DATASHEET F115 - BI-DIRECTIONAL FLOW RATE INDICATOR / TOTALIZER

BI-DIRECTIONAL FLOW RATE INDICATOR / TOTALIZER

WITH ANALOG, PULSE SIGNAL AND FLOW DIRECTION OUTPUTS

Advantages

- Robust IP67 (NEMA4X) field enclosure. It is so rugged, **you can even stand on it!**
- Intrinsically Safe available - ATEX and IECEx approval for gas and dust applications.
- Programming can be done by your own crew, with the sensible menu-driven structure, saving cost and irritation. **Know one, know them all**!
- Very diverse mounting possibilities: walls, pipes, panels or directly onto outdoor sensors!

Features

- Detects flow direction with quadrature signal inputs.
- Displays positive / negative flow rate ref. flow direction.
- Displays forward & reverse total and accumulated total count up and count down ref. flow direction.
- Large 17mm (0.67") digits for flow rate or total.
- Selectable on-screen engineering units; volumetric or mass.
- Explosion/flame proof Ⓔx II 2 GD 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 flow rate.
- Scaled pulse output according to accumulated total - count up and count down.
- Switch output related to flow direction and accumulated total.

Signal input

Flow

- Ability to process all types of flow meter signals: Reed-switch, NAMUR, NPN/PNP pulse, Sine wave (coil), Active pulse signals.

Applications

- The F-Series is your first and safest choice for field mount indicators. Especially in harsh weather conditions like rain, snow, salty atmosphers and temperatures between -40°C up to +80°C (-40°F up to 176°F) for safe and hazardous area applications!
- Bi-directional flow measurement applications like loading / unloading through the same flow meter or where undesired backflow disturbs a correct totalisation. For DIN panel mount indicators, check our D-Series.

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 flow meter 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 flow meter which are 90° or 270° degrees out of phase. A wide selection of options further enhances this models capabilities.

Display

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

Configuration

All configuration settings are accessed via a simple operator menu which can be password protected. Each setting is clearly indicated with an alpha-numerical description, which avoides 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 flow rate is re-transmitted with the (0)4 - 20mA or 0 - 10V DC output signal. The output signal is updated eight times per second. The output value is user defined in relation to the flow rate, e.g. 4mA equals the minimum flow rate (not negative) 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. Moreover, 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 0.001 second up to 9.999 seconds. The maximum output frequency is 500Hz. The output signal can be a passive NPN, active PNP or an isolated electro-mechanical relay.

Signal input

The F115 accepts most pulse input signals for volumetric flow or mass flow measurement. To detect the direction of flow, it is required to offer two signals 90° or 270° 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 and K-factors 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).

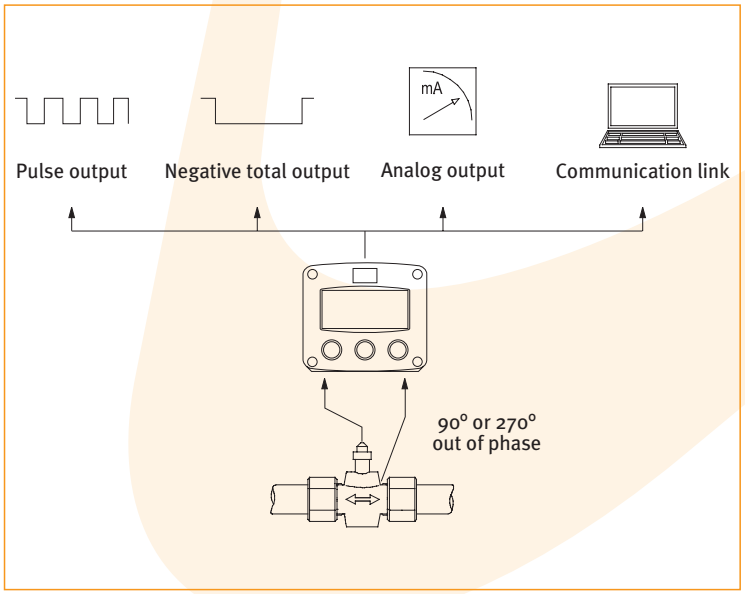
Hazardous areas

This model has been ATEX and IECEx certified Intrinsically Safe for gas and dust applications, with an allowed ambient temperature of -40°C to +70°C (-40°F to +158°F).
A flame proof enclosure with ATEX certification offers the rating Ex II 2 GD EEx d IIB T5.

Enclosures

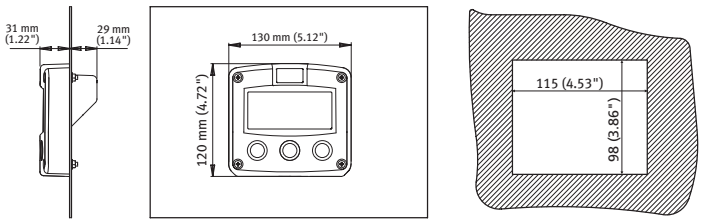
Various types of enclosures can be selected, all ATEX and IECEx approved. As standard the F115 is supplied in an GRP panel mount enclosure, which can be converted to an GRP field mount enclosure. Most popular is our rugged aluminum field mount enclosure with IP67 / NEMA 4X rating. Both European or U.S.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

Overview application F115



Dimensions enclosures

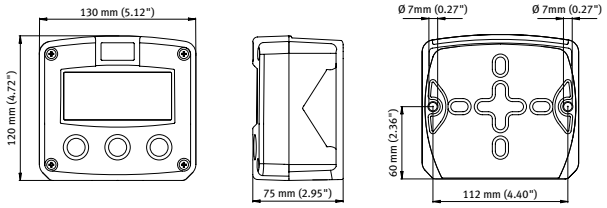
Aluminum & GRP panel mount enclosure



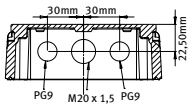
HB & HC enclosures

panel cut-out

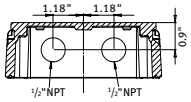
Aluminum & GRP field / wall mount enclosures



Aluminum



HA



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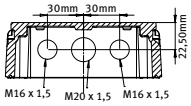

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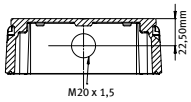

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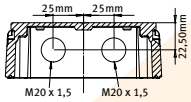

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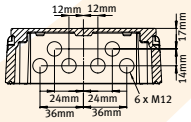

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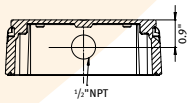

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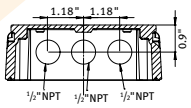

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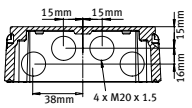

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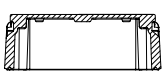
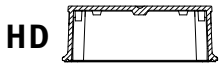
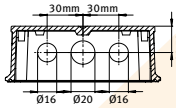


HZ

GRP



HD



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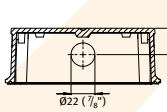

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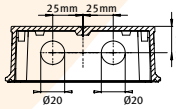

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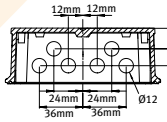

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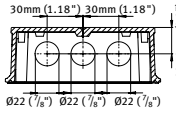
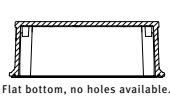


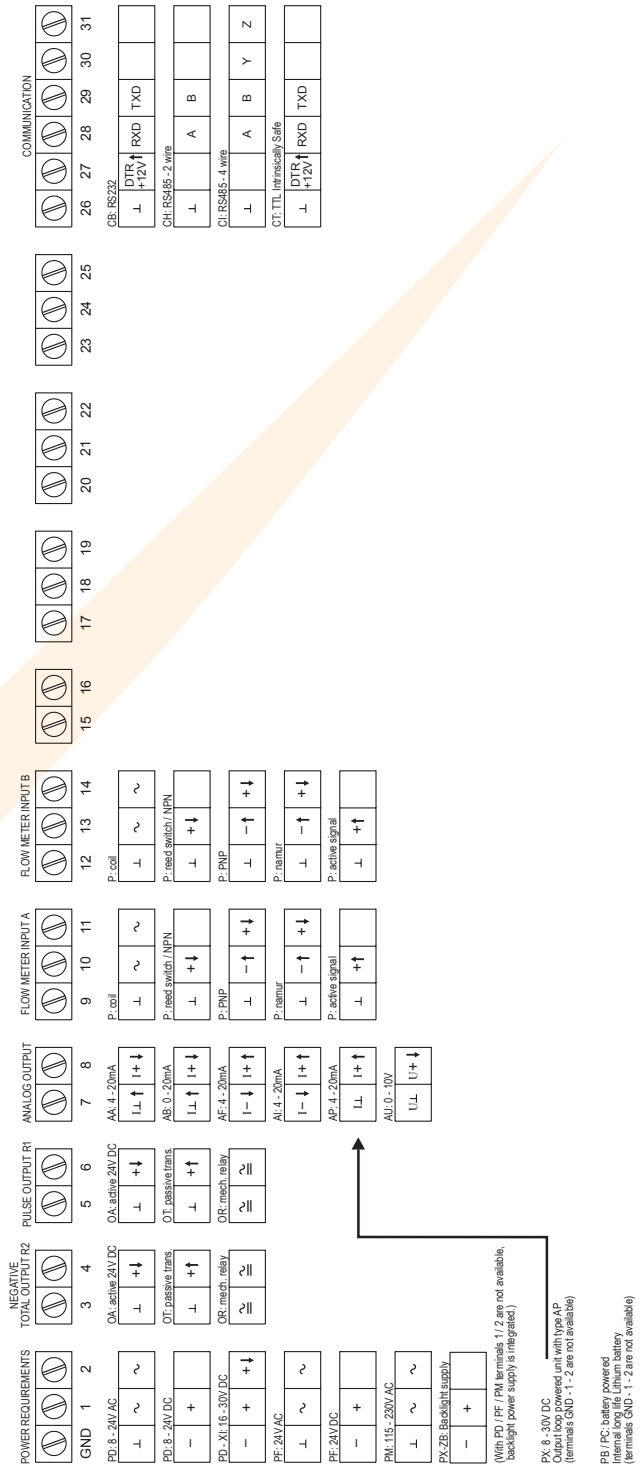
HJ



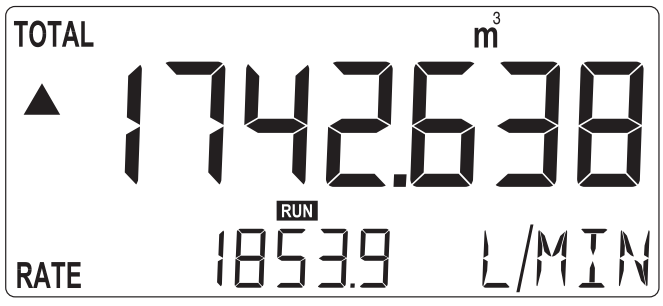
HK

Flat bottom, no holes available.

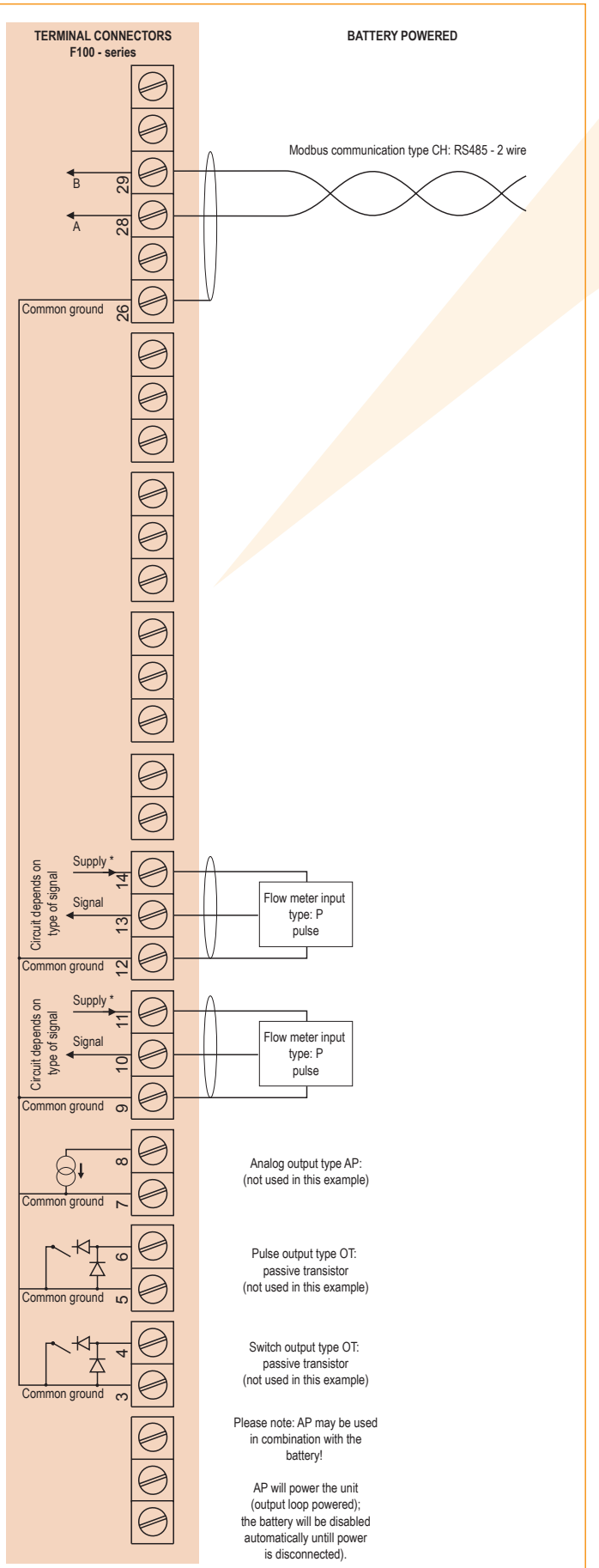
Terminal connections



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

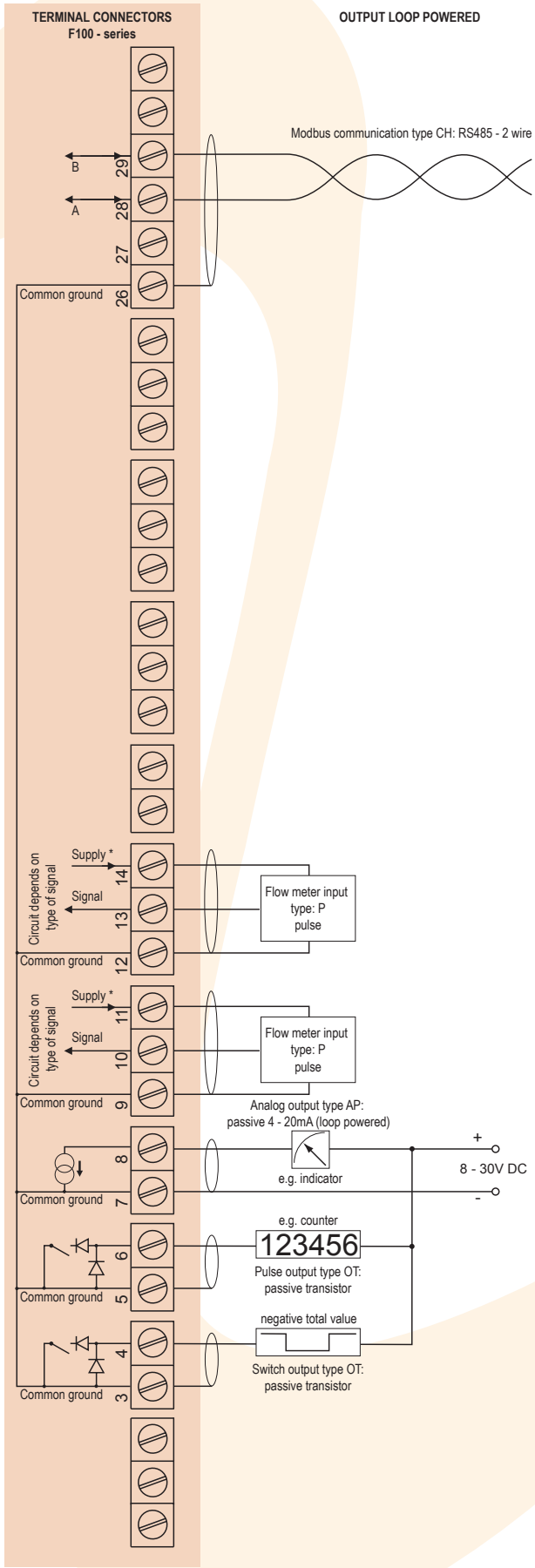


Typical wiring diagram F115-P-(AP)-CH-(OT)-PB



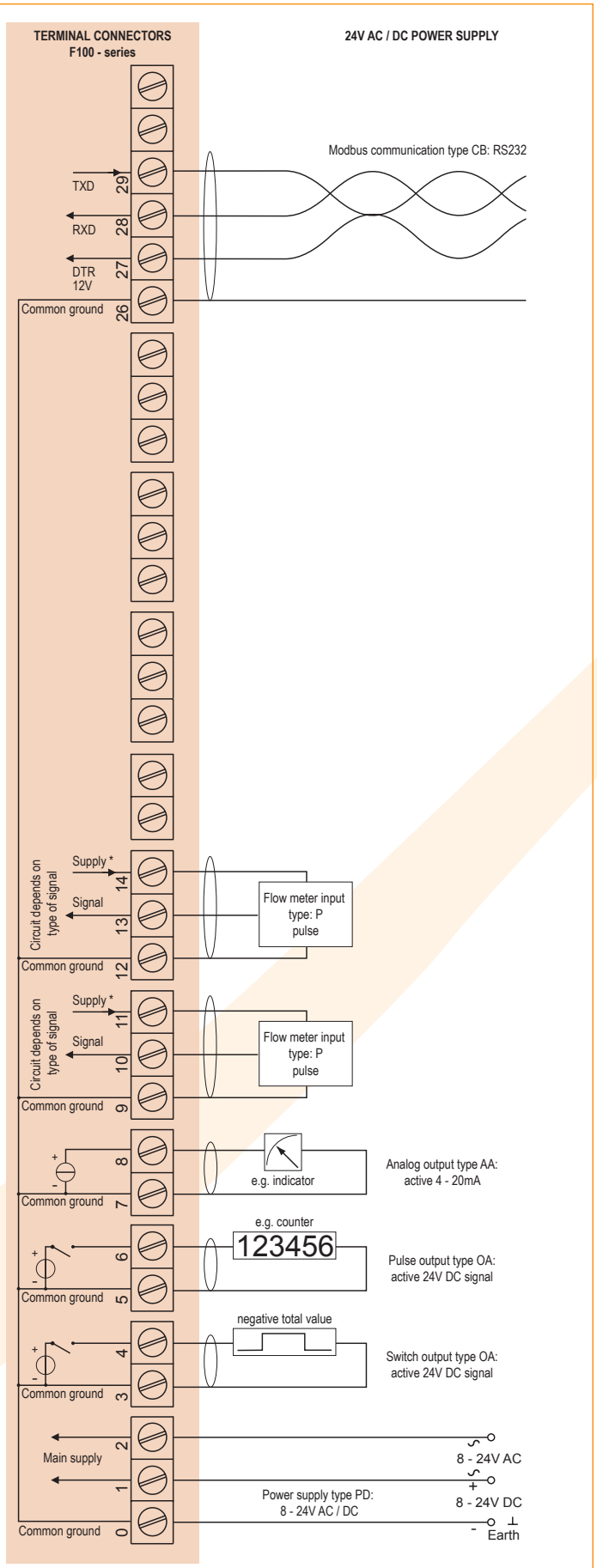
*Supply voltage: 1.2 / 3.2V DC to sensor

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



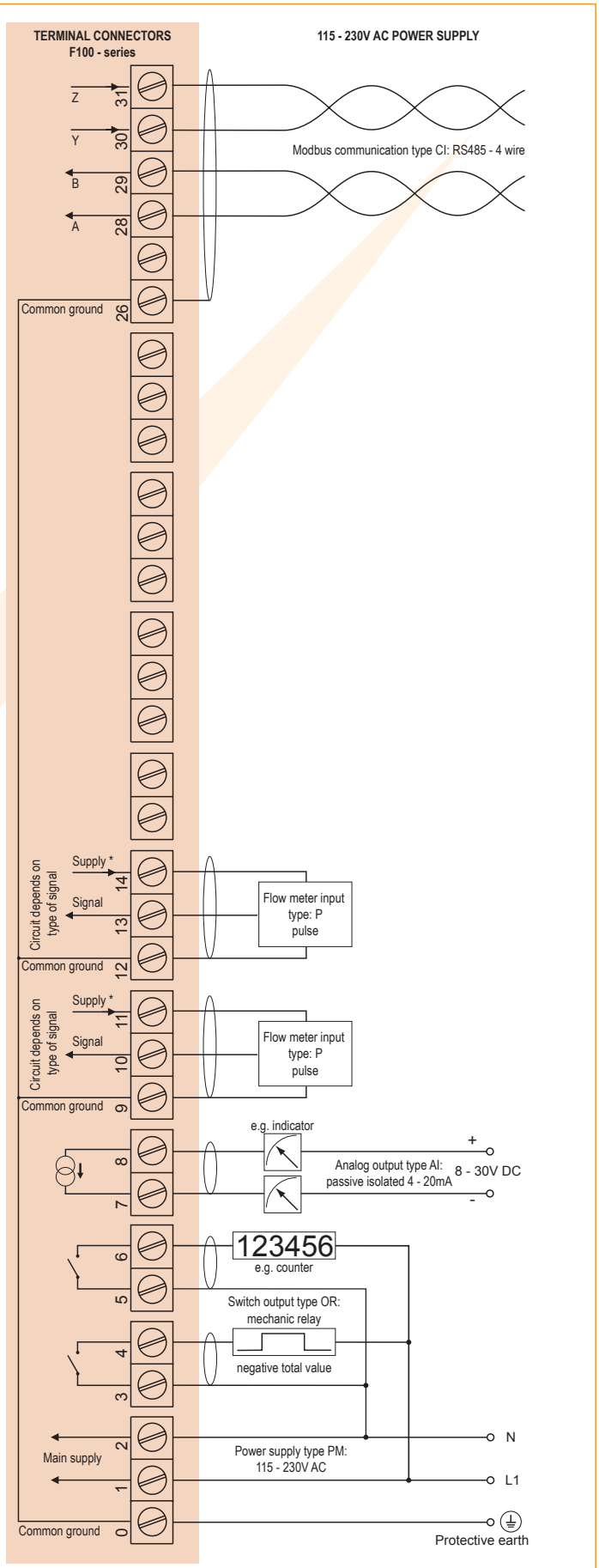
*Supply voltage: 1.2 / 3.2V DC to sensor

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



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

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



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

Hazardous area applications

The F115-XI has been certified according ATEX and IECEx by DEKRA for use in Intrinsically Safe applications with an ambient temperature of -40°C to +70°C (-40°F to +158°F).

- The ATEX markings for gas and dust applications are:
  II 1 G Ex ia IIB/IIC T4 Ga
  II 1 D Ex ia IIIC T100 °C Da IP6X.
- The IECEx markings for gas and dust applications are: **Ex ia IIC/IIB T4 Ga** and **Ex ia IIIC T100 °C Da IP6X.**

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/IIIC applications or one in IIC applications. Consult the certificate for the maximum input and output values of the circuits. 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 ATEX **II 2 GD EEx d IIB T5** is available as well. Please contact your supplier for further details.

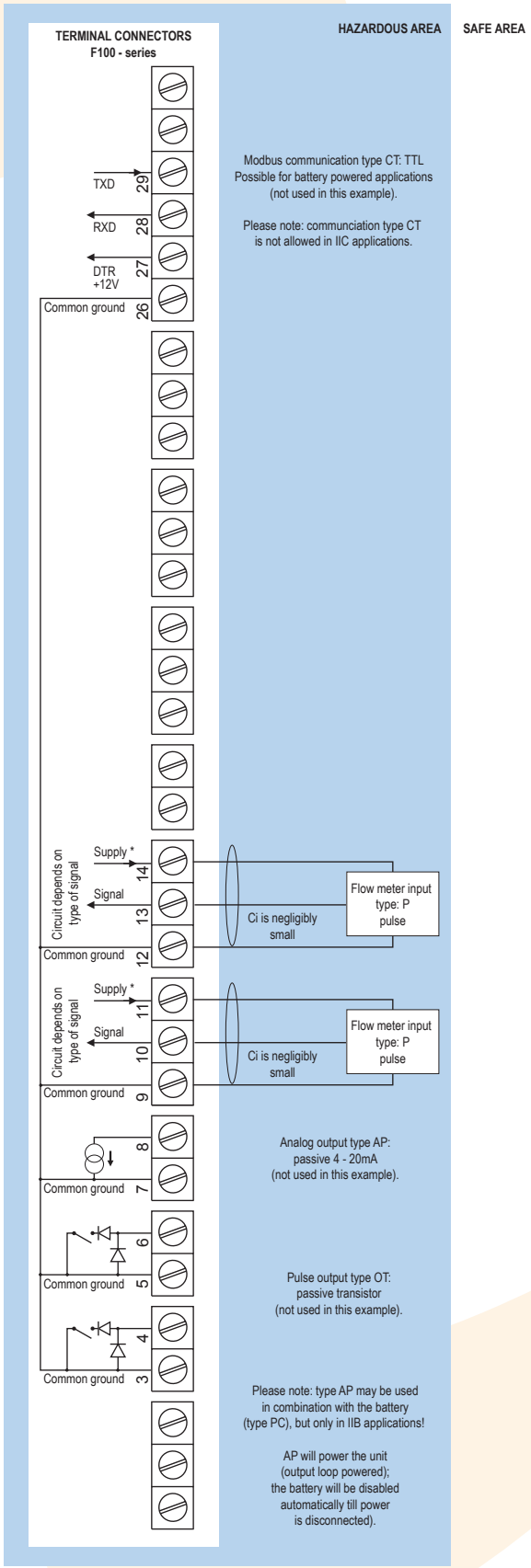
Certificate of conformity KEMA 03ATEX1074 X • IECEx DEK 11.0042X

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres

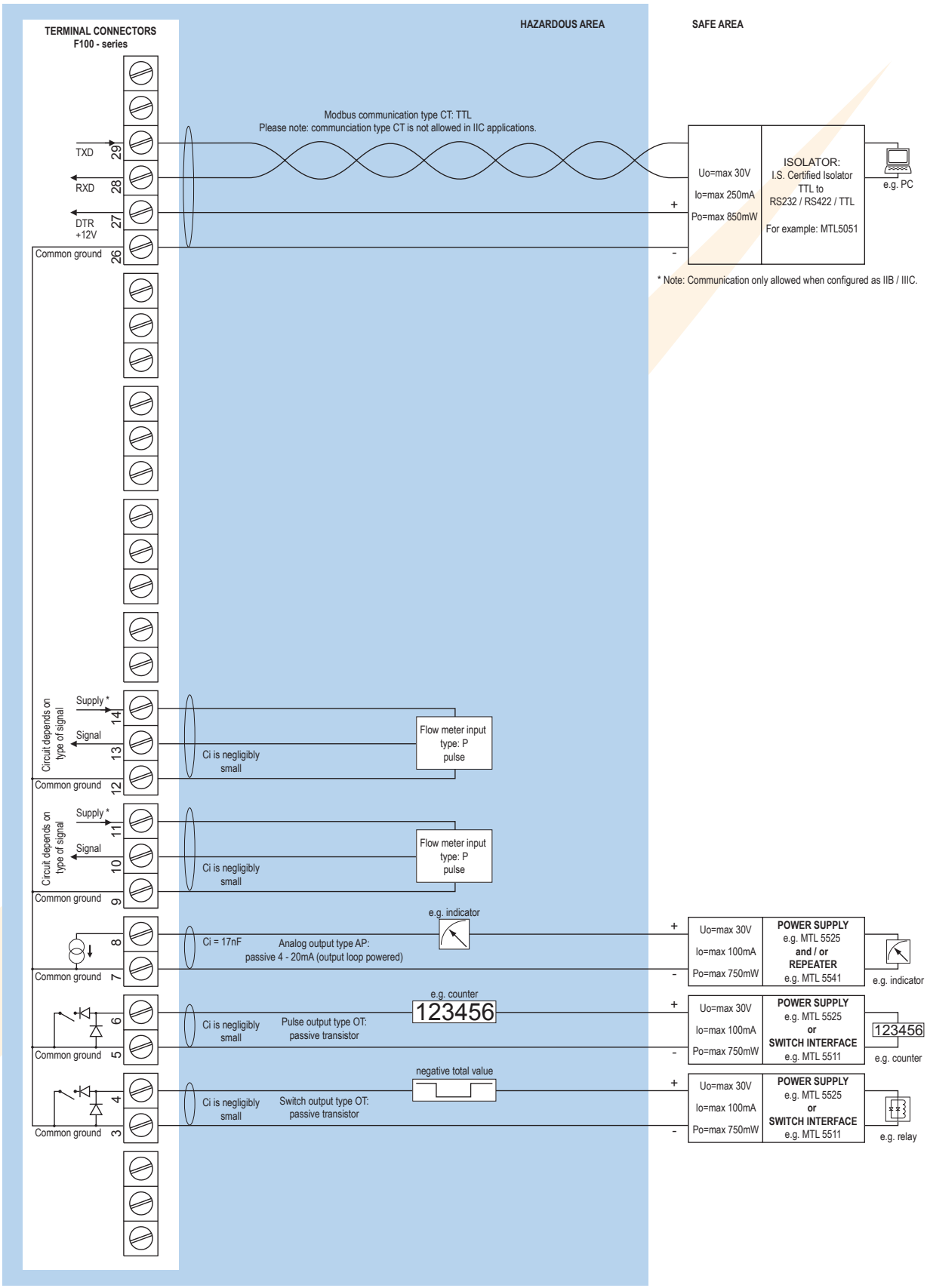
CERTIFICATE
EC-Type Examination

Configuration example IIB / IIIC and IIC
F115-P-(AP)-(CT)-(OT)-PC-XI - Battery powered unit



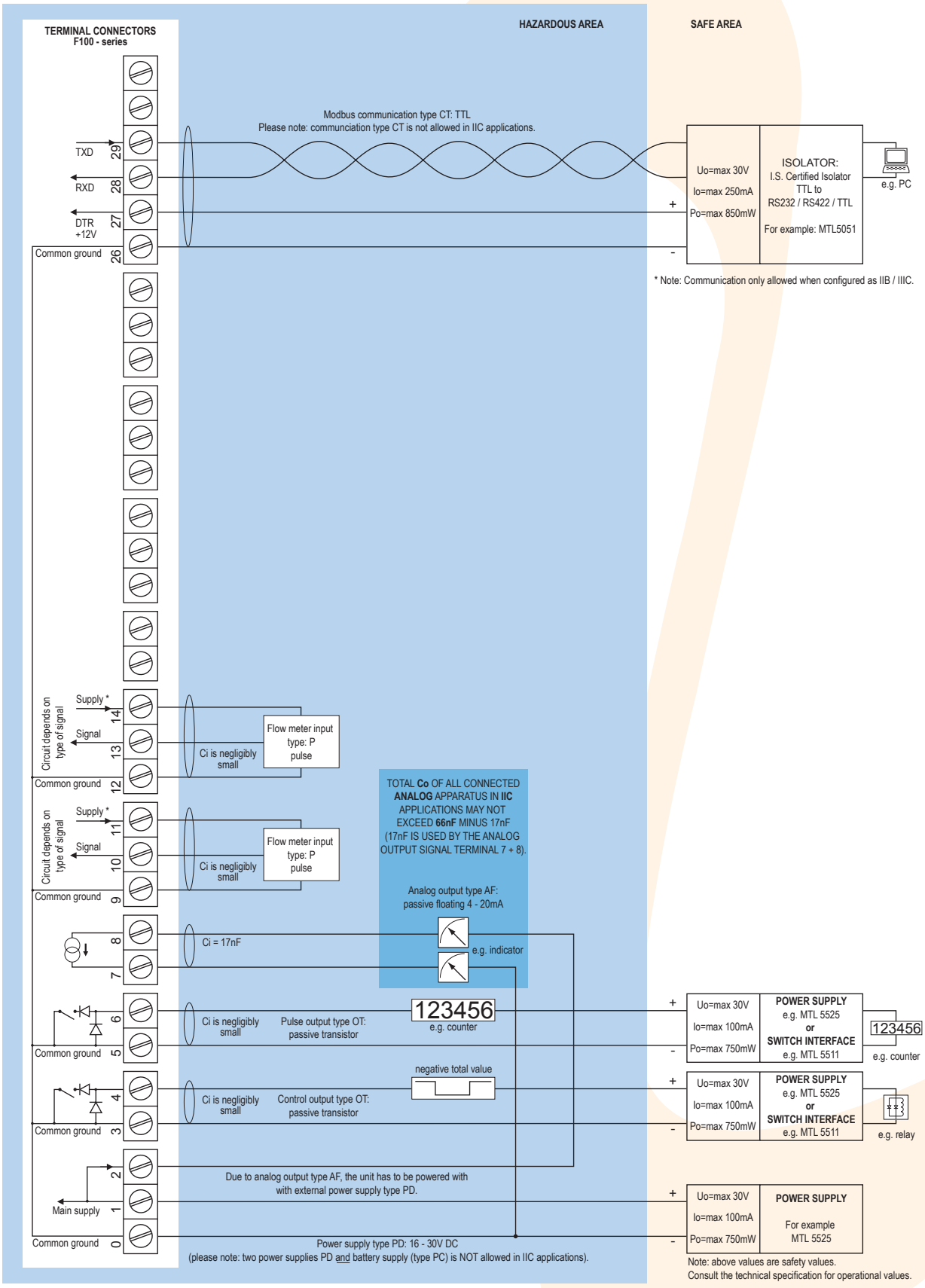
* Note sensor supply voltage: 1.2V DC for coil sensors or 3.2V DC for other pulse sensors.

Configuration example IIB / IIIC and IIC - F115-P-AP-(CT)-OT-PX-XI - Output loop powered



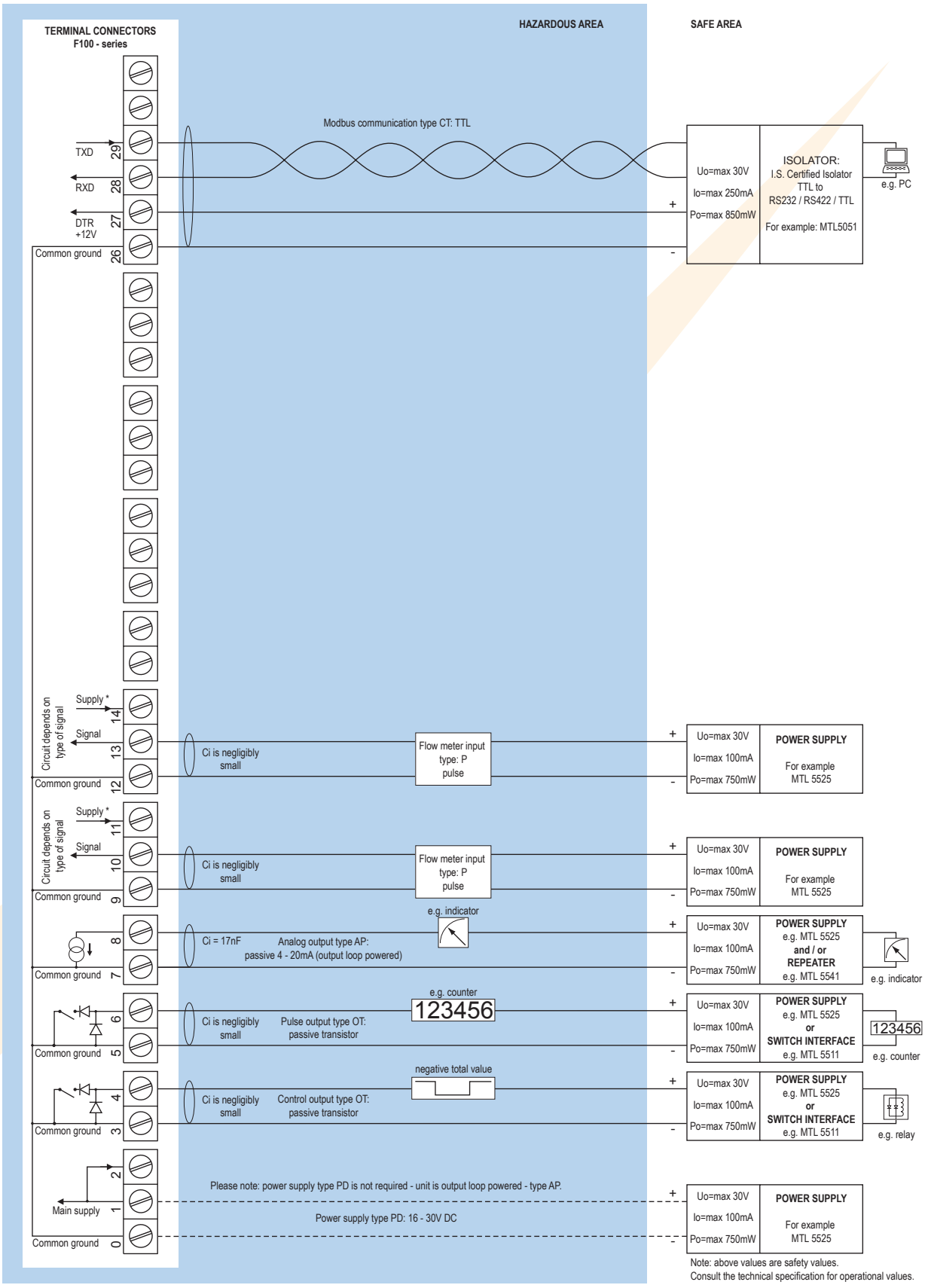
* Note sensor supply voltage: 1.2V DC for coil sensors or 3.2V DC for other pulse sensors.

Configuration example IIB / IIIC and IIC - F115-P-AF-(CT)-OT-PD-XI - Power requirement 16 - 30V DC



* Note power supply type PD: the supply voltage to pulse sensors is maximum 8.7V (Uo=max 8.7V Io=max 25mA Po=max 150mW) and to analog sensors as connected to terminal 1 (internally linked).

Configuration example IIB / IIIC - F115-P-AP-CT-OT-(PD)-XI - Power requirement 16 - 30V DC



* Note power supply type PD: the supply voltage to pulse sensors is maximum 8.7V (Uo=max 8.7V Io=max 25mA Po=max 150mW) and to analog sensors as connected to terminal 1 (internally linked).

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: fast, 1sec , 3sec, 15sec, 30sec, off.
Option ZB	Transflective LCD with adjustable green LED backlight. Good readings in full sunlight and darkness.
Note ZB	Only available for safe area applications.

Ambient temperature	
Safe areas	-40°C to +80°C (-40°F to +176°F).
Intrinsically Safe	-40°C to +70°C (-40°F to +158°F).

Power requirements	
Type PB	Long life Lithium battery - life-time depends upon settings and configuration - up to 5 years.
Type PC	Intrinsically Safe long life lithium battery - life-time depends upon settings and configuration - 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 PM	115 - 230V AC ± 10%. Power consumption max. 15 Watt.
Type PX	8 - 30V DC. Power consumption max. 0.5 Watt.
Type ZB	12 - 24V DC ± 10% or internally powered with type PD / PF / PM. Power consumption max. 1 Watt.
Note PB/PF/PM	Not availble Intrinsically Safe.
Note PF/PM	The total consumption of the sensors and outputs may not exceed 400mA @ 24V.
Note	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 sensors with a very low power consumption like coils (sine wave) and reed-switches.
Type PD	1.2 / 3.2 / 8.2 / 12 / 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 / 24V DC - max. 400mA @ 24V DC.

Terminal connections	
Type	Removable plug-in terminal strip. Wire max. 1.5mm² and 2.5mm².

Data protection	
Type	EEPROM backup of all settings. Backup of running totals every minute. Data retention at least 10 years.
Password	Configuration settings can be password protected.

Directives & Standards	
EMC	Directive 2004/108/EC, FCC 47 CFR part 15.
Low voltage	Directive 2006/95/EC
ATEX / IECEx	Directive 94/9/EC, IEC 60079-0, IEC 60079-11, IEC 60079-26.
IP & NEMA	EN 60529 & NEMA 250

Enclosure

General	
Window	Polycarbonate window.
Sealing	Silicone.
Control keys	Three industrial micro-switch keys. UV-resistant silicone keypad.

Aluminum wall / field mount enclosures	
General	Die-cast aluminum wall/field mount enclosure IP67 / NEMA 4X with 2-component UV-resistant coating.
Dimensions	130 x 120 x 75mm (5.12" x 4.72" x 2.95") - W x H x D.
Weight	1100 gr.
Type HA	Cable entry: 2 x PG9 and 1 x M20.
Type HL	Cable entry: 2 x 1/2" NPT.
Type HM	Cable entry: 2 x M16 and 1 x M20.
Type HN	Cable entry: 1 x M20.
Type HO	Cable entry: 2 x M20.
Type HP	Cable entry: 6 x M12.
Type HT	Cable entry: 1 x 1/2" NPT.
Type HU	Cable entry: 3 x 1/2" NPT.
Type HV	Cable entry: 4 x M20.
Type HZ	Cable entry: no holes.

GRP wall / field mount enclosures	
General	GRP wall/field mount enclosure IP67 / NEMA 4X, UV-resistant and flame retardant.
Dimensions	130 x 120 x 75mm (5.12" x 4.72" x 2.95") - W x H x D.
Weight	600 gr.
Type HD	Cable entry: no holes.
Type HE	Cable entry: 2 x Ø 16mm and 1 x Ø 20mm.
Type HF	Cable entry: 1 x Ø 22mm (7/8").
Type HG	Cable entry: 2 x Ø 20mm.
Type HH	Cable entry: 6 x Ø 12mm.
Type HJ	Cable entry: 3 x Ø 22mm (7/8").
Type HK	Flat bottom, cable entry: no holes.

Panel mount enclosures	
Dimensions	130 x 120 x 60mm (5.12" x 4.72" x 2.36") - W x H x D.
Panel cut-out	115 x 98mm (4.53" x 3.86") L x H.
Type HB	Die-cast aluminum panel mount enclosure IP65 / NEMA 4X.
Weight	600 gr.
Type HC	GRP panel mount enclosure IP65 / NEMA 4X, UV-resistant and flame retardant.
Weight	450 gr.

Hazardous area

Intrinsically Safe (Type XI)	
ATEX certification	II 1 G Ex ia IIB/IIC T4 Ga. II 1 D Ex ia IIIC T100 °C Da IP6X.
IECEx certification	Ex ia IIC/IIB T4 Ga. Ex ia IIIC T100 °C Da IP6X.
Ambient Ta	-40°C to +70°C (-40°F to +158°F).

Explosion proof (Type XF)	
ATEX certification	II 2 GD EEx d IIB T5.
Dimensions	300 x 250 x 200mm (11.8" x 9.9" x 7.9") L x H x D.
Weight	Appr. 15kg.

Signal inputs

Flow meter	
Type P	Coil / sine wave (HI: 20mVpp or LO: 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 flow rate and single pulse. Double pulse max. 3.5kHz without communications and 2.5kHz with communications. Maximum frequency depends on signal type and internal low-pass filter. E.g. reed switch with low-pass filter: max. frequency 120Hz.
K-Factors	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) flow rate. 4mA or 0V equals the minimum (zero) flow rate, it cannot equal a negative flow rate value
Accuracy	10 bit. Error < 0.05%.
Update time	Eight times per second.
Type AA	Active 4 - 20mA output (requires PD, PF or PM).
Type AB	Active 0 - 20mA output (requires PD, PF or PM).
Type AF	Passive floating 4 - 20mA output for Intrinsically Safe applications (requires XI + PC 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 PD, PF or PM).

Digital outputs	
Function	Pulse output and indication negative totalisation.
Frequency	Max. 500Hz. Pulse length user definable between 0.001 second up to 9.999 seconds.
Type OA	Two active 24V DC transistor outputs (PNP); max. 50mA per output (requires 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. Max. 50V DC - 300mA per output.
Note	Output 2 is switched in case a negative acc. total is transmitted.

Communication option	
Function	Reading display information, reading / writing all configuration settings.
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.

Operational

Operator functions	
Displayed functions	• Positive and negative flow rate. • Total (count up and down) and accumulated total. • Total can be reset to zero by pressing the CLEAR-key twice.

Total	
Digits	7 digits.
Units	L, m^3, 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.

Flow rate	
Digits	7 digits.
Units	mL, L, m^3, Gallons, kg, Ton, lb, bl, cf, RND, ft^3, scf, Nm^3, Nl, igal - no units.
Decimals	0 - 1 - 2 or 3.
Time units	/sec - /min - /hr - /day.

Accessories

Mounting accessories	
ACF02	Stainless steel wall mounting kit.
ACF05	Stainless steel pipe mounting kit (worm gear clamps not included).
ACF06	Two stainless steel worm gear clamps Ø 44 - 56mm.
ACF07	Two stainless steel worm gear clamps Ø 58 - 75mm.
ACF08	Two stainless steel worm gear clamps Ø 77 - 95mm.
ACF09	Two stainless steel worm gear clamps Ø 106 - 138mm.

Intrinsically Safe isolators	
ACG01	MTL5511 - One channel pulse or switch output transfer from hazardous area to safe area.
ACG02	MTL5525 - One channel power supply from safe area to hazardous area (e.g. to power the unit with PD or to power a switching or analog device in hazardous area).
ACG03	MTL5541 - One channel 4 - 20mA repeater from hazardous area to safe area.
ACG04	MTL 5051 - Bi-direction serial-data-isolator (for Modbus communication).
ACG05	MTL5516C - Two channel pulse or switch output transfer from hazardous area to safe area.
ACG06	MTL5513 - One channel pulse or switch output transfer from hazardous area to safe area.
ACG07	MTL5546Y - One channel isolated driver bringing 4 - 20mA from safe area to hazardous area, HART transparent, OCD.

Ordering information

Standard configuration: F115-P-AP-CX-EX-HC-IX-OT-PX-TX-XX-ZX.

Ordering information: F115	-_	-A _	-C _	-EX	-H _	-IX	-O _	-P _	-TX	-X _	-Z _
Flow meter input signal											
P Ex **Pulse input: coil, npn, pnp, namur, reed-switch.**											
Analog output signal											
AA Active 4 - 20mA output - requires PD, PF or PM.											
AB Active 0 - 20mA output - requires PD, PF or PM.											
AF Ex I.S. floating 4 - 20mA output - requires XI + PC or PD.											
AI Isolated 4 - 20mA output - requires PB, PD, PF or PM.											
AP Ex **Passive 4 - 20mA output, loop powered unit.**											
AU Active 0 - 10V DC output - requires PD, PF or PM.											
Communication											
CB Communication RS232 - Modbus RTU.											
CH Communication RS485 - 2-wire - Modbus RTU.											
CI Communication RS485 - 4-wire - Modbus RTU.											
CT Ex Intrinsically Safe TTL - Modbus RTU.											
CX Ex **No communication.**											
Flow equations											
EX Ex **No flow equations.**											
Panel mount enclosures - IP65 / NEMA4X											
HB Ex Aluminum enclosure.											
HC Ex **GRP enclosure.**											
GRP field / wall mount enclosures - IP67 / NEMA4X											
HD Ex Cable entry: no holes.											
HE Ex Cable entry: 2 x Ø 16mm & 1 x Ø 20mm.											
HF Ex Cable entry: 1 x Ø 22mm (7/8").											
HG Ex Cable entry: 2 x Ø 20mm.											
HH Ex Cable entry: 6 x Ø 12mm.											
HJ Ex Cable entry: 3 x Ø 22mm (7/8").											
HK Ex Flat bottom, cable entry: no holes.											
Aluminum field / wall mount enclosures - IP67 / NEMA4X											
HA Ex Cable entry: 2 x PG9 flow rate 1 x M20.											
HL Ex Cable entry: 2 x 1/2"NPT.											
HM Ex Cable entry: 2 x M16 flow rate 1 x M20.											
HN Ex Cable entry: 1 x M20.											
HO Ex Cable entry: 2 x M20.											
HP Ex Cable entry: 6 x M12.											
HT Ex Cable entry: 1 x 1/2"NPT.											
HU Ex Cable entry: 3 x 1/2"NPT.											
HV Ex Cable entry: 4 x M20.											
HZ Ex Cable entry: no holes.											
Additional input signal											
IX Ex **No additional input.**											
Digital output signals											
OA Two active transistor outputs - requires PD, PF or PM.											
OR Two mechanical relay outputs - requires PF or PM.											
OT Ex **Two passive transistor outputs - standard configuration.**											
Power requirements											
PB Lithium battery powered.											
PC Ex Lithium battery powered - Intrinsically Safe.											
PD Ex 8 - 24V AC/DC + sensor supply - with XI: 16 - 30V DC.											
PF 24V AC/DC + sensor supply.											
PM 115 - 230V AC + sensor supply.											
PX Ex **Basic power supply 8 - 30V DC (no real sensor supply). Unit requires external loop AP.**											
Temperature input signal											
TX Ex **No temperature input signal.**											
Hazardous area											
XI Ex Intrinsically Safe, according ATEX and IECEx.											
XF EExd enclosure - 3 keys.											
XX Safe area only.											
Other options											
ZB Adjustable backlight.											
ZF Ex Coil input 10mVpp.											
ZX Ex **No options.**											

The bold marked text contains the standard configuration.

Ex Available Intrinsically Safe.

Specifications are subject to change without notice.

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