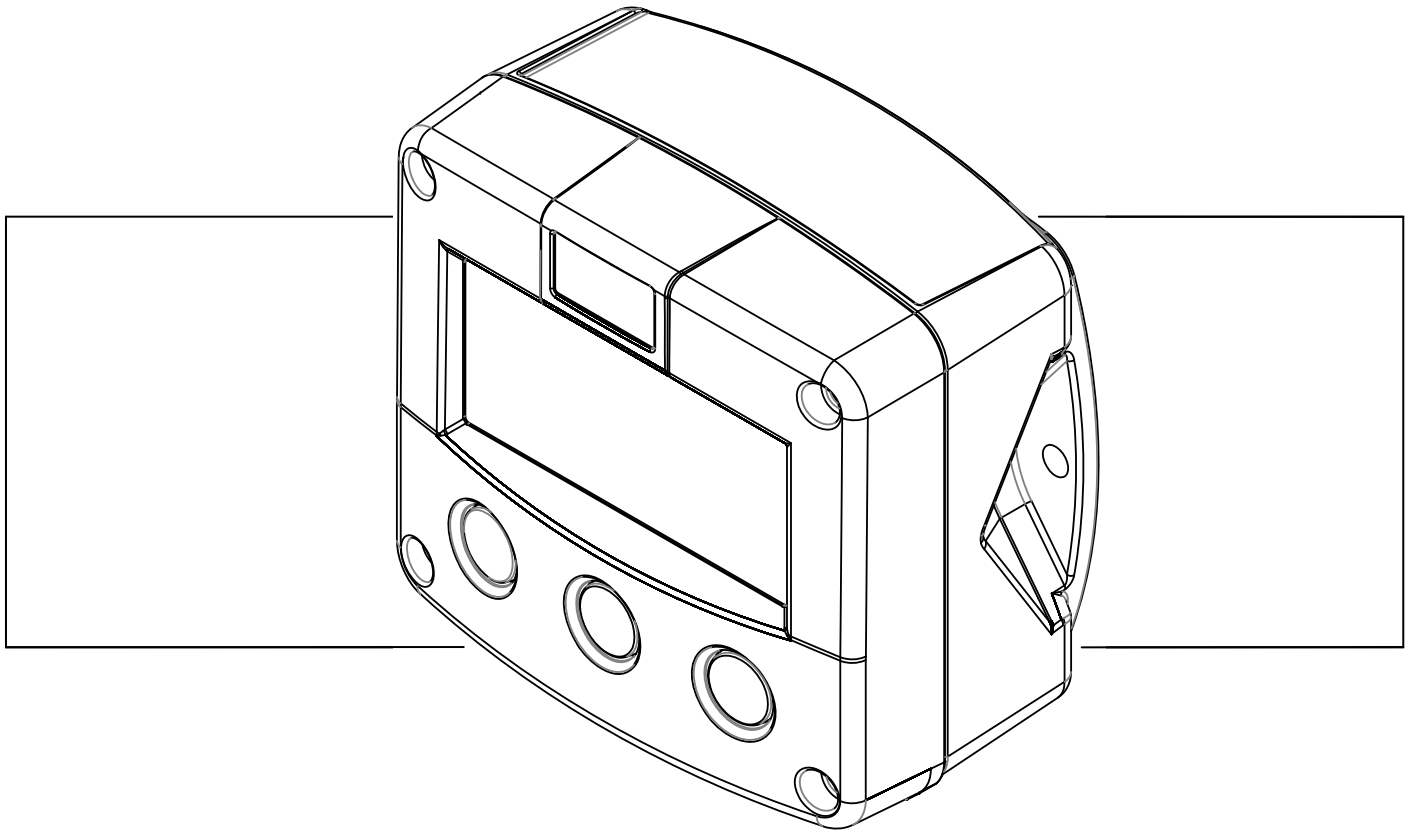
F197-A

SETPOINT GENERATOR



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

Signal outputs: (0)4-20mA or 0-10V control output and two alarm outputs

Options: Intrinsically Safe, Modbus communication

F-Series - Field mounted indicators for safe and hazardous areas. More info: www.fluidwell.com/fseries

SAFETY INSTRUCTIONS

- **Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.**
- **LIFE SUPPORT APPLICATIONS: The F197-A is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.**
- **Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.**
- **This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).**
- **Do connect a proper grounding to the aluminum casing as indicated if the F197-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 F197-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 F197-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 F197-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 F197-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 F197-A or connected instruments.


Note !

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

Hardware version	:	02.01.xx
Software version	:	02.05.xx
Manual	:	HF197AEN_v050_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.

CONTENTS MANUAL

1. INTRODUCTION

1.1. SYSTEM DESCRIPTION OF THE F197-A

Functions and features
The setpoint generator model F197-A is a microprocessor driven instrument designed for manually control of a device with a (0)4-20mA or 0-10V signal. Moreover, an input value can be displayed but has no control link with the output value.
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 sensor signals,
- transmitting possibilities with two alarm and communication (option) outputs.

Sensor input
This manual describes the unit with a (0)4-20mA sensor input "-A version". Other versions are available to process pulse or 0-10V signals.
One sensor with a (0)4-20mA output can be connected to the F197-A. To power the sensor, several options are available.

Standard outputs

- Linear (0)4-20mA or 0-10V control output with 10-bits resolution to control a device manually. The setpoint as well as the minimum and maximum signal output can be tuned.
- Two transistor or relay (option) outputs for high / low alarm, relatedto the input value.

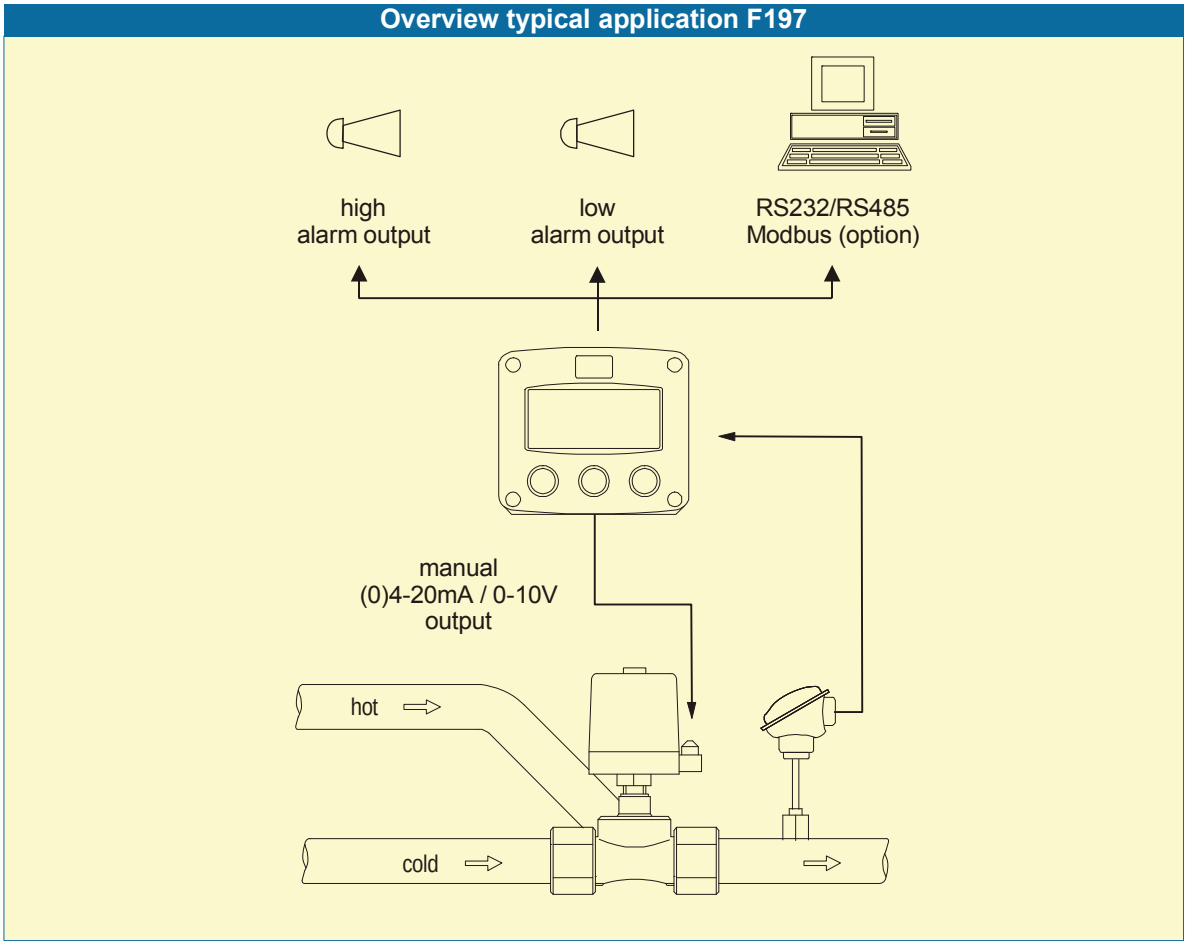


Fig. 1: Typical application for the F197-A.

Configuration of the unit
The F197-A was designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F197-A according to your specific requirements.
SETUP includes several important features, such as Span, measurement units, signal selection etc.
All setting 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 transflective LCD with all kinds of symbols and digits to display measuring units, status information, trend-indication and key-word messages.

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

Caution !

- *The F197-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 F197-A. This instruction is meant for users / operators.

2.2. CONTROL PANEL

The following keys are available:

Fig. 2: Control Panel.

Functions of the keys

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

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

The arrow-key ▶ is used to select a digit after PROG has been pressed or to decrease a value or to configure the unit; please read chapter 3.

2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the F197-A will always function at Operator level. The information displayed is dependant upon the SETUP-settings. If available, a sensor can be connected to the F197 to display the actual value. However, there is NO control relationship between the output value and the sensor input value. The signal generated by the connected sensor is measured by the F197-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 setpoint / preset value**

  Related to the configuration of the F197, a setpoint value can be entered as a value or by using the center button to increase a value and the left button to decrease the value.
  The value to be entered is an absolute or mA value or a percentage.

  To **enter** the 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. A negative value (e.g. -40°F) can be entered by pressing the middle and right button simultaneously.
  3) set the new PRESET-value by pressing ENTER.

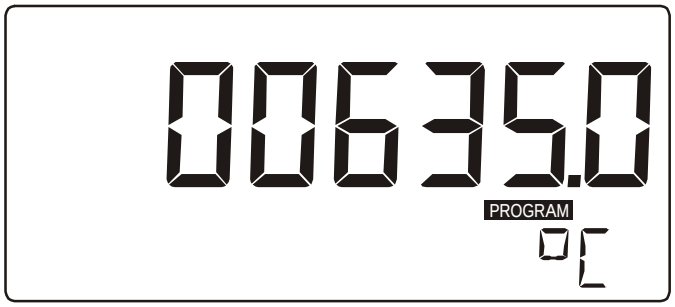


Fig. 3: Example display information during entering preset value.

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.

Note !

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

To **increase / decrease** the value, following procedure must be followed:
1) press PROG: the word "PROGRAM" will be flashing,
2) use ▲ to increase the value and ▸ to decrease the value. The longer the key is pressed, the faster it will increase or decrease.
3) set the new PRESET-value by pressing ENTER.

Note !

Please note: related to the configuration of the F197, it might be that the new value is active inmediately or first after pressing ENTER.
The new value must however ALWAYS be confirmed by pressing ENTER, else the former value will be re-installed.

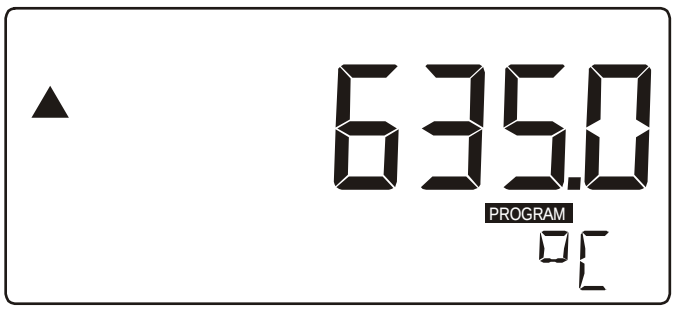


Fig. 4: Example display information during increasing / decreasing preset value.

- **Programming the alarm values**

Note !

Note: *This function might not be available or accessible due to a configuration setting.*

When the SELECT-key is pressed a few times, the values are displayed. These values are related to the input value of the sensor:

1) low alarm: enter here 830 °C for example.
2) high alarm: enter here 1200 °C for example.

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

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

Fig. 4: Example of display information during programming low alarm 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.

- **High or low alarm**

  When the actual sensor value is outside the allowed range, an alarm message will be displayed indicating the type of alarm: "LO ALARM" or "HI ALARM". An alarm might first be initiated after a certain period of time due to configuration settings.
  The alarm is terminated automatically as soon as the value is within its range again.

- **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.

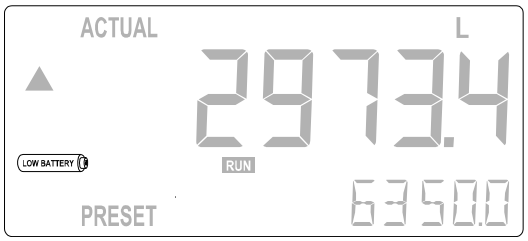


Fig. 5: Example of low-battery alarm.

- **Alarm 01-03**

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

3. CONFIGURATION

3.1. INTRODUCTION

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

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 F197-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

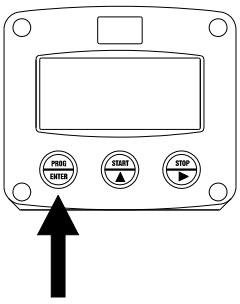
3.2.1. GENERAL

Configuration of the F197-A is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows ⬍ 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 F197-A remains fully operational.

Note !

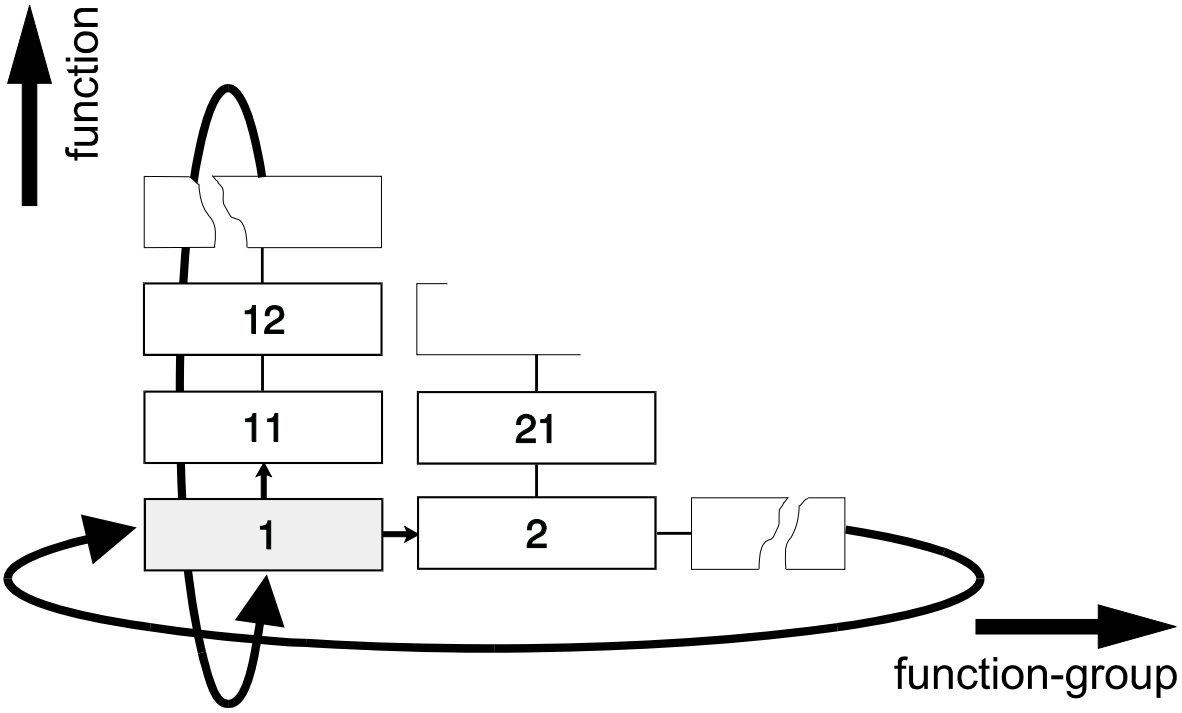
Note: *A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.*

To enter SETUP-level:



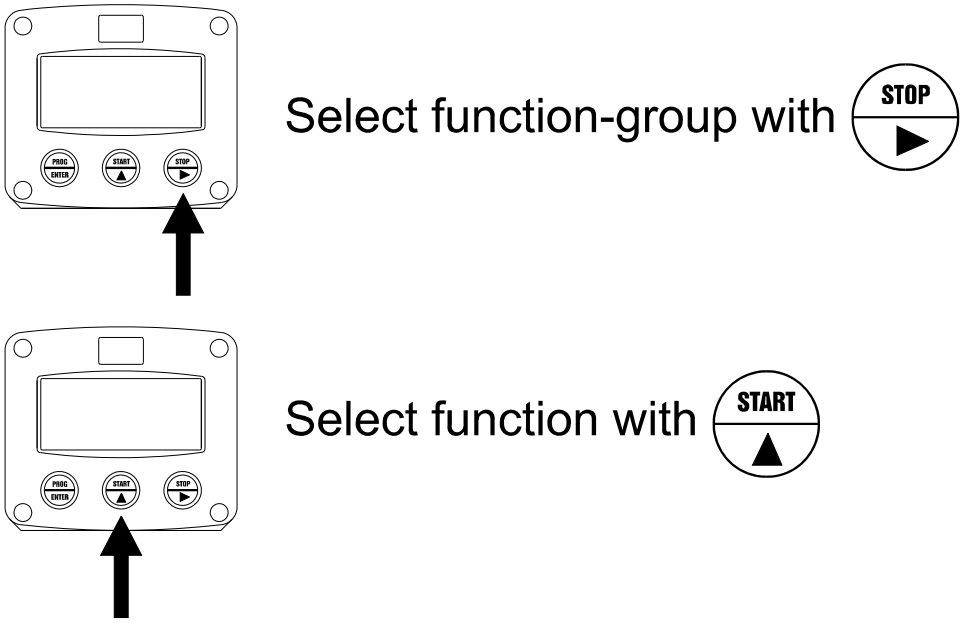
Press PROG/ENTER for 7 seconds

Matrix structure SETUP-level:



SCROLLING THROUGH SETUP-LEVEL

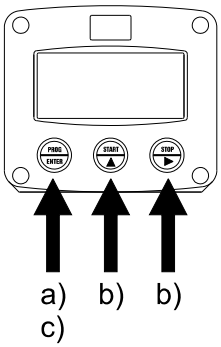
Selection of function-group and function:
SETUP is divided into several function groups and functions.



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

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

To change or select a value:



a) press PROG ENTER briefly; **PROGRAM** will start flash

b) select or enter value with START ▲ and / or STOP ▶

c) press PROG ENTER to confirm the value / selection.

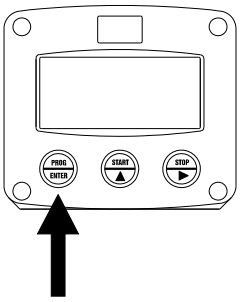
To change a value, use ▸ to select the digits and ▲ to increase that value.
To select a setting, both ▲ and ▸ can be used.
If the new value is invalid, the increase sign ▲ or decrease-sign ▼ will be displayed while you are programming.

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 PROG ENTER for 3 seconds

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

3.2.2. OVERVIEW FUNCTIONS SETUP LEVEL

SETUP FUNCTIONS AND VARIABLES			
1	**INPUT**		
	11	SENSOR VALUE	disable - enable
	12	UNIT	no unit - mm - cm - m - meter - mil - in - ft - yd - fath - sqft - ml - l -nl - al - m3 - nm3 - am3 - gal - usgal - igal - bbl - cuft - mg - g - kg - ton - oz - lb - st - qr - cwt - psi - psig - mbar - mbarg - bar - barg - pa - pag - kpa - kpag - mmh2o - mh2o - inh20 - mmhg - inhg - °C - °F - K - p - rpm - % - ppm.
	13	TIME UNIT	sec - min - hour - day - off
	14	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	15	SPAN	0.000001 - 9,999,999 unit
	16	DECIMALS SPAN	0 - 6
	17	OFFSET	-999,999 - +999,999 units
2	**OUTPUT**		
	21	PRESET SET	enter - setup - scroll - edit
	22	UNIT	input - mA - %
	25	PRESET	-999,999 - +999,999 units
3	**ALARM**		
	31	ALARM SET	operate - setup - disable
	32	OFFSET	ignore - default - no relay
	33	ALARM LO	-999,999 - +999,999 units
	34	ALARM HI	-999,999 - +999,999 units
	35	DELAY ALARM LO	0.1 - 999.9 seconds
	36	DELAY ALARM HI	0.1 - 999.9 seconds
4	**POWERMANAGEMENT**		
	41	LCD UPDATE	fast - 1 sec - 3 sec - 15 sec - 30 sec - off
	42	BATTERY MODE	operational - shelf
5	**SENSOR**		
	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
6	**ANALOG**		
	61	OUTPUT	disable - enable
	62	OUTPUT MINIMUM	-999,999 - +999,999 units
	63	OUTPUT MAXIMUM	-999,999 - +999,999 units
	64	CUT-OFF	0.0 - 9.9%
	65	TUNE MIN - (0)4mA / 0V	0 - 9,999
	66	TUNE MAX- 20mA / 10V	0 - 9,999
	67	FILTER	00 - 99
7	**COMMUNICATION**		
	71	SPEED / BAUDRATE	1200 - 2400 - 4800 - 9600
	72	ADDRESS	1 - 255
	73	MODE	rtu - off
8	**OTHERS**		
	81	TYPE / MODEL	F197–A / F197–U
	82	SOFTWARE VERSION	xx.xx.xx
	83	SERIAL NO.	xxxxxxx
	84	PASSWORD	0000 - 9999
	85	TAGNUMBER	0000000 - 9999999

3.2.3. EXPLANATION OF SETUP-FUNCTIONS

1 - SENSOR	
The settings for sensor do not influence the output signal directly. The input signal is just used to display and monitor a value at the operator level, which is likely influence by the setpoint generator. The display update time for this value is one second or more. ***Note:*** *some of these settings also influence other settings.*	
SENSOR VALUE **11**	If a sensor is available to display the actual value, do select enable to make this function available for the operator. Else select disable.
MEASUREMENT UNIT **12**	SETUP - 12 determines the measurement unit: The following units can be selected: no unit - mm - cm - m - meter - mil - in - ft - yd - fath - sqft - ml - l - nl - al - m3 - nm3 - am3 - gal - usgal - igal - bbl - cuft - mg - g - kg - ton - oz - lb - st - qr - cwt - psi - psig - mbar - mbarg - bar - barg - pa - pag - kpa - kpag - mmh2o - mh2o - inh20 - mmhg - inhg - °C - °F - K - p - rpm - % - ppm. Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the Span has to be adapted as well; the calculation is not done automatically.
TIME UNIT **13**	The unit can be displayed as a rate, e.g. L/min. The rate can be displayed per second (SEC), minute (MIN), hour (HR) or day (DAY).
DECIMALS **14**	This setting determines for the number of digits following the decimal point. The following can be selected: 00000 - 1111.1 - 222.22 - 333.333
SPAN **15**	With the span, the sensor signal is converted to the selected units (setup 12 and 13). The **span** is determined on the basis of the **selected measurement unit and time unit** at 20mA. Enter the span in whole numbers (decimals are set with SETUP 16). The more accurate the span, the more accurate the functioning of the system will be. **Example 1** **Calculating the span for flowrate** *Let us assume that the sensor generates 20mA at a flowrate of 2,481.3 Liters/minute, the selected unit is "Liters" and time unit "minute".* *The span is 2481.3 Enter for* SETUP*15: "248130" and for SETUP16 - decimals span "2".* **Example 2** **Calculating the span for level** *Let us assume that the sensor generates 20mA at a level of 652.31 USGAL, the selected unit is USG and the offset value is 200 (setup 17).* *The span is 652.31-200=452.31. Enter for SETUP 14: "452.31 and for SETUP 15 "2" and SETUP 16 "200".*
DECIMALS SPAN **16**	This setting determines the number of decimals for Span (SETUP 15). The following can be selected: 0 - 1 - 2 - 3 - 4 - 5 - 6 Please note that this SETUP - influences the accuracy of the Span indirectly. This setting has NO influence on the displayed number of digits for (SETUP 14)!
OFF SET **17**	Enter here the "not measured" value which is below the sensor, in case a pressure transducer e.g. is used to measure the level. Also, a negative offset can be entered: do press the middle and left button simultaneously - e.g. for -85°F.

2 - OUTPUT	
PRESET SET **21**	With this function it is determined how the opertor has to enter a new setpoint value. The following can be selected: **enter:** the digits have to be selected and each digit is increased individually. **setup:** as enter, but the value can NOT be chganged by the operator, only at setup level (setup 23) **scroll:** the value will increase by pressing the center button or decrease by pressing the left button. The value is inmediatly valid. **edit:** as scroll, but the value is first valid after pressing ENTER.
UNIT **22**	This function determines the measurement unit for the setpoint. The following units can be selected: **unit:** the measuring unit as selected with setup 12 will be displayed. Consequently, the setpoint range will be 6 digits (incl. max three decimals - setup 14) **mA:** the setpoint value will be mA. Consequently, the setpoint range will be 4 digits (incl. one decimal).. **%:** the setpoint value will be %. Consequently, the setpoint range will be 4 digits (incl. one decimal).
PRESET **23**	With this setting a setpoint (preset value) can be entered. As this value is at opertor level, it can be password protected (setup 84 and 21).

Note !

3 - ALARM	
If setup 11 is enabled, the sensor value can be monitored with these alarm settings. Consequently, the low and high alarm outputs will be switched in case of an alarm. Please be aware that the alarm levels can be programmed at operator level as well. Moreover, the function be locked out (setup 31).	
ALARM SET **31**	This function determines following: **operate**: the alarm values can be set at both Operator level and SETUP-level. **setup**: the alarm values can be set at SETUP-level only, but are still visible for the operetor **disable**: the monitoring function is switched-off and not visible for the operator.
OFFSET **32**	When the signal is the minimum value, then it is possible to ignore or disable the monitoring function. The following settings can be selected: **default:** in case of a low-alarm and minimum signal value, it will switch the alarm output and indicate the alarm on the display. **no relay:** in case of a low-alarm and minimum signal value, it won't switch the alarm output but will indicate the alarm on the display only. **ignore:** in case of a low-alarm and minimum signal value, it won't switch the alarm output and nothing will be indicated on the display.
ALARM VALUE LOW **33**	The low alarm is set with this setting. An alarm will be generated as long as the value is lower as this value. A negative offset can be entered: do press the middle and left button simultaneously.
ALARM VALUE HIGH **34**	The high alarm is set with this setting. An alarm will be generated as long as the value is higher as this value.
DELAY TIME ALARM LOW **35**	An alarm generated by SETUP 33 “low” can be ignored during X-time period. If the actual value is still incorrect after this delay time, then an alarm will be generated.
DELAY TIME ALARM HIGH **36**	An alarm generated by SETUP 34 “high” can be ignored during X-time period. If the actual value is still incorrect after this delay time, then an alarm will be generated.

4 - POWER MANAGEMENT

When used with the internal battery (type PB / PC), the user can expect reliable measurement over a long period of time. The F197-A has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:

LCD NEW **41**	The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display update, it is **strongly advised** to select a slow refresh rate. Please understand that NO information will be lost; the input signal will be processed and the output signals will be generated in the normal way. The following can be selected: Fast - 1 sec - 3 sec - 15 sec - 30 sec - off. **Example 3:** **Battery life-time** *battery life-time with a FAST update: about 3 years.* *battery life-time with a 1 sec update: about 7 years.* ***Note:** after a button has been pressed by the operator - the display refresh rate will always switch to FAST for 30 seconds. When "OFF" is selected, the display will be switched off after 30 seconds and will be switched on as soon as a button has been pressed.*
Note ! **BATTERY-MODE** **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 are stored. In this mode, power consumption is extremely low. To wake up the unit again, press the SELECT-key twice.

5 - SENSOR

f setup 11 has been enabled, following functions are used to scale the senor signal.

SIGNAL **51**	The F197-A can process the 4-20mA signal in two ways: ▪ Interpolation: the signal is processed linear **V = S x I** ▪ Square root: for differential pressure **V = S** $\sqrt{}$ **I** where: V = Value: the calculated value S = Span: the maximum value at 20mA. The span is programmed with setting 15. I = Input: the scaled analog value; in these formulas value 0 (zero) for (0)4mA and value 1 (one) for 20mA.

Continued next page >>>

5 - SENSOR (CONTINUED)

FILTER
52

The analog output signal of a sensor does mirror the actual value. This signal is measured several times a second by the F197-A. The value measured is a "snap-shot" of the real value as it will be fluctuating. With the help of this digital filter a stable and accurate reading can be obtained while the filter level can be set to a desired value.
The filter principal is based on three input values: the filter level (01-99), the last measured analog value and the last average value. The higher the filter level, the longer the response time on a value change will be.
Below, several filter levels with there response times are indicated:

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
05	1.0 seconds	1.8 seconds	2.8 seconds	5.3 seconds
10	1.8 seconds	3.5 seconds	5.6 seconds	11 seconds
20	3.5 seconds	7.0 seconds	11 seconds	23 seconds
50	8.8 seconds	17 seconds	29 seconds	57 seconds
99	17 seconds	34 seconds	57 seconds	114 seconds

CUT-OFF
53

To ignore e.g. vibration, a low-level 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.
The cut-off value can be programmed is the range 0.0 - 99.9%.
Example:

	SPAN (setup 15)	REQUIRED CUT-OFF	CUT-OFF (setup 53)	REQUIRED OUTPUT
	450 L	25 L	25/450 x 100%=5.5%	16mA x 5.5% + 4mA = 4.88mA

TUNE MIN / 4MA
54

With this setting it is possible to calibrate the input value for (0)4mA as the signal from the sensor might not be exact 4.0 mA (or 0.0 mA) at value zero. This function will measure the real output value at level zero.

- *Warning: be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!*

After pressing PROG, three settings can be selected:
- CALIBRATE: with this setting, the input will be calibrated with the actual "(0)4mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be more than the calibrated value before the signal will be processed.
- DEFAULT: with this setting, the manufactures value is re-installed.
- CAL SET: to select the last calibrated value.

TUNE MAX / 20MA
54

With this setting it is possible to calibrate the input value for 20mA as the signal from the sensor might not be exact 20.0 mA at maximum value. This function will measure the real output value at maximum level.

- *Warning: be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!*

After pressing PROG, three settings can be selected:
- CALIBRATE: with this setting, the input will be calibrated with the actual "20mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be less than the calibrated value.
- DEFAULT: with this setting, the manufactures value is re-installed.

CAL SET: to select the last calibrated value.

6 - ANALOG OUTPUT

A linear 4-20mA signal (type AB: 0-20mA or type AU: 0-10V) output signal is generated according to the setpoint with a 10 bits resolution. The settings for “OUTPUT” (SETUP - 2) directly influence the analog output.
When a power supply is available but the output is disabled, a 3.5mA signal will be generated.

OUTPUT **61**	With this function, the setpoint function can be switched-off for e.g. safety or service reasons. Do select disable or enable.
MINIMUM OUTPUT **62**	Enter here the value at which the setpoint should generate a 4mA signal (or 0mA / 0V) - in most applications at value "zero". The measuring unit is according to SETUP 22 (and 12, 13 and 14 if “unit” has been selected) but are not displayed. The number of decimals for percentage and mA is one; for unit it is according to SETUP 13. A negative value can be entered: do press the middle and left button simultaneously Example mA: do enter 4.0 here. Example %: do enter 0.0 here. Example value: do enter -50.00 °F here.
MAXIMUM OUTPUT **63**	Enter here the value at which the setpoint should generate a 20mA (or 10V) - in most applications at maximum value. Example mA: do enter 20.0 here. Example %: do enter 100.0 here. Example value: do enter 375.00 °F here.
CUT-OFF **64**	A low value cut-off can be set as a percentage of the full range of 16mA (or 20mA / 10V). When the value is less than the required value, the current will be 4mA. (less suitable function for the F197). **Examples:**

4MA (SETUP 62)	20MA (SETUP 63)	CUT-OFF (SETUP 64)	REQUIRED RATE	OUTPUT
0 L/min	100 L/min	2%	(100-0)*2% = 2.0 L/min	4+(16*2%) = 4.32mA
20 L/min	800 L/min	3.5%	(800-20)*3.5%= 27.3 L/min	4+(16*3.5%)=4.56mA

TUNE MIN / 4MA **65**	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. ▪ *Before tuning the signal, be sure that the analog signal is not being used for any application!* After pressing PROG, the current will be about 4mA (or 0mA / 0V). The current can be increased/decreased with the arrow-keys and is directly active. Press ENTER to store the new value.
TUNE MAX / 20MA **66**	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. ▪ *Before tuning the signal, be sure that the analog signal is not being used for any application!* After pressing PROG, the current will be about 20mA. The current can be increased/decreased with the arrow-keys and is directly active. Press ENTER to store the new value.

Continued next page >>>

6 - ANALOG OUTPUT (CONTINUED)

FILTER **67**	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:

FILTER VALUE	RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE. TIME IN SECONDS			
	50% INFLUENCE	75% INFLUENCE	90% INFLUENCE	99% INFLUENCE
01	filter disabled	filter disabled	filter disabled	filter disabled
02	0.1 second	0.2 second	0.4 second	0.7 second
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 - COMMUNICATION (OPTIONAL)

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

BAUDRATE **71**	For external control, the following communication speeds can be selected: 1200 - 2400 - 4800 - 9600 baud
BUS ADDRESS **72**	For communication purposes, a unique identity can be attributed to every F197-A. This address can vary from 1-255.
MODE **73**	The communication protocol is Modbus RTU mode. Select OFF, to disable this communication function.

8 - OTHERS

TYPE OF MODEL **81**	For support and maintenance it is important to have information about the characteristics of the F197-A. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
VERSION SOFTWARE **82**	For support and maintenance it is important to have information about the characteristics of the F197-A. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
SERIAL NUMBER **83**	For support and maintenance it is important to have information about the characteristics of the F197-A. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
PASS CODE **84**	All SETUP-values can be pass code protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
TAGNUMBER **85**	For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.

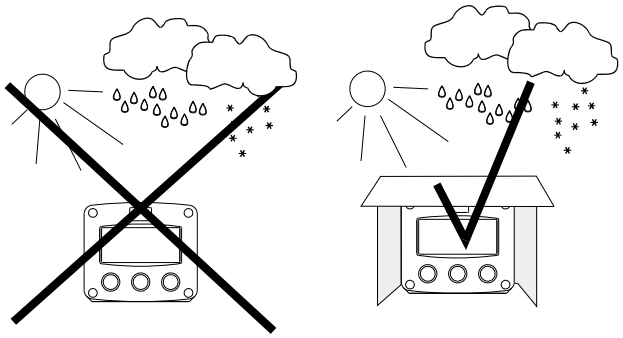
4. INSTALLATION

4.1. GENERAL DIRECTIONS

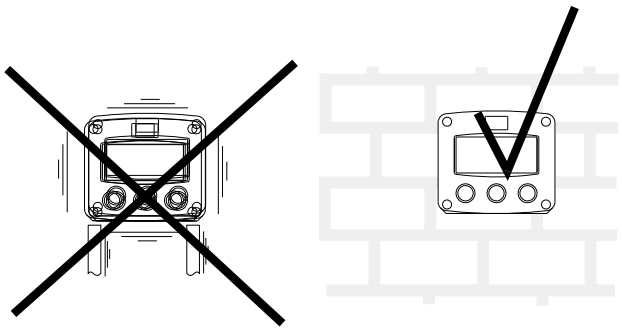
Caution !

- Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- The F197-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 F197-A on a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE

Aluminum enclosures:

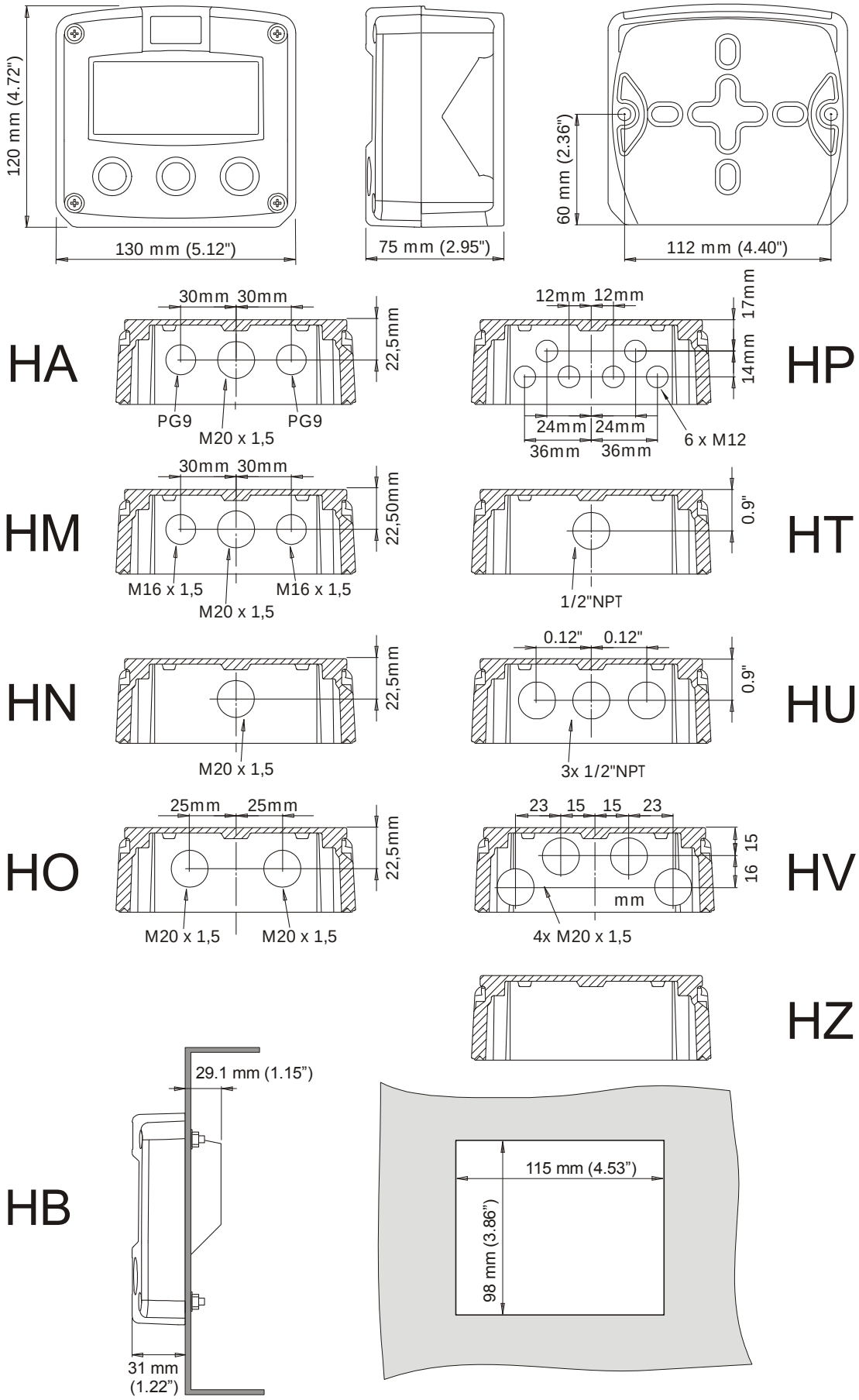
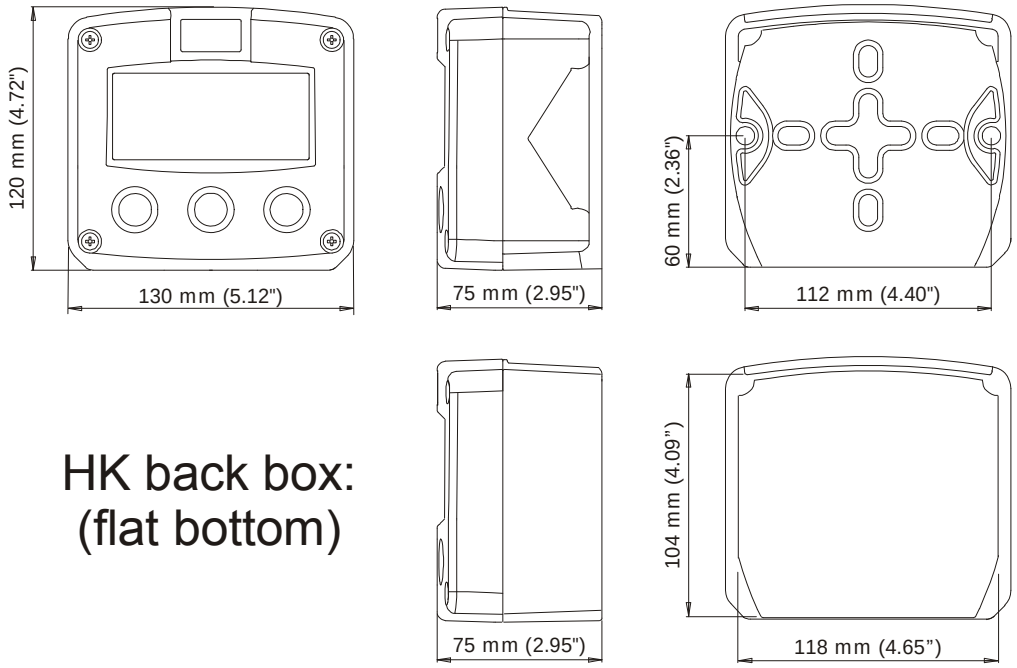
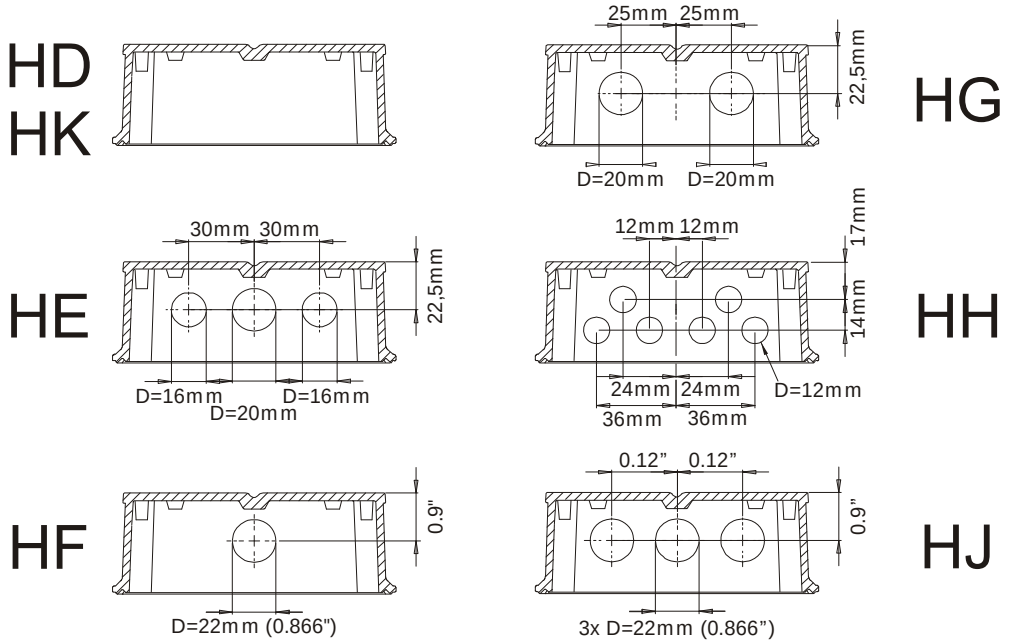


Fig. 6: Dimensions aluminum enclosures.

GRP enclosures:





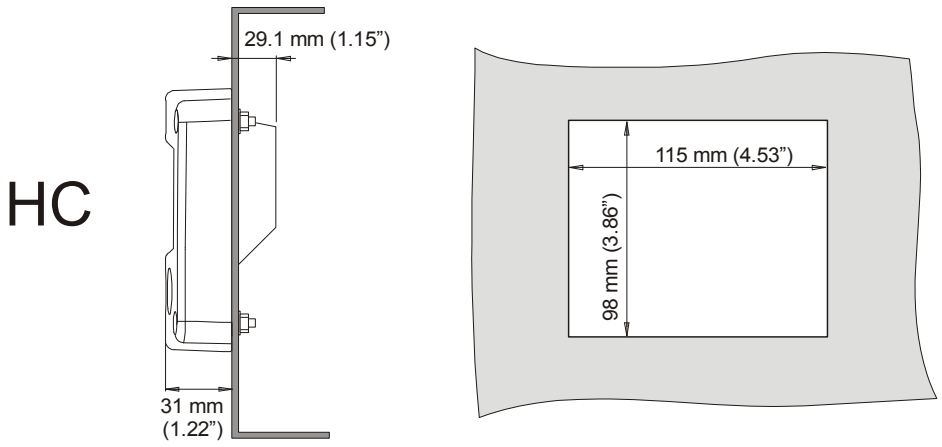


Fig. 7: Dimensions GRP enclosures.

4.4. INSTALLING THE HARDWARE

4.4.1. INTRODUCTION

- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.

- This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).

Aluminum enclosures

- When installed in an aluminum enclosure and a potentially explosive atmosphere requiring apparatus of equipment protection level Ga and Da, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.

- Do ground the aluminum enclosure properly as indicated, if the F197-A has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-casing and removable terminal-block may never be removed.

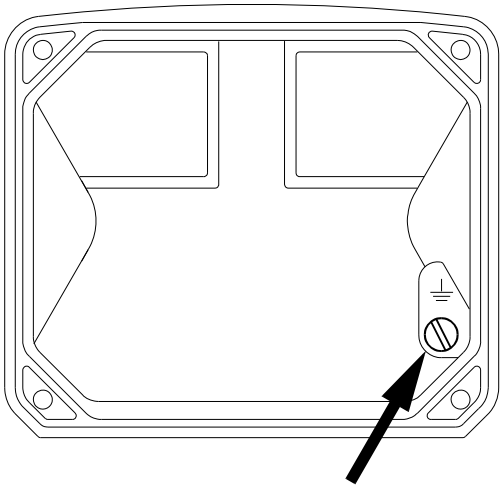


Fig. 8: Grounding aluminum enclosure with type PM 115-230V AC.

FOR INSTALLATION, PAY EMPHATIC ATTENTION TO:

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

4.4.2. VOLTAGE SELECTION SENSOR SUPPLY

For Intrinsically Safe applications: read chapter 5.

Type PB / PC / PX (AP) - battery powered and output loop-powered applications:
Terminal 11 provides a limited supply voltage of 3.2 V DC which is not suitable for analog sensors.

Type PD / PF / PM: Sensor supply: 3.2V, 8.2V, 12V or 24 V DC:
With this option, a real power supply for the sensor is available. The sensor can be powered with 3.2, 8.2, 12 or 24 V DC.
Total power consumption PD: max. 50mA@24V and PF / PM: max. 400mA@24V.
The voltage is selected with the three switches inside the enclosure.

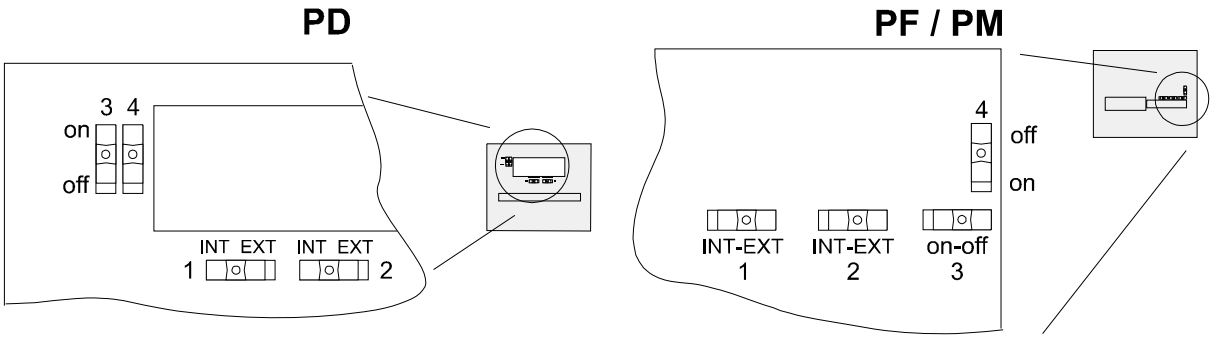


Fig. 9: switch position voltage selection (type PD / PF / PM).

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

4.4.3. TERMINAL CONNECTORS

For Intrinsically Safe applications: read chapter 5.

The following terminal connectors are available:

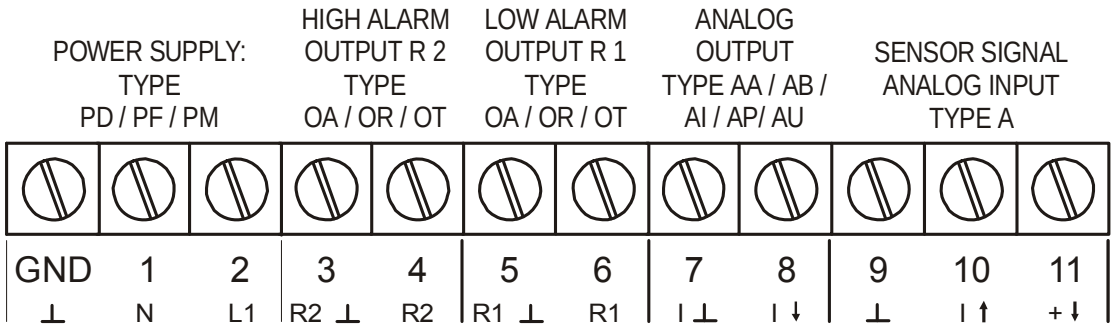


Fig. 10: Overview of terminal connectors standard configuration F197-A and options.

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. 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								

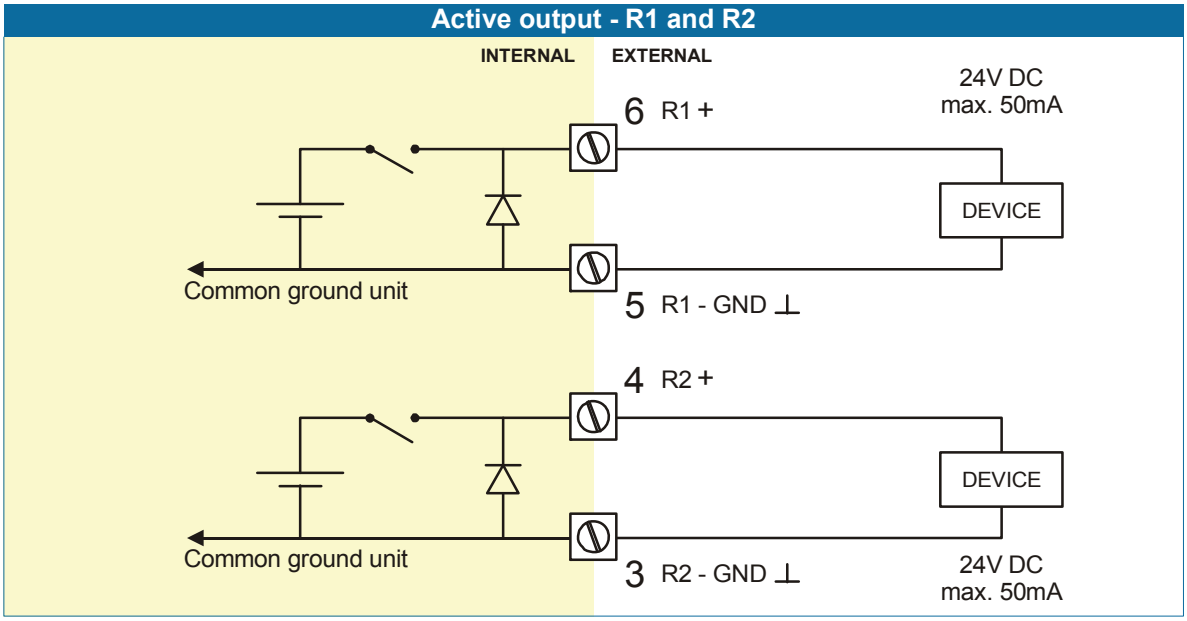
◊=option

For Intrinsically Safe applications: read chapter 5.

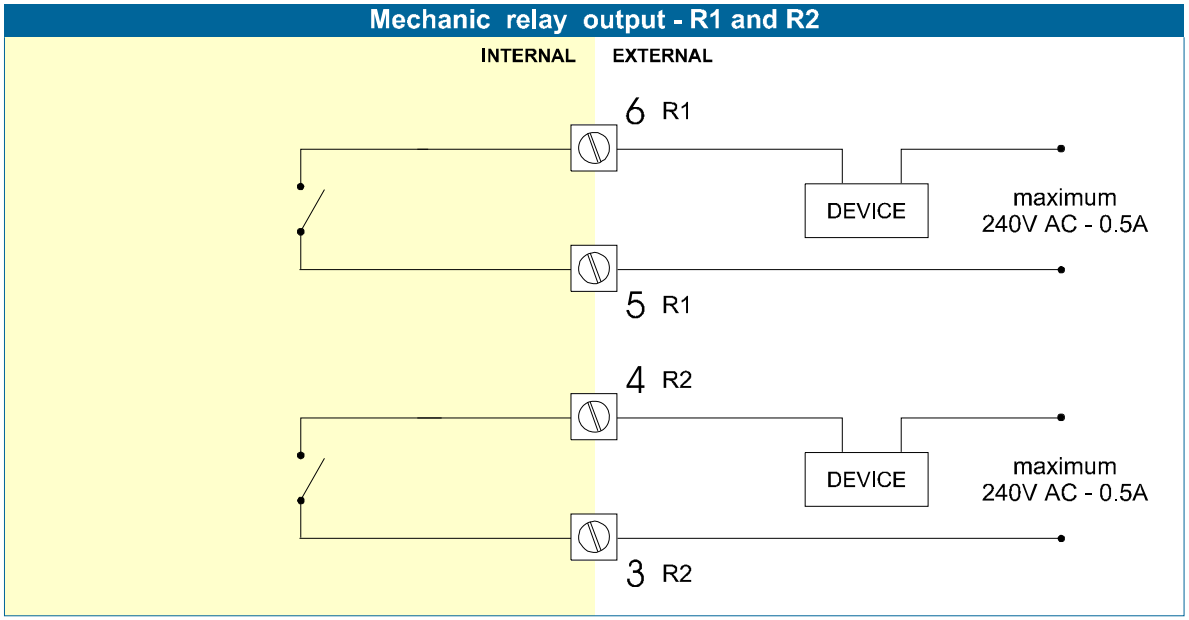
Terminal 03-04; alarm output R2:
This output is the high alarm output.

Terminal 05-06; alarm output R1:
This output is the low alarm output.

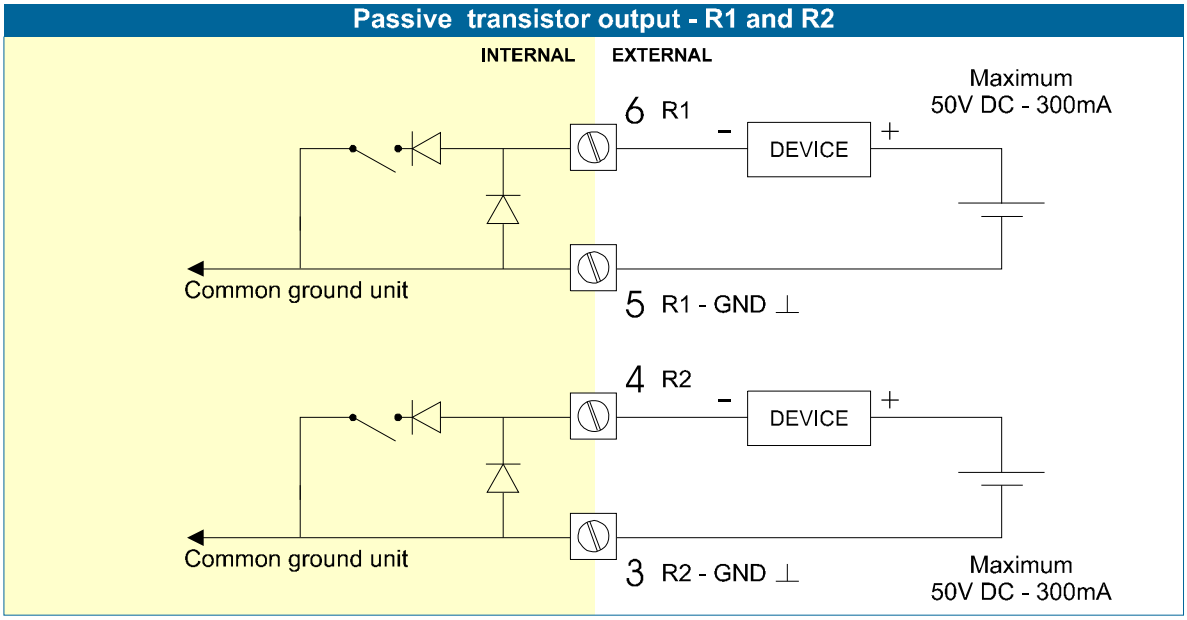
Type OA:
An active 24V DC signal according to the functions R1 and R2 is available with this option.
Max. driving capacity 50mA@24V DC per output. (Requires power supply type PD / PF / PM).



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).



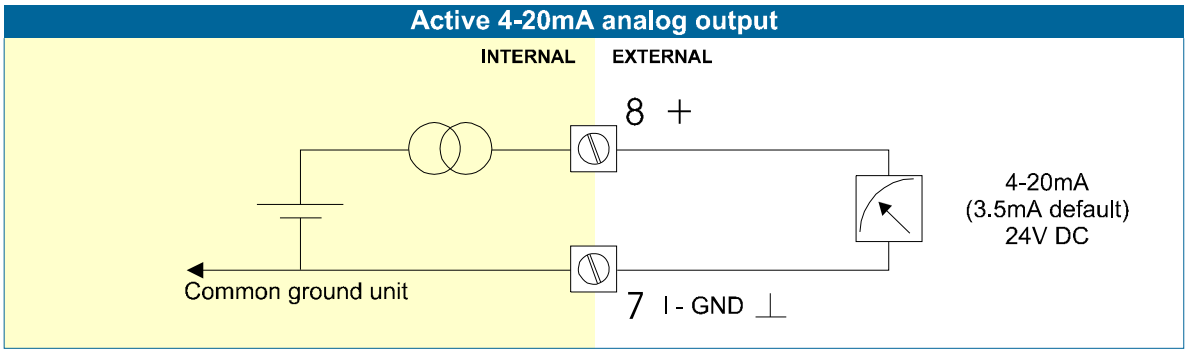
Type OT:
A passive transistor output is available with this option. Max. driving capacity 300mA@50V DC.



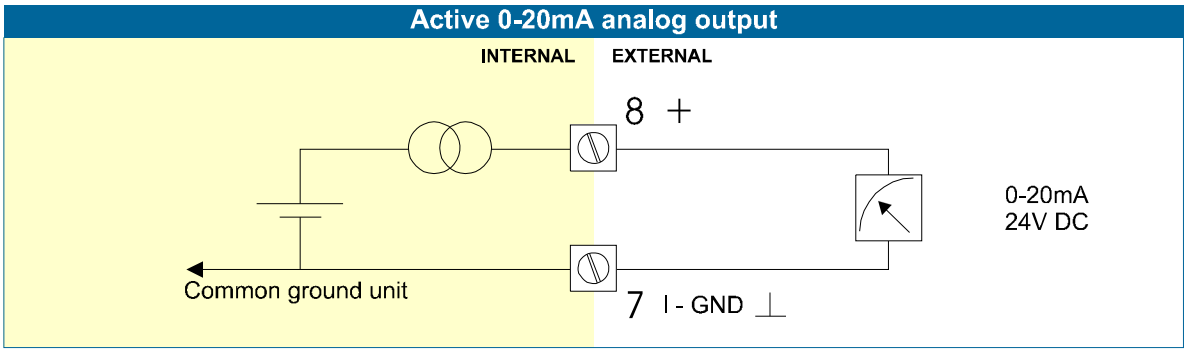
Terminal 07-08; basic POWER SUPPLY - type PX - output loop powered:
Connect an external power supply of 8-24 volts AC or 8-30VDC to these terminals or a 4-20mA loop. For a DC supply: connect the "**-**" to terminal 7 and the "**+**" to terminal 8. When power is applied to these terminals, the (optional) internal battery will be disabled / enabled automatically to extend the battery life time. (Only valid for standard passive output).

Terminal 07-08 analog output (SETUP 2 and 6):
This is the analog setpoint output.

Type AA:
An active 4-20mA signal proportional to the output value is available with this option.
When the output is disabled, a 3.5mA signal will be generated on these terminals.
Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD / PF / PM).

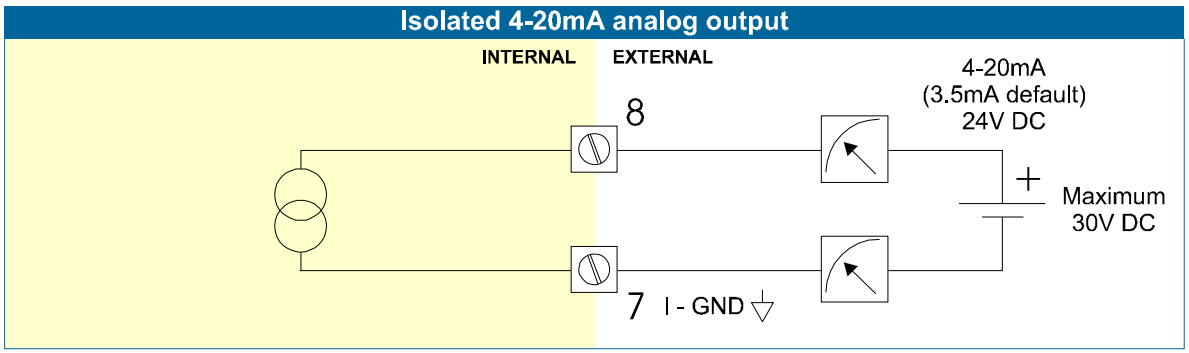


Type AB:
An active 0-20mA signal proportional to the output value is available with this option.
Max. driving capacity 1000 Ohm @ 24VDC. (Requires power supply type PD / PF / PM).

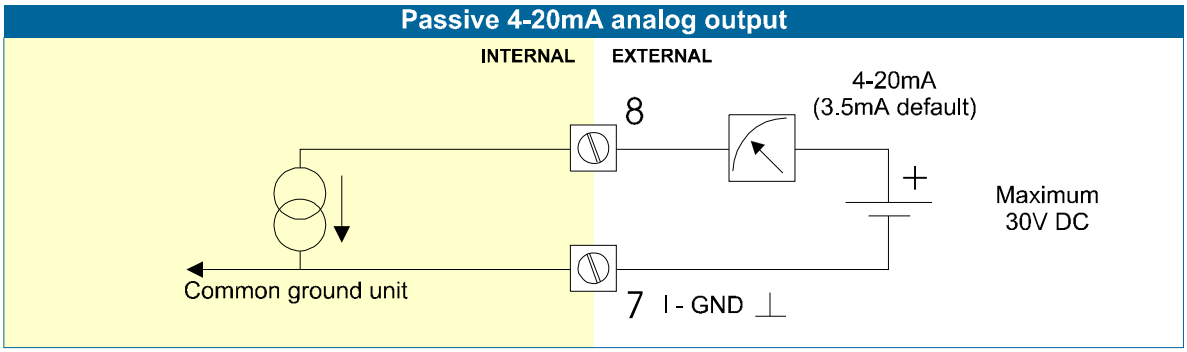


Type AF:
For the Intrinsically Safe floating 4-20mA signal: please read Chapter 5.

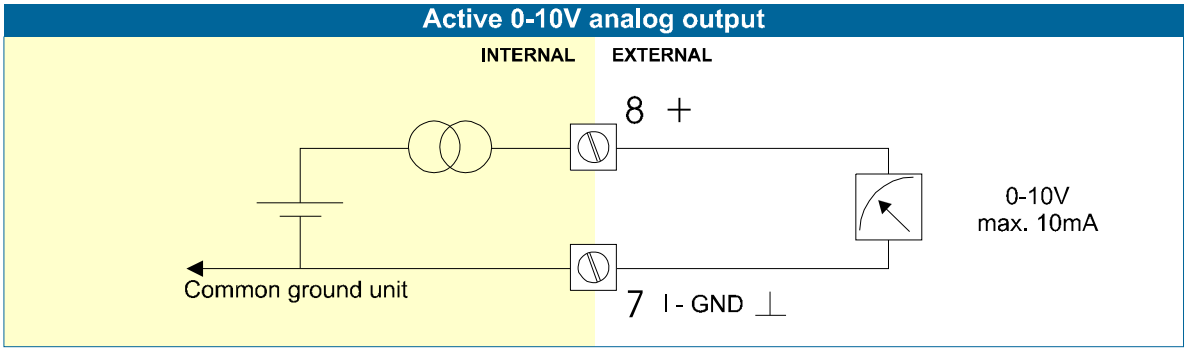
Type AI:
An isolated 4-20mA signal proportional to the output value is available with this option.
When the output is disabled, a 3.5mA signal will be generated on these terminals.
Max. driving capacity 1000 Ohm @ 30VDC.
This option can be battery powered but the life time of the battery is about 2 -3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



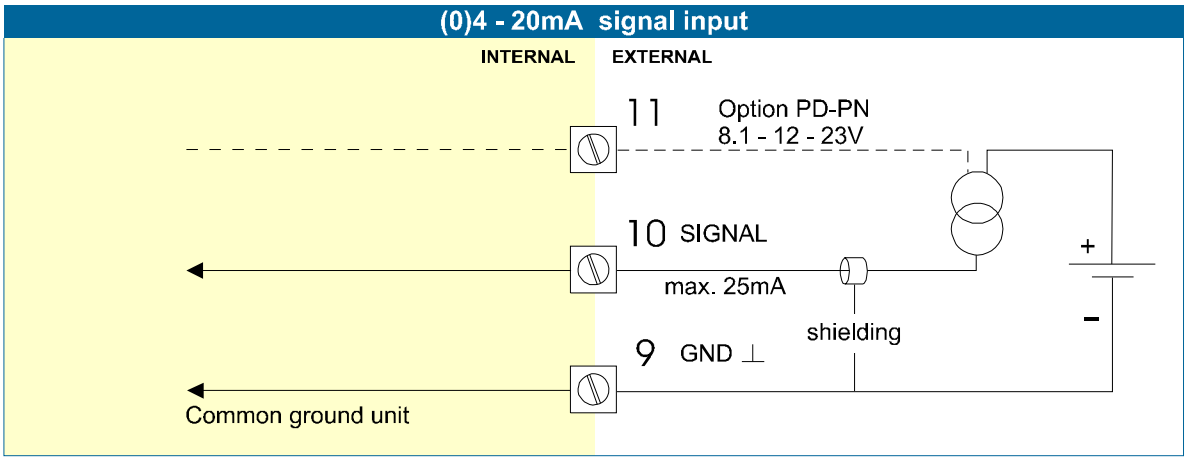
Type AP:
A passive 4-20mA signal proportional to the output value is available with this option. When a power supply is connected but the output is disabled, a 3.5mA signal will be generated.
Max. driving capacity 1000 Ohm. This output does loop power the unit as well (type PX).



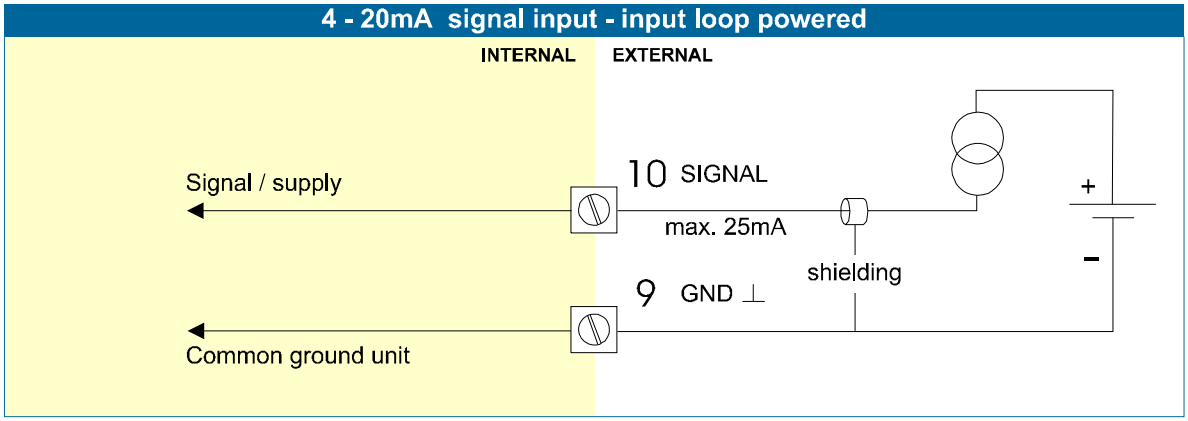
Type AU:
A 0-10VDC signal proportional to the output value is available with this option.
Max. load 10mA @ 10VDC. (Requires power supply type PD / PF / PM).



Terminal 09-11: Type A – sensor input (general)
The F197-A requires a (0)4-20mA sensor 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 – sensor input / power supply:
The F197-A-PL requires a 4-20mA sensor 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 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.

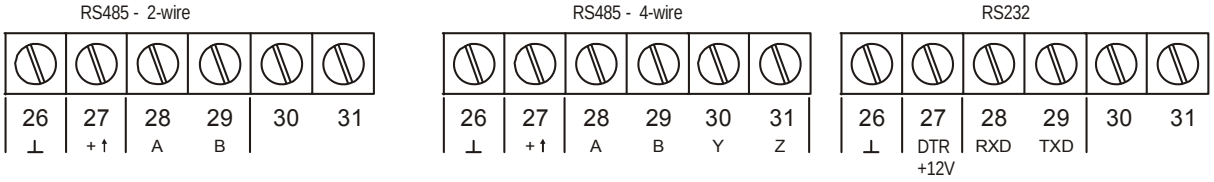


Fig. 11: Overview terminal connectors communication option.

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

Note !

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 option ZB.

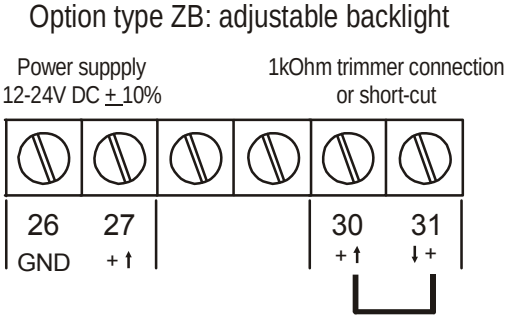


Fig. 12: Overview terminal connectors backlight option.

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

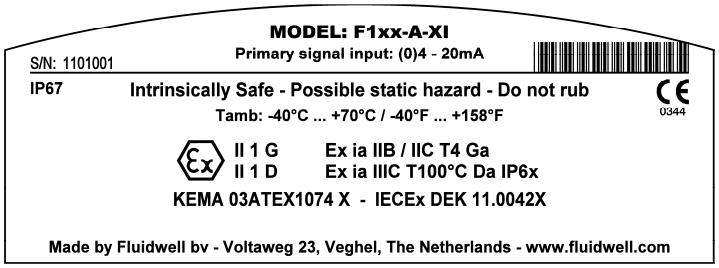
- When two or more active intrinsically safe circuits are connected to the indicator, in order to prevent voltage and/or current addition, applicable to the external circuits, precautions must be taken to separate the intrinsically safe circuits in accordance with IEC 60079-11.
- For the combined connection 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 !

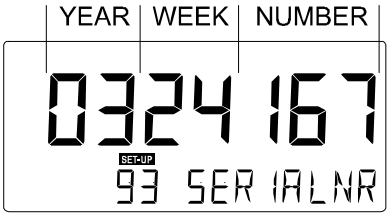
Please Note

- 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

Note !

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 F197-P-XI:

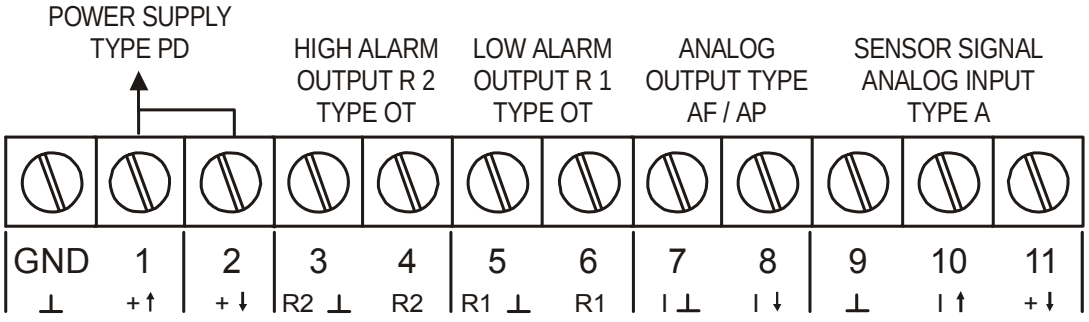


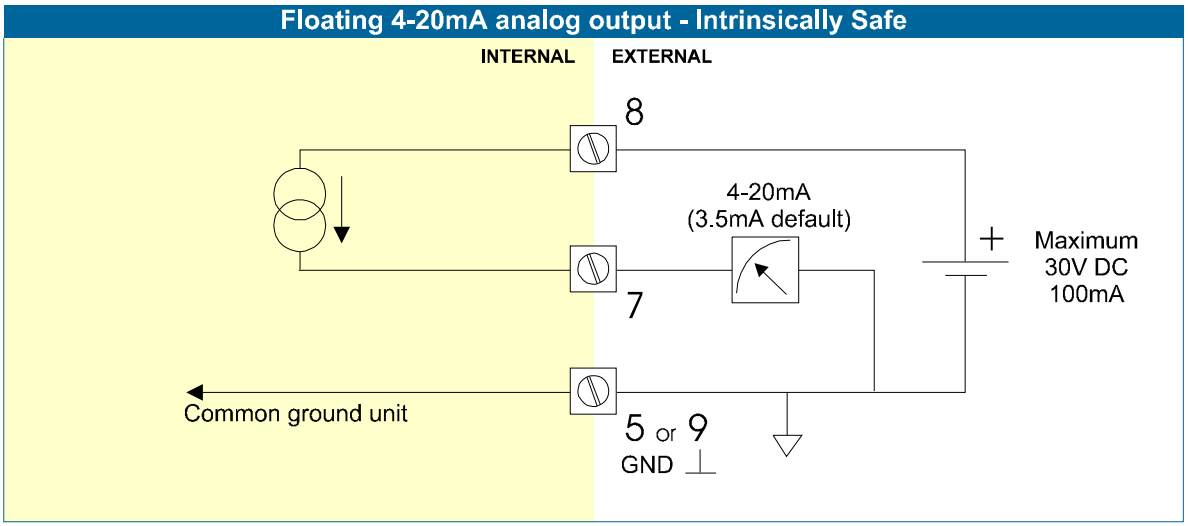
Fig. 13: Overview terminal connectors XI - Intrinsically Safe applications.

Explanation Intrinsically Safe options:

Type AF - Intrinsically Safe floating 4-20mA analog output:
A floating 4-20mA signal proportional to the output value is available with this option.
When the output is disabled, a 3.5mA signal will be generated.
Max. driving capacity 1000 Ohm @ 30VDC.

Note !

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



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

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

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

5.3. CONFIGURATION EXAMPLES INTRINSICALLY SAFE APPLICATIONS

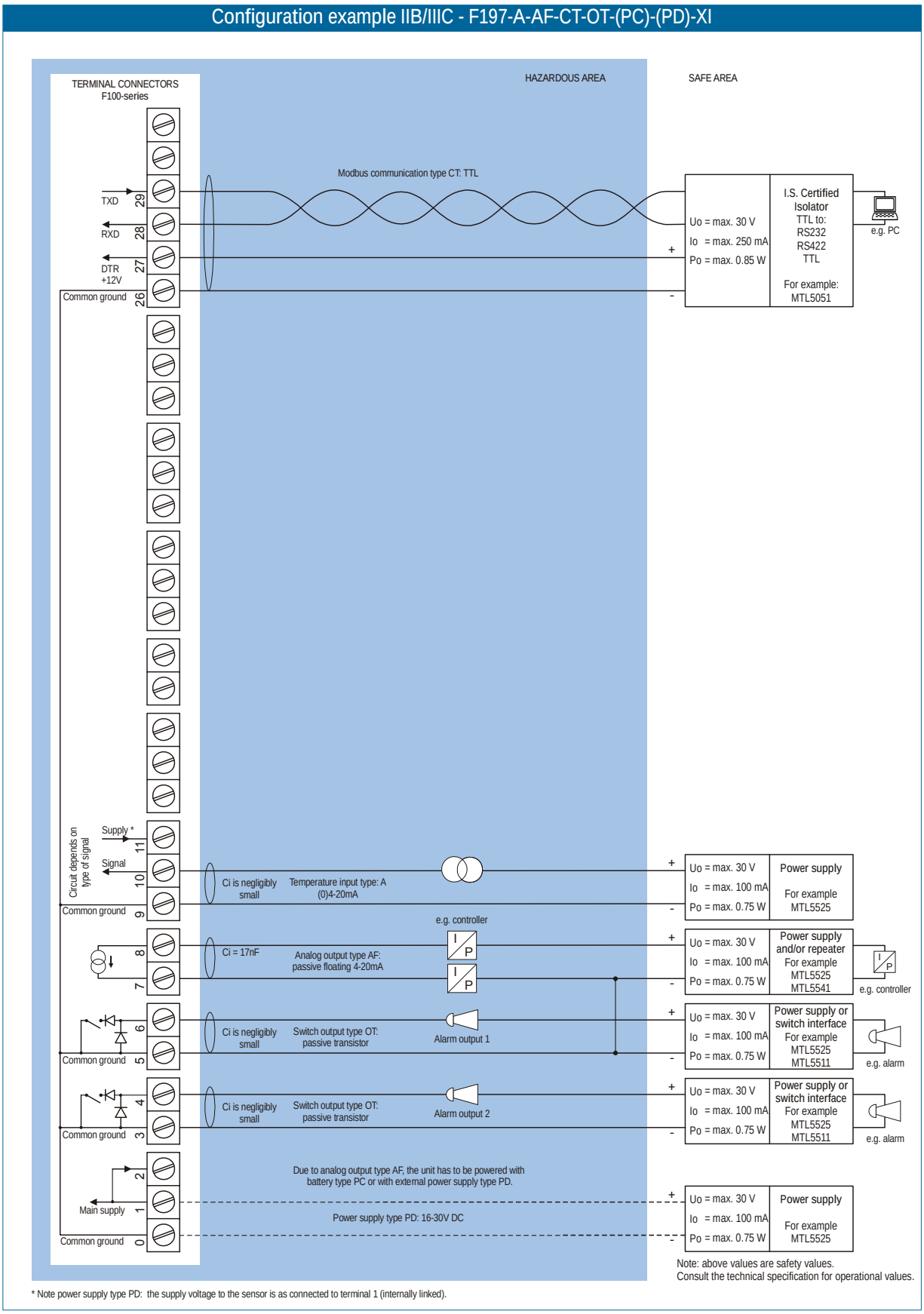


Fig. 14: Configuration example 1 Intrinsically Safe.

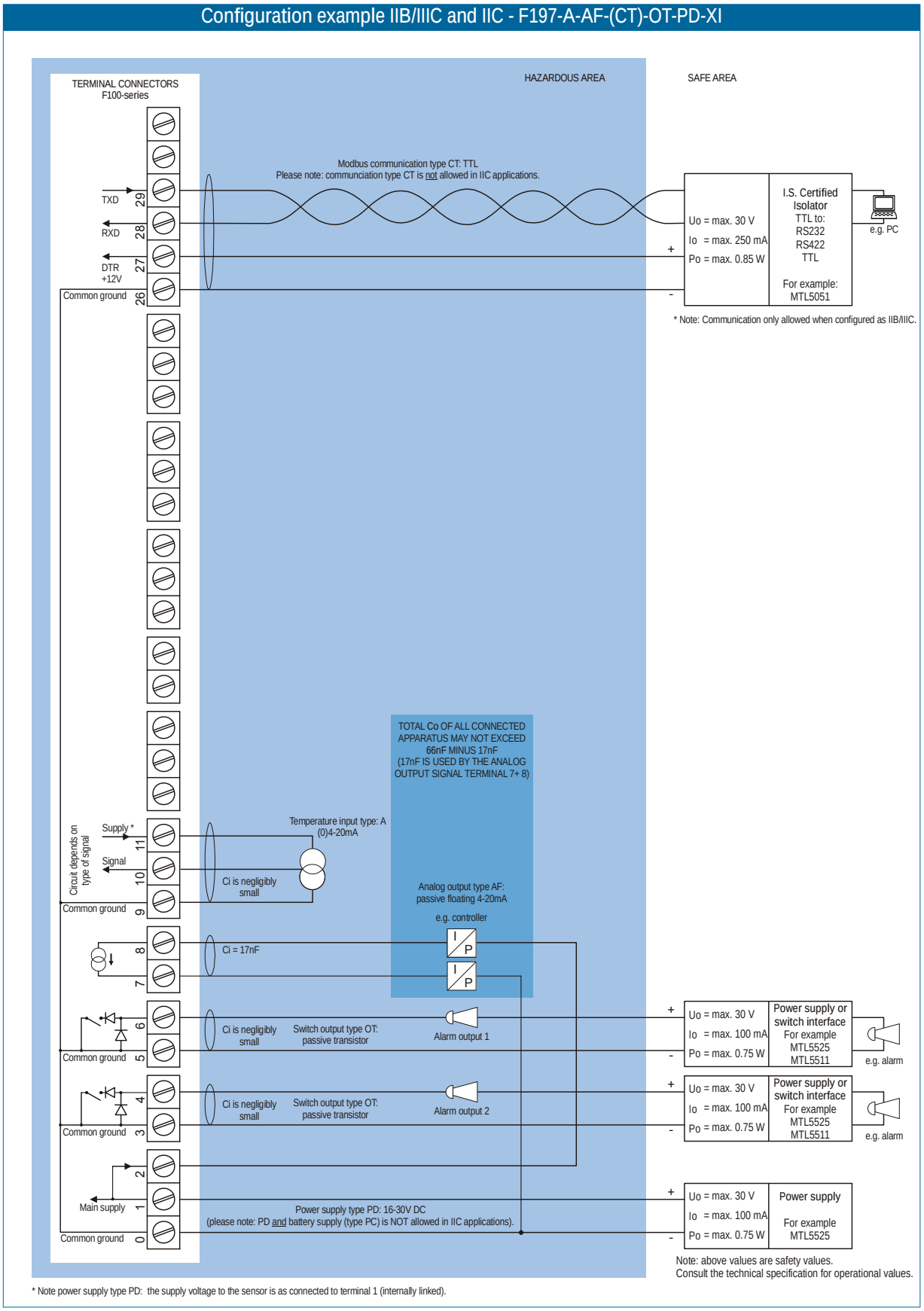


Fig. 15: Configuration example 2 Intrinsically Safe.

5.4 BATTERY REPLACEMENT INSTRUCTIONS

Safety Instructions

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

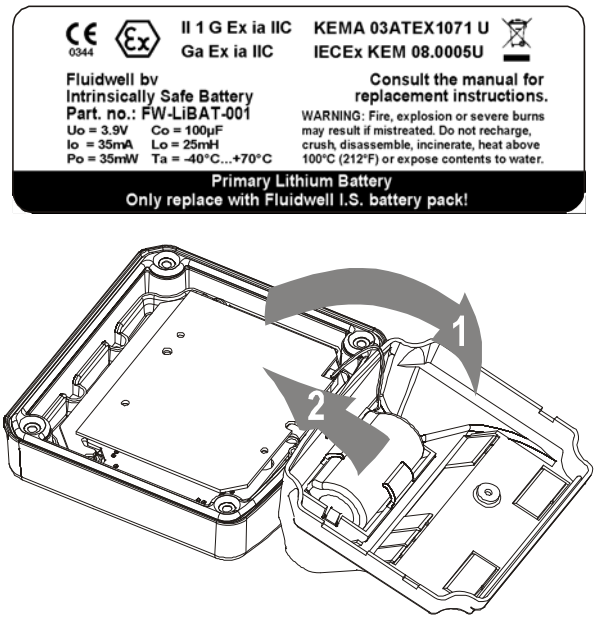
Safety instructions for hazardous areas

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

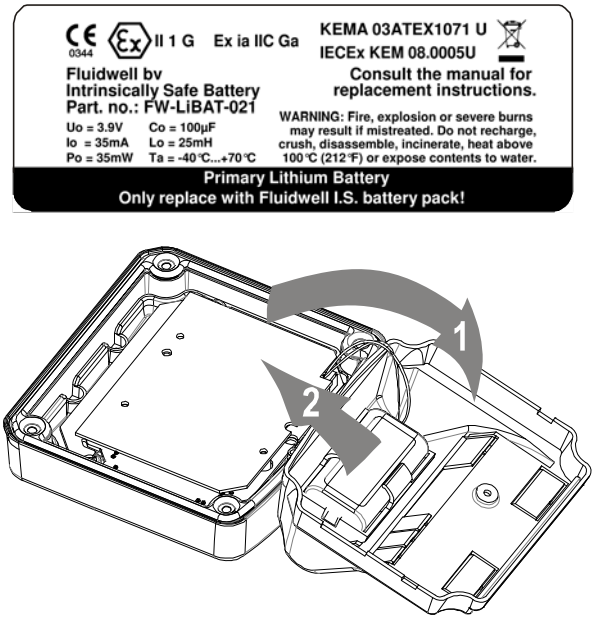
Battery replacement procedure

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

FW-LiBAT-001 battery



FW-LiBAT-021 battery



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 F197-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 F197-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 F197-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 41.
- Alarm outputs and communication.
- Low temperatures; the available power will be less due to battery chemistry.


Note !

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

Check periodically:

- The condition of the casing, cable glands and front panel.
- The input/output wiring for reliability and aging symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the sensor 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. Note: only available for safe area applications. Power requirements: 12-24V DC + 10% or type PD, PF, PM. Power consumption max. 1 Watt.

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

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

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

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

Terminal connections	
Type:	Removable plug-in terminal strip. Wire max. 1.5mm2 and 2.5mm2 (Type PM / PF)

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

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

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

INPUTS

Sensor	
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. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-Factor	0.000010 - 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.
Type A	(0)4-20mA - with signal calibration feature. Resolution: 14 bit.
Type U	0-10 V, 0-5 V, 1-5 V - with signal calibration feature. Resolution: 14 bit.
Accuracy	Resolution: 14 bit.. Error < 0.025mA / ±0.125% FS. Low level cut-off programmable.
Span	0.000010 - 9,999,999 with variable decimal position.
Update time	Four times a second.
Voltage drop	2.5 Volt.
Load impedance	3kOhm
Relationship	Linear and square root calculation.
Note	For signal type A and U: external power to sensor is required; e.g. type PD.

OUTPUTS

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

Alarm outputs	
Function	One high and one low alarm value related to the input value.
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.

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

OPERATIONAL

Operator functions	
Functions	• enter a setpoint value, • enter alarm high and low value.
Displayed information	• preset value and actual value (if available).

Preset / Setpoint	
Digits	6 digits: - 999,999 to + 999,99 units or 4 digits: 0 to 999.9 % or mA.
Units	no unit - mm - cm - m - meter - mil - in - ft - yd - fath - sqft - ml - l -nl - al - m3 - nm3 - am3 - gal - usgal - igal - bbl - cuft - mg - g - kg - ton - oz - lb - st - qr - cwt - psi - psig - mbar - mbarg - bar - barg - pa - pag - kpa - kpag - mmh2o - mh2o - inh20 - mmhg - inhg - °C - °F - K - p - rpm - % - ppm or mA
Time units	/sec - /min - /hr - /day.
Decimals	0 - 1 - 2 or 3.

Alarm values	
Digits	6 digits.
Units	According to selection for setpoint.
Decimals	According to selection for setpoint.
Time units	According to selection for setpoint.
Type of alarm	low or high actual alarm. Includes delay time alarm.

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F197-A is going to be installed or while it is in operation.

Sensor does not work properly
Check:
- Settings for span SETUP - 14 - 15
- Did you re-calibrate the 4-20mA input in a proper way? You can remove the re-calibration with the default setting. SETUP 54-55
- Sensor, wiring and connection of terminal connectors (par. 4.4.4.),
- Power supply of sensor (par. 4.4.4.).

Analog output does not function properly:
Check:
- SETUP 61 - is the function enabled?
- SETUP 62 / 63: are the output levels programmed correctly?
- connection of the external power-supply according to the specification.

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

Contact Technical support for details.

INDEX OF THIS MANUAL

LIST OF FIGURES IN THIS MANUAL

LIST OF CONFIGURATION SETTINGS

SETTING	DEFAULT	DATE :	DATE :
1 - SENSOR			
11 sensor value	enabled		
12 unit	mm		
13 time unit	/ no unit		
14 decimals	0000000		
15 span	1600 mm		
16 decimals span	0		
17 offset	0		
2 - OUTPUT	Enter your settings here		
21 preset set	enter		
22 unit	unit		
23 preset	0		
3 - ALARM			
31 alarm set	disabled		
32 offset	0		
33 alarm low	0		
34 alarm high	0		
35 delay low alarm	0.0 sec		
36 delay high alarm	0.0 sec		
4 - POWER MANAGEMENT			
41 LCD-new	1 sec.		
42 mode	operational		
5 - SENSOR			
51 formula	interpolation		
52 filter	01 (off)		
53 cut-off %	00.0%		
54 calibrat. low-(0)4mA	default		
55 calibrat. high-20mA	default		
6 - ANALOG OUTPUT			
61 output	disabled		
62 min. value 4mA	0000000		
63 max. value 20mA	9999999		
64 cut off percentage	0.0%		
65 tune min - 4mA	0208		
66 tune max - 20mA	6656		
67 filter	01 (off)		
7 - COMMUNICATION			
71 baud-rate	2400		
72 address	1		
73 mode	BUS-RTU		
8 - OTHERS			
84 pass code	0000		
85 tagnumber	0000000		

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