DATASHEET F126-EL – FLOWCOMPUTER

FLOWCOMPUTER

WITH TEMPERATURE COMPENSATION FOR CORRECTED LIQUID VOLUME

H. HERMANN EHLERS GMBH
Pumpen · Durchflusszähler · Ventile · Armaturen

Advantages

- Robust IP66, 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

- Calculates compensated flow rate, total and accumulated total.
- Displays actual line temperature.
- Selectable on-screen engineering units; volumetric or mass.
- 7 digit resettable total.
- 11 digit accumulated total.
- Explosion/flame proof Ex 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

- (o)4 - 20mA / o - 10V DC according to compensated flow rate.

Signal input

Flow

- Ability to process all types of flowmeter signals: Reed-switch, NAMUR, NPN/PNP pulse, Sine wave (coil), Active pulse signals, (o)4 - 20mA, o - 10V DC.

Temperature

- PT100 - 2 or 3 wire.
- (o)4 - 20mA.
- o - 10V DC.

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!
- Applications where nett flow calculation at base conditions is desired without the influence of thermal product expansion. For DIN panel mount indicators, check our D-Series.

General information

Introduction

The flowcomputer Model F126-EL has been developed to calculate corrected liquid volume at normal conditions for generic products.
The corrected volumetric flow is calculated by using the thermal expansion coefficient algorithm stored in the flowcomputer. The reference temperature can be defined as desired, e.g. 15°C, 20°C or 60°F. A typical application is flow calculation of water, fuel or chemicals at base conditions. A wide selection of options further enhances the capabilities of this model, including Intrinsic Safety and full Modbus communication.

Display

The display has large 17mm (0.67") and 8mm (0.31") digits which can be set to show flow rate, total and temperature. On-screen engineering units are easily configured from a comprehensive menu. The accumulated total can register up to 11 digits and is backed-up in EEPROM memory every minute.

Configuration

All configuration settings are accessed via a simple operator menu which can be pass-code protected. Each setting is clearly indicated with an alphanumerical description, which avoids 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 are safely stored in EEPROM memory in the event of sudden power failure.

Analog output signal

The calculated flow rate is re-transmitted with the (0)4 - 20mA or 0 - 10V DC output signal. The output signal is updated ten times per second with a filter function being available to smoothen out the signal if desired.
The output value is user defined in relation to the flow rate, e.g. 4mA equals to 15Nm³/Hr and 20mA equals to 2000Nm³/Hr. The output signal can be passive, active or isolated where the passive output type will loop power the F126-EL as well.

Signal input

The flowcomputer measures the uncorrected volumetric flow and actual line temperature.
The F126-EL will accept most pulse and analog input signals for flow. For temperature measurement, 2 or 3 wire PT100 elements or sensors with a (0)4 - 20mA / 0 - 10V DC output signal can be used.

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).

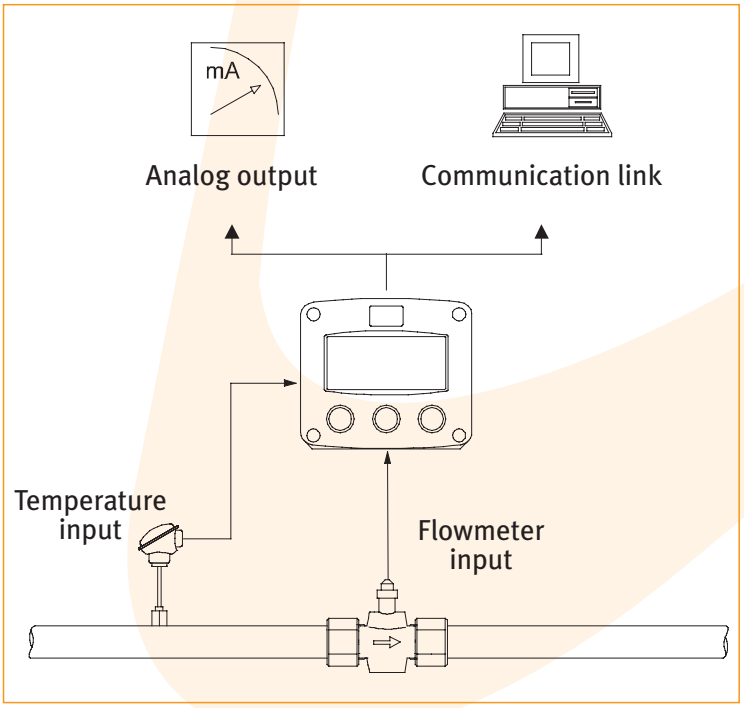
Hazardous areas

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

Enclosures

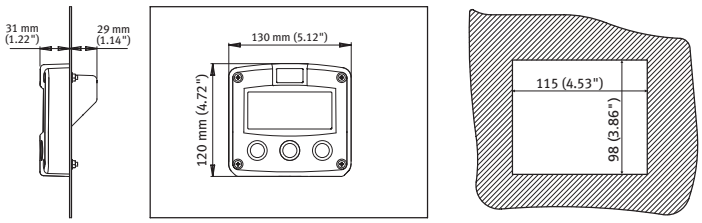
Various types of enclosures can be selected, all ATEX and IECEx approved. As standard the F126-EL is supplied in an GRP panel mount enclosure, which can be converted to an IP67 / NEMA 4X GRP field mount enclosure by the addition of a back case. Most popular is our rugged aluminum field mount enclosure with IP67 / NEMA 4X rating. Both European or U.S. cable gland entry threads are available.

Overview application F126-EL



Dimensions enclosures

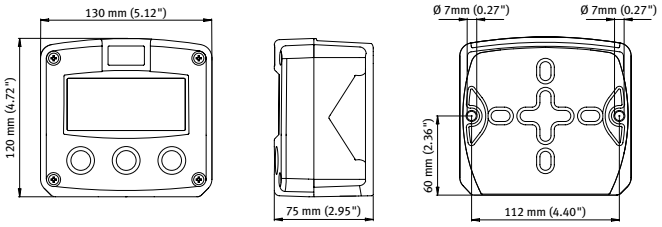
Aluminum & GRP panel mount enclosure



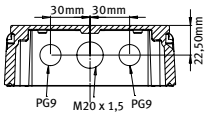
HB & HC enclosures

panel cut-out

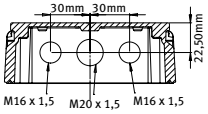
Aluminum & GRP field / wall mount enclosures



Aluminum



HA



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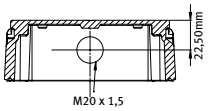

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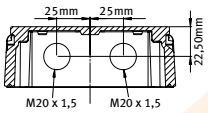

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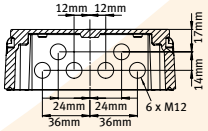

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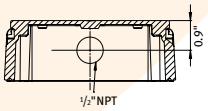

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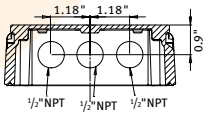
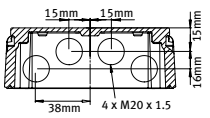


HU



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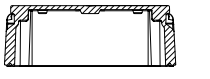
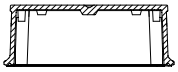


HZ

GRP



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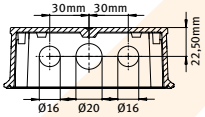
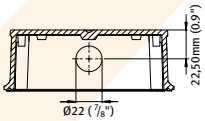


HE



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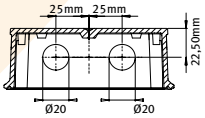

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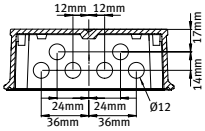

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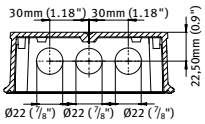
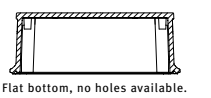


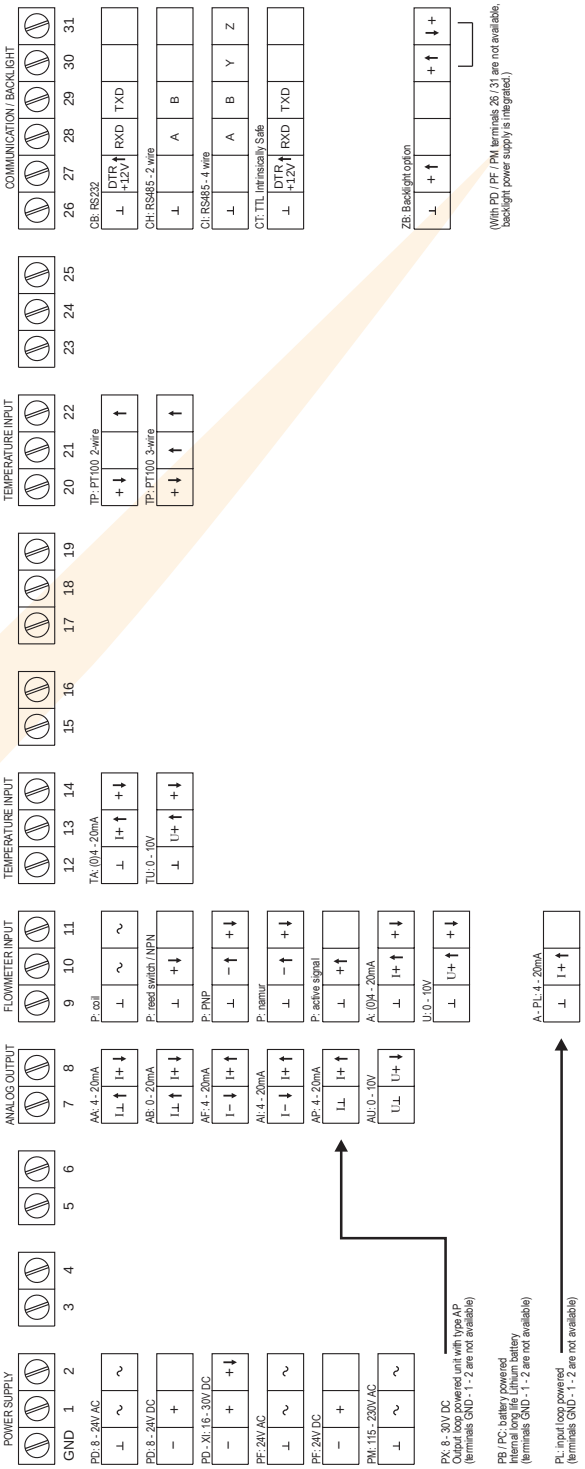
HJ



HK

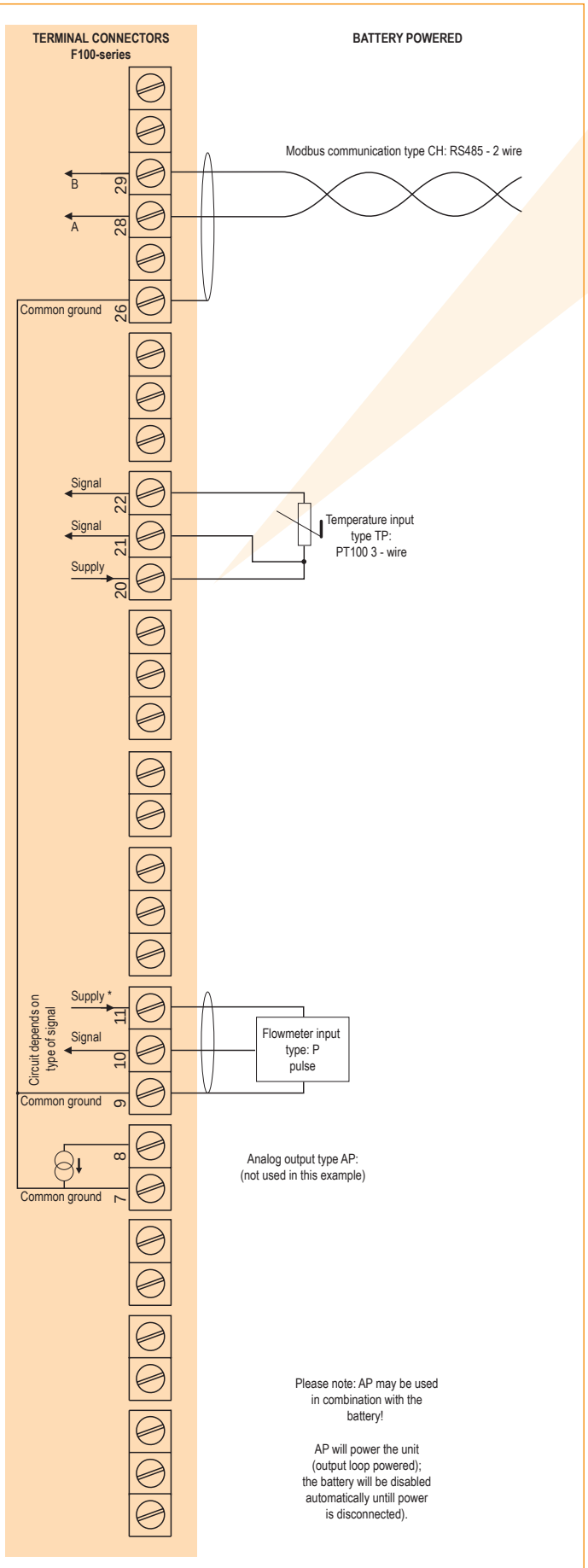
Flat bottom, no holes available.

Terminal connections



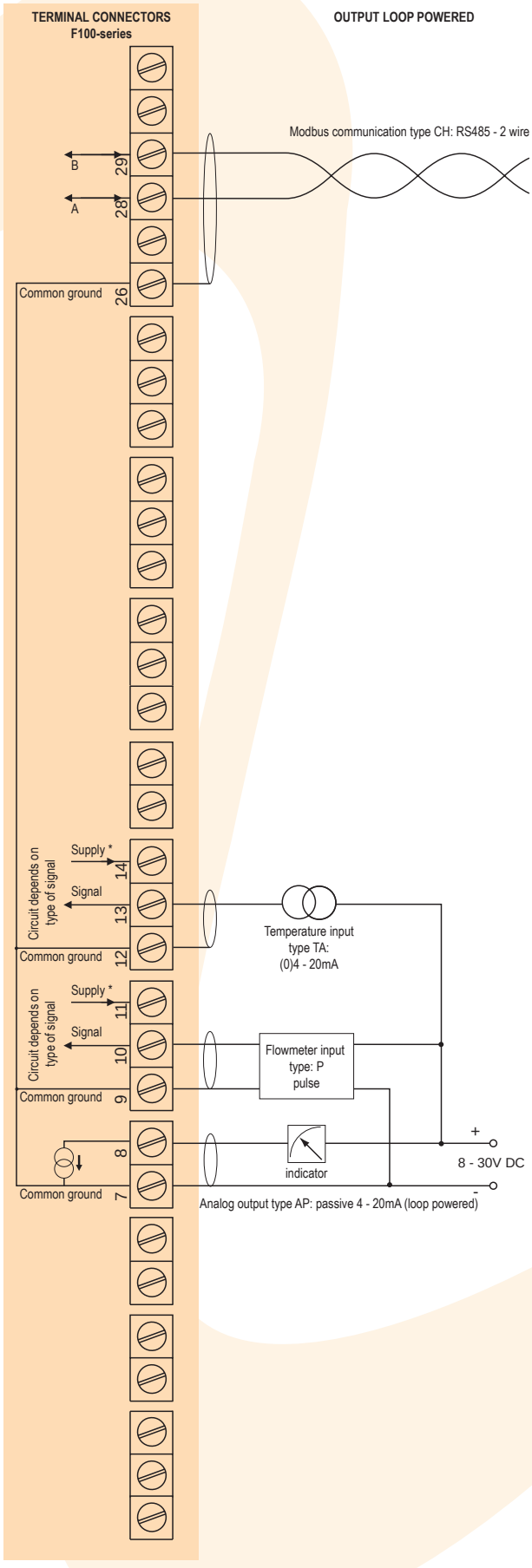
Display example - 90 x 40mm (3.5" x 1.6")

Typical wiring diagram F126-P-(AP)-CH-EL-PB-TP



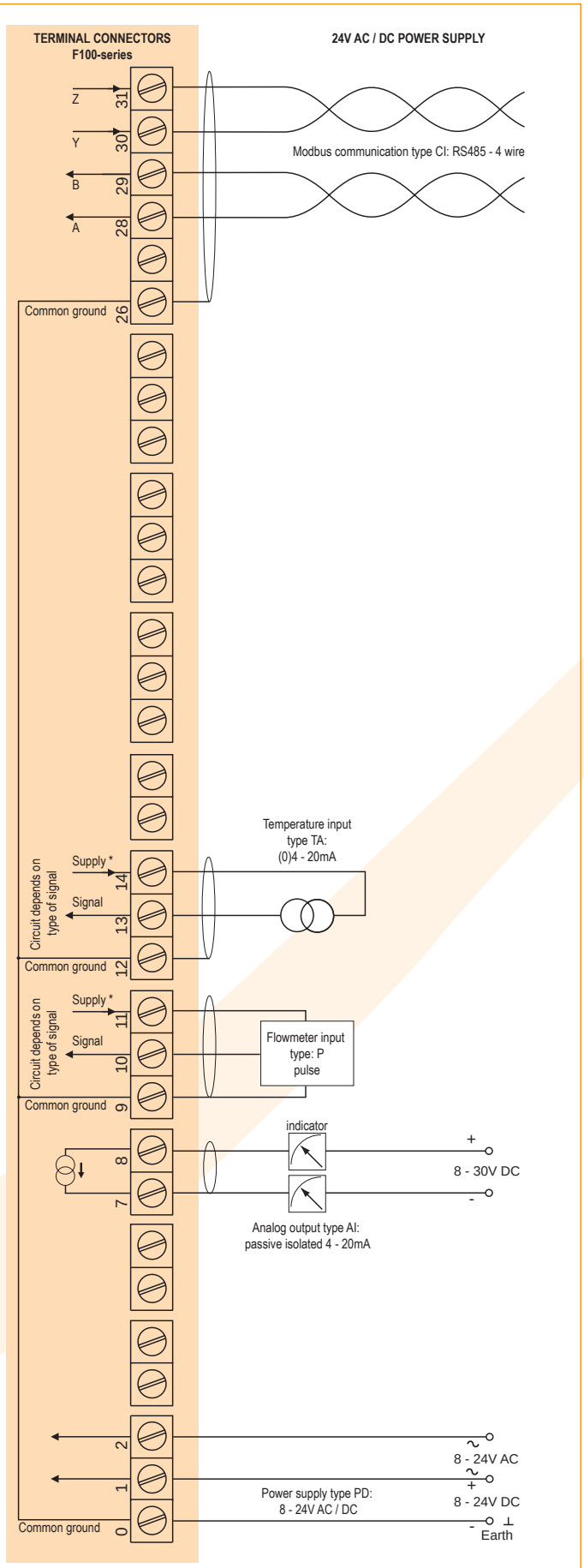
*Supply voltage: 1.2 / 3.2V DC to sensor

Typical wiring diagram F126-P-AP-CH-EL-PX-TA



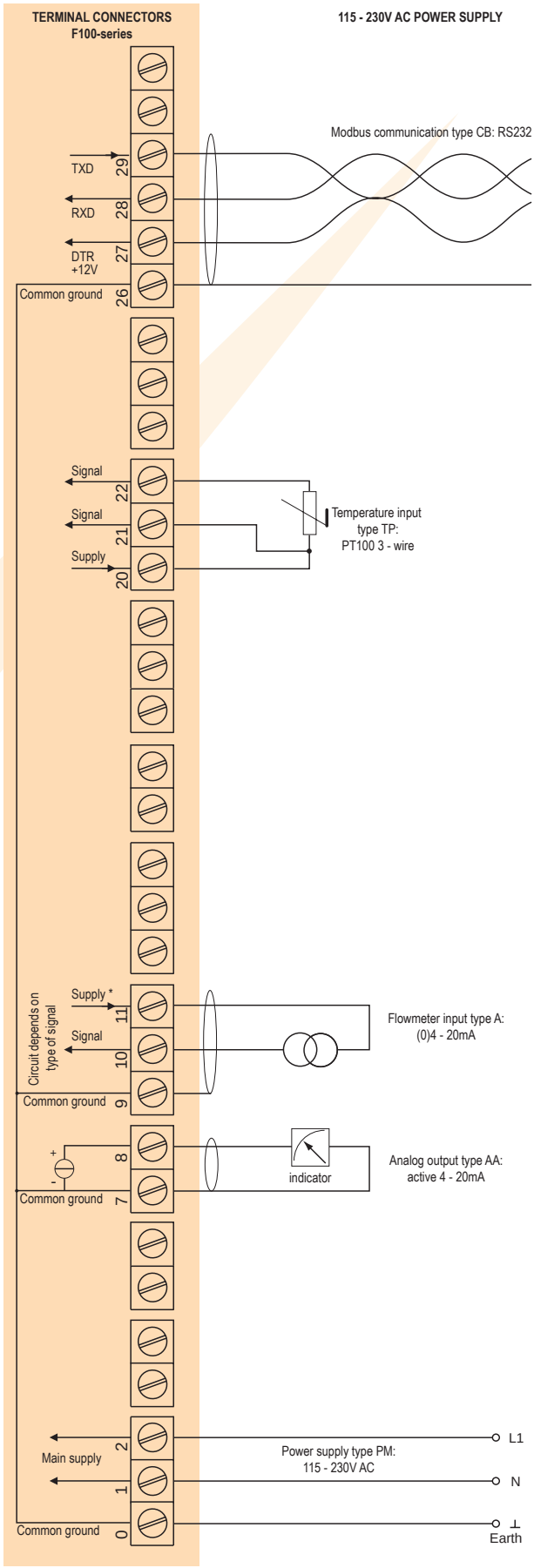
*Supply voltage: 1.2 / 3.2V DC to sensor

Typical wiring diagram F126-P-AI-CI-EL-PD-TA



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

Typical wiring diagram F126-A-AA-CB-EL-PM-TP



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

Hazardous area applications

The F126-EL-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.**

It is allowed to connect up to four barriers in IIB/IIIC applications or one barrier in IIC applications. Consult the certificate for the maximum input and output values of the circuits. Full functionality of the F126-EL remains available, including 4 - 20mA output according to the flow rate and Modbus communication (type CT). Power supply type PD-XI offers a 8.2V sensor supply e.g. for one Namur sensor and a temperature 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.

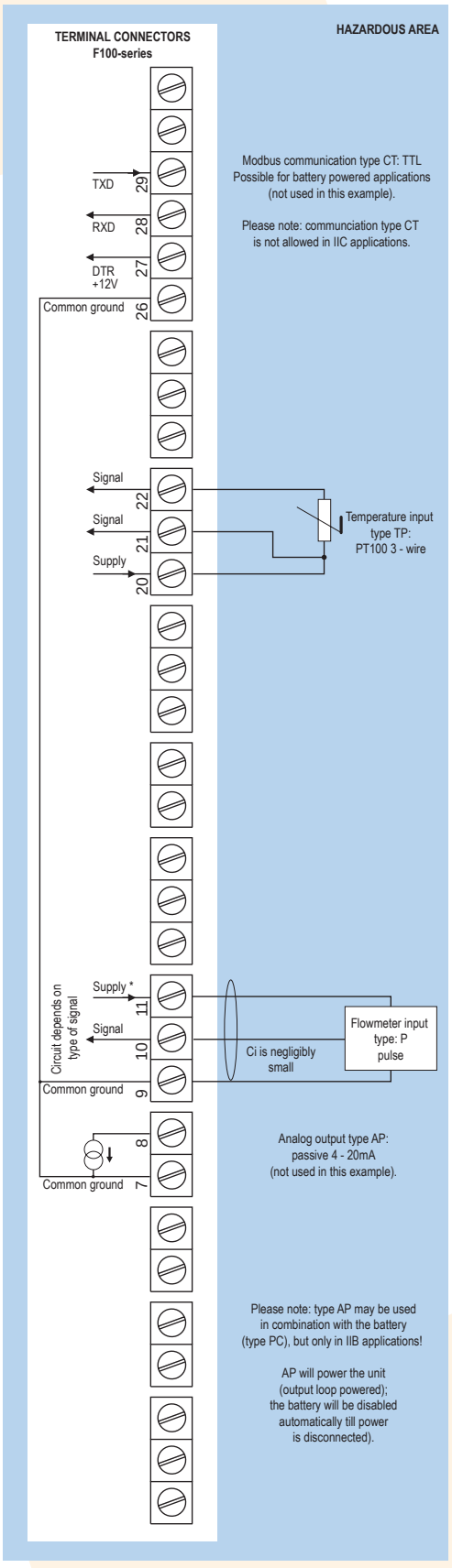
Certificate of conformity KEMA 03ATEX1074 X
• IECEx DEK 11.0042X

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres

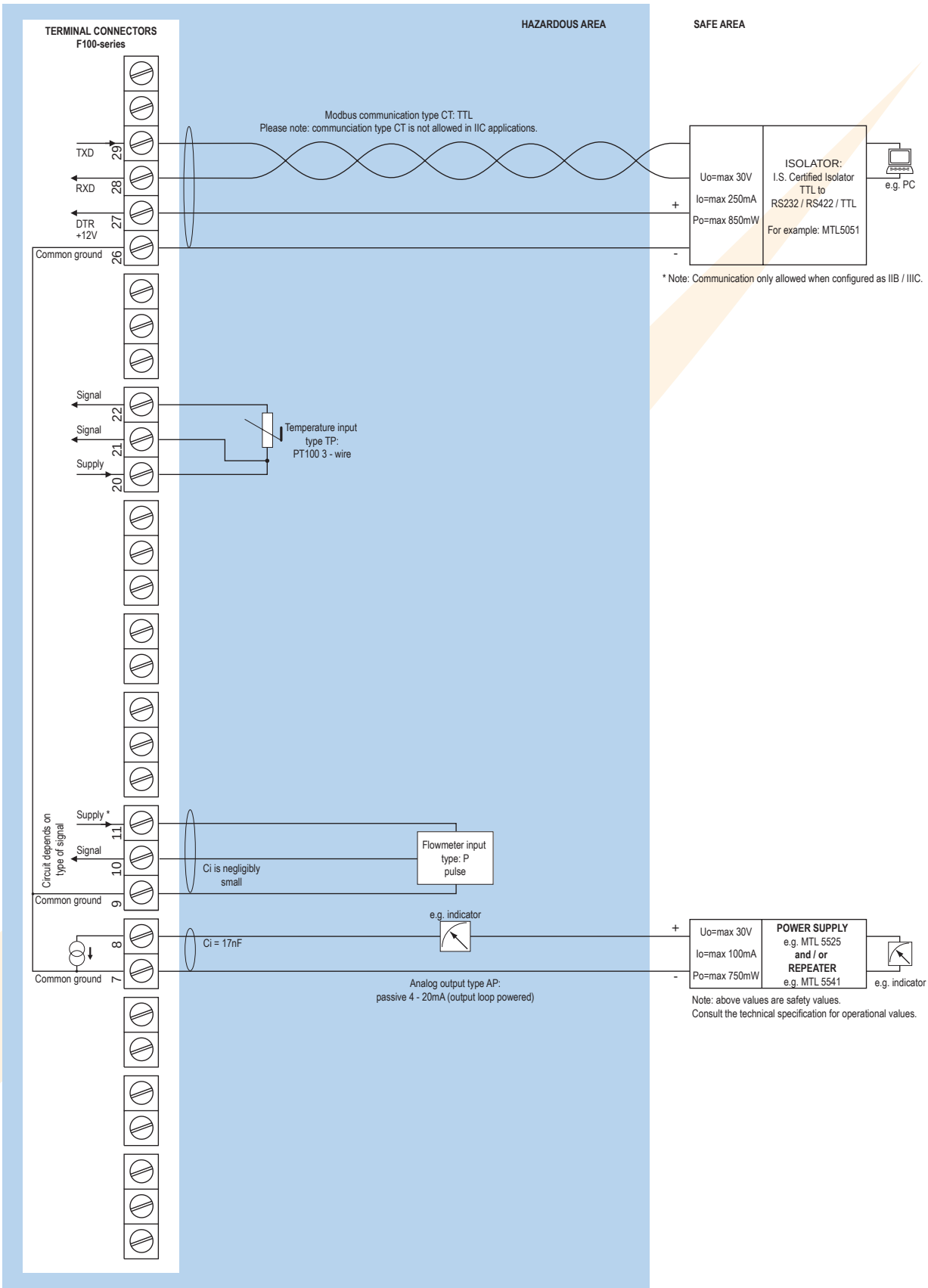
CERTIFICATE
EC-Type Examination

Configuration example IIB / IIIC and IIC
F126-P-(AP)-(CT)-EL-PC-TP-XI - Battery powered unit



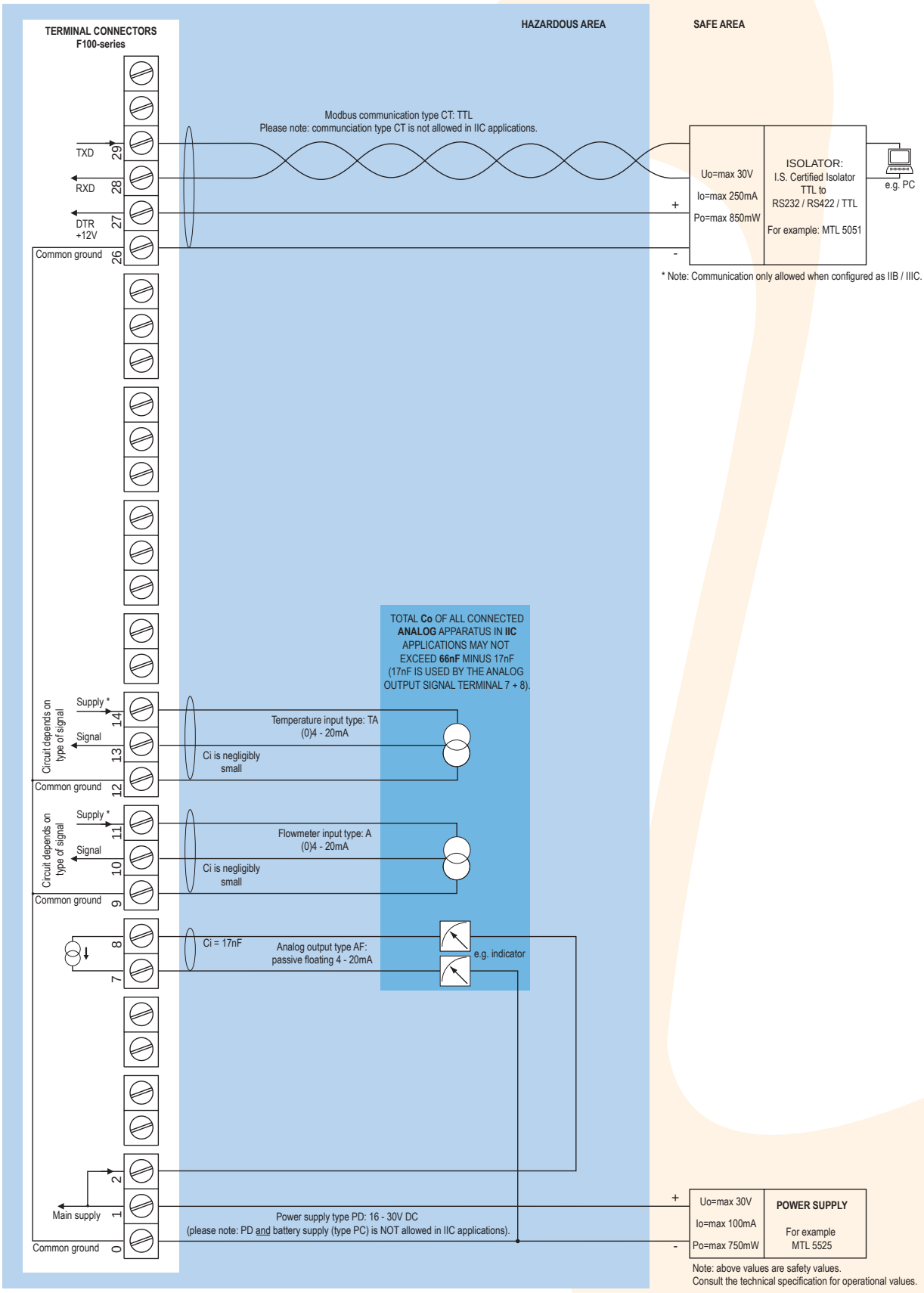
* Note sensor supply voltage: 1.2V DC for coil sensors or 3.2V DC for other pulse sensors.

Configuration example IIB / IIIC and IIC - F126-P-AP-(CT)-EL-PX-TP-XI - Output loop powered



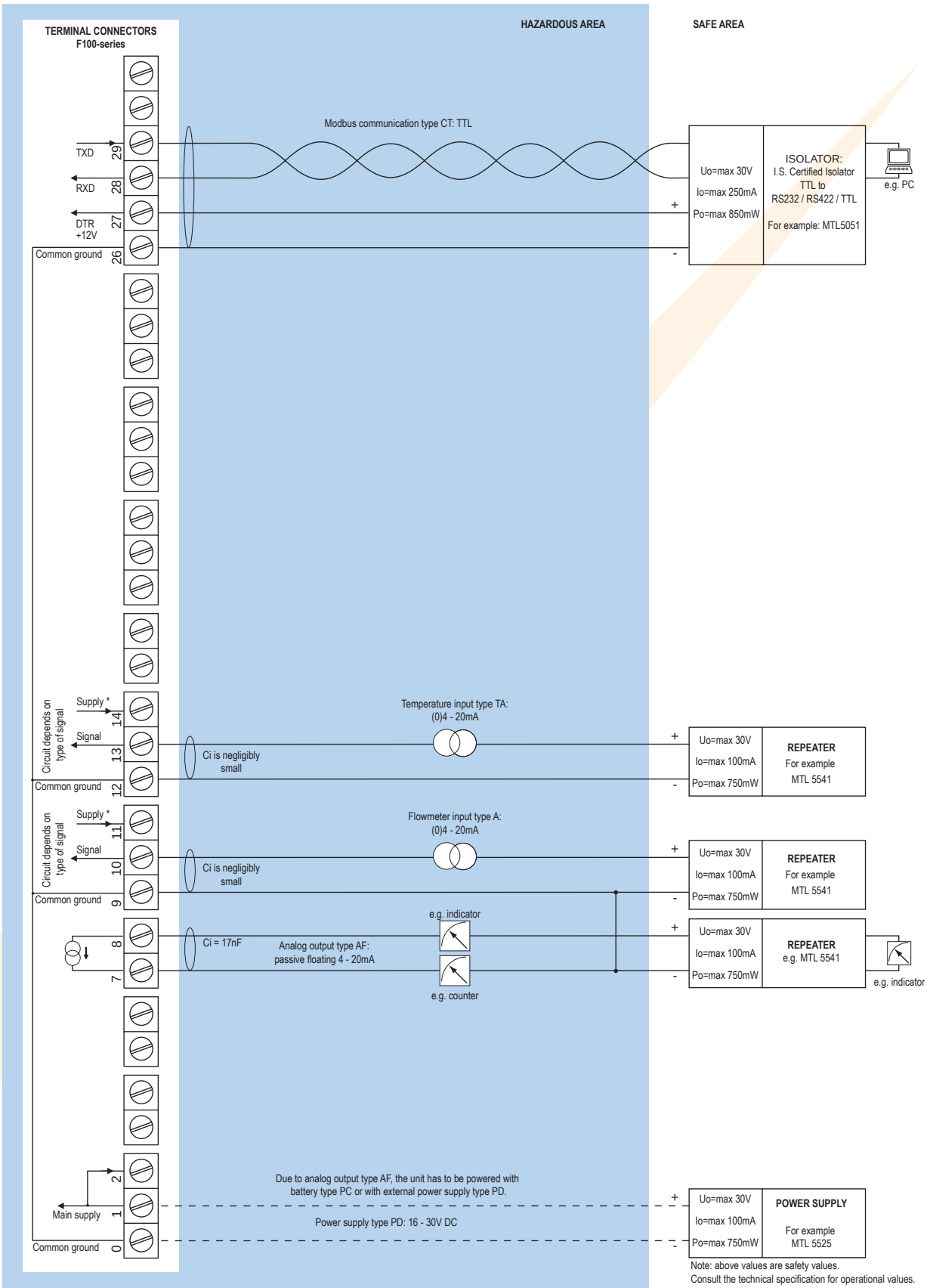
* Note sensor supply voltage: 1.2V DC for coil sensors or 3.2V DC for other pulse sensors.

Configuration example IIB / IIIC and IIC - F126-A-AF-(CT)-EL-PD-TA-XI - Power supply 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 - F126-A-AF-CT-EL-(PC)-(PD)-TA-XI - Power supply 16 - 30V DC or battery powered



* 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 green LED backlight. Good readings in full sunlight and darkness.
Note ZB	Only available for safe area applications.

Operating temperature	
Standard unit	-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 PL	Input loop powered from sensor signal 4 - 20mA (type "A") - requires types AI or AF (not Xi).
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).
Note	In case PD-XI and signal A or U: the sensor supply voltage is according to the power supply voltage connected to terminal 1. The sensor supply of the second analog input is fixed 8.2V DC.
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.
Pass-code	Configuration settings can be pass-code protected.

Casing

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 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.

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

Signal inputs

Flowmeter	
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.
Frequency	Minimum 0Hz - maximum 7kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. E.g. reed switch with low-pass filter: max. frequency 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.
Type A	(0)4 - 20mA. Analog input signal can be scaled to any desired range within 0 - 20mA.
Type U	0 - 10V DC. Analog input signal can be scaled to any desired range within 0 - 10V DC.
Accuracy	Resolution: 14 bit. Error < 0.025mA / ± 0.125% FS. Low level cut-off programmable.
Span	0.000010 - 9,999,999 with variable decimal position.
Update time	Four times per second.
Voltage drop	Type A: 2.5V @ 20mA.
Load impedance	Type U: 3kOhm.
Relationship	Linear and square root calculation.
Note	For signal type A and U: external power to sensor is required; e.g. type PD.

Temperature	
Accuracy	Resolution: 14 bit. Error < 0.025mA / ± 0.125% FS. Low level cut-off programmable.
Update time	Four times per second.
Type TA	(0)4 - 20mA. Analog input signal can be scaled to any desired range within 0 - 20mA.
Span	0.000010 - 9,999,999 K with variable decimal position.
Offset	0.00 - 99,999.99 K.
Voltage drop	2.5V @ 20mA.
Type TP	2 or 3 wire PT100.
Range	-100°C to +200°C (-148°F to 392°F). Accuracy 3°C (5.4°F).
Option ZV	Range: -200°C to +800°C (-328°F to 1832°F). Accuracy 3°C (5.4°F).
Type TU	0 - 10V DC. Analog input signal can be scaled to any desired range within 0 - 10V DC.
Span	0.000010 - 9,999,999 K with variable decimal position.
Offset	0.00 - 99,999.99 K.
Load impedance	3kOhm.
Note 1	For signal TA and TU: power supply to temperature sensor is required; e.g. PD.

Signal outputs

Analog output	
Function	Transmitting compensated flow rate.
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 PD or PM).
Type AB	Active 0 - 20mA output (requires PD 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, PL or PM).
Type AP	Passive 4 - 20mA output - not isolated. Unit will be loop powered.
Type AU	Active 0 - 10V DC output (requires PD or PM).

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	• Compensated flow rate. • Compensated total and accumulated total. • Actual line temperature. • 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.

Line temperature	
Digits	6 digits.
Units	°C, °F or K.
Decimals	1.

Flow equations	
Type EL	Corrected liquid volume.
Formula	$Q_{normal} = Q \times (1 + \alpha (T_{normal} - T))$ where α = thermal expansion coefficient.
Normal temp.	Default: 273.15 K - any temperature can be set.

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.
ACF10	Customized Grevopal tagplates for ACF02 and ACF05, including stainless steel screws. Dimension: 95mm x 12.5mm (3.75" x 0.50").

Ordering information

Standard configuration: F126-P-AP-CX-EL-HC-IX-OX PX-TA-XX-ZX.

Ordering information: F126	-_	-A _	-C _	-EL	-H _	-IX	-OX	-P _	-T _	-X _	-Z _

Flowmeter input signal

A	Ex	(o)4 - 20mA input.
P	Ex	**Pulse input: coil, npn, pnp, namur, reed-switch.**
U	Ex	0 - 10V DC input.

Analog output signal

AA		Active 4 - 20mA output - requires PD or PM.
AB		Active 0 - 20mA output - requires PD or PM.
AF	Ex	I.S. floating 4 - 20mA output - requires XI + PC or PD.
AI		Isolated 4 - 20mA output - requires PB, PD, PL or PM.
AP	Ex	**Passive 4 - 20mA output, loop powered unit.**
AU		Active 0 - 10V DC output - requires PD or PM.

Communication

CB		Communication RS232 - Modbus RTU.
CH		Communication RS485 - 2wire - Modbus RTU.
CI		Communication RS485 - 4 wire - Modbus RTU.
CT	Ex	Intrinsically Safe TTL - Modbus RTU.
CX	Ex	**No communication.**

Flow equations

EL	Ex	**Corrected liquid volume.**

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 + 1 x M20.
HM	Ex	Cable entry: 2 x M16 + 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 inputs

IX	Ex	**No additional input.**

Outputs

OX	Ex	**No output.**

Power supply

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.
PL		Input loop powered from sensor signal type "A" - requires AI or AF and OT (not Xi).
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

TA	Ex	**(o)4 - 20mA input.**
TP	Ex	PT100 input.
TU	Ex	0 - 10V DC input.

Hazardous area

XI	Ex	Intrinsically Safe, according ATEX and IECEx.
XF		EExd enclosure - 3 keys.
XX		**Safe area only.**

Other options

ZB		Backlight.
ZF	Ex	Coil input 10mVpp.
ZV	Ex	PRTD-range -200°C / +800°C.
ZX	Ex	**No options.**

The bold marked text contains the standard configuration.

Ex Available Intrinsically Safe.