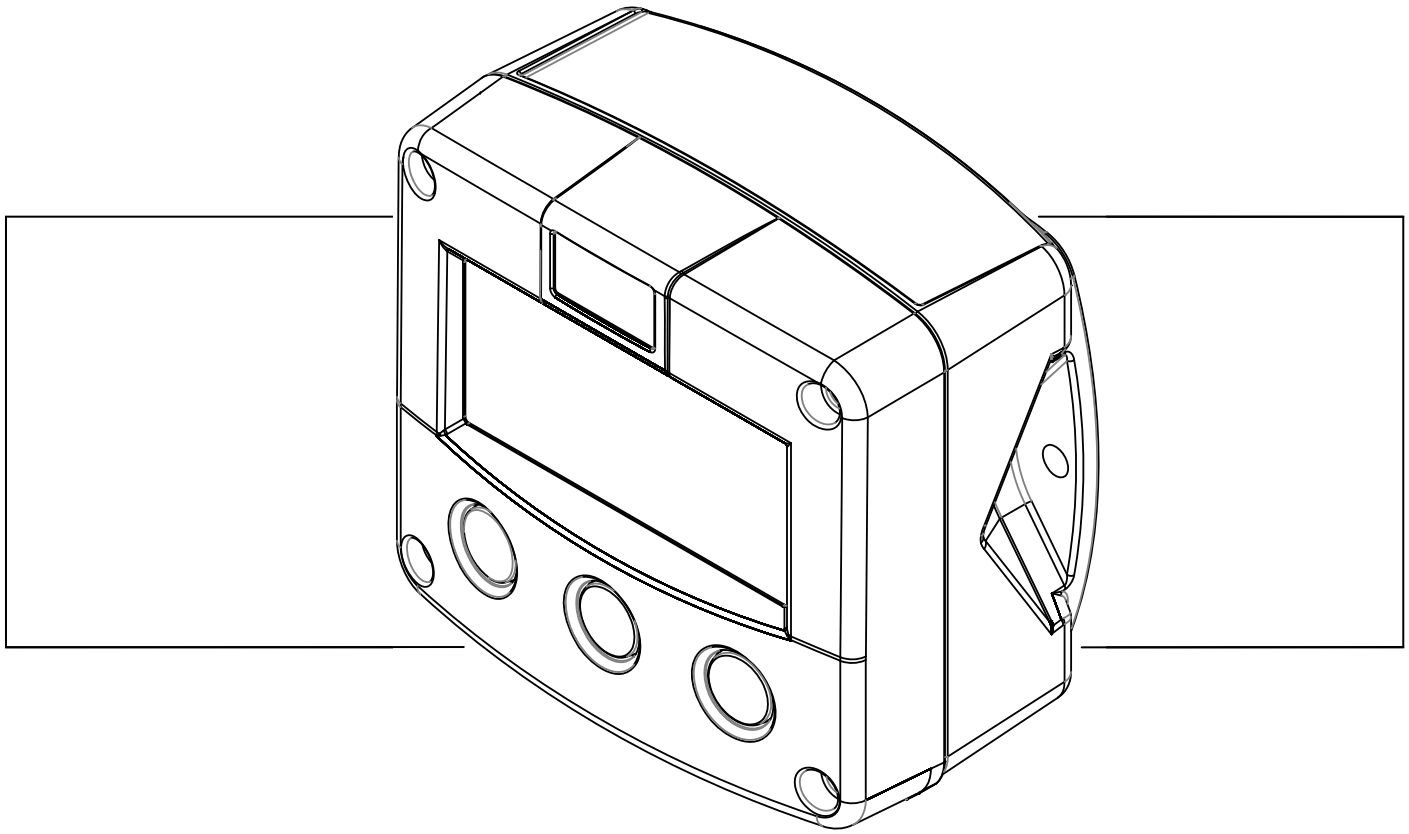
F151-A

DUAL PRESSURE INDICATOR



Signal input sensors: (0)4-20mA

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 F151-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 F151-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 F151-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 F151-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 F151-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 F151-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 F151-A or connected instruments.


Note !

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

Hardware version	:	02.01.xx
Software version	:	02.01.xx
Manual	:	HF151AEN_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.

CONTENTS MANUAL

1. INTRODUCTION

1.1. SYSTEM DESCRIPTION OF THE F151-A

Functions and features
The pressure indicator model F151-A is a microprocessor driven instrument designed to display the pressure measured by two separate sensors.
This product has been designed with a focus on:

- ultra-low power consumption to allow long-life battery powered applications (option PB),
- intrinsic safety for use in hazardous applications (option XI),
- several mounting possibilities with ABS or aluminum enclosures for harsh industrial surroundings,

Sensor input
This manual describes the unit with two analog (0)4-20mA inputs for the sensor "-A version". Other versions are available to process 0-10V sensor signals.

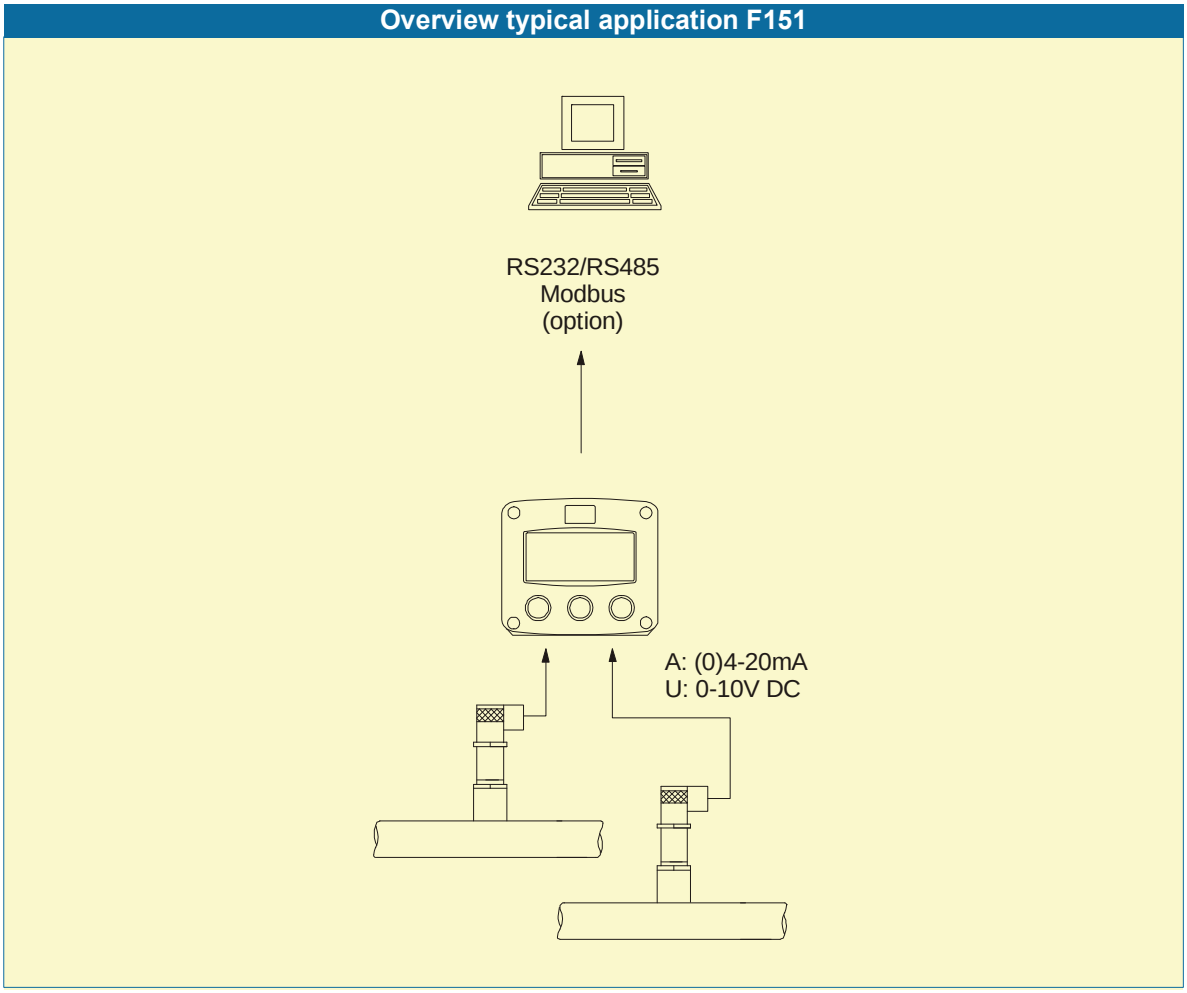


Fig. 1: Typical application for the F151-A.

Configuration of the unit
The F151-A was designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F151-A according to your specific requirements.
SETUP includes several important features, such as Span, measurement units, signal selection etc. All setting as are stored in EEPROM memory and will not get lost in case of power break-down or empty battery.
To extend the battery-life time (option), please make use of the power-management functions as described in chapter 3.2.3.

Display information
The unit has a large transflective LCD with all kinds of symbols and digits to display measuring units, status information, trend-indication and key-word messages.
The measured pressure of each line can be displayed one by one or simultaneously.

Options
Following options are available: full Modbus communication RS232/485 (also battery powered), intrinsic safety, power- and sensor-supply options, panel-mount, wall-mount and weather-proof enclosures, flame proof enclosure.

2. OPERATIONAL

2.1. GENERAL

Caution !

- *The F151-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 F151-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 get access to SETUP-level; please read chapter 3.

This key is used to SELECT manually one of the actual pressure value's.
The arrow-key ▲ is used to configure the unit; please read chapter 3.

T his key is used to select manually one of the actual pressure value's.
The arrow-key ▶ is used configure the unit; please read chapter 3.

2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the pressure indicator will always act at Operator level. The information displayed depends on the SETUP-settings. Although the refresh-rate of the display might be slow (due to power-management functions), the sensor signals will be processed at all times. After pressing a key, the display will be updated very fast during 30 seconds after which it will slow-down again.

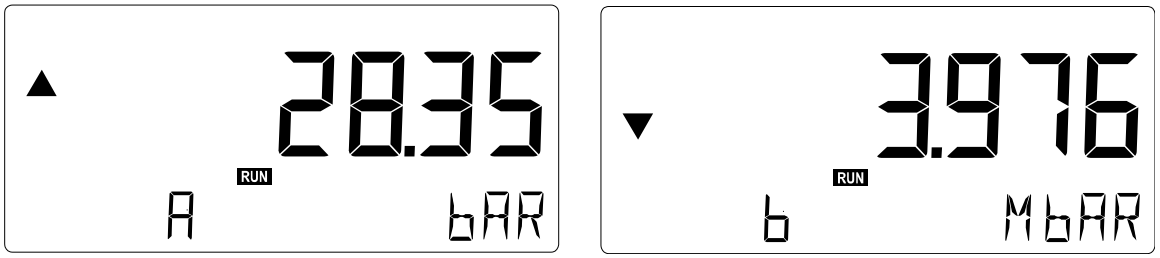


Fig. 3: Example display when the information is selected manually.

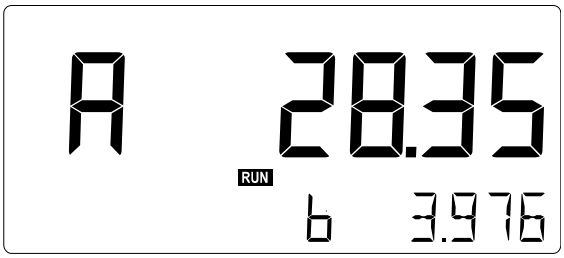


Fig. 4: Example display information when sensor A and B are displayed simultaneously.

For the Operator, the following functions are available:

- **Display pressure**
  The actual pressure is displayed with the 17mm digits at the upper line. When "-------" is shown, the pressure is too high to be displayed. The arrows ▲▼ indicate the increase / decrease of the pressure.
  Depending on the settings, both pressures can be displayed simultaneously where the input number is displayed as "A" or "b". When they are not displayed at the same time, then the information can be selected manually or it will be displayed automatically with an interval time of 6 seconds.

- **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 F151-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

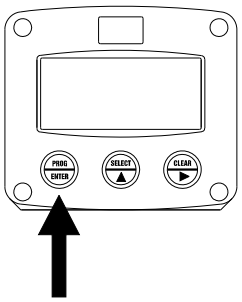
3.2.1. GENERAL

Configuration of the F151-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 F151-A remains fully operational.

Note !

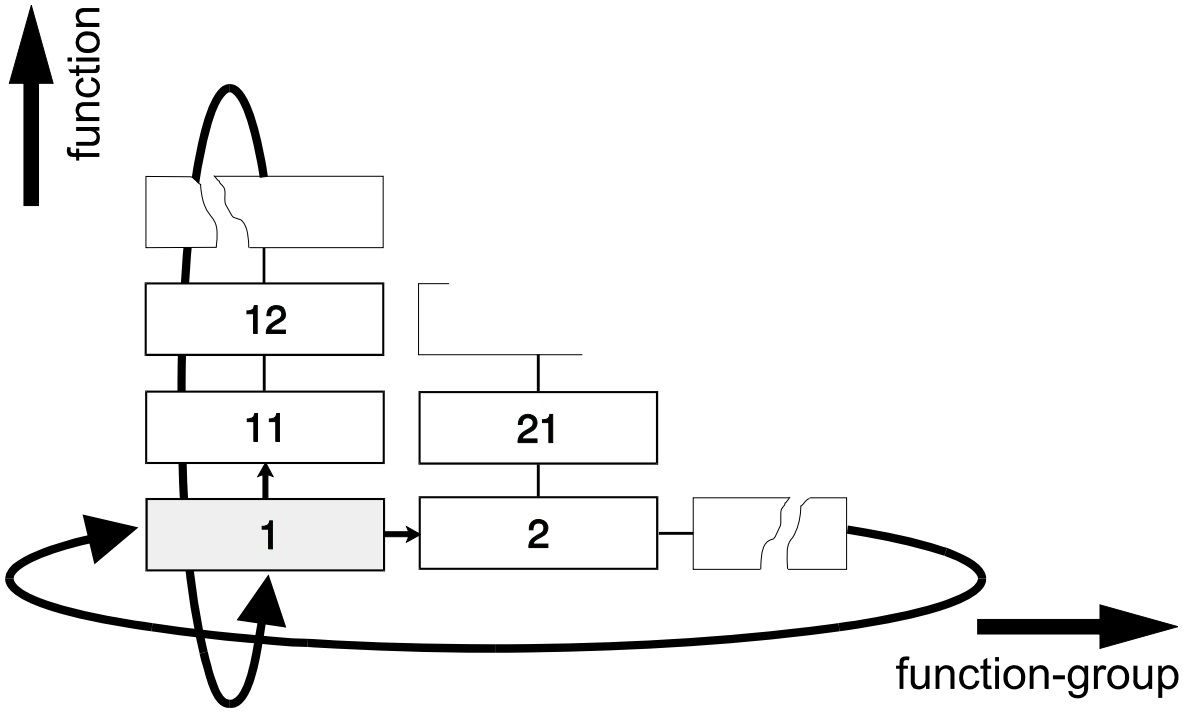
Note: *A password may be required to enter SETUP. Without this password access to SETUP is denied.*

To enter SETUP-level:



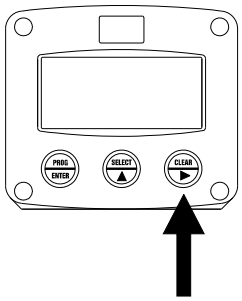
Press PROG/ENTER for 7 seconds

Matrix structure SETUP-level:

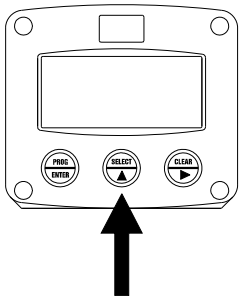


SCROLLING THROUGH SETUP-LEVEL

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



Select function-group with CLEAR ▶

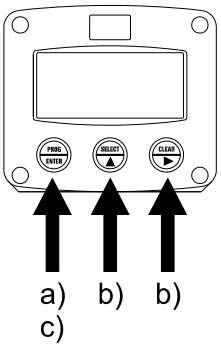


Select function with SELECT ▲

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

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

To change or a select a value or value:



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

b) select or enter value with SELECT ▲ and / or CLEAR ▶

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

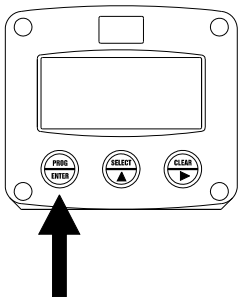
To change a value, use ▶ to select the digits and ▲ to increase that value.
To select a setting, both ▲ and ▶ can be used.
When the new value is not valid, the increase sign ▲ or decrease-sign ▼ will be displayed while you are programming.

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

Note !

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

To return to OPERATOR-level:



Press 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	**PRESSURE A**		
	11	UNIT	mbar - bar - psi - no unit
	12	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	13	SPAN	0.000001 - 999,999 units
	14	DECIMALS SPAN	0 - 6
	15	OFFSET	-999,999 - +999,999 units
2	**PRESSURE B**		
	21	UNIT	mbar - bar - psi - no unit
	22	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	23	SPAN	0.000001 - 999,999 units
	24	DECIMALS SPAN	0 - 6
	25	OFFSET	-999,999 - +999,999 units
3	**DISPLAY**		
	31	DISPLAY	toggle - A and B - hand
4	**POWER MANAGEMENT**		
	41	LCD UPDATE	fast - 1 sec - 3 sec - 15 sec - 30 sec - off
	42	BATTERY MODE	operational - shelf
5	**SENSOR A**		
	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	**SENSOR B**		
	61	FORMULA	interpolation, square root
	62	FILTER	00 - 99
	63	CUT-OFF	0.0 - 99.9%
	64	CALIBRATE LOW	(0)4mA
	65	CALIBRATE HIGH	20mA
7	**COMMUNICATION**		
	71	SPEED / BAUDRATE	1200 - 2400 - 4800 - 9600
	72	ADDRESS	1 - 255
	73	MODE	ASCII - RTU - off
8	**OTHERS**		
	81	TYPE / MODEL	
	82	SOFTWARE VERSION	
	83	SERIAL NO.	
	84	PASSWORD	0000 - 9999
	85	TAGNUMBER	0000000 - 9999999

3.2.3. EXPLANATION SETUP-FUNCTIONS

1 - PRESSURE - A	
MEASUREMENT UNIT **11**	SETUP - 11 determines the measurement unit for pressure measured with sensor A (completely independent of sensor B). The following units can be selected: mbar - bar - psi - no unit 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.
DECIMALS **12**	This setting determines for pressure the number of digits following the decimal point. The following can be selected: 00000 - 1111.1 - 2222.22 - 3333.333
SPAN **13**	With the span, the sensor signal is converted to a pressure. The **span for pressure** is determined on the basis of the **selected measurement unit** at 20mA. Enter the span in whole numbers (decimals are set with SETUP 14). The more accurate the span, the more accurate the functioning of the system will be. **Example 1** **Calculating the span for level** *Let us assume that the sensor generates 20mA at a pressure of 18.95 Bar and the selected unit is "mbar". The span is 18,950 mbar, Enter for SETUP - 13: "18950" and for SETUP - 14 - decimals span "0".*
DECIMALS SPAN **14**	This setting determines the number of decimals for Span (SETUP 13). 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 "pressure" (SETUP 12)!
OFF SET **15**	Enter here the "not measured" pressure, in case a pressure transducer is not placed in the bottom of a container but somewhere halfway for example. A negative offset can be entered by pressing the middle and right button simultaneously.

2 - PRESSURE - B	
MEASUREMENT UNIT **21**	SETUP - 21 determines the measurement unit for pressure measured with sensor B (completely independent of sensor A). The following units can be selected: mbar - bar - psi - no unit 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.
DECIMALS **22**	This setting determines for pressure the number of digits following the decimal point. The following can be selected: 00000 - 1111.1 - 2222.22 - 3333.333
SPAN **23**	With the span, the sensor signal is converted to a pressure. The **span for pressure** is determined on the basis of the **selected measurement unit** at 20mA. Enter the span in whole numbers (decimals are set with SETUP 24). The more accurate the span, the more accurate the functioning of the system will be. **Example 1** **Calculating the span for level** *Let us assume that the sensor generates 20mA at a pressure of 18.95 Bar and the selected unit is "mbar". The span is 18,950 mbar, Enter for SETUP - 23: "18950" and for SETUP - 24 - decimals span "0".*
DECIMALS SPAN **24**	This setting determines the number of decimals for Span (SETUP 23). 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 "pressure" (SETUP 22)!
OFF SET **25**	Enter here the "not measured" pressure, in case a pressure transducer is not placed in the bottom of a container but somewhere halfway for example. Also, a negative offset can be entered: do press the middle and left button simultaneously.

3 - DISPLAY	
DISPLAY **31**	The large 17mm digits and the 8mm digits can be set in several ways to display the pressure and measuring units of both sensors. Following can be selected: • Toggle: the pressure, measuring unit and sensor number (A or B) of each sensor will be displayed during 6 seconds followed with the information of the other pressure sensor. • Hand: as toggle but the selection must be made by pressing the SELECT-button (manual selection by the operator). • A and B: Pressure A is displayed with 17mm digits simultaneously with pressure B with 8mm mm digits. No measuring units are displayed; only the sensor number (A and B). All information of each sensor can be selected by hand.

4 - POWER MANAGEMENT

When used with the internal battery option, the user may hold the concern of reliable measurement over a long period of time. The F151-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 following can be selected: Fast - 1 sec - 3 sec - 15 sec - 30 sec - off. **Example 3:** **Battery life-time** *battery life-time with FAST update: about 2 years.* *battery life-time with 1 sec update: about 5 years.* ***Note:** after a button has been pressed by the operator - the display refresh-rate will always be FAST during 30 seconds. When "OFF" is selected, the display will be switched-off after 30 seconds and will be switched-on as soon as a button has been pressed.*
BATTERY-MODE **42**	The unit has two modes: operational or shelf. After "shelf" has been selected, the unit can be stored for several years; it will process the input signal, 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.

Note !

5 - SENSOR - A

SIGNAL **51**	The F151-A can process the (0)4-20mA signal of sensor A in two ways: ▪ Interpolation: the signal is processed linear **R = S x I** ▪ Square root: for differential pressure **R = S $\sqrt{}$ I** where: R = Rate: the calculated pressure S = Span: the maximum pressure at 20mA. The span is programmed with setting 13 for pressure I = Input: the scaled analog value; in these formulas value 0 (zero) for (0)4mA and value 1 (one) for 20mA.

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5 - SENSOR - A (CONTINUED)

FILTER
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Note !

The analog output signal of a sensor does mirror the actual pressure. This signal is measured several times a second by the F151-A. The value measured is a "snap-shot" of the real pressure 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
03	0.5 seconds	1.0 seconds	1.5 seconds	3 seconds
05	1.0 seconds	1.8 seconds	2.8 seconds	5.3 seconds
10	1.8 seconds	3.5 seconds	5.6 seconds	11 seconds
20	3.5 seconds	7.0 seconds	11 seconds	23 seconds
30	5.3 seconds	10 seconds	17 seconds	34 seconds
50	8.8 seconds	17 seconds	29 seconds	57 seconds
75	13 seconds	26 seconds	43 seconds	86 seconds
99	17 seconds	34 seconds	57 seconds	114 seconds

CUT-OFF
53

To ignore e.g. vibration, a low-pressure 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%.

Examples:

FUNCTION (setup 51)	SPAN (setup 13)	REQUIRED CUT-OFF	CUT-OFF (setup 53)	REQUIRED OUTPUT
interpolation	450 PSI	25 PSI	25/450 x 100%=5.5%	16mA x 5.5% + 4mA = 4.88mA
square root	450 PSI	25 PSI	$(25/450)^2$ x 100%=0.3%	16mA x 0.3% + 4mA = 4.05mA

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 minimum pressure.
This function will measure the real output value at minimum pressure.

- *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!*

WARNING

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.

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5 - SENSOR - A (CONTINUED)	
TUNE MAX / 20MA **55**	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 pressure. This function will measure the real output value at maximum pressure. ▪ *Warning: be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!* After pressing PROG, three settings can be selected: ▪ CALIBRATE: with this setting, the input will be calibrated with the actual "20mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be less than the calibrated value for a reliable measurement. ▪ DEFAULT: with this setting, the manufactures value is re-installed. ▪ CAL SET: to select the last calibrated value.

6 - SENSOR - B	
SIGNAL **61**	The F151-A can process the (0)4-20mA signal of sensor B in two ways: ▪ Interpolation: the signal is processed linear **R = S x I** ▪ Square root: for differential pressure **R = S $\sqrt{}$ I** where: R = Rate: the calculated pressure S = Span: the maximum pressure at 20mA. The span is programmed with setting 13 for pressure I = Input: the scaled analog value; in these formulas value 0 (zero) for (0)4mA and value 1 (one) for 20mA.
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6 - SENSOR - B (CONTINUED)

FILTER
62

Note !

The analog output signal of a sensor does mirror the actual pressure. This signal is measured several times a second by the F151-A. The value measured is a "snap-shot" of the real pressure 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
03	0.5 seconds	1.0 seconds	1.5 seconds	3 seconds
05	1.0 seconds	1.8 seconds	2.8 seconds	5.3 seconds
10	1.8 seconds	3.5 seconds	5.6 seconds	11 seconds
20	3.5 seconds	7.0 seconds	11 seconds	23 seconds
30	5.3 seconds	10 seconds	17 seconds	34 seconds
50	8.8 seconds	17 seconds	29 seconds	57 seconds
75	13 seconds	26 seconds	43 seconds	86 seconds
99	17 seconds	34 seconds	57 seconds	114 seconds

CUT-OFF
63

To ignore e.g. vibration, a low-pressure 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%.

Examples:

FUNCTION (setup 61)	SPAN (setup 23)	REQUIRED CUT-OFF	CUT-OFF (setup 63)	REQUIRED OUTPUT
interpolation	450 PSI	25 PSI	25/450 x 100%=5.5%	16mA x 5.5% + 4mA = 4.88mA
square root	450 PSI	25 PSI	$(25/450)^2$ x 100%=0.3%	16mA x 0.3% + 4mA = 4.05mA

TUNE MIN / 4MA
64

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 minimum pressure.
This function will measure the real output value at minimum pressure.

- *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!*

WARNING

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.

Continued next page >>>

6 - SENSOR - B (CONTINUED)	
TUNE MAX / 20MA **65**	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 pressure. This function will measure the real output value at maximum pressure. ▪ *Warning: be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!* After pressing PROG, three settings can be selected: ▪ CALIBRATE: with this setting, the input will be calibrated with the actual "20mA" value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be less than the calibrated value for a reliable measurement. ▪ DEFAULT: with this setting, the manufactures value is re-installed. ▪ CAL SET: to select the last calibrated value.

7 - COMMUNICATION (OPTIONAL)	
Functions as described below deal with hardware that are not part of the standard delivery. Programming of these functions does not have any effect if this hardware has not been installed. Consult Appendix C and the Modbus communication protocol description for a detailed explanation.	
BAUDRATE **71**	For external control, 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 F151-A. This address can vary from 1-255.
MODE **73**	The communication is executed according Modbus protocol ASCII or RTU mode. With OFF, the communication is disabled.

8 - OTHERS	
TYPE OF MODEL **81**	For support and maintenance it is important to have information about the characteristics of the F151-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 F151-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 F151-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.
PASSWORD **84**	All SETUP-values can be password protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
TAGNUMBER **85**	For identification of the unit and communication purposes, a unique tagnumber of maximum 7 digits can be entered.

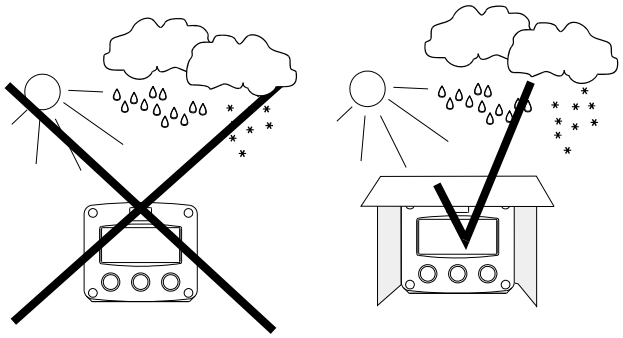
4. INSTALLATION

4.1. GENERAL DIRECTIONS

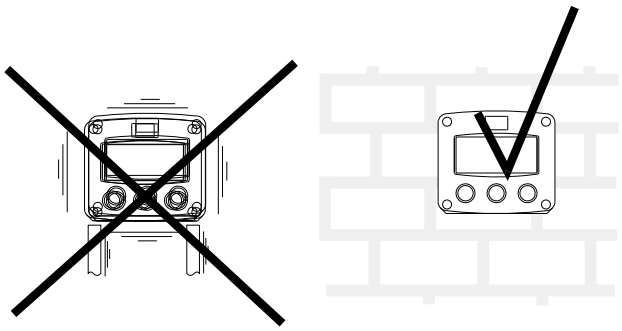
Caution !

- 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 F151-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 F151-A on a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE

Aluminum enclosures:

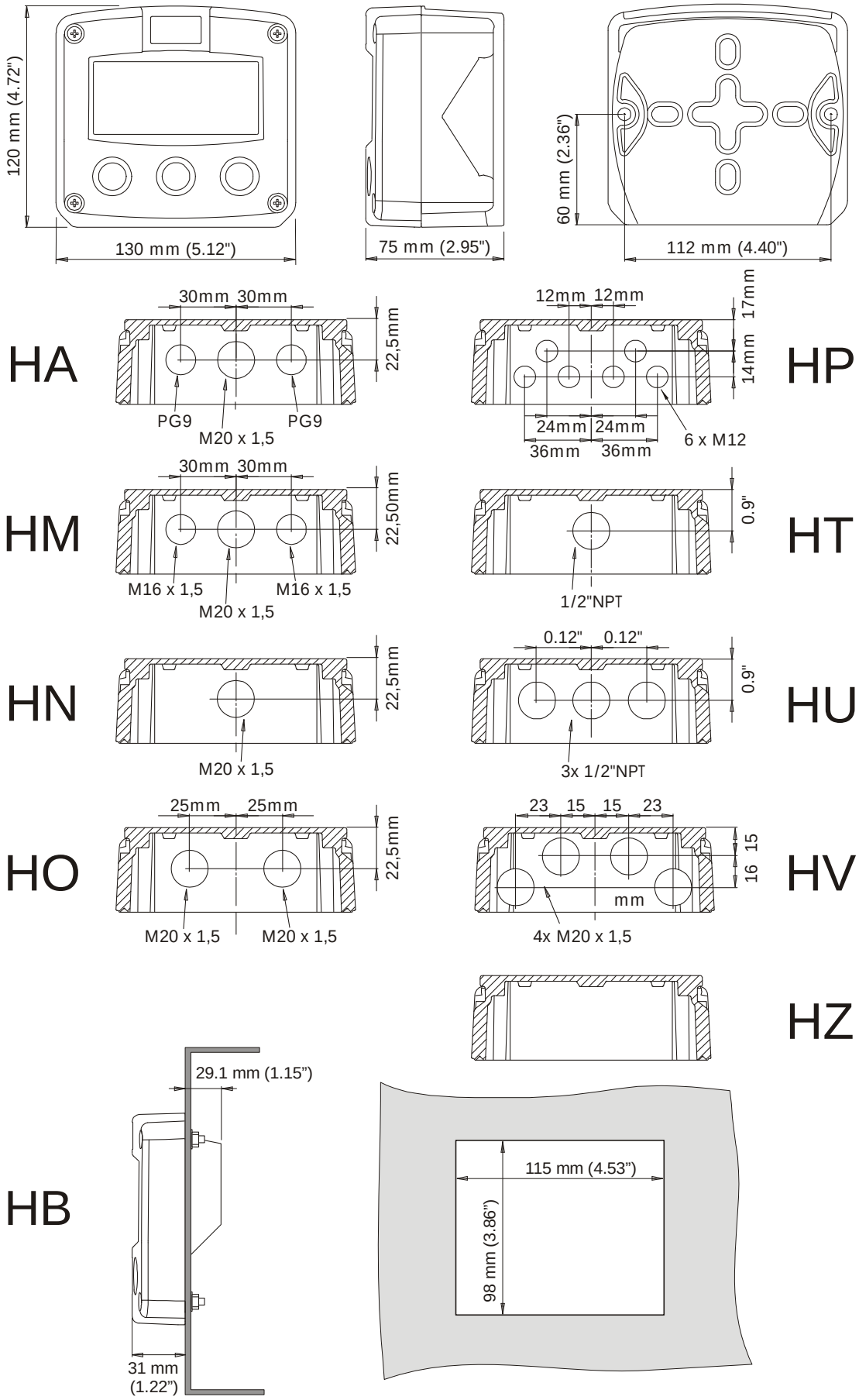
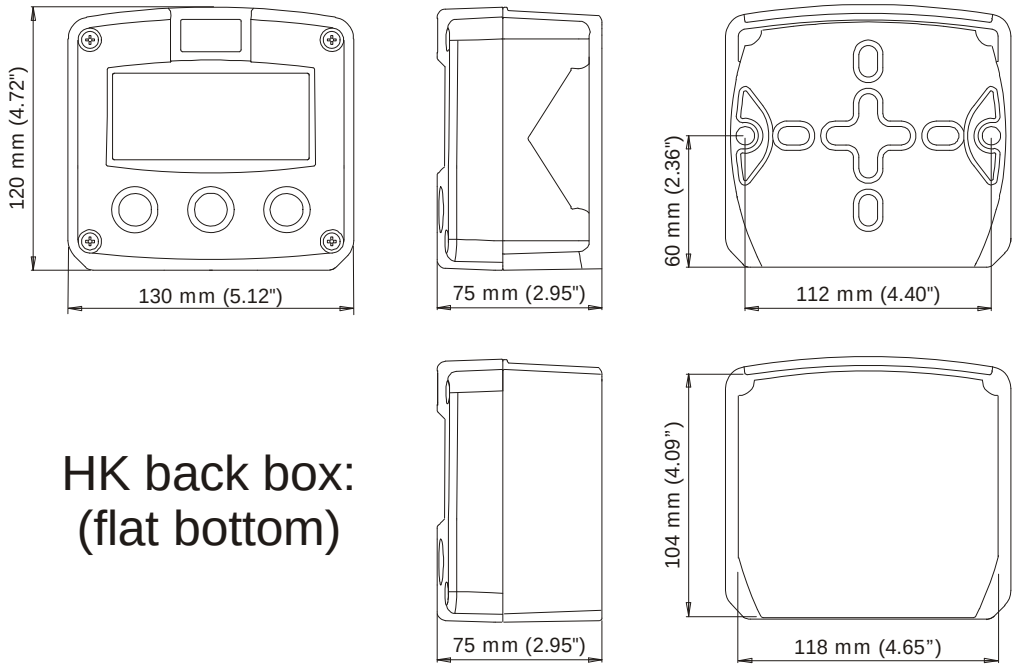
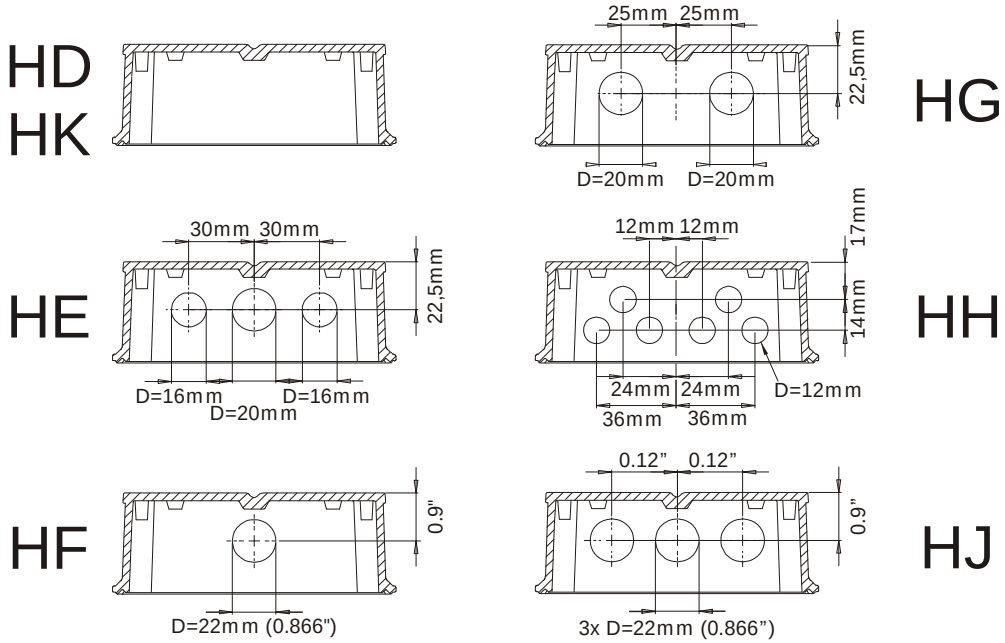


Fig. 6: Dimensions aluminum enclosures.

GRP enclosures:





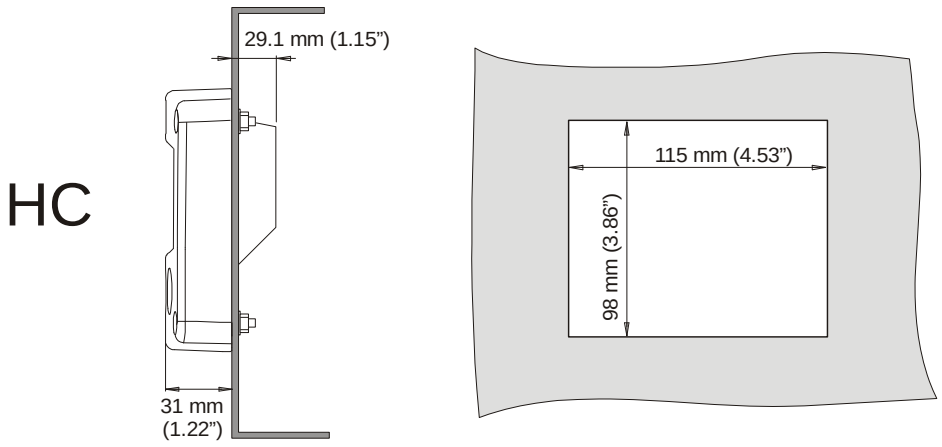


Fig. 7: Dimensions GRP enclosures.

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 F151-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.

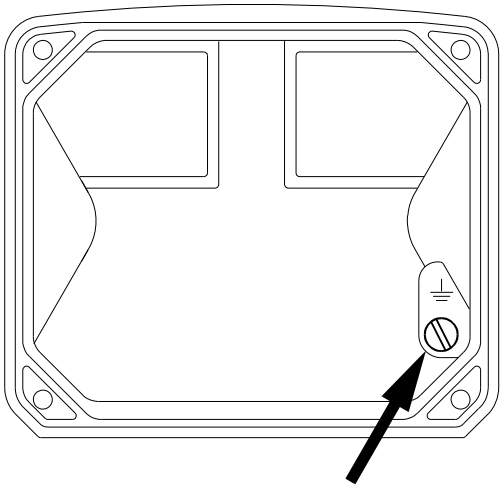


Fig. 8: Grounding aluminum enclosure with type PM 115-230V AC.

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.

Battery powered and output loop-powered applications:
Terminal 11 provides a limited supply voltage of 3.2 V DC which is not sufficient to power a (0)4-20mA or 0-10V sensor.

Option PD-PM: Sensor supply: 3.2V - 8.2V - 12V or 24 V:
With this option, a real power supply for the sensor is available. The sensor can be powered with 8.2 - 12 or 24 V DC (max. 50mA@24V). The voltage is selected by the three switches inside the enclosure.

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

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

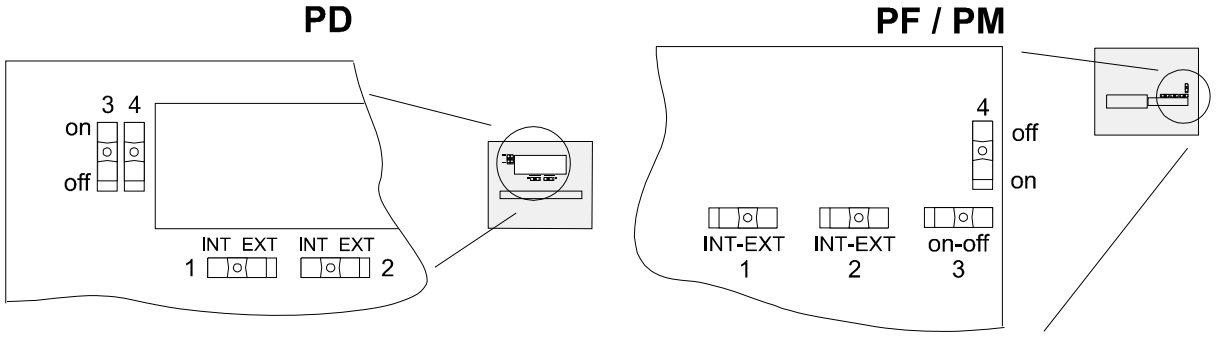


Fig. 9: switch position voltage selection (option PD, PF and PM).

Switch positions

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

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

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

Function switch 1: voltage selection sensor A - 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.
If switch 1 and 2 are both set to position OFF than the selected voltage with switch 3+4 is valid for both sensors.

4.4.3. TERMINAL CONNECTORS

For Intrinsically Safe applications: read chapter 5.

The following terminal connectors are available:

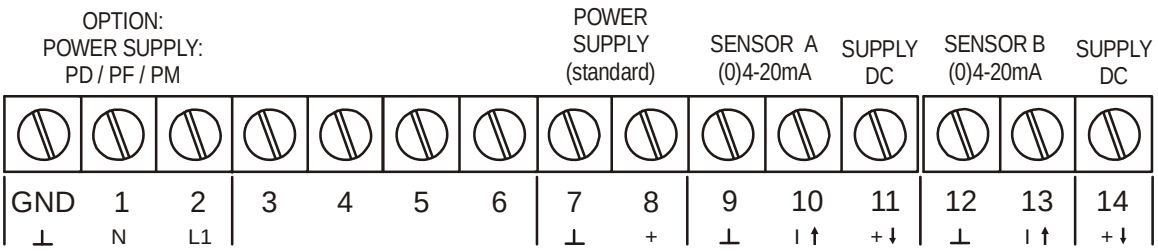


Fig. 10: Overview terminal connectors standard configuration F151-A and options.

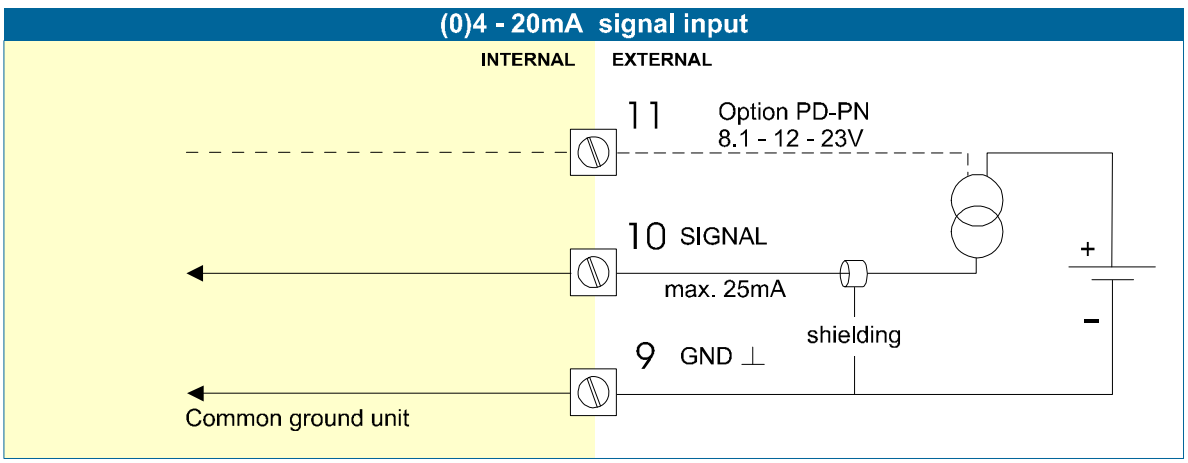
REMARKS TERMINAL CONNECTORS:

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

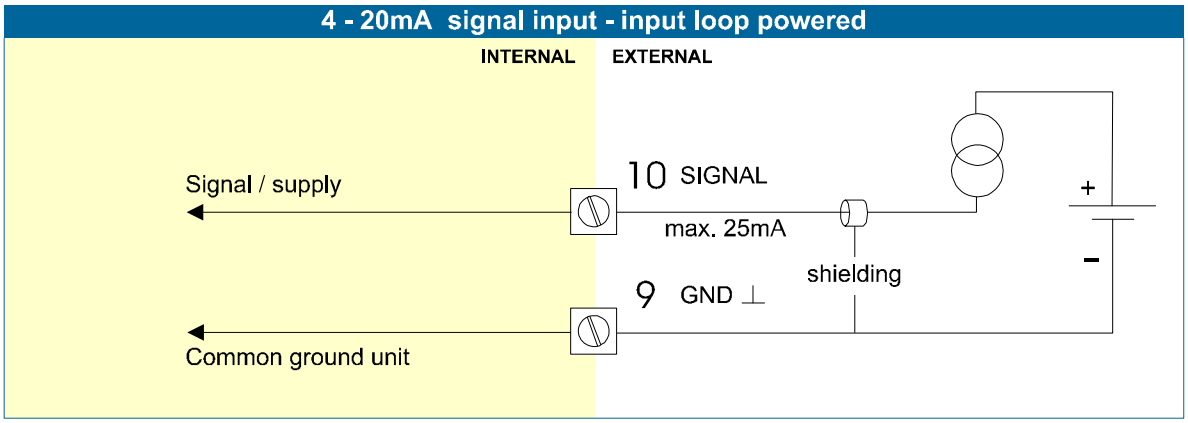
OPTION	SENSOR SUPPLY	Terminal		
		GND	01	02
PD 8-24V AC	8,2-12-24V max 50mA		AC	AC
PD 8-30V DC	8,2-12-24V max 50mA	L-	L+	
PF 24V AC ± 15%	8,2-12-24V max 50mA		AC	AC
PF 24V DC ± 15%	8,2-12-24V max 50mA	L-	L+	
PM 115-230V AC ± 15%	8,2-12-24V max 50mA	EARTH	AC	AC

Terminal 07-08 POWER SUPPLY (standard):
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. The sensor supply voltage available on terminal 11 and 14 is only 3.2V.

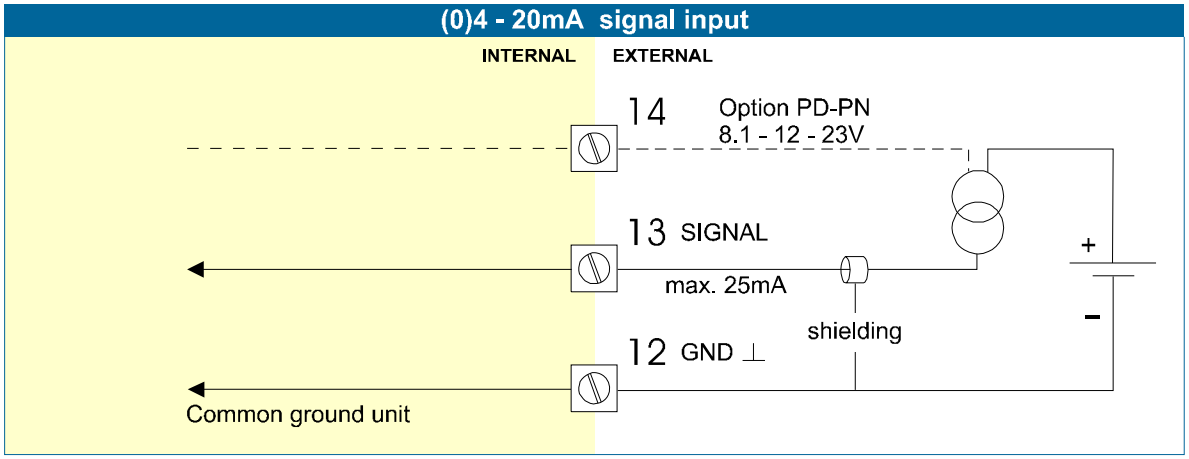
Terminal 09-11: Type A – sensor input A (general)
The F111-A requires a (0)4-20mA sensor signal which will be processed 4 times a second with a 14 bits accuracy. The input is not isolated.
For Intrinsically safe applications (without input loop power): please read chapter 5.



Terminal 09-10: Type A-PL – sensor input A / power supply:
The F111-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 12-14; Sensor input B:
The F151-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: please read chapter 5.



Option - communication/printer RS232/RS485:
- 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.

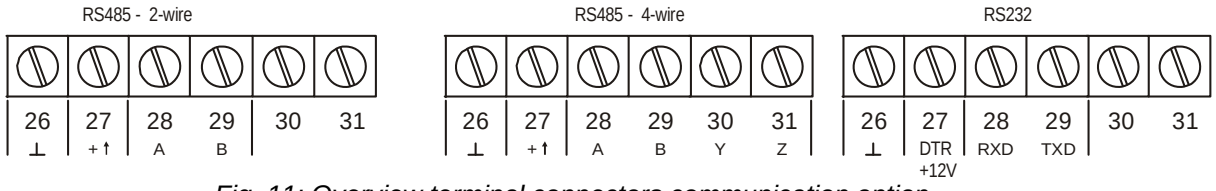


Fig. 11: Overview terminal connectors communication option.

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 separte supply between terminals 26 and 27 with a voltage between 8V and 24V.

5. INTRINSICALLY SAFE APPLICATIONS

5.1. GENERAL INFORMATION AND INSTRUCTIONS

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.

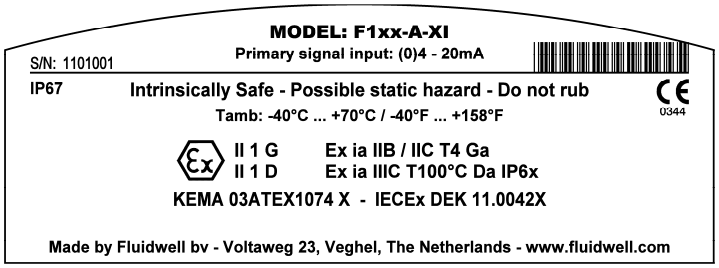
Safety Instructions

- 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.

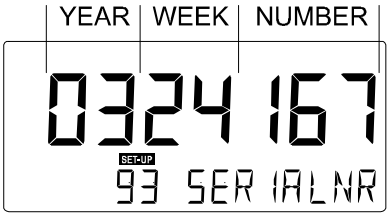
Please Note

- 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 F151-A-XI:

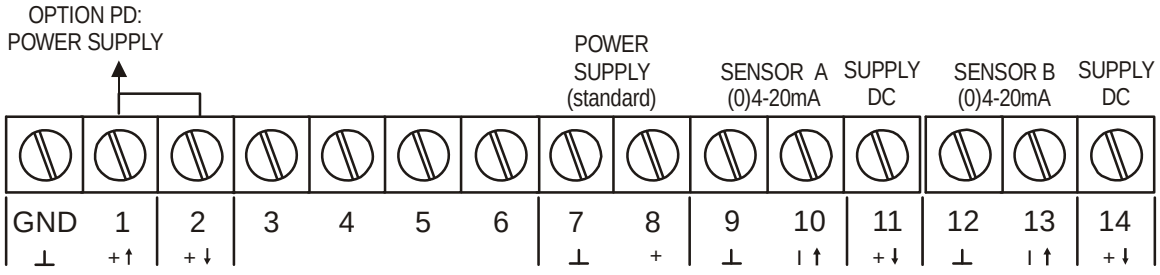


Fig. 12: Overview terminal connectors Intrinsically Safe.

Explanation Intrinsically Safe options:

Option PD-XI
Intrinsically Safe power supply and sensor supply - Terminal GND- 01, 11 and 14.

OPTION		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, 11 and 14: these terminals offer the same voltage as connected to terminal 01.

5.3. CONFIGURATION EXAMPLES INTRINSICALLY SAFE APPLICATIONS

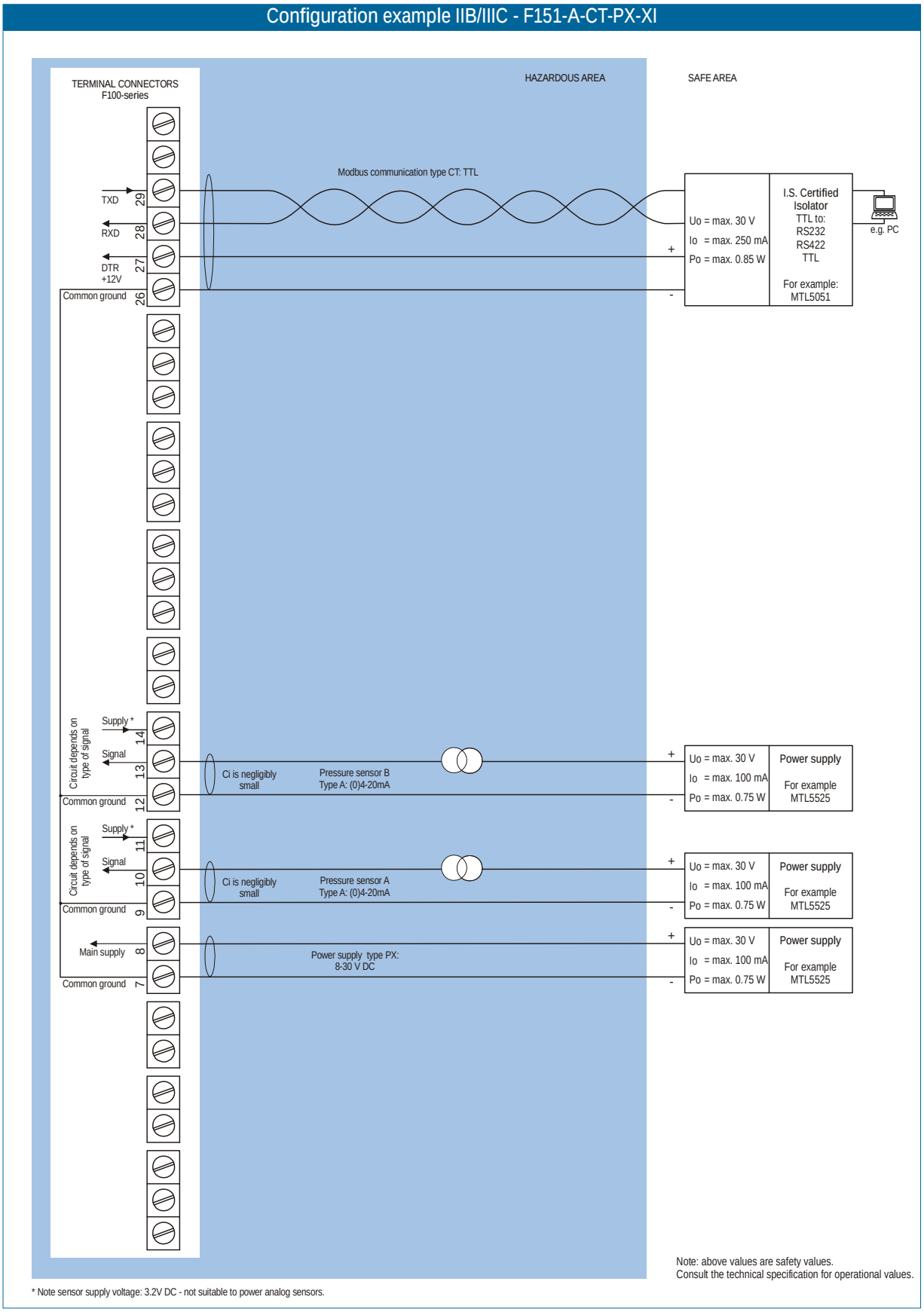


Fig. 13: Configuration example 1 Intrinsically Safe.

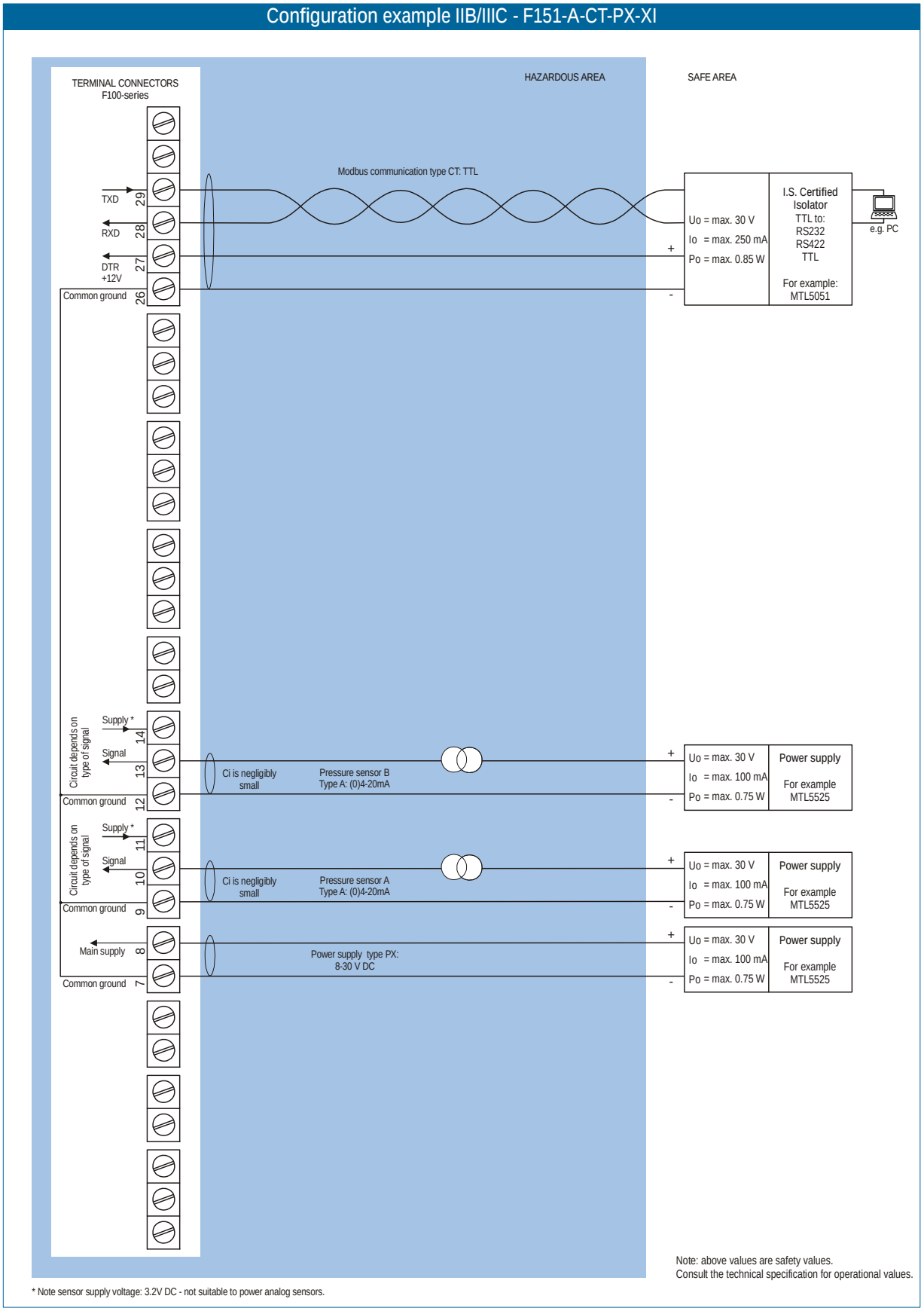


Fig. 14: Configuration example 2 Intrinsically Safe.

5.4 BATTERY REPLACEMENT INSTRUCTIONS

Safety Instructions

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

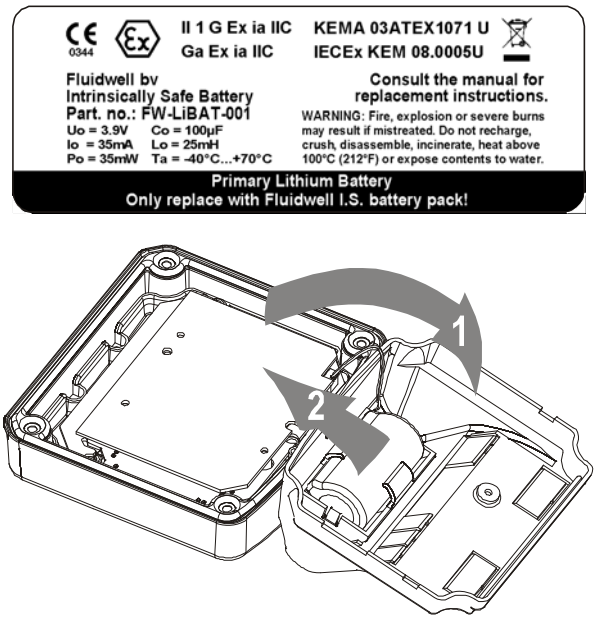
Safety instructions for hazardous areas

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

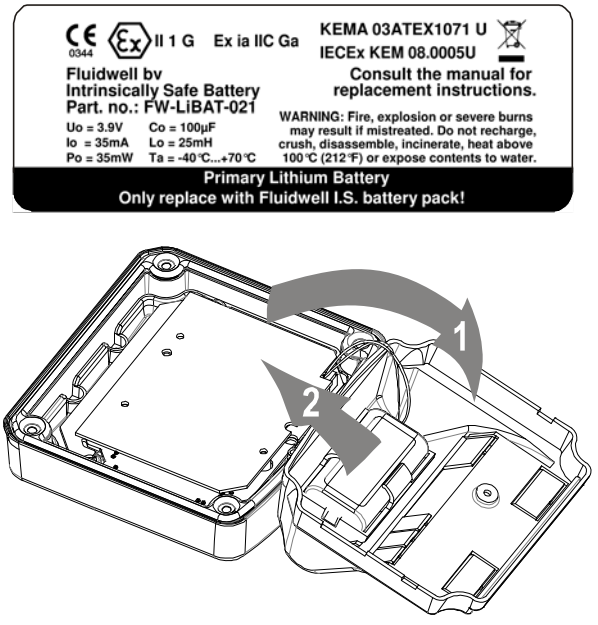
Battery replacement procedure

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 F151-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 F151-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 F151-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 as:
- Display update: fast display update has major influence; SETUP 61.
- 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 re-enter any subsequent Span alterations.
- The indication for low-battery.
- Clean the casing with soapy-water; don't 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 A	(0)4-20mA - with signal calibration feature. Resolution: 14 bit.
Type U	0-10 V, 0-5 V, 1-5 V - with signal calibration feature. Resolution: 14 bit.
Accuracy	0.05%. Low level cut-off programmable.
Span	0.000010 - 9,999,999 with variable decimal position.
Update time	Four times a second.
Voltage drop type A	2.5 Volt.
Load impedance type U	3kOhm
Relationship	Linear and square root calculation.
Note	For signal type A and U: external power to sensor required; e.g. option PD.

OUTPUTS

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

OPERATIONAL

Operator functions	
Displayed functions	• pressure line A • pressure line B Both pressure's can be displayed simultaneously or separately by manual operation or automatic toggle function.

Pressure A and B	
Digits	5 digits.
Units	BAR - mbar - PSI - no unit
Decimals	0 - 1 - 2 or 3.

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F151-A is going to be installed or while it is in operation.

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

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

0001: irrecoverable display-data error: data on the display might be corrupted.
0002: irrecoverable data-storage error: the programming cycle might have gone wrong: check programmed values.
0003: error 1 and error 2 occurred simultaneously

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

APPENDIX C: COMMUNICATION VARIABLES

Remarks:

- Below, an overview of the F151-A specific variables; other common variables are described in the standard table.
- All numbers are decimal numbers, unless otherwise noted.
- Following variables of the standard table (var00-var30) are not valid for this product and will be responded with value 1: var00, 03-05, 07,08, 16-22, 24, 26-29.

CONFIGURATION VARIABLES F151-A - SETUP-LEVEL:				
VAR	**DESCRIPTION**	**BYTES**	**VALUE**	**REMARKS**
PRESSURE A				
48 (30h)	unit	1	0=mbar 1=bar 2=psi 3=none	
50 (32h)	decimals	1	0…1	
51 (33h)	Span	3	1....99.999	
54 (36h)	decimals Span	1	0…5	
	offset			
PRESSURE B				
	unit	1	0=mbar 1=bar 2=psi 3=none	
	decimals	1	0…1	
	Span	3	1....99.999	
	decimals Span	1	0…5	
	offset			
DISPLAY				
195 (C3h)	display	1	0=toggle 1=hand 2=A and B	
POWERMANAGEMENT				
80 (50h)	LCD update time	1	0=fast 1=1sec 2=3sec 3=15sec 4=30sec 5=off	
81 (51h)	power-mode battery	1	0=operational 1=shelf	
SENSOR A				
98 (62h)	formula	1	0=linear 1=square root	
99 (63h)	filter	1	0….99	
100 (64h)	cut-off	2	0….999	steps of 0.1%
102 (66h)	calibration low (4mA)	1	0=default 1=calibrate 2=cal set	
103 (67h)	calibration high (20mA)	1	0=default 1=calibrate 2=cal set	
SENSOR B				

	formula	1	0=linear 1=square root	
	filter	1	0….99	
	cut-off	2	0….999	steps of 0.1%
	calibration low (4mA)	1	0=default 1=calibrate 2=cal set	
	calibration high (20mA)	1	0=default 1=calibrate 2=cal set	
OTHERS				
168 (A8h)	password	2	xxxx	read only!
170 AAh	tagnumber	3	0..9999999	Other vars: see standard table

OTHER F151-A VARIABLES FOR COMMUNICATION

READ PRESSURE: The value of pressure read using communication might differ from the value displayed. This is due to the fact that the display can only display up to seven digits (e.g. when two decimals are selected for pressure and pressure has a value of 123456,78 the display will show 23456,78 while communication will read a “pressure” of 12345678 and a “pressure decimals” of 2).

WRITE PRESSURE: Impossible.

Pressure A - variable number 572 (23Ch) – 4 bytes
Pressure B - variable number 588 (24Ch) – 4 bytes

LIST OF CONFIGURATION SETTINGS

SETTING	DEFAULT	DATE :	DATE :
1 - PRESSURE A			
11 unit	BAR		
12 decimals	00000		
13 span	00001		
14 decimals span	0		
15 offset	0		
2 - PRESSURE B			
21 unit	BAR		
22 decimals	00000		
23 span	00001		
24 decimals span	0		
25 offset	0		
3 - DISPLAY			
31 display	toggle		
4 - POWER MANAGEMENT			
41 LCD-new	1 sec.		
42 mode	operational		
5 - SENSOR - A			
51 formula	interpolation		
52 filter	01 (off)		
53 cut-off %	00.0%		
54 calibrate low-(0)4mA	default		
55 calibrate high-20mA	default		
6 - SENSOR - B			
61 formula	interpolation		
62 filter	01 (off)		
63 cut-off %	00.0%		
64 calibrate low-(0)4mA	default		
65 calibrate high-20mA	default		
7 - COMMUNICATION			
71 baud-rate	2400		
72 address	1		
73 mode	off		
8 - OTHERS			
84 password	0000		
85 tagnumber	0000000		

Fluidwell bv
PO box 6
5460 AA Veghel
The Netherlands

Voltaweg 23
5466 AZ Veghel
The Netherlands

Website: www.fluidwell.com
Find your nearest representative: www.fluidwell.com/representatives