DATASHEET F016 - FLOW RATE INDICATOR / TOTALIZER

FLOW RATE INDICATOR / TOTALIZER

WITH LINEARIZATION AND PULSE SIGNAL OUTPUT

Features

- Displays instantaneous flow rate, total and accumulated total.
- Eight point linearization of the flowcurve - with interpolation.
- Large 17mm (0.67") digit selection for flow rate or total.
- Ability to process all types of pulse flowmeter signals.
- Auto backup of settings and running totals.
- Operational temperature -40°C up to +80°C (-40°F up to 176°F).
- Very compact design for panel mount, wall mount or field mount applications.
- Rugged aluminum field mount enclosure IP67/NEMA4X.
- Intrinsically Safe - ATEX, IECEx, FM and CSA approval for gas and dust applications.
- Explosion/flame proof Ex II 2 GD EEx d IIB T5.
- LED backlight option.
- Battery powered, 8 - 24V AC/DC or 115 - 230V AC power supply.
- Sensor supply 3.2 / 8.2 / 12 / 24V DC.

Signal output

- Scaled pulse output according to linearised accumulated total.

Signal input

Flow

- Reed-switch.
- NAMUR.
- NPN/PNP pulse.
- Sine wave (coil).
- Active pulse signals.

Applications

- Liquid flow measurement with mechanical flowmeters where a precise calculation over the full measurement range is required. Also re-transmission of the totalizer function is desired. Alternative more advanced models: F112 - F118.

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General information

Introduction

The F016 is a local indicator with linearization to display the actual flow rate, total and non-resettable accumulated total. In addition to the average K-Factor or Span, eight linearization points can be entered with there frequencies or values. The unit will interpolate between these points greatly enhancing accuracy in any flowrange. Even for very low frequency applications is catered for. This linearization affects all displayed information as well as the pulse output. A wide selection of options further enhances the capabilities of this model, including Intrinsic Safety.

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. The accumulated total can register up to 11 digits and is backed-up in EEPROM memory every minute, just as the running total. A smart display update function achieves a readable display even at -40°C / -40°F.

Backlight

For those applications where readability during day and night is an issue, a bi-color backlight is available. The background color green or amber and the intensity can be adjusted from the keyboard. The display is a transflective type, which means that a high contrast reading is guaranteed in full sunlight as well as during the night. This backlight option is also available Intrinsically Safe.

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. Once familiar with one F-series product, you will be able to program all models in the series without a manual.

Pulse output

The scaleable pulse output reflects the count on the accumulated display. The pulse length is user defined from 0.001 second up to 10 seconds. The maximum output frequency is 500Hz. The output signal can be a passive NPN or an active PNP transistor, or an isolated electro-mechanical relay.

Signal input

The F016 accepts most pulse input signals for volumetric flow or mass flow measurement. The input signal type can be selected by the user in the configuration menu without having to adjust any sensitive mechanical dip-switches, jumpers or trimmers.

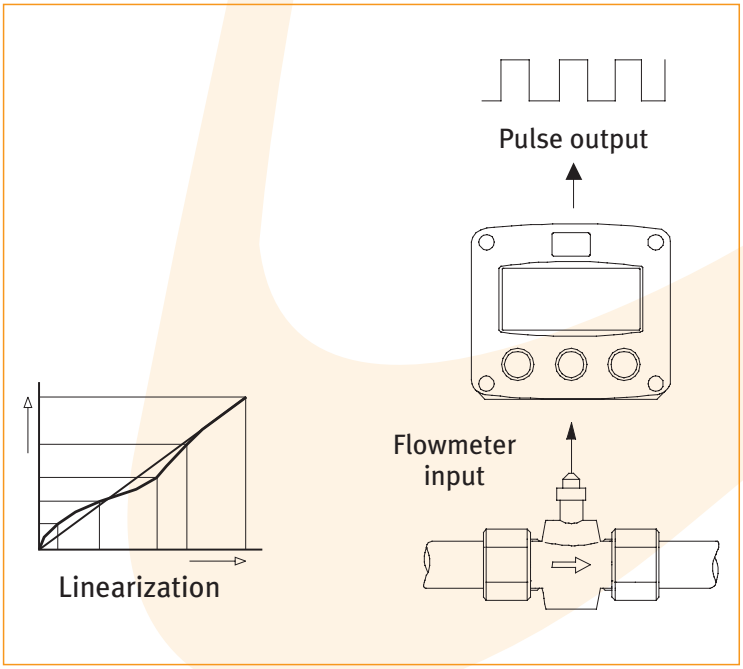
Hazardous area

For hazardous area applications, this model has been ATEX, IECEx, FM and CSA 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 Ex II 2 GD EEx d IIB T5.

Enclosures

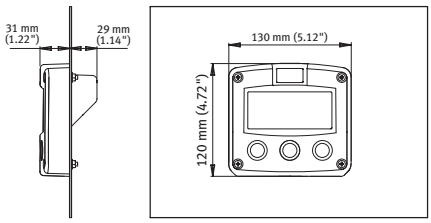
Various types of enclosures can be selected, all ATEX, IECEx, FM and CSA approved. As standard the F016 is supplied in an GRP panel mount enclosure. Most popular is our aluminum field mount enclosure with IP67 / NEMA 4X rating. Both European or U.S. cable gland entry threads are available.

Overview application F016

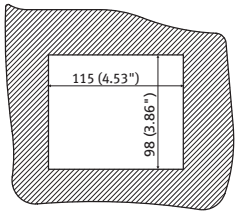


Dimensions enclosures

Aluminum & GRP panel mount enclosure

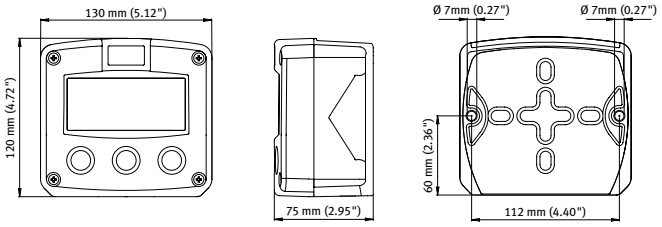


HB & HC enclosures

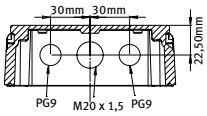


panel cut-out

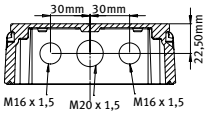
Aluminum & GRP field / wall mount enclosures



Aluminum



HA



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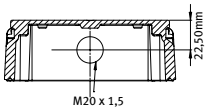

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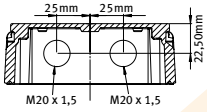

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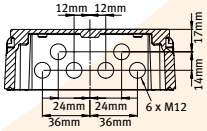

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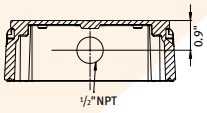

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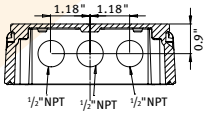

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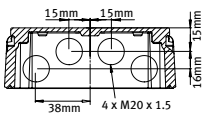
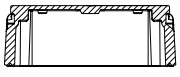
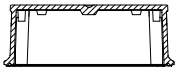


HV

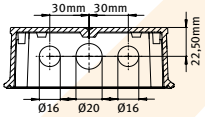


HZ

GRP



HD



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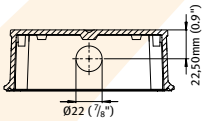

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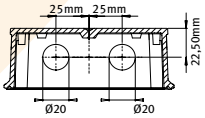

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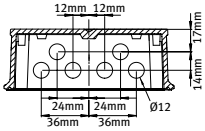

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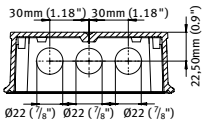

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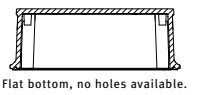
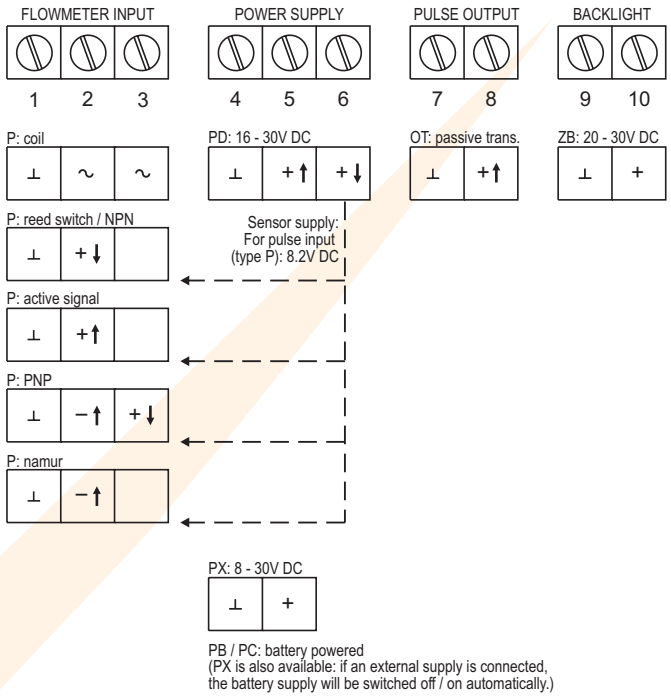


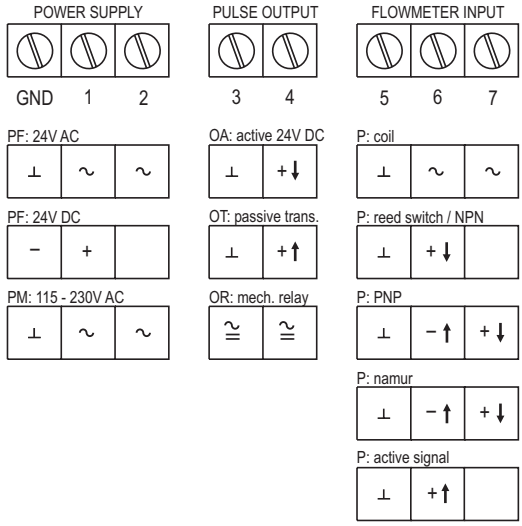
HK

Flat bottom, no holes available.

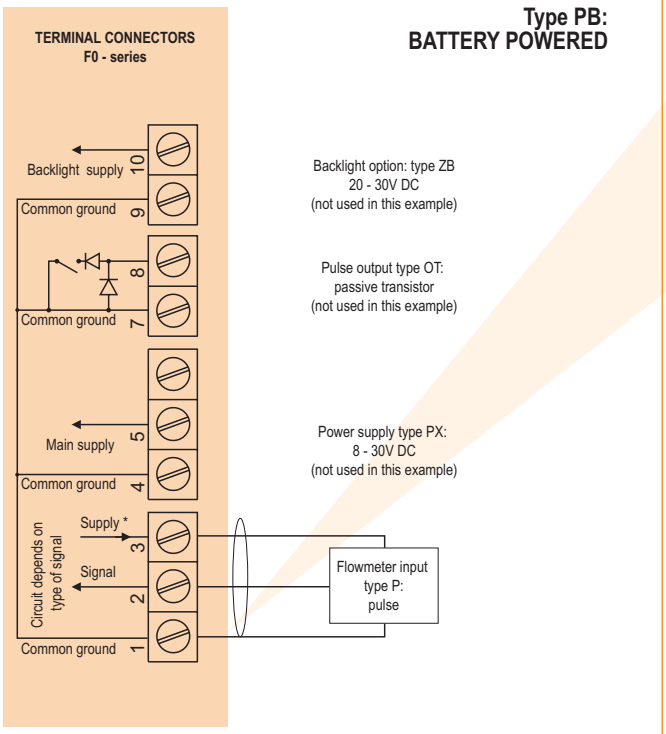
Terminal connections power supply PB/PC - PD - PL - PX



Terminal connections power supply PF - PM

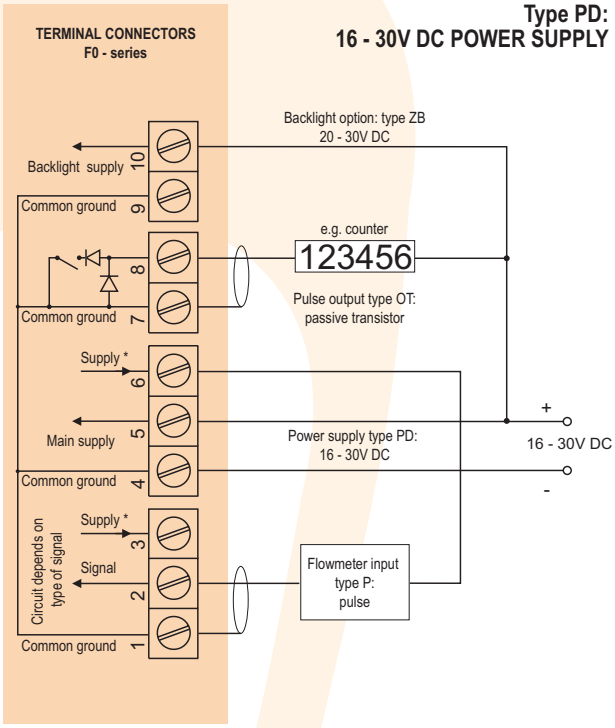


Typical wiring diagram Fo16-P-(OT)-PB-(PX)-(ZB)



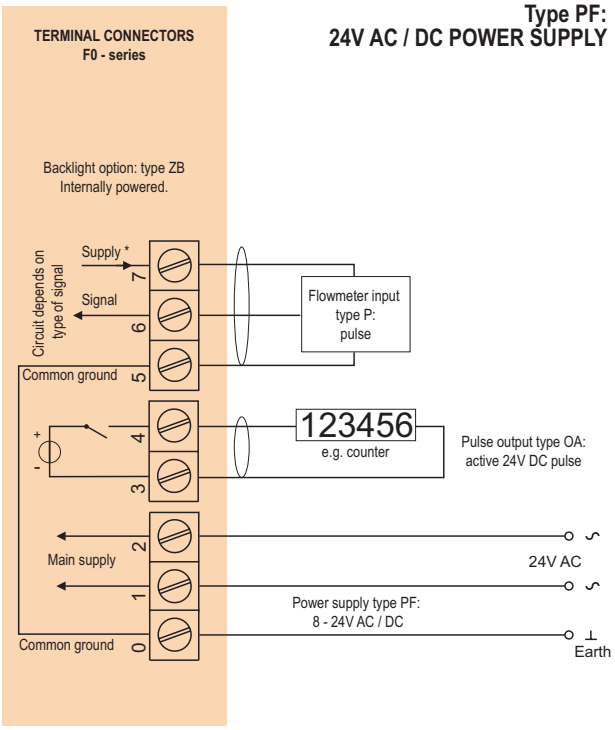
* Sensor supply voltage for pulse flowmeter type P:
Terminal 3: 1.2 / 3.2V DC.

Typical wiring diagram Fo16-P-OT-PD-ZB



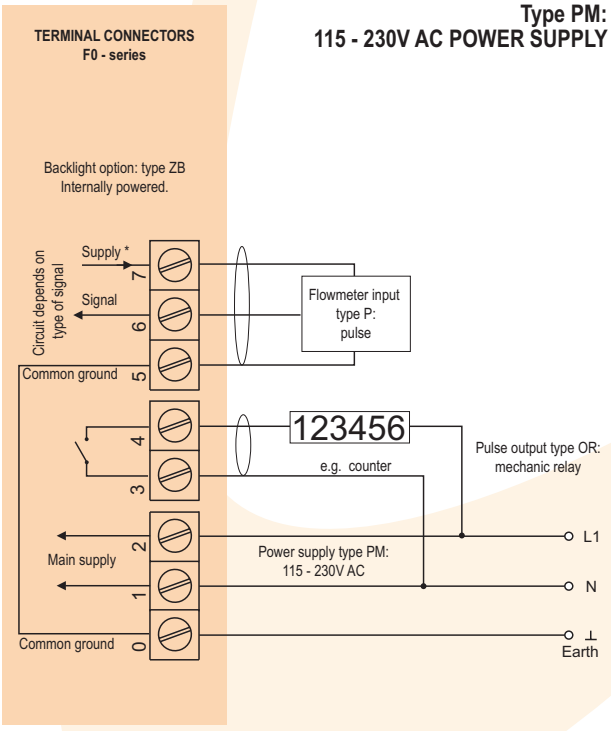
* Sensor supply voltage for pulse flowmeter type P:
Terminal 3: 1.2 / 3.2V DC. Terminal 6 with type PD: 8.2V DC.

Typical wiring diagram Fo16-P-OA-PF-ZB



* Sensor supply voltage for pulse flowmeter type P:
Terminal 7: 1.2 / 3.2 / 8.2 / 12 / 24V DC.

Typical wiring diagram Fo16-P-OR-PM-ZB



* Sensor supply voltage for pulse flowmeter type P:
Terminal 7: 1.2 / 3.2 / 8.2 / 12 / 24V DC.

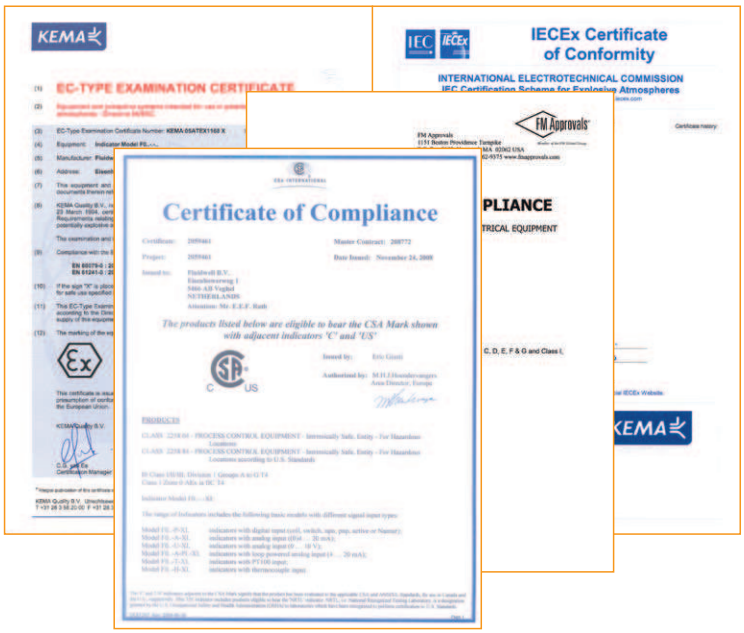
Hazardous area applications

The F016-XI has been certified according ATEX and IECEx by KEMA and according CSA c-us and FM for use in Intrinsically Safe applications with an ambient temperature of -40°C to +70°C (-40°F to +158°F).

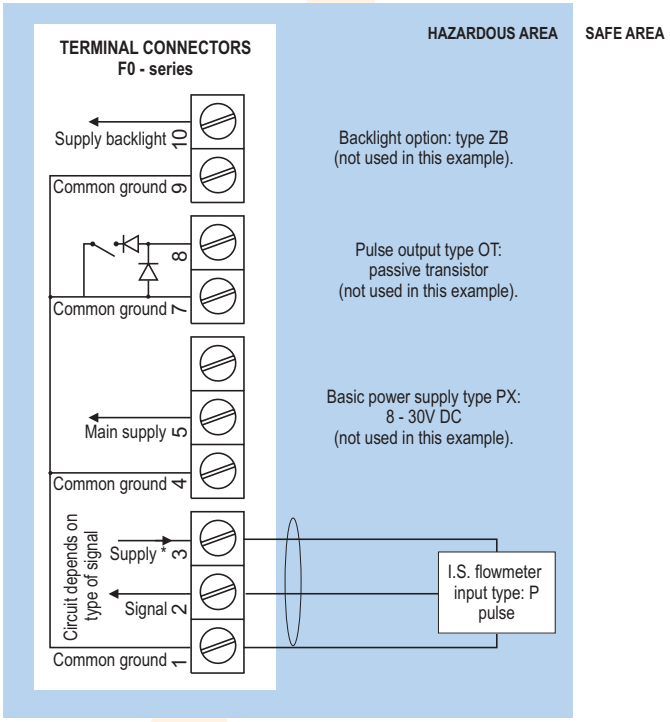
- The ATEX markings for gas and dust applications are:
  II 1 G Ex ia IIC T4
  II 1 D Ex iaD 20 IP 65/67 T 100 °C.
- The IECEx markings for gas and dust applications are: **Ga Ex ia IIC T4** and **Ex iaD 20 IP 65/67 T100 °C**.
- The CSA c-us markings are: **Class I/II/III, Division 1, Groups A, B, C, D, E, F, G, Temperature class T4** and **Class I, Zone 0, AEx ia IIC T4**.
- The FM markings are: **Class I/II/III, Division 1, Groups A, B, C, D, E, F, G, Temperature class T4** and **Class I, Zone 0, AEx ia IIC T4**.

It is allowed to connect up to three I.S. power supplies to power the unit, sensor and back-light. Consult the certificate for the maximum input and output values of the circuits. The F016-PD-XI offers a 8.2V DC sensor supply to power e.g. a Namur sensor or the input voltage to power an analog sensor. An ATEX approved flame proof enclosure with rating II 2 GD EEx d IIB T5 is available as well. Please contact your supplier for further details.

Certificate of conformity KEMA 05ATEX1168 X • IECEx KEM 08.0006X • CSA.08.2059461 X

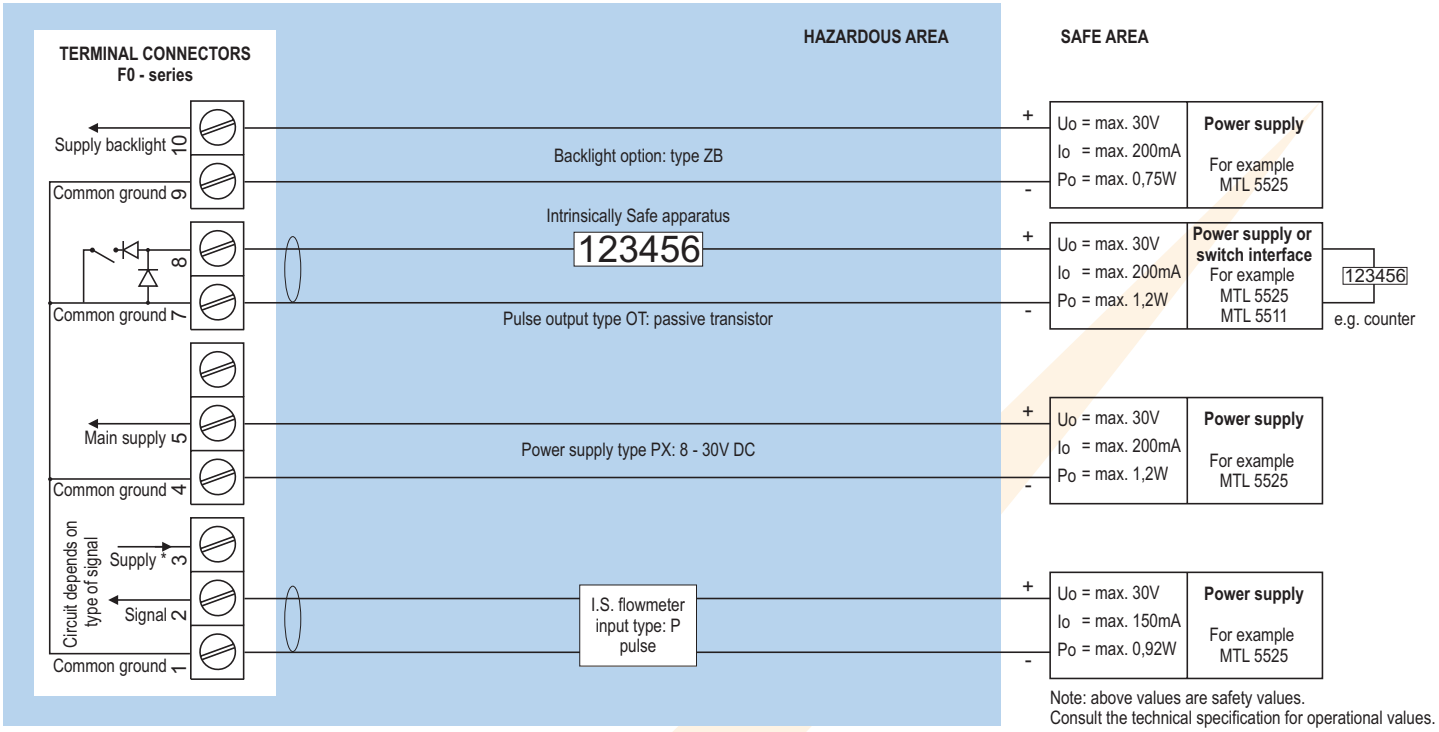


Configuration example IIA - IIB and IIC
Fo16-P-(OT)-PC-(PX)-XI-(ZB) - Battery powered unit



* Sensor supply voltage for pulse flowmeter type P : Terminal 3: 1.2 / 3.2V DC.
Please note: type PX may be used in combination with the battery (type PC).
PX will power the unit; the battery will be disabled automatically till power is disconnected.

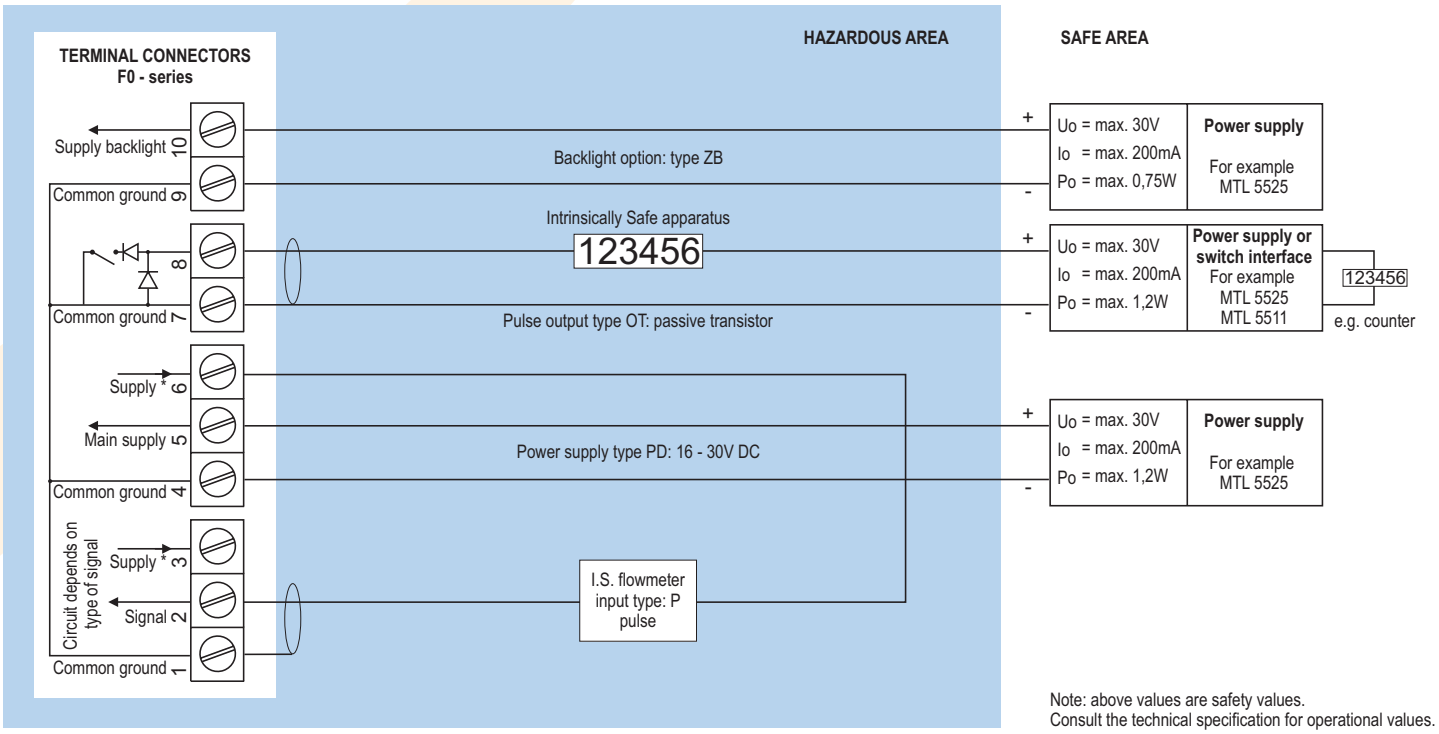
Configuration example IIA - IIB and IIC - Fo16-P-OT-PX-XI-ZB - Basic power supply 8 - 30V DC



Note: above values are safety values.
Consult the technical specification for operational values.

* Sensor supply voltage for pulse type P: Terminal 3: 1.2V / 3.2V DC.
Please note: type PX may be used in combination with the battery (type PC). PX will power the unit; the battery will be disabled automatically till power is disconnected.

Configuration example IIA - IIB and IIC - Fo16-P-OT-PD-XI-ZB - Power supply 16 - 30V DC



Note: above values are safety values.
Consult the technical specification for operational values.

* Sensor supply voltage for pulse type P: Terminal 3: 1.2V / 3.2V DC. Terminal 6: 8.2V DC.
Please note: type PD may be used in combination with the battery (type PC). PD will power the unit; the battery will be disabled automatically till power is disconnected.

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. - 1 time/30 secs - off.
Option ZB	Transflective LCD with bi-color LED-backlight; green / amber. Intensitiy and color selected trough the keyboard. Good readings in full sunlight and darkness. Also available Intrinsically Safe.

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	16 - 30V DC. Power consumption max. 1 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. 0.3 Watt.
Type ZB	20 - 30V DC. Power consumption max. 1 Watt. With type PF / PM: internally powered.
Note PB/PF/PM	Not available Intrinsically Safe.
Note PF/PM	The total consumption of the sensor, active output type OA and backlight type ZB may not exceed 400mA @ 24V DC.
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	for pulse signals: 1.2 / 3.2 / 8.2V DC - max. 5mA@8.2V DC. For analog signals, the sensor supply voltage is according to the power supply voltage connected.
Type PF / PM	With pulse input: 1.2 / 3.2 / 8.2 / 12 / 24V DC - max. 400mA @ 24V DC. With analog input: 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.

ABS wall / field mount enclosures	
General	Silicone free ABS wall/field mount enclosure IP65 with EPDM and PE sealings. UV-resisitant polyester keypad (old HD enclosure).
Dimensions	130 x 114 x 71mm (5.1" x 4.5" x 2.8") - W x H x D.
Weight	450 gr.
Type HS	Cable entry: no holes.

Hazardous area

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

Intrinsically Safe	
ATEX certification	II 1 G Ex ia IIC T4. II 1 D Ex iaD 20 IP 65 / 67 T 100 °C.
IECEx certification	Ga Ex ia IIC T4. Ex iaD 20 IP 65 / 67 T 100 °C.
CSA c-us certification	Intrinsically Safe for Class I/II/III, Div. 1, Groups A, B, C, D, E, F, G, Temp. class T4 and Class I, Zone 0, AEx ia IIC T4.
FM certification	Intrinsically Safe for Class I/II/III, Div. 1, Groups A, B, C, D, E, F, G, Temp. class T4 and Class I, Zone 0, AEx ia IIC T4.
Ambient Ta	-40°C to +70°C (-40°F to +158°F).

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

Signal input

Flowmeter sensor	
Type P	Coil / sine wave (minimum 20mVpp or 80mVpp - sensitivity selectable), NPN/PNP, open collector, reed-switch, Namur, active pulse signals 8 - 12 and 24V 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.
Option ZG	coil sensitivity 5mVpp.

Signal output

Pulse output	
Function	Pulse output - transmitting accumulated total.
Frequency	Max. 500Hz. Pulse length user definable between 1msec up to 10 seconds.
Type OA	One active 24V DC transistor output (PNP); load max. 400mA (requires PF or PM).
Type OR	One electro-mechanical relay output - isolated; max. switch power 230V AC (N.O.) - 0.5A (requires PF or PM).
Type OT	One passive transistor output (NPN) - not isolated. Max. 50V DC - 300mA per output.

Operational

Operator functions	
Displayed functions	• Linearised flow rate and / or total. • Linearised total and accumulated total. • Total can be reset to zero by pressing the CLEAR-key twice.

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.

Flow rate	
Digits	7 digits.
Units	mL, L, m³, Gallons, kg, Ton, lb, bl, cf, RND, ft³, scf, Nm³, 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.
ACF10	Customized Grevopal tagplates for ACF02 and ACF05, including stainless steel screws. Dimension: 95mm x 12.5mm (3.75" x 0.50").

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

Ordering information

Standard configuration: Fo16-P-HC-OT-PX-XX-ZX.

ordering information:		F016	-_	-H _	-O _	-P _	-X _	-Z _
Flowmeter Sensor input signal								
P	Ex	**Pulse input: coil, npn, pnp, namur, reed-switch.**						
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 ½"NPT.						
HU	Ex	Cable entry: 3 x ½"NPT.						
HV	Ex	Cable entry: 4 x M20.						
HZ	Ex	Cable entry: no holes.						
ABS field / wall mount enclosures - IP65								
HS	Ex	Silicone free ABS field enclosure – Cable entry: no holes (old HD enclosure).						
Output								
OA		One active transistor output - requires PF or PM.						
OR		One mechanical relay output - requires PF or PM.						
OT	Ex	**One passive transistor output - standard configuration.**						
Power supply								
PB		Lithium battery powered.						
PC	Ex	Lithium battery powered - Intrinsically Safe.						
PD	Ex	16 - 30V DC + sensor supply.						
PF		24V AC / DC + sensor supply.						
PM		115 - 230V AC + sensor supply.						
PX	Ex	**Basic power supply 8 - 30V DC (no real sensor supply).**						
Hazardous area								
XI	Ex	Intrinsically Safe, according ATEX, IECEx, CSA c-us and FM.						
XF		EExd enclosure - 3 keys.						
XX		**Safe area only.**						
Other options								
ZB	Ex	Backlight.						
ZF	Ex	Coil input 10mVpp.						
ZG	Ex	Coil input 5mVpp.						
ZX	Ex	**No options.**						

The bold marked text contains the standard configuration.

Ex Available Intrinsically Safe.

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