP - 11 determines the measurement unit for total, accumulated total and pulse output. The following units can be selected:</p> <p style="text-align: center;">L - m3 - kg - lb. - GAL - USGAL - bbl - _ (no unit).</p> <p>Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the K-factor has to be adapted as well; the calculation is not done automatically.</p>
<b>DECIMALS 12</b>	<p>The decimal point determines for total, accumulated total and pulse output the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">000000 - 111111.1 - 22222.22 - 3333.333</p>
<b>K-FACTOR 13</b>	<p>With the K-factor, the flow meter pulse signals are converted to a quantity. The K-factor is based on the number of pulses generated by the flow meter per selected measurement unit (SETUP 11), for example per cubic meter. The more accurate the K-factor, the more accurate the functioning of the system will be.</p> <p><b>Example 1: Calculating the K-factor.</b> <i>Let us assume that the flow meter generates 2.4813 pulses per liter and the selected unit is "cubic meters / m3". A cubic meter consists of 1000 parts of one liter which implies 2,481.3 pulses per m3. So, the K-factor is 2,481.3. Enter for SETUP - 13: "2481300" and for SETUP - 14 - decimals K-factor "3".</i></p> <p><b>Example 2: Calculating the K-factor.</b> <i>Let us assume that the flow meter generates 6.5231 pulses per gallon and the selected measurement unit is gallons. So, the K-Factor is 6.5231. Enter for SETUP - 13: "6523100" and for SETUP - 14 decimals K-factor "6".</i></p>
<b>DECIMALS K-FACTOR 14</b>	<p>This setting determines the number of decimals for the K-factor entered. (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 setting influences the accuracy of the K-factor indirectly. (i.e. the position of the decimal point and thus the value given) This setting has NO influence on the displayed number of digits for total (SETUP 12)!</p>

## 2 - FLOWRATE

The settings for total and flow rate are entirely separate. In this way, different units of measurement can be used for each e.g. cubic meters for total and liters for flow rate.  
The display update time for flow rate is one second or more.

**Note:** *these settings also influence the analog output.*

<b>MEASUREMENT UNIT 21</b>	<p>SETUP - 21 determines the measurement unit for flow rate. The following units can be selected:</p> <p style="text-align: center;">mL - L - m3 - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm3 - NL - P.</p> <p>Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the K-factor has to be adapted as well; the calculation is not done automatically.</p>
<b>TIME UNIT 22</b>	The flow rate can be calculated per second (SEC), minute (MIN), hour (HR) or day (DAY).
<b>DECIMALS 23</b>	<p>This setting determines for flow rate the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">00000 - 1111.1 - 2222.22 - 3333.333</p>
<b>K-FACTOR 24</b>	<p>With the K-factor, the flow meter pulse signals are converted to a flow rate. The K-factor is based on the number of pulses generated by the flow meter per selected measurement unit (SETUP 21), for example per liter. The more accurate the K-factor, the more accurate the functioning of the system will be. For examples read SETUP 13.</p>
<b>DECIMALS K-FACTOR 25</b>	<p>This setting determines the number of decimals for the K-factor (SETUP 24). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>Please note that this SETUP - influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for "flow rate" (SETUP 23)!</p>
<b>CALCULATION 26</b>	<p>The flow rate is calculated by measuring the time between a number of pulses, for example 10 pulses. The more pulses the more accurate the flow rate will be. The maximum value is 255 pulses.</p> <p><b>Note:</b> <i>this setting does influence the update time for the analog output directly (maximum update 10 times a second). If the output response is too slow, decrease the number of pulses.</i></p> <p><b>Note:</b> <i>the lower the number of pulses, the higher the power consumption of the unit will be (important for battery powered applications).</i></p> <p><b>Note:</b> <i>for low frequency applications (below 10Hz): do not program more than 10 pulses else the update time will be very slow.</i></p> <p><b>Note:</b> <i>for high frequency applications (above 1kHz) do program a value of 50 or more pulses.</i></p>
<b>CUT-OFF TIME 27</b>	<p>With this setting, you determine a minimum flow requirement thresh-hold, if during this time less than XXX-pulses (SETUP 26) are generated, the flow rate will be displayed as zero. The cut-off time has to be entered in seconds - maximum time is 999 seconds (about 15 minutes).</p>



Note !

3 - DISPLAY	
<b>CAPACITY</b> 31	Enter here the maximum quantity that will be measured when the valve or device will make one opening stroke. Be sure this quantity is at least equal to or a bit higher as the quantity measured in reality. Based on this quantity the percentage displayed will be calculated.
<b>CLOSED</b> 32	The word "CLOSED" will be displayed <u>below</u> this percentage. In case a value of zero is entered, "CLOSED" will <u>not</u> be displayed. If a value higher as 99.99 is entered, "CLOSED" will be displayed at all times!
<b>OPEN</b> 33	The word "OPEN" will be displayed <u>above</u> this percentage. In case a value of 100.0 is entered, "OPEN" will <u>not</u> be displayed. If a value of zero has been entered, "OPEN" will be displayed at all times!
<b>TOTAL SET</b> 34	This function displays the actual total just as at operator level, but from here, this total can be programmed. This might be desired during installation work or maintenance. Also, a value of zero can be entered.
<b>TOTAL MAXIMUM</b> 35	In practice, it might be that the totalizer goes (far) beyond the capacity, for example due to leakage. With this function, the totalizer can be limited. It is advised to program this value slightly above the "capacity - setting 31.
<b>AUTO RESET</b> 36	This function allows the system to reset the totalizer to zero automatically, this to avoid incorrect measurement over a longer time. The auto reset function is <b>ONLY</b> active as long as the word CLOSED is displayed. Further following condition has to be fulfilled: total will only be reset to zero as NO PULSES are coming in on BOTH signal inputs during X seconds. After this time, total will be reset to zero.
<b>SERVICE COUNTER</b> 37	Setup 37 displays the number of full open / close strokes that have been made.

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 F195-P has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:	
<b>LCD NEW</b> 41	<p>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; every pulse will be counted and the output signals will be generated in the normal way. The following can be selected:</p> <p style="text-align: center;">Fast - 1 sec - 3 sec - 15 sec - 30 sec - off.</p> <p><b>Example 3: Battery life-time</b>  <i>battery life-time with a coil pick-up, 1KHz. pulses and FAST update: about 2 years.</i>  <i>battery life-time with a coil pick-up, 1KHz. pulses and 1 sec update: about 5 years.</i></p> <p><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.</p>
<b>BATTERY-MODE</b> 42	The unit has two modes: operational or shelf. After "shelf" has been selected, the unit can be stored for several years; it will not count pulses, the display is switched off but all settings and totals are stored. In this mode, power consumption is extremely low. To wake up the unit again, press the SELECT-key twice.



Note !



Note !

5 - FLOWMETER				
<b>SIGNAL 51</b>	<p>The F195-P is able to handle several types of input signal. The type of the main flow meter pickup / signal is selected with SETUP 51.</p> <p><b>Note:</b> The selections "active pulse" offer a detection level of 50% of the supply voltage.</p> <p>Read also par. 4.4.3. Flow meter input terminal 09-11.</p>			
TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ. / MV	REMARK
NPN	NPN input	100K pull-up	6 kHz.	(open collector)
NPN - LP	NPN input with low pass filter	100K pull-up	2.2 kHz.	(open collector) less sensitive
REED	Reed-switch input	1M pull-up	1.2 kHz.	
REED - LP	Reed-switch input with low pass filter	1M pull-up	120 Hz.	Less sensitive
PNP	PNP input	100K pull-down	6 kHz.	
PNP - LP	PNP input with low pass filter	100K pull-down	700 Hz.	Less sensitive
NAMUR	Namur input	820 Ohm pull-down	4 kHz.	External power required
COIL HI	High sensitive coil input	-	20mV p-p	Sensitive for disturbance!
COIL LO	Low sensitive coil input	-	90mV p-p	Normal sensitivity
ACT_8.1	Active pulse input 8.1 VDC	3K9	10KHz.	External power required
ACT_12	Active pulse input 12 VDC	4K	10KHz.	External power required
ACT_24	Active pulse input 24 VDC	3K	10KHz.	External power required
<b>SIGNAL 52</b>	<p>The secondary signal is used to detect the direction of flow or to indicate a negative or positive value: you can keep this input high or low as long as desired which will result in count up or down!</p> <p>In most applications, the type of signal will be as the main signal (setting 51). For selection, please read setting 51.</p>			
<b>BI-DIRECTINAL 53</b>	<p>The dual pulse input of the F195 can be set to:</p> <ul style="list-style-type: none"> <li>• <b>disable:</b> input B will be ignored; the unit will act as a normal flow rate / totalizer.</li> <li>• <b>enable:</b> the phase difference between flow A and flow B is used to detect the flow-direction in the flow meter and will result in counting up or down. When the flow is negative, the total and accumulated will count down and the displayed flow rate is negative.</li> </ul> <p>The analog output signal remains positive or will transmit the minimum value (in most cases 4mA). The direction of flow is linked to the pulse output in such a way that as soon as the pulse mirrors a negative, output 2 will be switched.</p>			
<b>PHASE 54</b>	<p>The phase difference between flow A and flow B can be set to 90 degrees or 270 degrees. In this way, you can easily swap the input signal to make it count positive in the preferred direction.</p>			
<b>COUNT NAGATIVE 55</b>	<p>This function determines if a negative (return) flow should result in counting down or if it should be ignored which means that no flow will be counted at all.</p> <ul style="list-style-type: none"> <li>• <b>disable:</b> a reverse flow will result in a flow rate of zero. Total does not count.</li> <li>• <b>enable:</b> a reverse flow will result in a negative flow rate. Total counts down.</li> </ul>			



## 6 - ANALOG OUTPUT

A linear 4-20mA signal (type AB: 0-20mA or type AU: 0-10V) output signal is generated according to the calculated percentage with a 10 bits resolution.

**Note:** *When the analog output is not used, please make sure that setting 61 is disabled, or else the battery life time will be reduced significantly!*

When a power supply is available but the output is disabled, a 3.5mA signal will be generated. The relationship between the percentage and analog output is set with the following functions:

<b>DISABLE / ENABLE 61</b>	The D/A converter has a relatively high power consumption. If the analog output is not being used, select "disable" to switch-off the converter. For more information read par. 4.4.3.
<b>PERCENTAGE END 62</b>	With this function, it is determined how the analog output signal will behave as soon the word CLOSE or OPEN is displayed: <b>borders:</b> as soon as CLOSE is displayed, the analog output value will be according setting 65 (in most cases 4mA). As soon as OPEN is displayed, the analog output value will be according setting 66 (in most cases 20mA). <b>percentage:</b> the analog output will always follow the percentage calculation taking setting 63 - 66 into account.
<b>PERCENTAGE MINIMUM 63</b>	Enter here the percentage at which the output should generate a 4mA signal (or 0mA / 0V) - in most applications at 0%.
<b>PERCENTAGE MAXIMUM 64</b>	Enter here the percentage at which the output should generate a 20mA (or 10V) - in most applications at 100%.
<b>TUNE MIN / 4MA 65</b>	<p>The initial minimum analog output value is 4mA (or 0mA / 0V). However, this value might differ slightly due to external influences such as temperature for example. The 4mA value (or 0mA / 0V) can be tuned precisely with this setting.</p> <ul style="list-style-type: none"> <li>▪ <b><i>Before tuning the signal, be sure that the analog signal is not being used for any application!</i></b></li> </ul> <p>After pressing PROG, the current will be about 4mA (or 0mA / 0V). The current can be increased/decreased with the arrow-keys and is <u>directly active</u>. Press ENTER to store the new value.</p>
<b>TUNE MAX / 20MA 66</b>	<p>The initial maximum analog output value is 20mA (or 10V). However, this value might differ slightly due to external influences such as temperature for example. The 20mA value (or 10V) can be tuned precisely with this setting.</p> <ul style="list-style-type: none"> <li>▪ <b><i>Before tuning the signal, be sure that the analog signal is not being used for any application!</i></b></li> </ul> <p>After pressing PROG, the current will be about 20mA. The current can be increased/decreased with the arrow-keys and is <u>directly active</u>. Press ENTER to store the new value.</p>
Continued next page >>>	



Note !



## 6 - ANALOG OUTPUT (CONTINUED)

<b>FILTER 68</b>	This function is used to stabilize the analog output signal. The output value is updated every 0.1 second. With the help of this digital filter a more stable but less precise reading can be obtained. The filter principal is based on three input values: the filter level (01-99), the last analog output value and the last average value. The higher the filter level, the longer the response time on a value change will be. Below, several filter levels with their response times are indicated:			
<b>FILTER VALUE</b>	<b>RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE. TIME IN SECONDS</b>			
	<b>50% INFLUENCE</b>	<b>75% INFLUENCE</b>	<b>90% INFLUENCE</b>	<b>99% INFLUENCE</b>
01	filter disabled	filter disabled	filter disabled	filter disabled
02	0.1 second	0.2 second	0.4 second	0.7 second
03	0.2 second	0.4 second	0.6 second	1.2 seconds
05	0.4 second	0.7 second	1.1 seconds	2.1 seconds
10	0.7 second	1.4 seconds	2.2 seconds	4.4 seconds
20	1.4 seconds	2.8 seconds	4.5 seconds	9.0 seconds
30	2.1 seconds	4 seconds	7 seconds	14 seconds
50	3.5 seconds	7 seconds	11 seconds	23 seconds
75	5.2 seconds	10 seconds	17 seconds	34 seconds
99	6.9 seconds	14 seconds	23 seconds	45 seconds

## 7 - RELAY OUTPUT

One transistor or mechanic relay output is available as scaled pulse output according to the accumulated total. The second output indicates if the transmitted pulse is related to a positive (count up) or a negative (count down) totalisation.

If a mechanic relay is used for the pulse output, it is recommended to reduce the max. output frequency to 0.5Hz, else the life time will be reduced significantly.

<b>PERIOD TIME PULSE OUTPUT 71</b>	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. <b>Note:</b> <i>If the frequency should go out of range - when the flow rate increases for example - an internal buffer will be used to "store the missed pulses": As soon as the flow rate reduces again, the buffer will be "emptied".</i> <i>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</i>		
	<b>NUMBER OF PERIODS</b>	<b>PERIOD TIME</b>	<b>MAX. FREQUENCY</b>
	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.

<b>PULSE PER 72</b>	According to the measurement unit settings for total, a pulse will be generated every X-quantity. Enter this quantity here while taking the displayed decimal position and measuring unit into account.
-------------------------	---



Note !

## 8 - 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> 81	For external control, the following communication speeds can be selected:  1200 - 2400 - 4800 - 9600 baud
<b>BUS ADDRESS</b> 82	For communication purposes, a unique identity can be attributed to every F195-P. This address can vary from 1-255.
<b>MODE</b> 83	The communication protocol is Modbus ASCII or RTU mode. Select OFF, to disable this communication function.

## 9 - OTHERS

<b>TYPE OF MODEL</b> 91	For support and maintenance it is important to have information about the characteristics of the F195-P. 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> 92	For support and maintenance it is important to have information about the characteristics of the F195-P. 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> 93	For support and maintenance it is important to have information about the characteristics of the F195-P. 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> 94	All SETUP-values can be pass code protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
<b>TAGNUMBER</b> 95	For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.

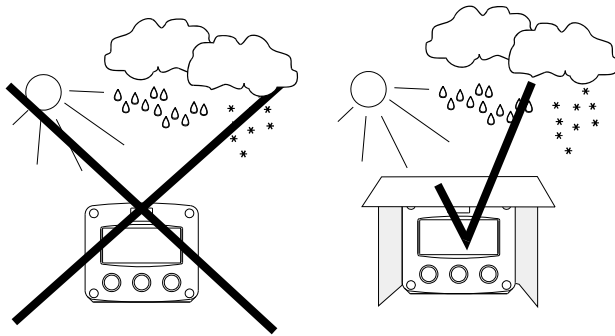
## 4. INSTALLATION

### 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 F195-P 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.

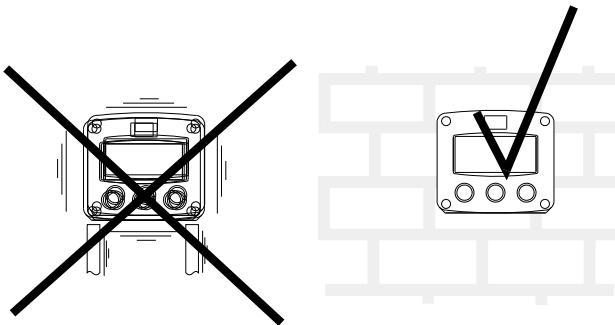
### 4.2. INSTALLATION / SURROUNDING CONDITIONS



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 F195-P on a solid structure to avoid vibrations.

**4.3. DIMENSIONS- ENCLOSURE**  
**Aluminum enclosures:**

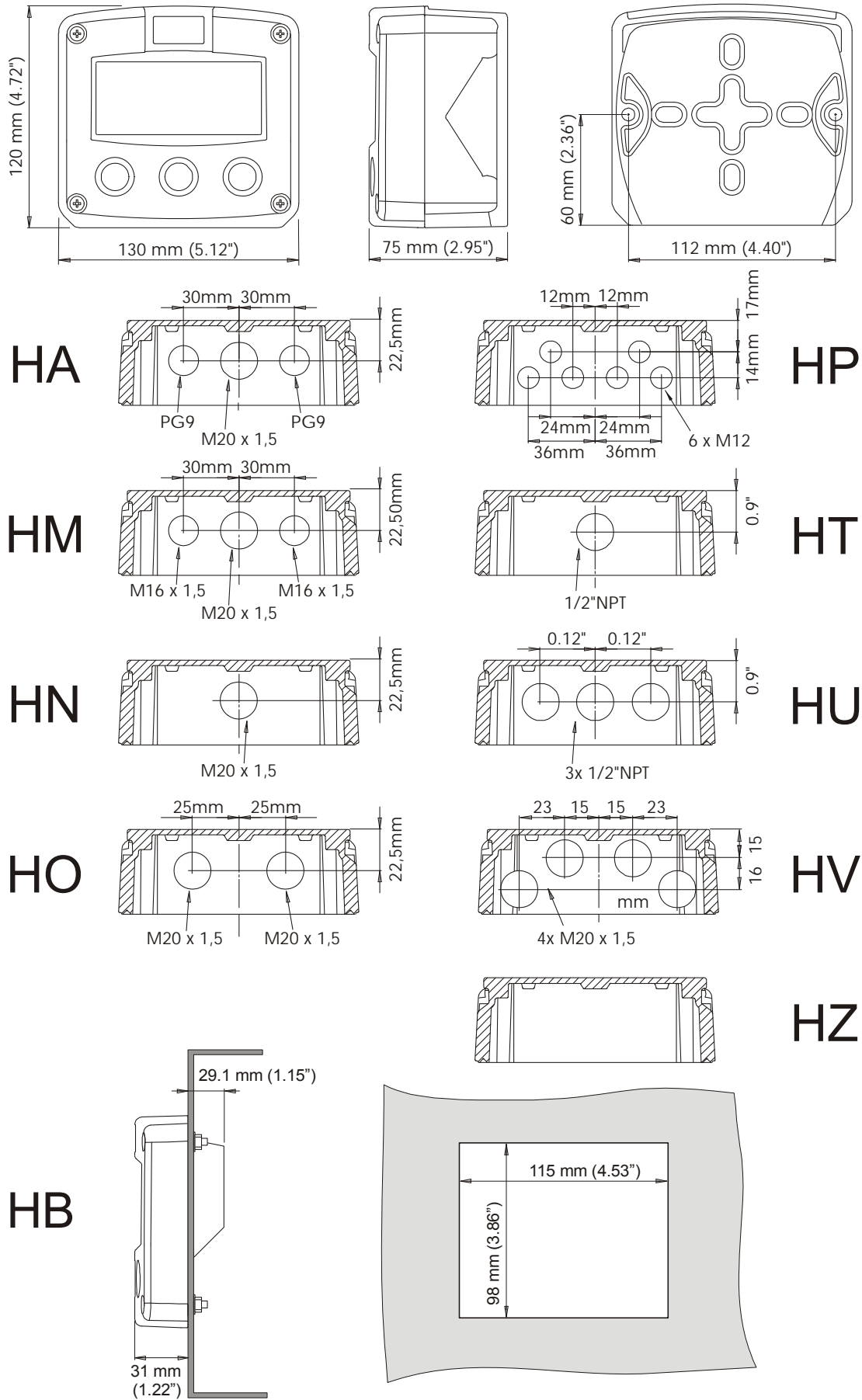
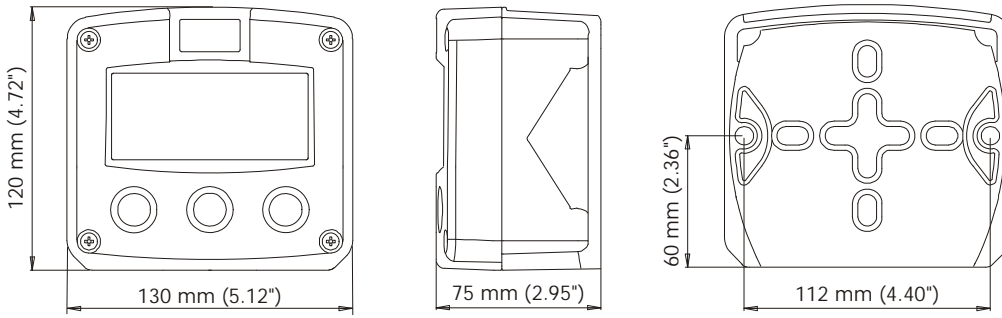
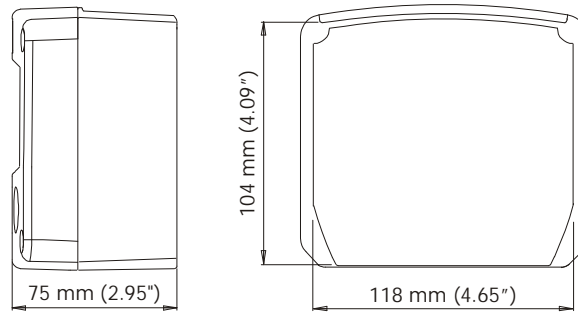


Fig. 5: Dimensions aluminum enclosures.

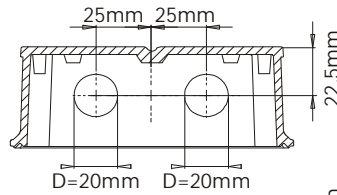
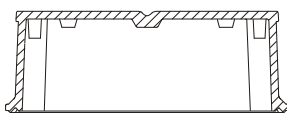
GRP enclosures:



HK back box:  
(flat bottom)

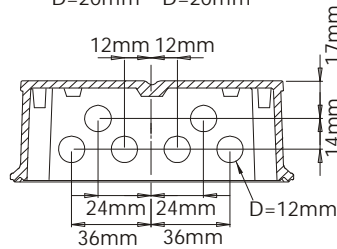
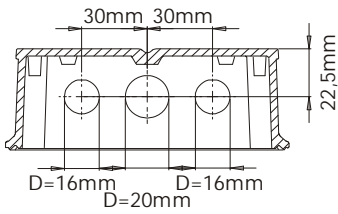


HD  
HK



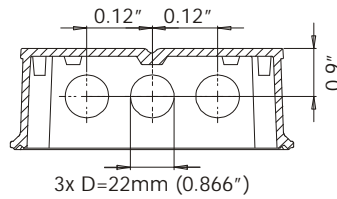
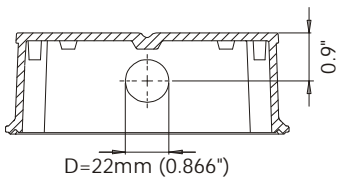
HG

HE



HH

HF



HJ

HC

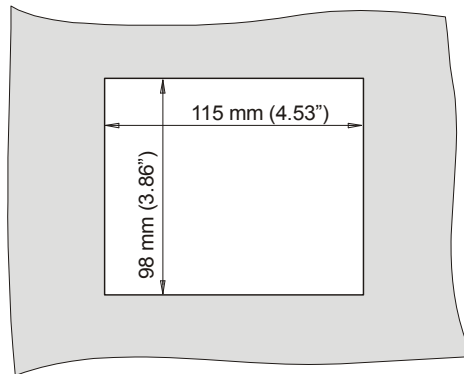
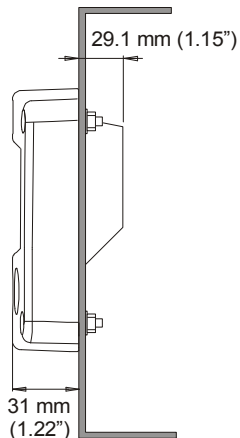


Fig. 6: Dimensions GRP enclosures.

## 4.4. INSTALLING THE HARDWARE

### 4.4.1. INTRODUCTION

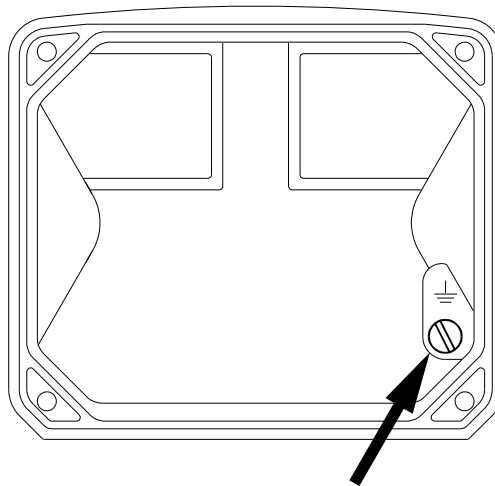


- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.
- This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).



#### Aluminum enclosures

- When installed in an aluminum enclosure and a potentially explosive atmosphere requiring apparatus of equipment protection level Ga and Da, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.
- Do ground the aluminum enclosure properly as indicated, if the F195-P has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-casing and removable terminal-block may never be removed.



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

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

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

4.4.2. VOLTAGE SELECTION SENSOR SUPPLY

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

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

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



Note !

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

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

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

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

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



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

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

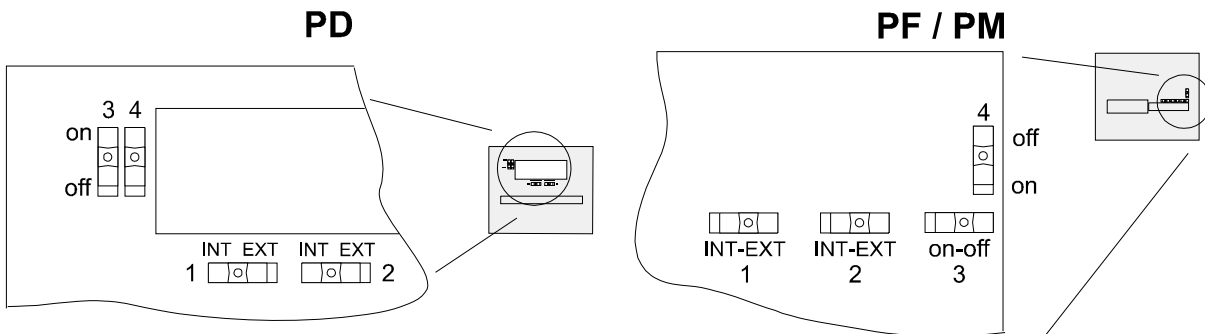


Fig. 8: Switch setting sensor supply voltage.

Switch positions

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

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

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

- Function switch 1:** voltage selection sensor A - terminal 11.  
**Function switch 2:** voltage selection sensor B - terminal 14.  
**Function switch 3+4:** the combination of these switches determine the voltage as indicated. Do move switch 1 and / or switch 2 to the OFF position to enable the selected voltage with switch 3+4.



#### 4.4.3. TERMINAL CONNECTORS

For Intrinsically Safe applications: read chapter 5.

The following terminal connectors are available:

POWER SUPPLY TYPE PD / PF / PM	NEGATIVE TOTAL OUTPUT R 2 TYPE OA / OR / OT		PULSE OUTPUT R 1 TYPE OA / OR / OT		ANALOG OUTPUT TYPE AA / AB / AI / AP / AU		INPUT A SENSOR SIGNAL PULSE INPUT			INPUT B SENSOR SIGNAL PULSE INPUT				
GND ⊥	1 N	2 L1	3 R2 ⊥	4 R2	5 R1 ⊥	6 R1	7 I ⊥	8 I ↓	9 ⊥	10 SIGNAL	11 +↓	12 ⊥	13 SIGNAL	14 +↓

Fig. 9: Overview of terminal connector's standard configuration F195-P and options.

#### REMARKS TERMINAL CONNECTORS:

Terminal GND- 01- 02; power supply - only available with type PD, PF or PM:

TYPE	SENSOR SUPPLY	Terminal			backlight	TYPE AA	TYPE AU	Type OA	Type OR
		GND	01	02					
PD 8-24V AC	8,2-12-24V max. 50mA		AC	AC	◇	◇	◇	◇	
PD 8-30V DC	8,2-12-24V max. 50mA	L-	L+		◇	◇	◇	◇	
PF 24V AC ± 15%	8,2-12-24V max. 400mA		AC	AC	◇	◇	◇		◇
PF 24V DC ± 15%	8,2-12-24V max. 400mA	L-	L+		◇	◇	◇		◇
PM 115-230V AC ± 15%	8,2-12-24V max. 400mA	EARTH	AC	AC	◇	◇	◇	◇	◇
Note PD	do not use a AC autotransformer (Spartrafo) without a galvanic isolation.								
Note PF / PM	The total consumption of the sensors and outputs may not exceed 400mA@24V								

◇=option

**Terminal 03-04; negative total - transistor or relay output R2:**

This output is switched in case the calculated accumulated total counts down.

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

This output is a pulse output. With SETUP 7, the function of this output is set.

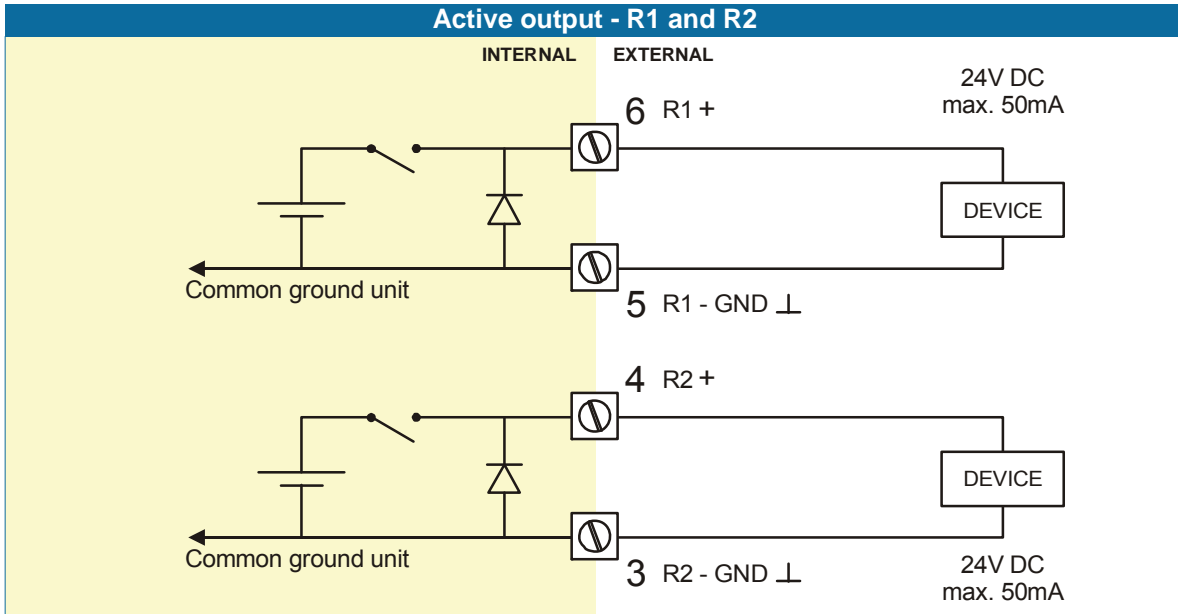
The maximum pulse frequency of this output is 60Hz.

If a relay output option has been supplied, be sure that the output frequency does not exceed 1 Hz else the life-time of the relay will be reduced significantly.

**Type OA:**

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

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

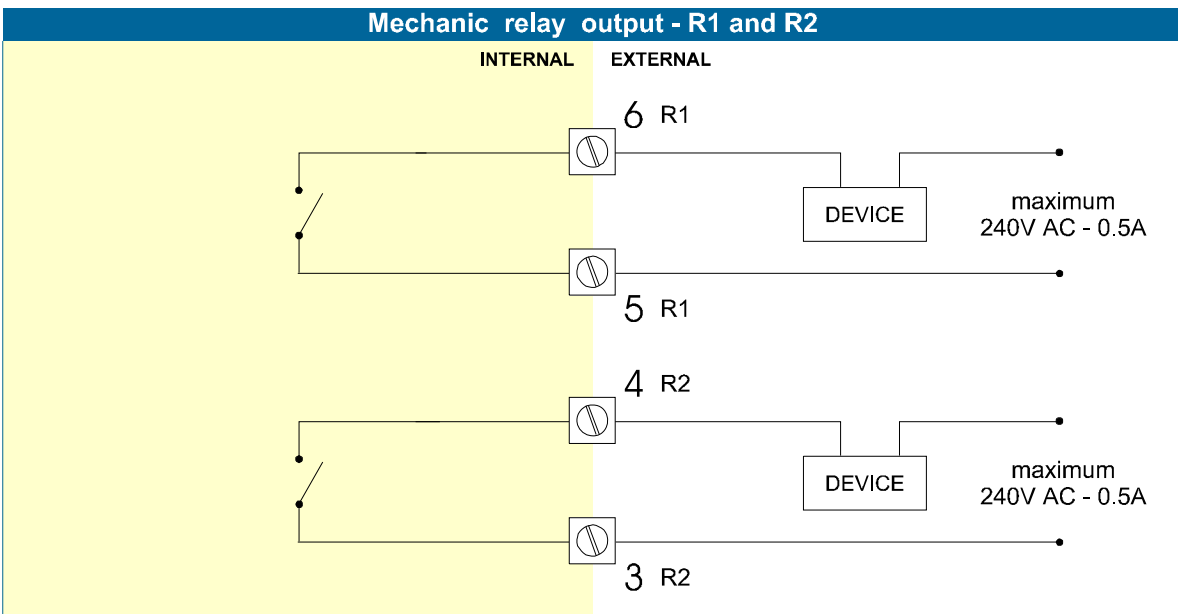


**Type OR:**

A mechanical relay output is available with this option.

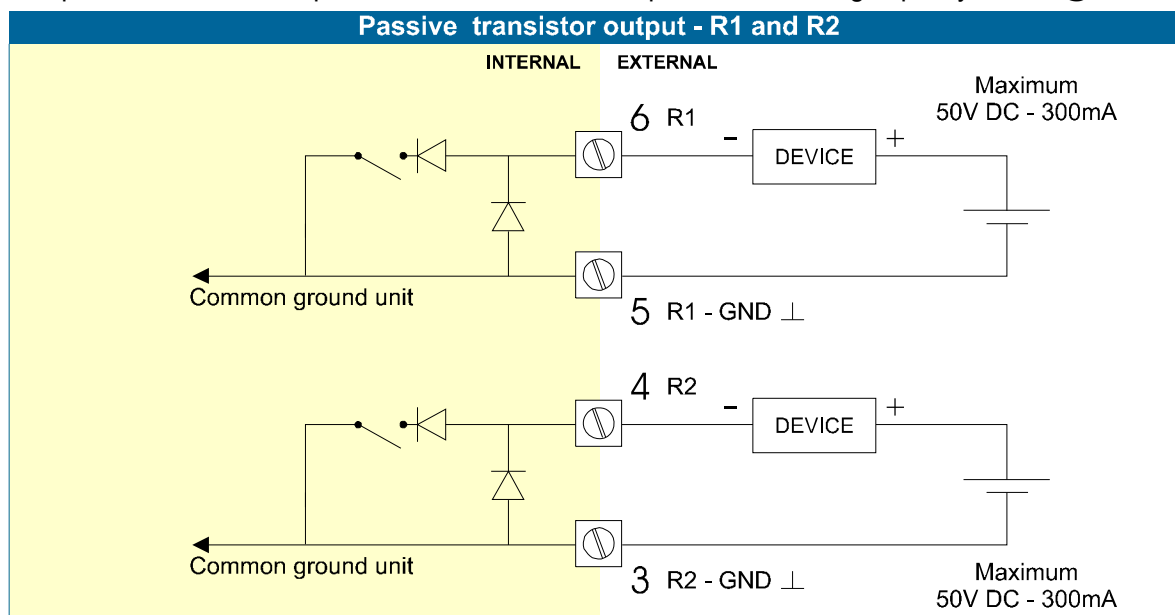
Max. switch power 240V 0,5A per output. (Requires power supply type PF / PM).

If this option has been supplied: be sure that the output frequency does not exceed 5Hz else the life-time of the relay is influenced significantly.



**Type OT:**

Two passive transistor outputs are available with this option. Max. driving capacity 300mA@50V DC.

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

Connect an external power supply of 8-30VDC to these terminals or a 4-20mA loop. Do not 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.

**Terminal 07-08 analog output (SETUP 7) :**

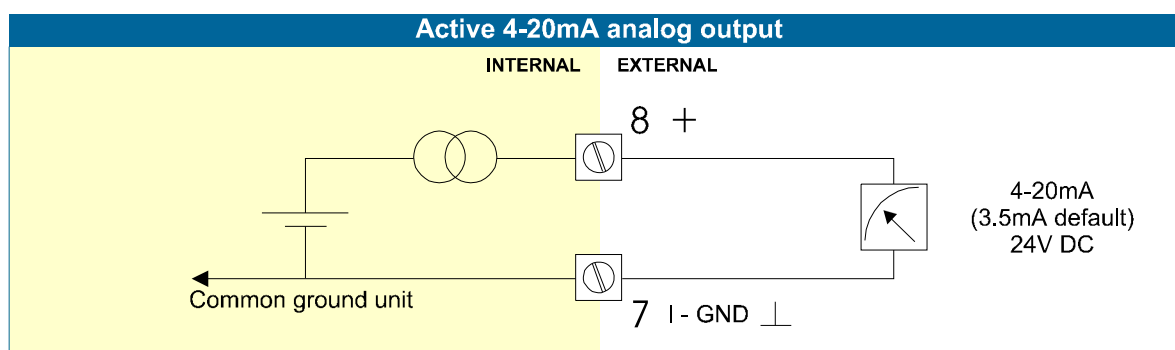
An analog output signal is available proportional to the calculated percentage (this is the position of the hydraulic valve).

**Type AA:**

An active 4-20mA signal proportional to the percentage is available with this option.

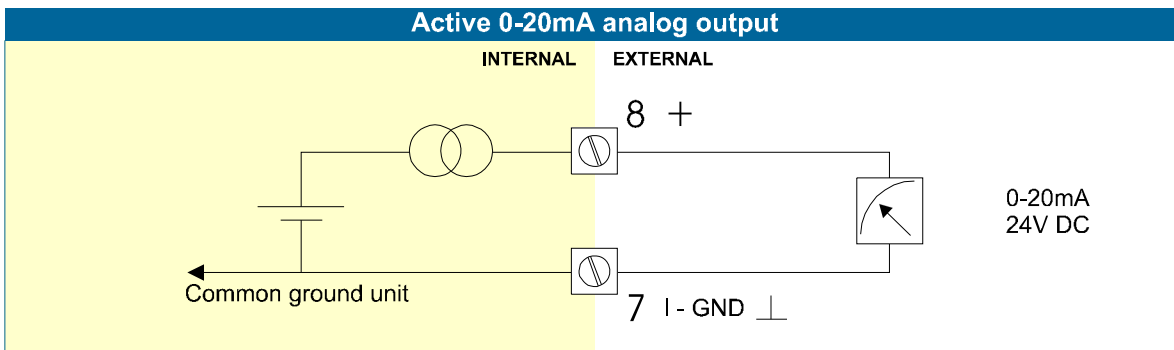
When the output is disabled, a 3.5mA signal will be generated on these terminals.

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



**Type AB:**

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

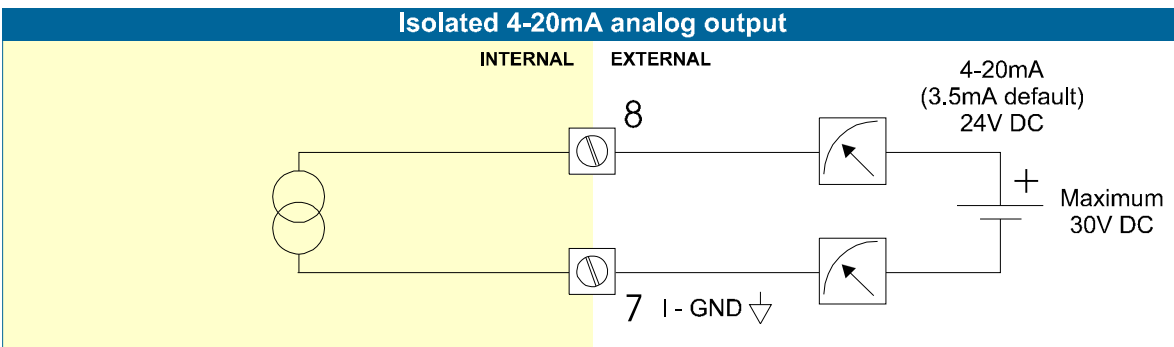


**Type AF:**

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

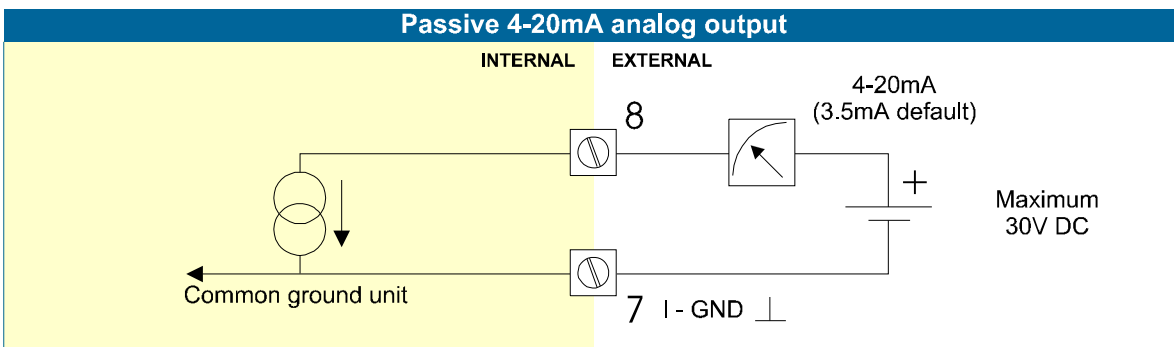
**Type AI:**

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



**Type AP:**

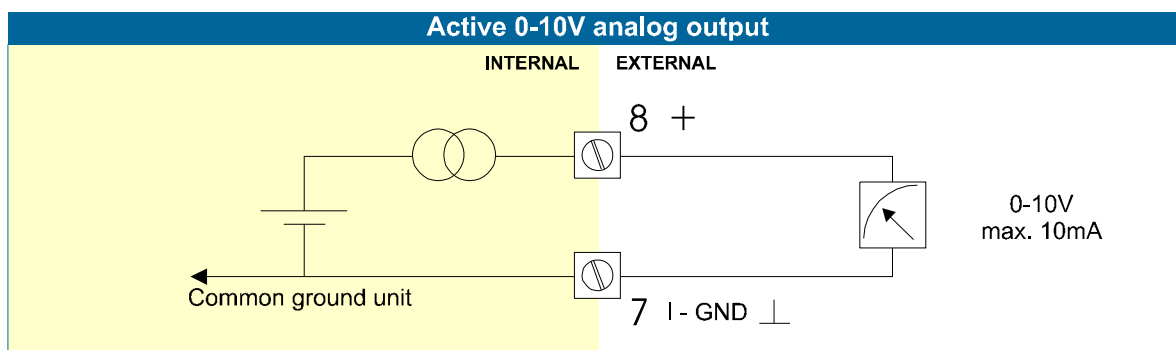
A passive 4-20mA signal proportional to the percentage is available with this option. When a power supply is connected but the output is disabled, a 3.5mA signal will be generated. Max. driving capacity 1000 Ohm. This output does loop power the unit as well (type PX).



**Type AU:**

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

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

**Terminal 09-11; Flow meter input:**

Three basic types of flow meter signals can be connected to the unit: pulse, active pulse or coil. The screen of the signal wire must be connected to the common ground terminal 09 (unless earthed at the sensor itself) The maximum input frequency is approximately 10 kHz (depending on the type of signal). The input signal type has to be selected with the correct SETUP-function (read par. 3.2.3.)

**Coil-signal:**

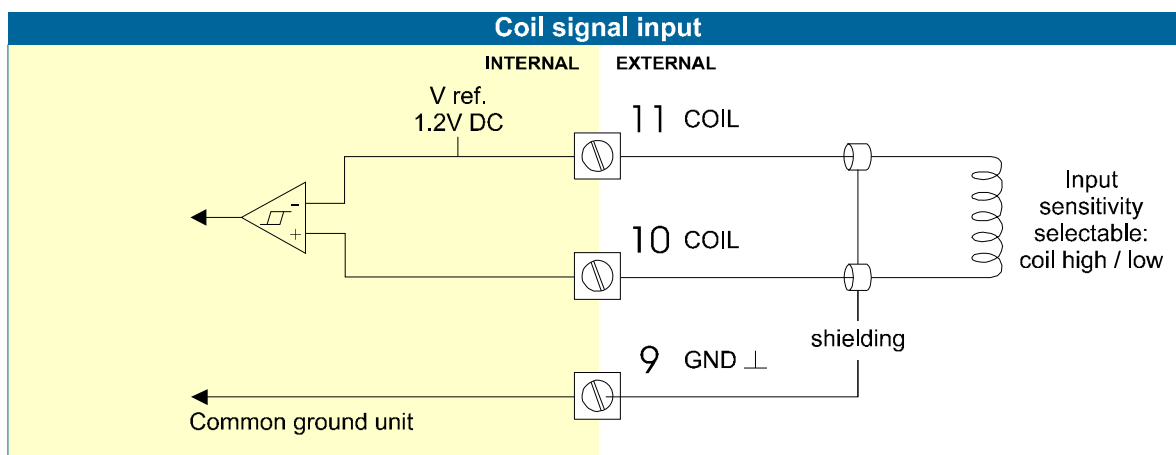
The F195-P is suitable for use with flow meters which have a coil output signal. Two sensitivity levels can be selected with the SETUP-function:

COIL LO: sensitivity from about 120mV peak to peak.

COIL HI: sensitivity from about 20mV peak to peak.

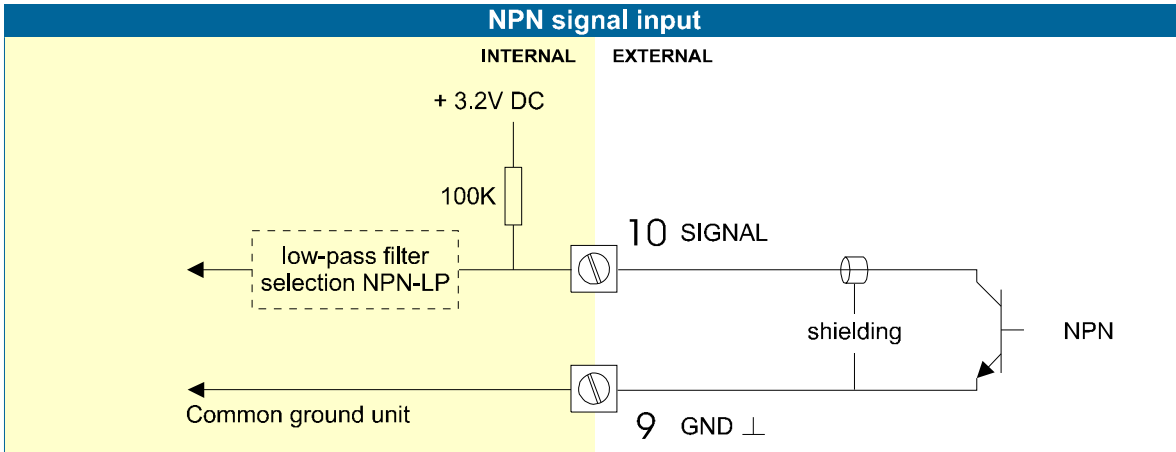
Type ZF offers for setting COIL HI : sensitivity from about 10mV peak to peak.

Type ZG offers for setting COIL HI : sensitivity from about 5mV peak to peak.



**Pulse-signal NPN / NPN-LP:**

The F195-P is suitable for use with flow meters which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.

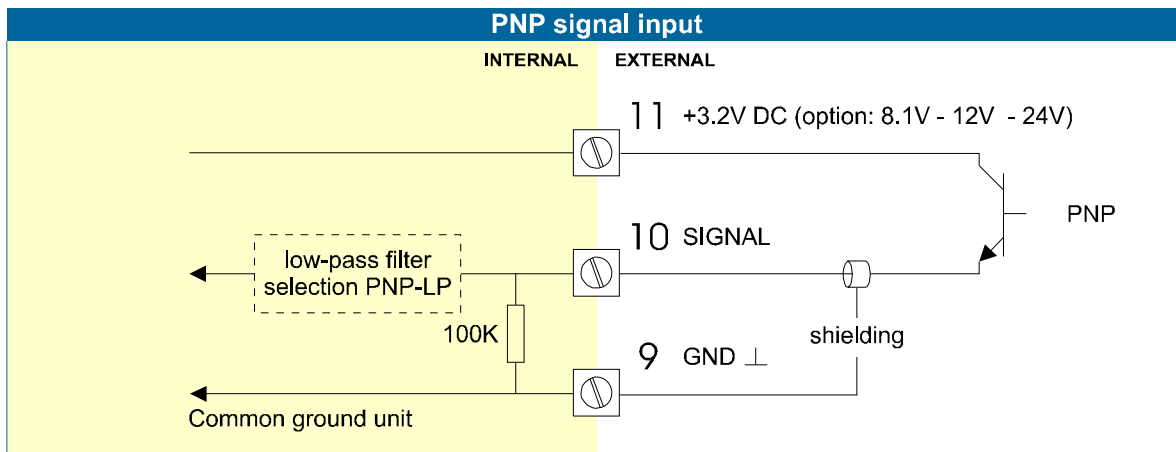


**Pulse-signal PNP / PNP-LP:**

The F195-P is suitable for use with flow meters which have a PNP output signal. 3.2V is offered on terminal 11 which has to be switched by the sensor to terminal 10 (SIGNAL). For a reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.

A sensor supply voltage of 8.1 -12 or 24V DC can be provided with options PD-PM.

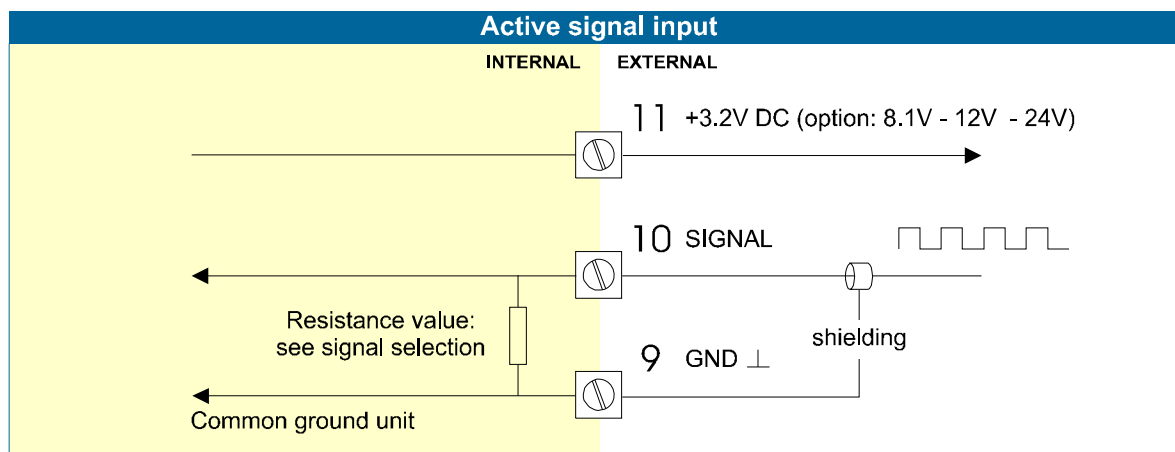
For a signal detection level of 50% of the supply voltage: please refer to "active signals".



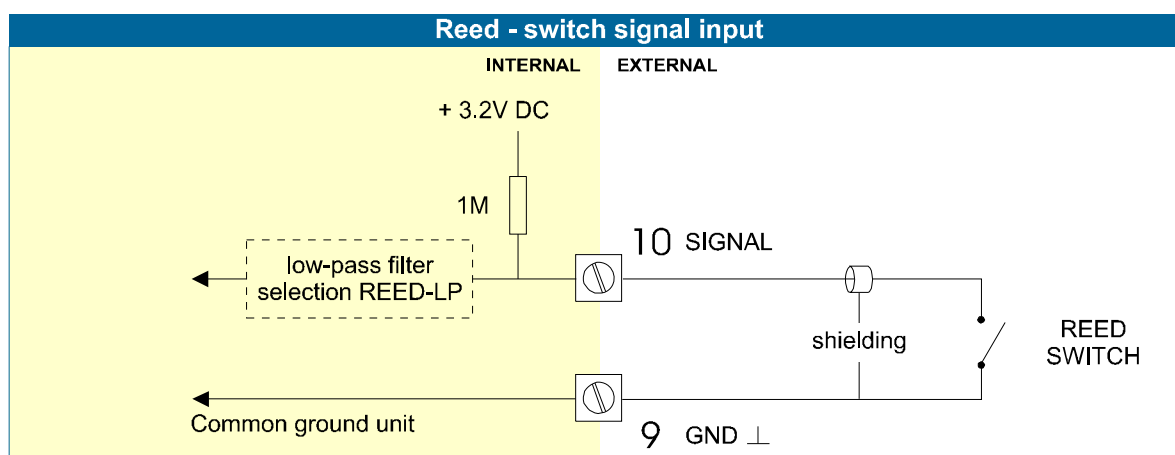
**Active signals 8.1V - 12V and 24V:**

If a sensor gives an active signal, please read par. 3.2.3. The detection levels are 50% of the selected supply voltage; approximately 4V (ACT\_8.1) or 6V (ACT\_12) or 12V (ACT\_24).

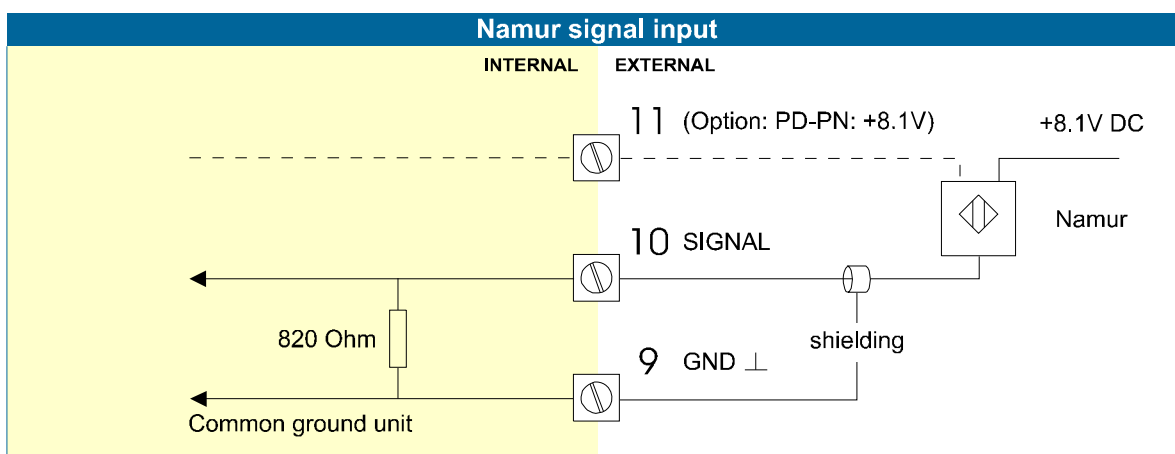
Active signal selection may well be desired in the case of options PD-PM being supplied for sensor supply.

**Reed-switch:**

The F195-P is suitable for use with flow meters which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass filter (read par. 3.2.3.)

**NAMUR-signal:**

The F195-P is suitable for flow meters with an Namur signal. The standard F195-P is not able to power the Namur sensor, as an external power supply for the sensor is required. However, a 8.2V sensor supply voltage (terminal 11) can be provided via options PD-PM.



**Terminal 12-14; Flow meter input B:**

Exactly as described for the flow meter A, several flow meter signal types can be selected for flow meter input B. Please refer to the descriptions per flow meter type as describer for flow meter A. The 9-10-11 do correspond with the terminals 12-13-14.

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

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

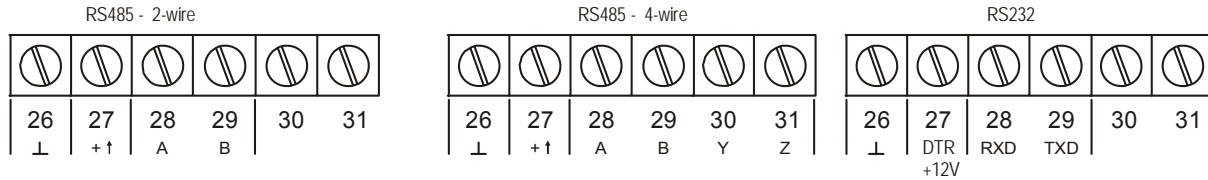


Fig. 10: Overview terminal connector's communication option.

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:**

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

To power the backlight, provide a 12-24V DC to terminal 26 (-) and 27 (+). An external trimmer 1kOhm trimmer can be used to tune the brightness of the backlight, or if not desired, a short-cut between these terminals have to be made which will result in the maximum brightness. Note: Intrinsically Safe as well as 4-wire RS485 communication is not possible in combination with type ZB.

Option type ZB: adjustable backlight

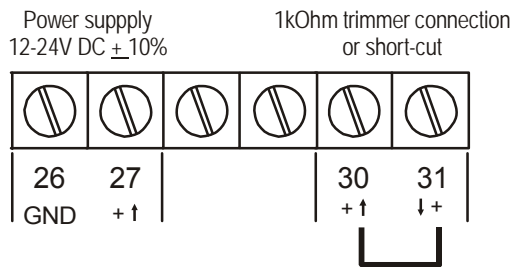


Fig. 11: Overview terminal connectors backlight option.



## 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 with the product certificate IECEx DEK 11.0042X.
- Exchange of Intrinsically Safe battery FWLiBAT-0xx with certificate number KEMA 03ATEX1071 U or IECEx KEM 08.0005U is allowed in Hazardous Area. See paragraph 5.4. for detailed battery replacement instructions.



Note !

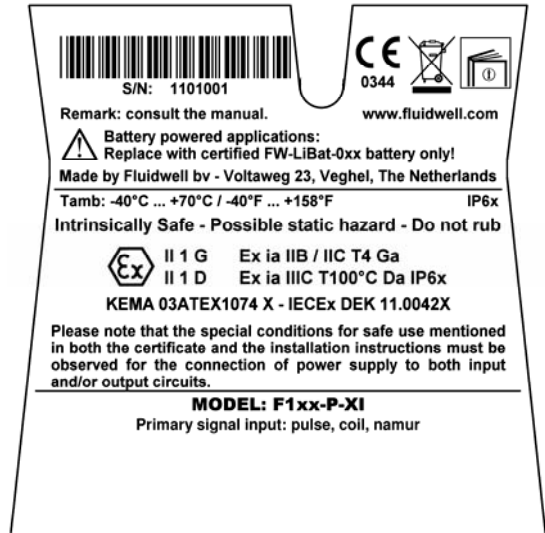
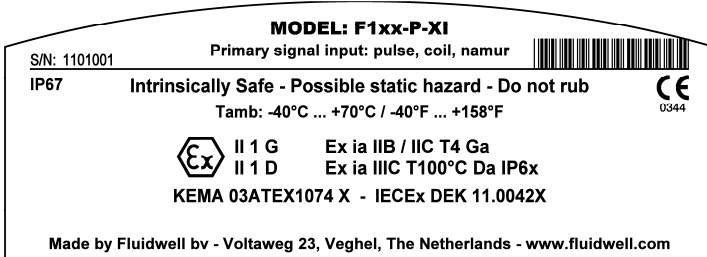
### Please Note

- 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)**

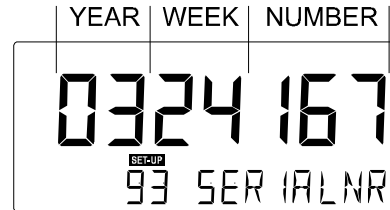
Indicated labels on the back cover (below) and on the inside cover (right) show the type labels for intrinsically safe certified units.

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



**Serial number and year of production**

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



**5.2. TERMINAL CONNECTORS INTRINSICALLY SAFE APPLICATIONS**



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 F195-P-XI:**

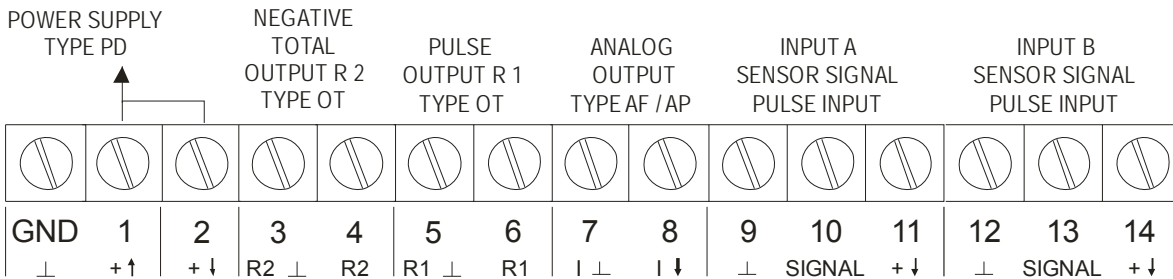


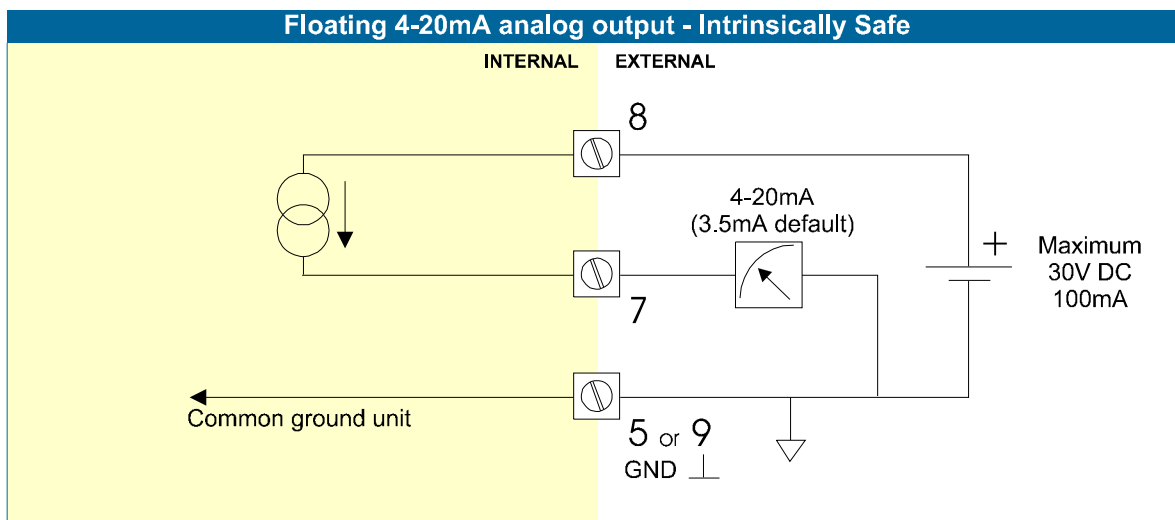
Fig. 12: Overview terminal connectors XI - Intrinsically Safe applications.

**Explanation Intrinsically Safe options:**

**Type AF - Intrinsically Safe floating 4-20mA analog output:**

A floating 4-20mA signal proportional to the flow rate is available with this option. When the output is disabled, a 3.5mA signal will be generated. Max. driving capacity 1000 Ohm @ 30V DC.

*Note! It is required to link the minus from the analog output - terminal 7 - with a ground terminal of the unit; terminal: GND, 3, 5, 9, 12 or 15.*



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

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

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

Terminal 11: this terminal offers a 3.2V or 8.1V to power the sensor.

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

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

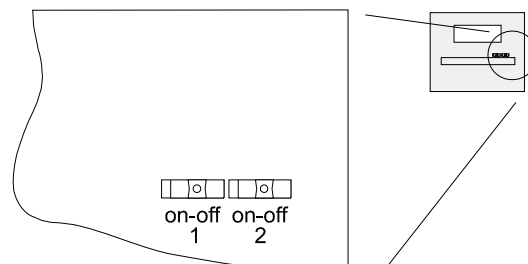


Fig. 13: Switch position voltage selection type PD-XI.

5.3. CONFIGURATION EXAMPLES INTRINSICALLY SAFE APPLICATIONS

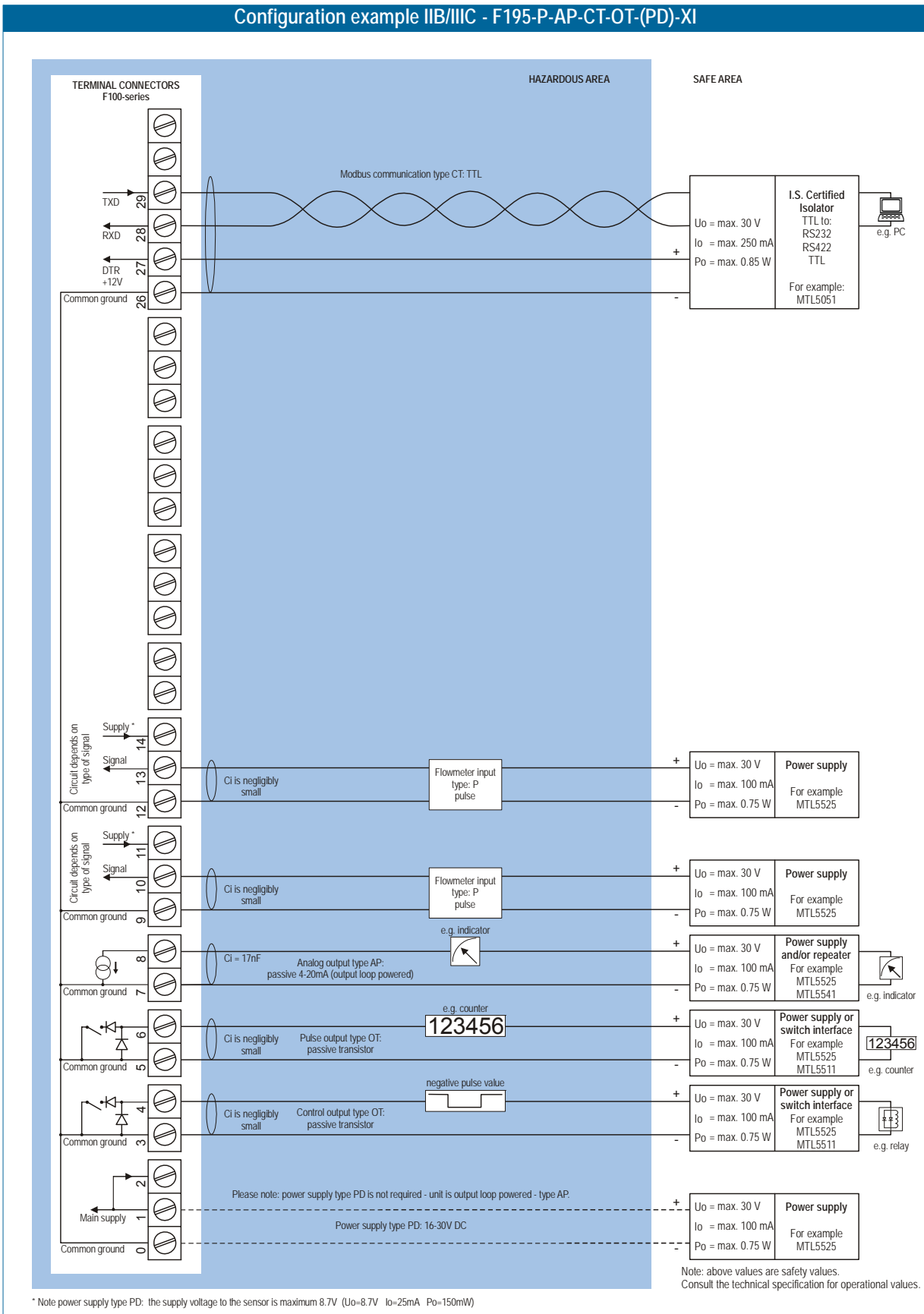


Fig. 14: Configuration example 1 Intrinsically Safe

Configuration example IIB/IIC and IIC - F195-P-AP-(CT)-OT-PD-XI

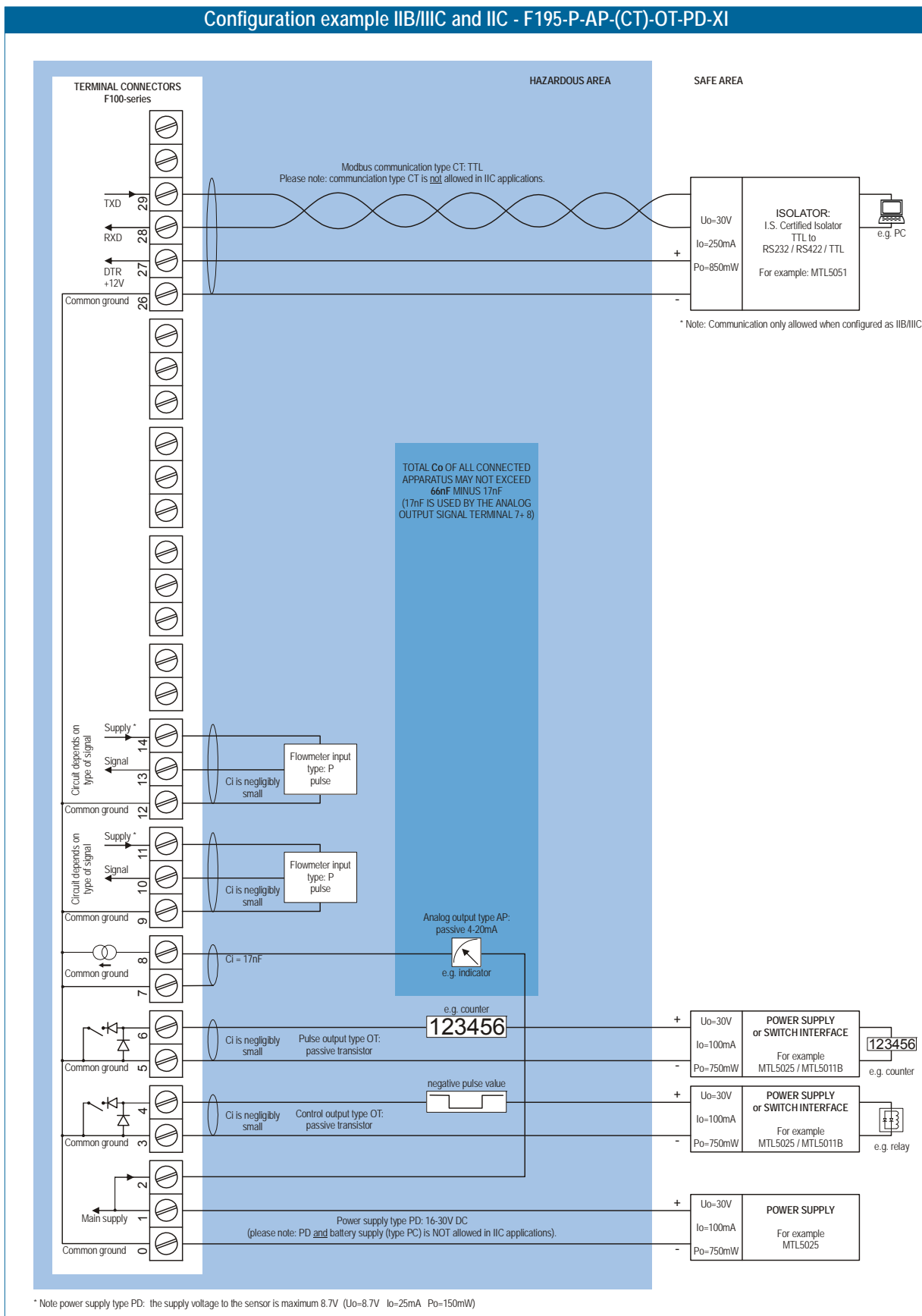


Fig. 15: Configuration example 2 Intrinsically Safe

## 5.4 BATTERY REPLACEMENT INSTRUCTIONS

**Safety Instructions**

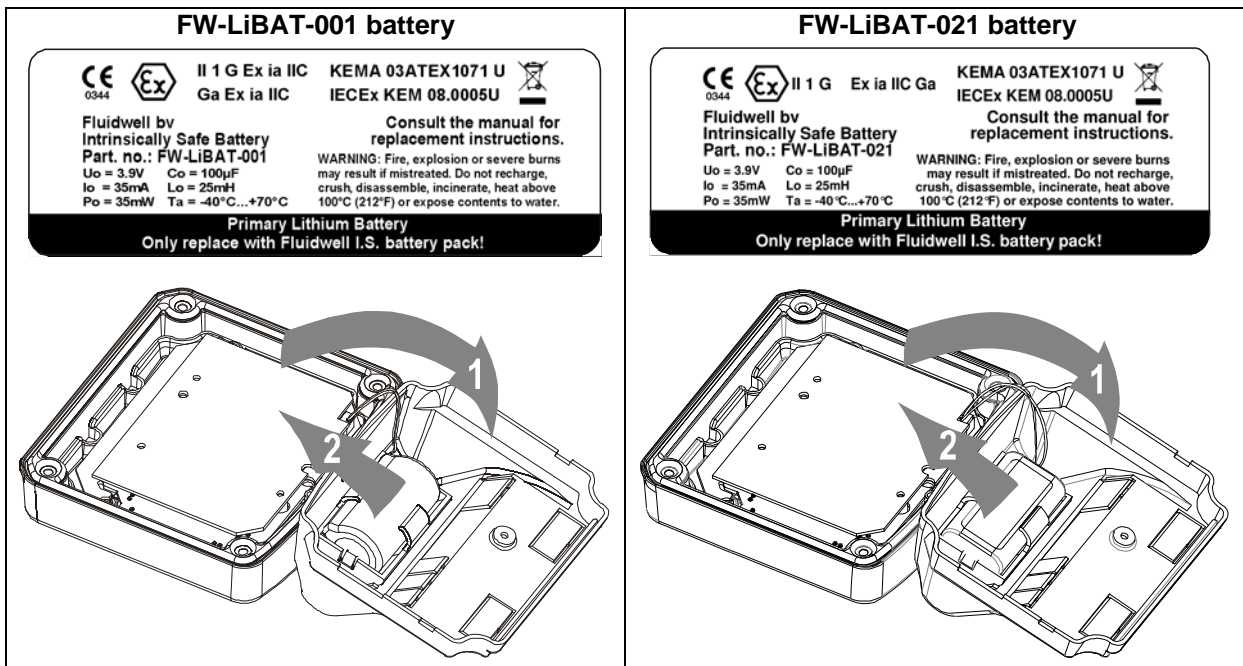
- **Fire, explosion or severe burns may result if mistreated.** Do not recharge, crush, disassemble, incinerate, heat above 100°C (212°F) or expose contents to water.
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained personnel authorized by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

**Safety instructions for hazardous areas**

- Verify the correct battery is supplied: **Only batteries with indicated Ex label are certified for replacement and use in hazardous areas.** Batteries for use in safe areas have no Ex label. **DO NOT EXCHANGE:** Using the wrong type of battery can pose a SERIOUS RISK.
- **For use in hazardous areas Fluidwell recommends FW-LiBAT 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 F195-P 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 F195-P 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 F195-P in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.

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

It is influenced by several issues :

- Type of sensor: read chapter 3.2.3. NPN and PNP inputs consume more energy than coil inputs.
- Input frequency: the higher the frequency, the shorter the battery life-time.
- Flow rate calculation: the lower number of pulses (SETUP 26) the shorter the battery life-time.
- Analog output signal; be sure that an external power supply is connected or that the function is disabled if not in use; or else it will have a major influence on the battery life-time (SETUP 61).
- Display update: fast display update uses significantly more power; SETUP 41.
- 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 flow meter might be necessary. Do not forget to re-enter any subsequent K-factor alterations.
- The indication for low-battery.
- Clean the casing with soapy-water. Do not use any aggressive solvents as these might damage the 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. Note: only available for safe area applications. Power requirements: 12-24V DC + 10% or type PD, PF, PM. Power consumption max. 1 Watt.

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

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


Power supply	
Type PB	Lithium battery - life-time depends upon settings - up to 5 years.
Type PC	Intrinsically Safe lithium battery - life-time depends upon settings - up to 5 years.
Type PD	8-24V AC / DC $\pm$ 10%. Power consumption max. 10 Watt. 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	3.2V DC for pulse signals and 1.2V DC for coil pick-up. Note: This is not a real sensor supply. Only suitable for pulse sensors with a very low power consumption like coils (sine wave) and reed-switches.
Type PD	1.2 / 3.2 / 8.2 / 12 and 24V DC - max. 50mA@24V DC
Type PD-XI	Intrinsically safe: Pulse signals: 1.2 / 3.2 / 8.2 - max. 7mA@8.2V DC. Analog signals: the sensor supply voltage is according to the power supply voltage connected to terminal 1. Also terminal 2 offers the same voltage.
Type PF / PM	1.2 / 3.2 / 8.2 / 12 and 24V DC - max. 400mA@24V DC.

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

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

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

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

## INPUTS

Flow meter	
Type P	Coil/sine wave (minimum 20mVp-p or 80mVp-p - sensitivity selectable), NPN/PNP, open collector, reed-switch, Namur, active pulse signals 8 - 12 and 24V.
Frequency	Minimum 0 Hz - maximum 7 kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-Factor	0.000010 - 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.

## OUTPUTS

Analog output	
Function	transmitting the valve position / displayed percentage.
Accuracy	10 bit. Error < 0.05% - update 10 times a second. Software function to calibrate the 4.00mA and 20.00mA levels precisely within set-up.
Load	max. 1 kOhm
Type AA	Active 4-20mA output (requires type OA + PD, PF or PM).
Type AB	Active 0-20mA output (requires type OA + PD, PF or PM).
Type AF	Floating 4-20mA output for Intrinsically Safe applications (isolated output)
Type AI	Galvanically isolated output - also for battery powered models.
Type AP	Passive 4-20mA output - output loop powered (type PX)
Type AU	Active 0-10V output (requires type OA + PD, PF or PM).

<b>Transistor output(s)</b>	
Function	pulse output - transmitting accumulated total and count-down indication acc. total.
Type OA	Two active 24V DC transistor outputs; max. 50mA per output (requires type AA + PD, PF or PM).
Type OR	Two mechanic relay outputs; max. switch power 230V AC - 0,5A (requires type PD or PM).
Type OT	Two passive transistor outputs - not isolated. Load max. 50V DC - 300mA.

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

**OPERATIONAL**

<b>Operator functions</b>	
Displayed functions	<ul style="list-style-type: none"> <li>percentage / open / close and total.</li> <li>total and/or flow rate.</li> </ul>

<b>Percentage</b>	
Digits	3 1/2 digits with one decimal position.

<b>Total</b>	
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.

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

## APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F195-P is going to be installed or while it is in operation.

### Flow meter does not generate pulses:

Check:

- Signal selection SETUP - 51 / 52,
- Pulse amplitude (par. 4.4.3.),
- Flow meter, wiring and connection of terminal connectors (par. 4.4.3.),
- Power supply of flow meter (par. 4.4.2.).

### Flow meter generates "too many pulses":

Check:

- Settings for total and Flow rate: SETUP 11-14 and 21-27,
- Type of signal selected with actual signal generated - SETUP - 51 / 52,
- Sensitivity of coil input - SETUP - 51 / 52 and par. 4.4.3.
- Proper grounding of the F195-P - par. 4.4.1.
- Use screened wire for flow meter signals and connect screen to terminal 9. (unless connected at sensor)

### Analog output does not function properly:

Check:

- SETUP 61 - is the function enabled?
- SETUP 63 / 64: are the flow-levels programmed correctly?
- connection of the external power-supply according to the specification.

### Pulse output does not function:

Check:

- SETUP 71 - pulse per "x" quantity; is the value programmed reasonable and will the maximum output be under 20Hz?
- SETUP 72 - impulse width; is the external device able to recognize the selected pulse width and frequency?

### Flow rate displays "0 / zero" while there is flow (total is counting):

Check:

- SETUP 22 / 25: are the K-factor and time unit correct?
- SETUP 26 / 27: The unit has to count the number of pulses according to SETUP 26 within the time according to SETUP 27. Make sure that 27 is set to 10.0 seconds for example : the result is that the unit has at least 10 seconds time to measure the number of pulses according to SETUP 26.

### The pass code is unknown:

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

## ALARM

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

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

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

0003: error 1 and error 2 occurred simultaneously

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

## APPENDIX C: COMMUNICATION VARIABLES

### Remarks:

- Below, an overview of the F195-P 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 F195-P - SETUP-LEVEL:				
VAR	DESCRIPTION	BYTES	VALUE	REMARKS
<b>TOTAL</b>				
32 (20h)	unit	1	0=L 1=m3 2=kg 3=lb 4=gal 5=usgal 6=bbbl 7=none	
33 (21h)	decimals	1	0...3	
34 (22h)	K-factor	3	1....9.999.999	K-f 0000001 - K-f 0000009 is allowed when decs < 6! (VAR37)
37 (25h)	decimals K-factor	1	0...6	
<b>FLOWRATE</b>				
48 (30h)	unit	1	0=mL 1=L 2=m3 3=mg 4=g 5=kg 6=ton 7=gal 8=bbbl 9=lb 10=cf 11=rev (revolutions for RPM) 12=none 13=scf 14=NM3 15=NL 16=p	
49 (31h)	time unit	1	0=sec 1=min 2=hour 3=day	
50 (32h)	decimals	1	0...3	
51 (33h)	K-factor	3	1....9.999.999	K-f 0000001 - K-f 0000009 is allowed when decs < 6! (VAR54)
54 (36h)	decimals K-factor	1	0...6	
55 (37h)	number of pulses	1	1..255	
56 (38h)	cut-off time	2	1 .. 9999	steps of 100ms

VAR	DESCRIPTION	BYTES	VALUE	REMARKS
<b>DISPLAY</b>				
<b>POWERMANAGEMENT</b>				
80 (50h)	LCD update time	1	0=fast 1=1sec 2=3sec 3=15sec 4=30sec 5=off	
81 (51h)	power-mode battery	1	0=operational 1=shelf	
<b>FLOWMETER</b>				
96 (60h)	flow meter signal A	1	0=npn 1=npn-lp 2=reed 3=reed LP 4=npn 5=npn-lp 6=namur 7=coil hi 8=coil lo	
97 (61h)	flow meter signal B	1	0=npn 1=npn-lp 2=reed 3=reed LP 4=npn 5=npn-lp 6=namur 7=coil hi 8=coil lo	
252 (FCh)	Bidirectional	1	0=disable 1=enable	
253 (FDh)	Phase	1	0=90 degrees 1=270 degrees	
73 (49h)	Count negative	1	0=disable 1=enable	
124 (7Ch)	Flow rate negative	1	0=ignore 1=absolute (mirror)	
<b>ANALOG OUTPUT</b>				
112 (70h)	analog output	1	0=disable 1=enable	
113 (71h)	minimum rate	3	0..9999999	unit, time, decimals acc. var48-50
116 (74h)	maximum rate	3	0..9999999	unit, time, decimals acc. var48-50
119 (77h)	cut off percentage	1	0..99	steps of 0.1%
120 (78h)	tune minimum rate	2	0..9999	
122 (7Ah)	tune maximum rate	2	0..9999	
99 63h	filter	1	0...99	

VAR	DESCRIPTION	BYTES	VALUE	REMARKS
<b>PULSE OUTPUT</b>				
128 (80h)	impulse width	1	0=off 1=short 2=long	
129 (81h)	pulse per X quantity	3	1..9999999	unit, decimals acc. var32 -33
<b>OTHERS</b>				
168 (A8h)	pass code	2	xxxx	read only!
170 AAh	tagnumber	3	0..9999999	Other vars: see standard table

### OTHER F195-P VARIABLES FOR COMMUNICATION

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

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

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

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

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

Write acc. total: Not possible.

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

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

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

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

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

Write flow rate: Not possible.

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## LIST OF CONFIGURATION SETTINGS

SETTING	DEFAULT	DATE :	DATE :
<b>1 - TOTAL</b>	Enter your settings here		
11 unit	L		
12 decimals	0000000		
13 K-factor	0000001		
14 decimals K-factor	0		
<b>2 - FLOWRATE</b>			
21 unit	L		
22 time unit	/min		
23 decimals	0000000		
24 K-factor	0000001		
25 decimals K-factor	0		
26 calculation / pulses	010		
27 cut-off time	30.0 sec.		

SETTING	DEFAULT	DATE :	DATE :
<b>3 - DISPLAY</b>			
31 capacity	1.00 L		
32 closed	4.00%		
33 open	96.00%		
34 total set	0.00 L		
35 total max	99999.99 L		
36 auto reset	10.0 sec		
37 service counter	0		
<b>4 - POWER MANAGEMENT</b>			
41 LCD-new	1 sec.		
42 mode	operational		
<b>5 - FLOWMETER</b>			
51 signal	coil-lo		
52 signal	coil-lo		
53 bi-directional	disable		
54 phase	90°		
55 count negative	enable		
<b>6 - ANALOG OUTPUT</b>			
61 output	disabled		
62 percentage end	percentage		
63 percentage minimum	0.00%		
64 percentage maximum	100.00%		
65 tune min - 4mA	0208		
66 tune max - 20mA	6656		
67 filter	0		
<b>7 - PULSE OUTPUT</b>			
71 impulse width	000 periods		
72 pulse per	0001000		
<b>8 - COMMUNICATION</b>			
81 baud-rate	2400		
82 address	1		
83 mode	BUS-ASC		
<b>9 - OTHERS</b>			
94 pass code	0000		
95 tagnumber	0000000		

