



## BI-DIRECTIONAL FLOWRATE INDICATOR / TOTALIZER

WITH ANALOG, PULSE SIGNAL AND FLOW  
DIRECTION OUTPUTS



### Features

- Ability to detect flow direction with quadrature signal inputs.
- Displays positive and negative flowrate ref. flow direction.
- Total and accumulated total count up and count down ref. flow direction.
- Large 17mm (0.67") digit selection for flowrate or total.
- Selectable on-screen engineering units; volumetric or mass.
- Auto backup of settings and running totals.
- Operational temperature -30°C up to +80°C (-22°F up to 178°F).
- Very compact design for panel mount, wall mount or field mount applications.
- Rugged aluminum field mount enclosure IP67 / NEMA4X.
- Intrinsically safe  
 II 1GD EEx ia IIB/IIC T4 T100°C.
- Explosion/flame proof  II 2G EEx d IIB T5.
- Full Modbus communication RS232/485/TTL.
- Loop or battery powered, 8 - 24V AC/DC or 115 - 230V AC power supply.
- Sensor supply 3.2 - 8.2 - 12 - 24V DC.

### Signal output

- (0)4 - 20mA / 0 - 10V DC according to positive and/or negative flowrate.
- Scaled pulse output according to accumulated total - count up and count down.
- Switch output related to flow direction and accumulated total.

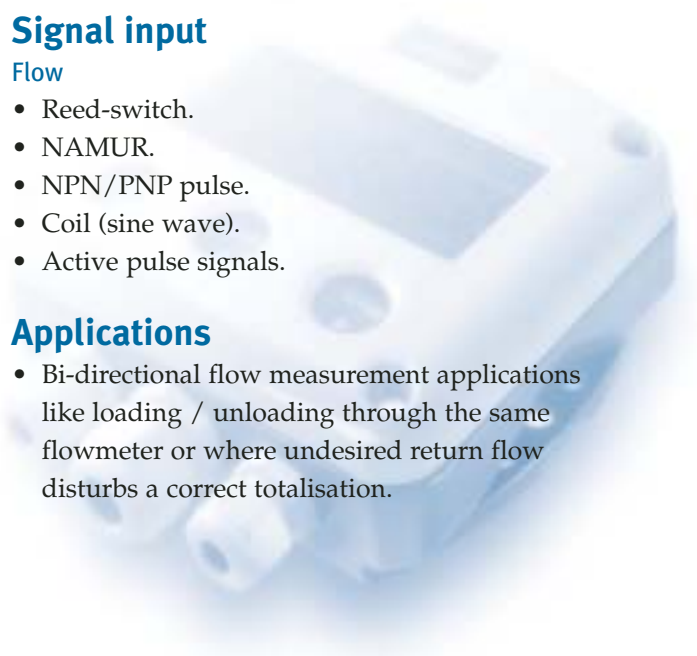
### Signal input

#### Flow

- Reed-switch.
- NAMUR.
- NPN/PNP pulse.
- Coil (sine wave).
- Active pulse signals.

### Applications

- Bi-directional flow measurement applications like loading / unloading through the same flowmeter or where undesired return flow disturbs a correct totalisation.



## General information

### Introduction

The F115 has been developed for applications where the direction of flow is an issue. Applications can be found by loading and unloading of ships where one bi-directional flowmeter is used. An other application is the correction of back-flow due to shocks in a pipeline caused by piston pumps or valve behavior. It is required to offer two pulse signals from the flowmeter which are 90° or 240° degrees out of phase. A wide selection of options further enhance this models capabilities.

### Display

The display has large 17mm (0.67") and 8mm (0.31") digits which can be set to show flowrate and totals. On-screen engineering units are easily configured from a comprehensive selection. In case of a reverse flow, the flowrate will be displayed as a negative value. The totalisers will count down.

### Configuration

All configuration settings are accessed via a simple operator menu which can be pass-code protected. Each setting is clearly indicated with an alpha-numerical description, therefore avoiding confusing abbreviations and baffling codes. Once familiar with one F-series product, you will be able to program all models in the series without a manual. All settings and totals are safely stored in EEPROM memory in the event of sudden power failure.

### Analog output signal

The positive and / or negative flowrate is re-transmitted with the (0)4 - 20mA or 0 - 10V DC output signal. The output signal is updated ten times per second. The output value is user defined in relation to the flowrate, e.g. 4mA equals to 0L / Hr and 20mA equals to + or -200L / Hr. The output signal can be passive, active or isolated where the passive output type will loop power the F115.

### Pulse output

The scaleable pulse output, reflects the count on the accumulated display. More over, if the transmitted pulse reflects a count-down situation due to reverse flow, the second output will be switched. The pulse length is user defined from 0.008 second up to 2 seconds. The maximum output frequency is 64Hz. The output signal can be a passive NPN, active PNP or an isolated electro-mechanical relay.

### Signal input

The F115 will accept most pulse input signals for flow or mass flow measurement. To detect the direction of flow, it is required to offer two signals 90° or 240° out of phase. The input signal types can be selected for both inputs in the configuration menu without having to adjust any sensitive mechanical dip-switches or jumpers. Different types of sensors are allowed for both inputs.

### Communication

All process data and settings can be read and modified manually or through the Modbus communication link (RS232 / RS485). Full Modbus functionality remains available for the Intrinsically Safe version (TTL).

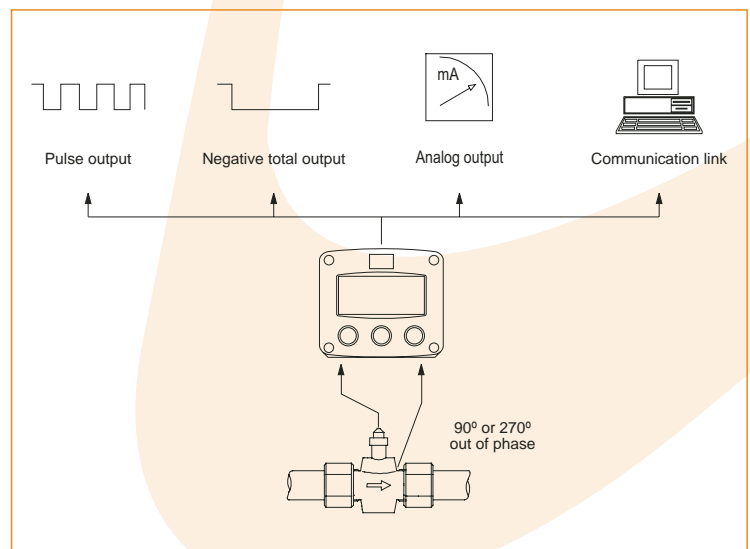
### Hazardous areas

For hazardous area applications, this model has been ATEX certified intrinsically safe  $\text{Ex II 1 GD EEx ia IIB / IIC T4 T100}^{\circ}\text{C}$  with an allowed operational temperature of  $-30^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$  to  $+158^{\circ}\text{F}$ ). A flame proof enclosure is also available with the rating  $\text{Ex II 2 G EEx d IIB T5}$ .

### Enclosures

Various types of enclosures can be selected, all ATEX approved. As standard the F115 is supplied in an ABS panel mount enclosure, which can be converted to an ABS field mount enclosure. Most popular is our rugged aluminum field mount enclosure with IP67 / NEMA 4X rating. Both European or U.S. cable gland entry threads are available.

## Overview application F115



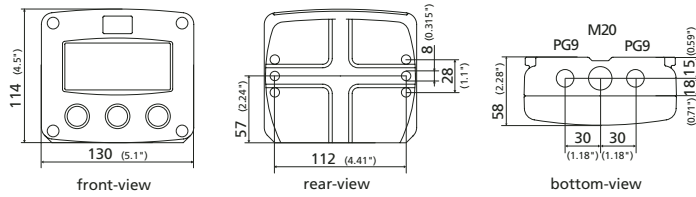
## Dimensions enclosures

### Enclosure HA

#### Aluminum field mount enclosure

#### IP67 / NEMA 4X

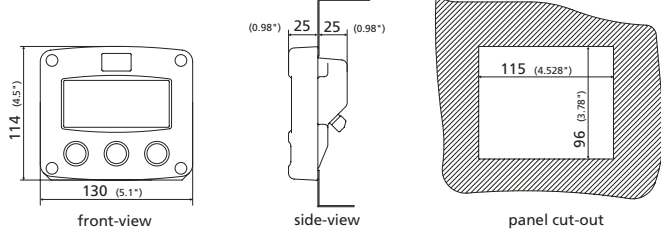
Tapped holes: European thread



### Enclosure HB

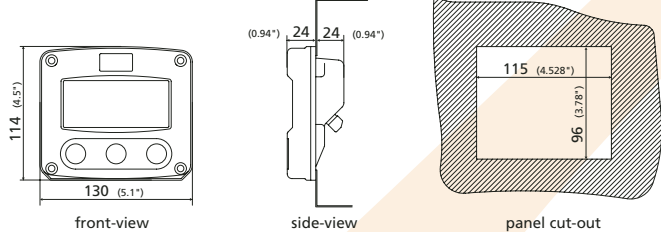
#### Aluminum panel mount enclosure

#### IP65 / NEMA 4



### ENCLOSURE HC (STANDARD) ABS PANEL MOUNT ENCLOSURE

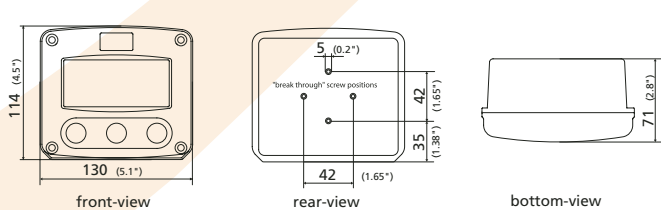
#### IP65 / NEMA 4



### Enclosure HD

#### ABS wall mount enclosure

#### IP67 / NEMA 4X Holes user defined

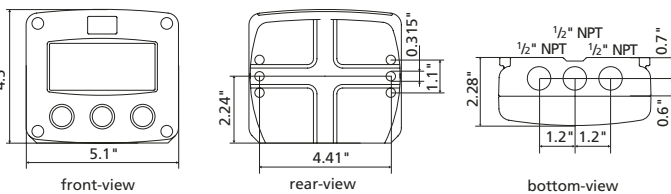


### Enclosure HU

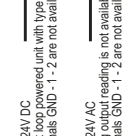
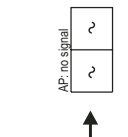
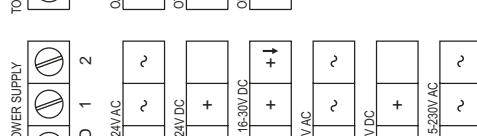
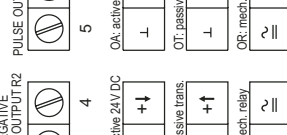
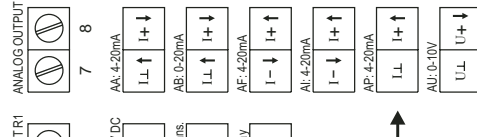
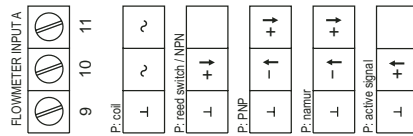
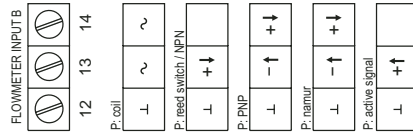
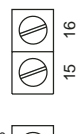
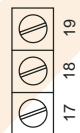
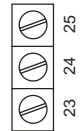
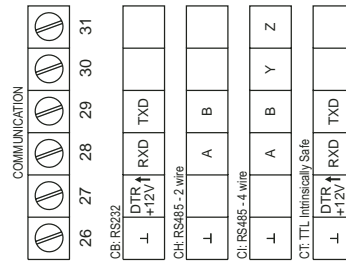
#### Aluminum field mount enclosure

#### IP67 / NEMA 4X

Tapped holes: U.S. thread

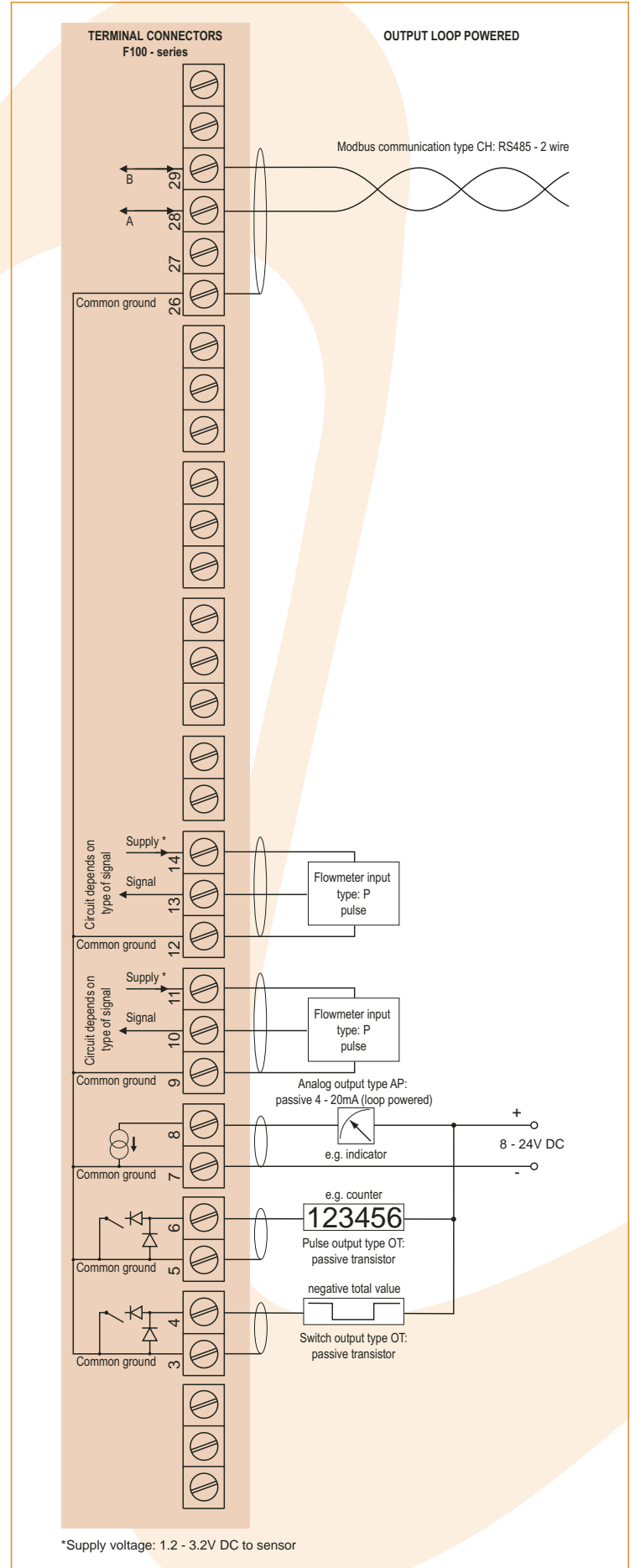
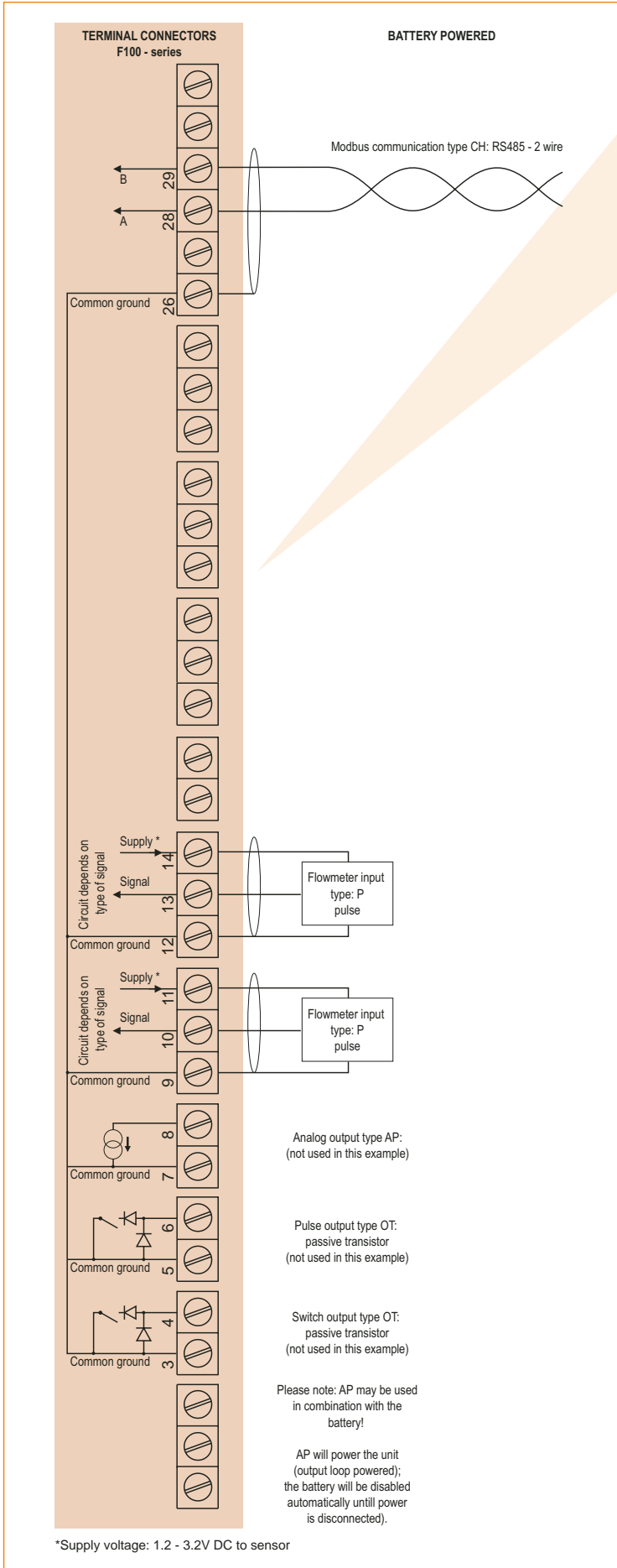


## Terminal connections



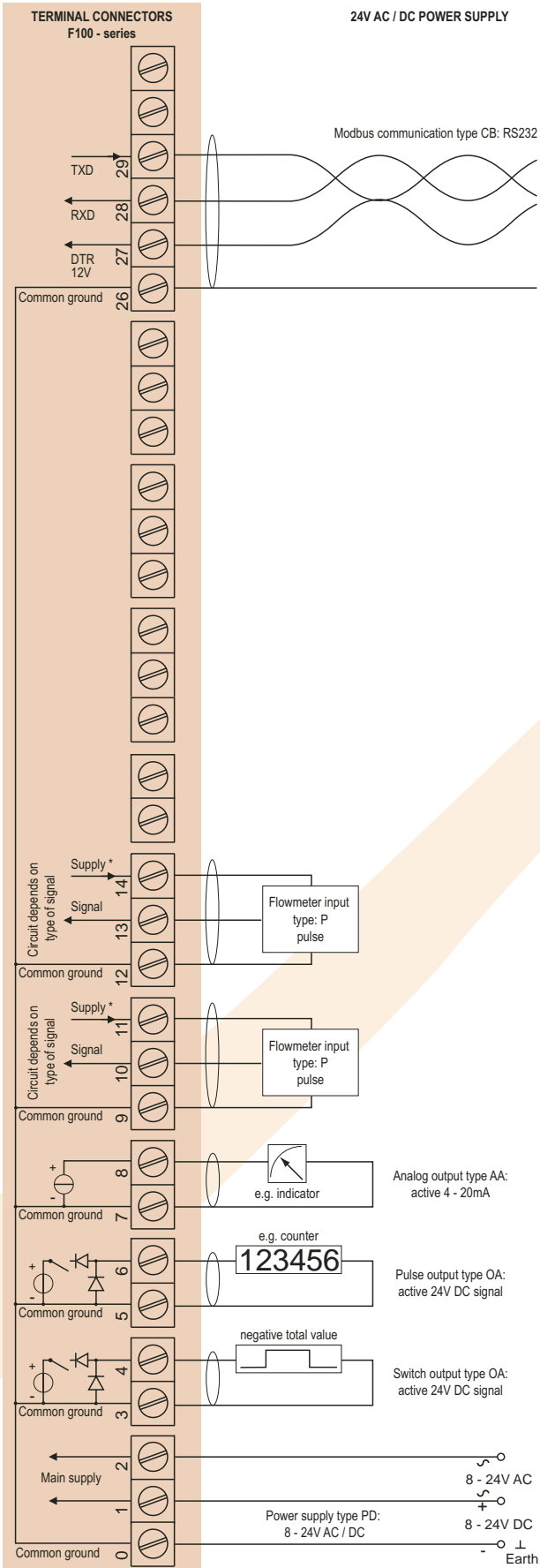
Typical wiring diagram F115-P-(AP)-CH-PB-(OT)

Typical wiring diagram F115-P-AP-CH-OT

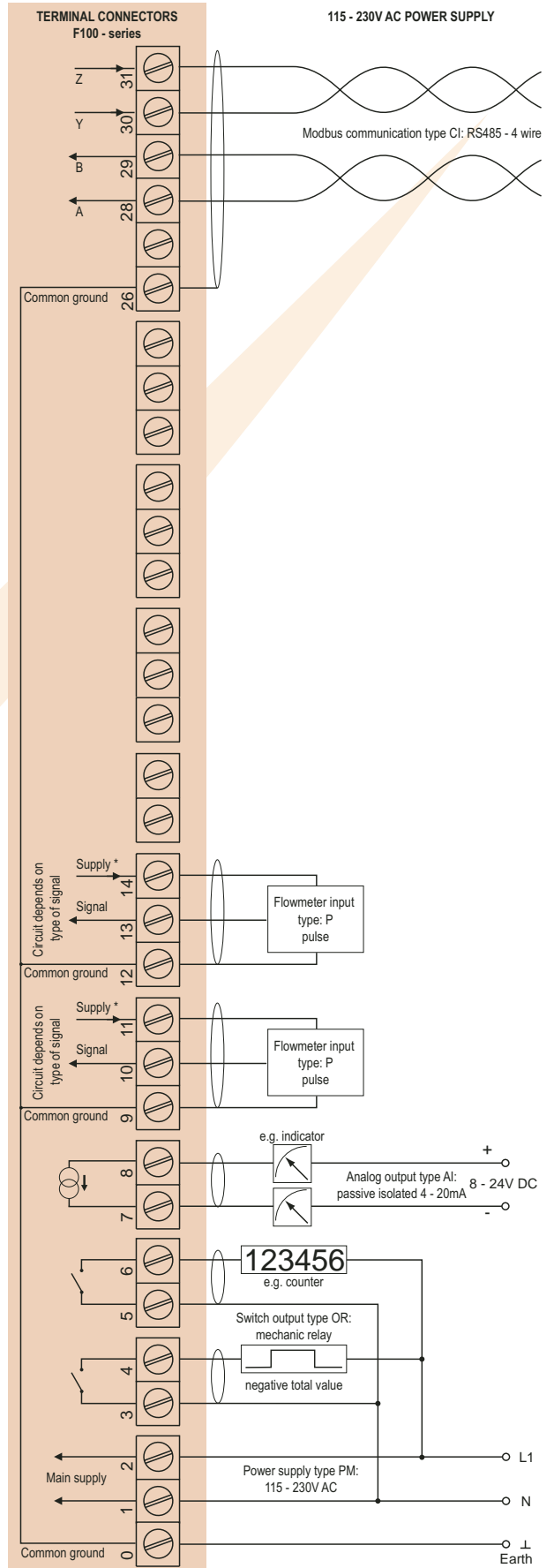


Typical wiring diagram F115-P-AA-CB-OA-PD

Typical wiring diagram F115-P-AI-CI-OR-PM



\*Supply voltage: 1.2 - 3.2 - 8.2 - 12 - 24V DC to sensor



\*Supply voltage: 1.2 - 3.2 - 8.2 - 12 - 24V DC to sensor

## Hazardous area applications

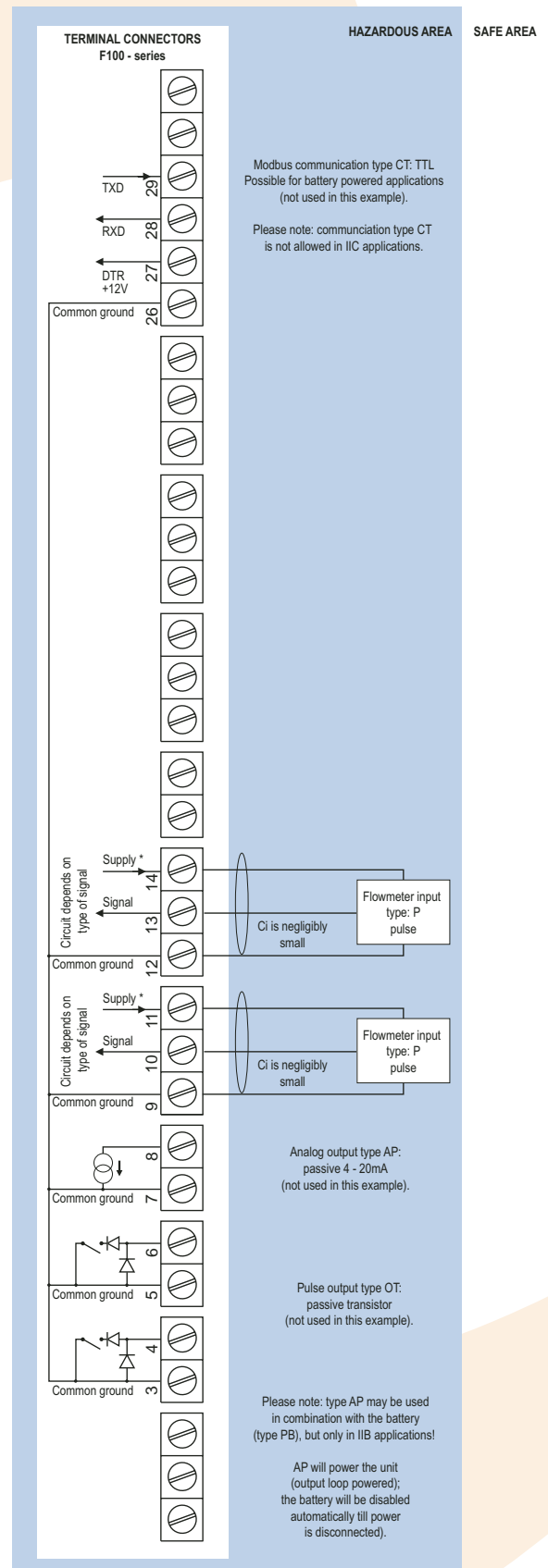
The F115-XI has been ATEX approved by KEMA for use in intrinsically safe applications. It is approved according to  $\text{Ex}$  II 1GD EEx ia IIB/IIC T4 T100°C for gas and dust applications with an operational temperature range of -30°C to +70°C (-22°F to +158°F). Besides the two I.S. power supply for the pulse and flow-direction outputs, it is allowed to connect up to four I.S. power supplies in IIB applications or one in IIC applications. Full functionality of the F115 remains available, including 4 - 20mA output, pulse and flow-direction outputs and Modbus communication (type CT). Power supply type PD-XI offers a 8.2V sensor supply e.g. for one Namur sensor. A flame proof enclosure with rating  $\text{Ex}$  II 2G EEx d IIB T5 is available as well. Please contact your supplier for further details.

**Certificate of conformity KEMA 03ATEX1074 X**



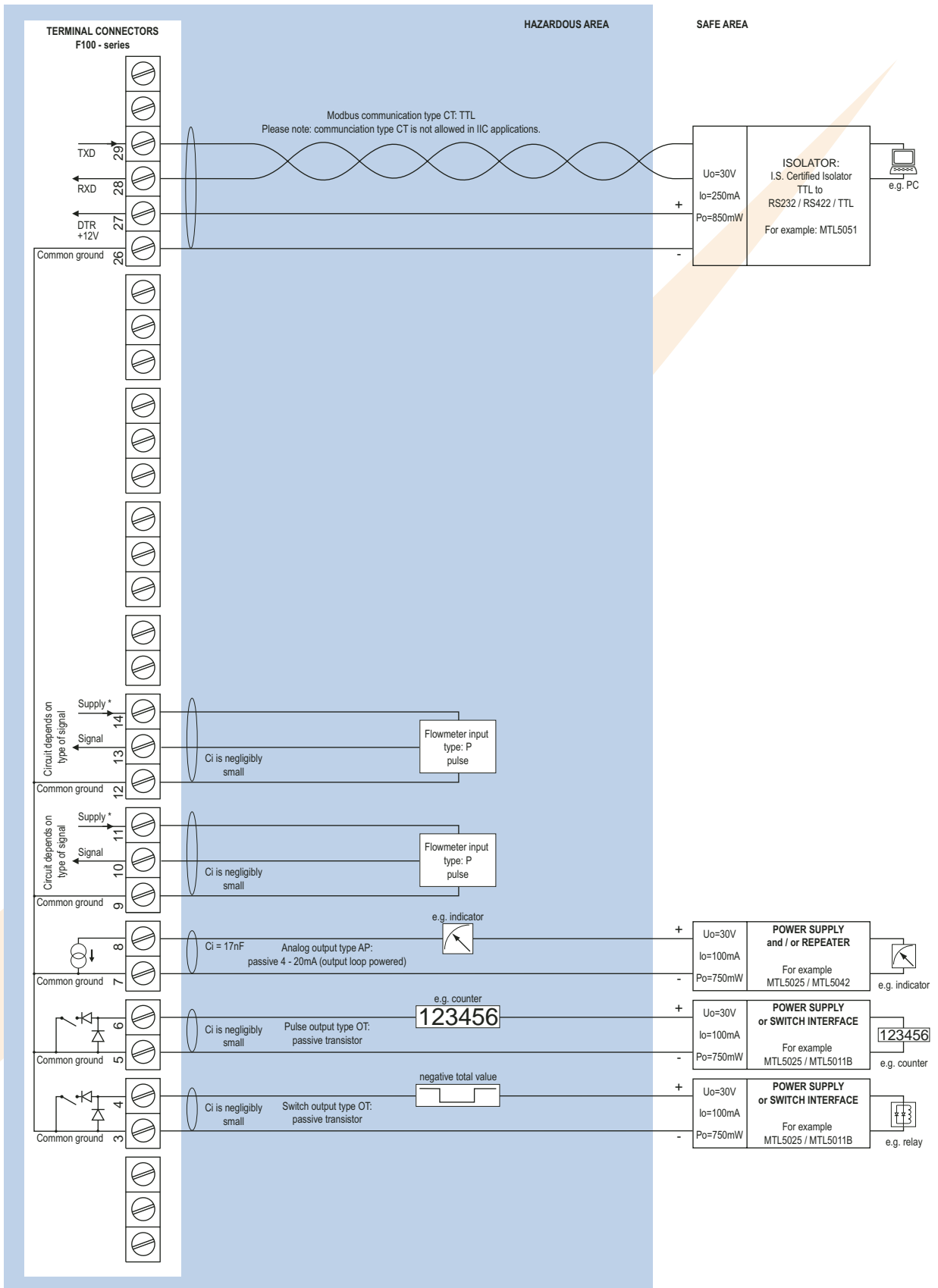
## Configuration example IIB and IIC

### F115-P-(AP)-(CT)-(OT)-PB-XI - battery powered unit



\* Note sensor supply voltage: 1.2V DC for coil sensors or 3.2V DC for other pulse sensors.

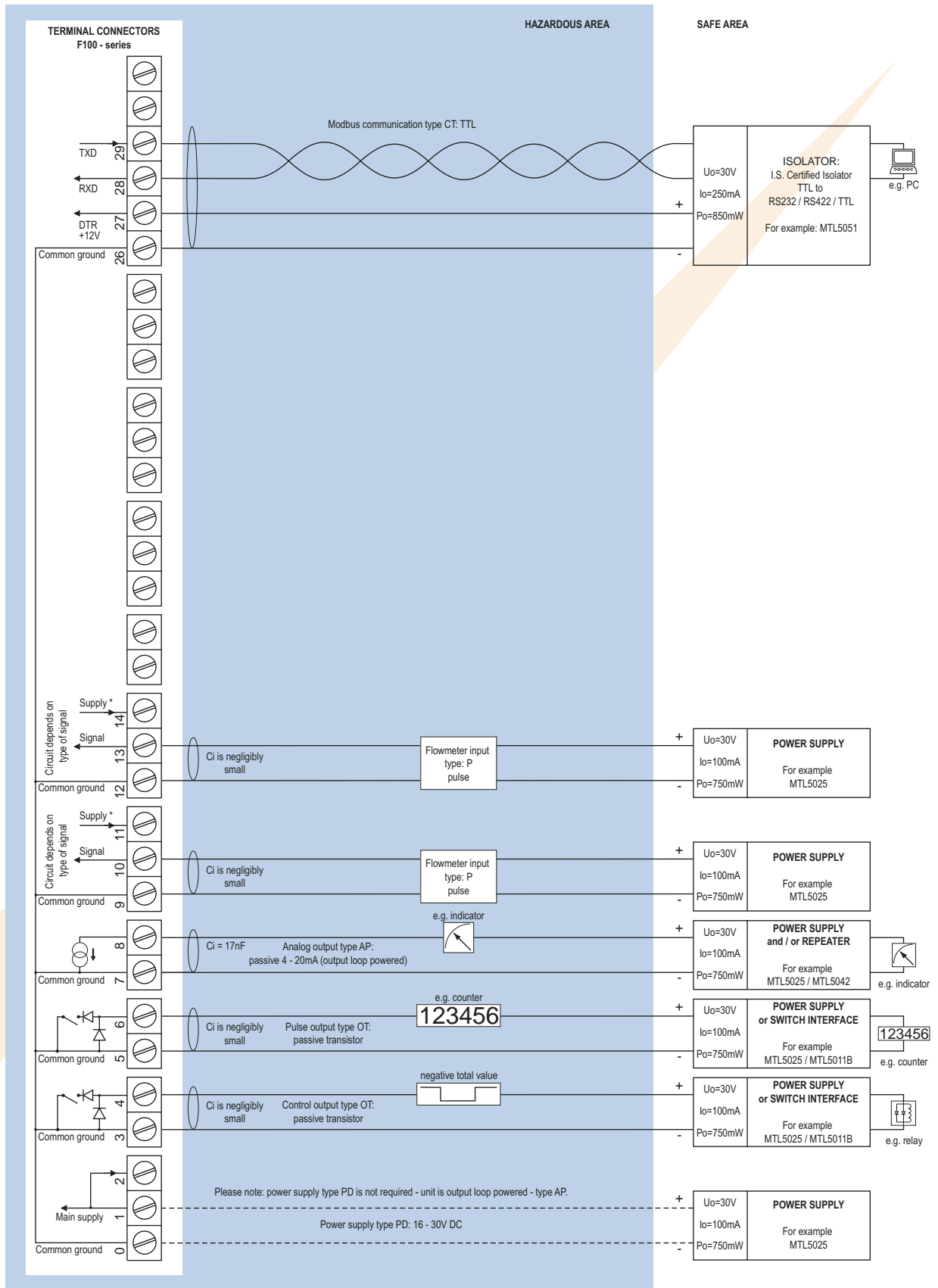
## Configuration example IIB and IIC - F115-P-AP-(CT)-OT-XI - output loop powered



\* Note sensor supply voltage: 1.2V DC for coil sensors or 3.2V DC for other pulse sensors.



## Configuration example IIB - F115-P-AP-CT-OT-(PD)-XI - power supply 16 - 30V DC



\* Note power supply type PD: the supply voltage to the sensor is maximum 8.7V (U<sub>o</sub>=8.7V I<sub>o</sub>=25mA P<sub>o</sub>=150mW)

## Technical specification

### General

Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Dimensions	90 x 40mm (3.5" x 1.6").
Digits	Seven 17mm (0.67") and eleven 8mm (0.31") digits. Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec. - 30 secs.
Option ZB	LED-backlight.

Casing	
Window	Polycarbonate window.
Sealing	EPDM and PE.
Control keys	Three industrial micro-switch keys. UV-resistant polyester keypad.
Type HA	Die-cast aluminum field mount enclosure IP67 / NEMA 4X with 2-component UV-resistant coating.
Dimensions	130 x 114 x 58mm (5.1" x 4.5" x 2.28") - W x H x D.
Cable Entry	2 x PG9 and 1 x M20 tapped hole in the centre.
Weight	950 gr.
Type HB	Die-cast aluminum panel mount enclosure IP65 / NEMA 4 with 2-component UV-resistant coating.
Dimensions	130 x 114 x 50mm (5.1" x 4.5" x 1.97") - W x H x D.
Panel cut-out	115 x 96mm (4.53" x 3.78") L x H.
Weight	525 gr.
Type HC	ABS panel mount enclosure IP65 / NEMA 4, UV-resistant and flame retardent.
Dimensions	130 x 114 x 48mm (5.1" x 4.5" x 1.89") - W x H x D.
Panel cut-out	115 x 96mm (4.53" x 3.78") L x H.
Weight	300 gr.
Type HD	ABS wall mount enclosure IP67 / NEMA 4X, UV-resistant and flame retardent.
Dimensions	130 x 114 x 71mm (5.1" x 4.5" x 2.8") - W x H x D.
Cable Entry	None, user defined.
Weight	400 gr.
Type HU	Die-cast aluminum field mount enclosure IP67 / NEMA 4X with 2-component UV-resistant coating.
Dimensions	5.1" x 4.5" x 2.28" - W x H x D.
Cable Entry	3 x 1/2" NPT tapped hole.
Weight	950 gr.



Operating temperature	
Operational	-30°C to +80°C (-22°F to +178°F).

Power requirements	
Type PB	Long life Lithium battery - life-time depends upon settings and configuration - up to 5 years.
Type PD	8 - 24V AC/DC ± 10%.
Type PD-XI	16 - 30V DC (Intrinsically Safe).
Type PF	24V AC/DC ± 10%.
Type PM	115 - 230V AC ± 10%.
Type PX	8 - 28V DC output loop powered unit with analog output signal type AP (or 8 - 24 V AC/DC if type AP will not be used).

Sensor excitation	
Type PB / PX	3.2V DC for pulse signals and 1.2V DC for coil pick-up.
Type PD	1.2 - 3.2 - 8.2 - 12 and 24V DC - max. 50mA@24V DC.
Type PD-XI	1.2 - 3.2 - 8.2V DC - max. 7mA@8.2V DC and mains power supply voltage (as connected to terminal 1).
Type PF / PM	1.2 - 3.2 - 8.2 - 12 and 24V DC - max. 200mA@24V DC.

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

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

Hazardous area	
Intrinsically safe	ATEX approval ref:  II 1GD EEx ia IIB/IIC T4 T100°C.
Type XI	Maximum ambient +70°C (158°F).
Explosion proof	ATEX approval ref:  II 2G EEx d IIB T5.
Type XD/XF	Dimensions of enclosure: 218 x 418 x 210mm (8.58" x 16.45" x 8.38") L x H x D.
Weight	16 Kg.

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

Signal inputs	
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 DC.
Note	Different sensor types can be used for both inputs.
Frequency	Minimum 0Hz - maximum 7kHz for total and flowrate. Maximum frequency depends on signal type and internal low-pass filter. E.g. reed switch with low-pass filter: max. frequency 120Hz.
K-Factor	0.000010 - 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.
Option ZF	coil sensitivity 10mVpp.

## Signal outputs

### Analog output

Function	Transmitting positive (and negative) flowrate.
Accuracy	10 bit. Error < 0.05%. Analog output signal can be scaled to any desired range.
Update time	Ten times per second.
Type AA	Active 4 - 20mA output (requires OA + PD, PF or PM).
Type AB	Active 0 - 20mA output (requires OA + PD, PF or PM).
Type AF	Passive floating 4 - 20mA output for Intrinsically Safe applications (requires PB or PD).
Type AI	Passive galvanically isolated 4 - 20mA output - also available for battery powered models (requires PB, PD, PF or PM).
Type AP	passive 4 - 20mA output - not isolated. Unit will be loop powered.
Type AU	Active 0 - 10V DC output (requires OA + PD, PF or PM).

### Pulse output

Function	Pulse output and indication negative totalisation.
Type OA	Two active 24V DC transistor outputs (PNP); max. 50mA per output (requires AA + PD, PF or PM).
Type OR	Two electro-mechanical relay outputs (N.O.) - isolated; max. switch power 230V AC - 0.5A per relay (requires PF or PM).
Type OT	Two passive transistor outputs (NPN) - not isolated.
Load	Max. 50V DC - 300mA per output.
Pulse output	Max. frequency 64Hz. Pulse length user definable between 7.8msec up to 2 seconds.
Note	Output 2 is switched in case a negative acc. total is transmitted.

### Communication option

Function	Reading display information, reading / writing all configuration settings.
Type CB	RS232
Type CH	RS485 2-wire
Type CI	RS485 4-wire
Type CT	TTL Intrinsically Safe.
Protocol	Modbus ASCII / RTU.
Speed	1200 - 2400 - 4800 - 9600 baud.
Addressing	Maximum 255 addresses.

## Operational

### Operator functions

Displayed functions	<ul style="list-style-type: none"> <li>Positive and negative flowrate.</li> <li>Total and accumulated total (count up and down).</li> <li>Total can be reset to zero by pressing the CLEAR-key twice.</li> </ul>
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### Total

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

### Accumulated total

Digits	11 digits.
Units / decimals	According to selection for total.
Note	Can not be reset to zero.

### Flowrate

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

## Display example - 90 x 40mm (3.5" x 1.6")



## Ordering information

Example (standard configuration)

F115-P-AP-CX-HC-OT-PX-XX-ZX.

Explanation standard configuration:

P: flowmeter signal: pulse; AP: passive 4 - 20mA analog output; CX: no communication; HC: ABS panel mount enclosure; OT: passive transistor output; PX: the unit is powered by the analog output loop, type AP: 8 - 28V DC (or AC); XX: Safe area; ZX: no options.

Ordering information:	F114	-	-A	-C	-H	-O	-P	-X	-Z
<b>Flowmeter input signal</b>									
P	⊗								
Pulse input: coil, npn, pnp, namur, reed-switch.									
<b>Analog output signal</b>									
AA									
Active 4 - 20mA output - requires OA + PD, PF or PM.									
AB									
Active 0 - 20mA output - requires OA + PD, PF or PM.									
AF	⊗								
I.S. floating 4 - 20mA output - requires PB or PD.									
AI									
Isolated 4 - 20mA output - requires PB, PD, PF or PM.									
AP	⊗								
<b>Passive 4 - 20mA output, loop powered unit.</b>									
AU									
Active 0 - 10V DC output - requires OA + PD, PF or PM.									
<b>Communication</b>									
CB									
Communication RS232 - Modbus RTU.									
CH									
Communication RS485 - 2-wire - Modbus RTU.									
CI									
Communication RS485 - 4-wire - Modbus RTU.									
CT	⊗								
Intrinsically Safe TTL - Modbus RTU.									
CX	⊗								
<b>No communication.</b>									
<b>Enclosure</b>									
HA	⊗								
Aluminum field mount enclosure IP67 / NEMA 4X.									
HB	⊗								
Aluminum panel mount enclosure IP65 / NEMA 4.									
HC	⊗								
<b>ABS panel mount enclosure IP65 / NEMA 4.</b>									
HD	⊗								
ABS wall mount enclosure IP67 / NEMA 4X.									
HU	⊗								
Aluminum field mount enclosure IP67 / NEMA 4X.									
<b>Outputs</b>									
OA									
Two active transistor outputs - requires AA, AB or AU and PD, PF or PM.									
OR									
Two mechanic relay outputs - requires PF or PM.									
OT	⊗								
<b>Two passive transistor outputs - standard configuration.</b>									
<b>Power supply</b>									
PB	⊗								
Lithium battery powered.									
PD	⊗								
8 - 24V AC/DC + sensor supply - with XI: 16 - 30V DC.									
PF									
24V AC/DC + sensor supply.									
PM									
115 - 230V AC + sensor supply.									
PX	⊗								
<b>No power supply option. Unit requires external loop AP.</b>									
<b>Hazardous area</b>									
XI	⊗								
Intrinsically safe.									
XD	⊗								
EExd enclosure - 1 key.									
XF	⊗								
EExd enclosure - 3 keys.									
XX	⊗								
<b>Safe area only.</b>									
<b>Other options</b>									
ZB									
Backlight.									
ZF	⊗								
Coil input 10mVpp.									
ZX	⊗								
<b>No options.</b>									

The bold marked text contains the standard configuration.

⊗ Available Intrinsically Safe.

Specifications are subject to change without notice.