

Flow rate Monitor / Totalizer

with linearization, pulse/alarm and analog outputs and HART communication



HART
COMMUNICATION PROTOCOL



Application examples: Extreme cold weather regions



Hot and sandy deserts



Red flashing LED backlight in case of a flow rate alarm.

The F-Series is your first and safest choice for field mount indicators in safe and hazardous area applications. Especially in harsh weather conditions like rain, snow, salty atmospheres and temperatures between -40°C up to +80°C (-40°F up to 176°F).

Advantages

- Robust aluminum or stainless steel 316L field enclosure (IP67 / NEMA Type4X). It is so rugged, a truck can even stand on it!
- Intrinsically Safe available - ATEX, IECEx, FM and CSA 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

- Fifteen point linearization of the flowcurve - with interpolation.
- Displays instantaneous flow rate, total and accumulated total.
- 2 alarm values can be entered: low and high flow rate alarm.
- Large 17mm (0.67") digits for flow rate or total.
- Red flashing LED backlight in case of a flow rate alarm.
- Ability to process all types of signals: Sine wave (coil), NAMUR, NPN/PNP pulse, Reed-switch, Active pulse signals.
- HART communication.
- 1 configurable digital output for alarm, scaled pulse output of the linearized accumulated total or input retransmission.
- Galvanically isolated, loop powered 4 - 20mA output according to the linearized flow rate.
- Output loop powered, battery powered or 8 - 30V DC.
- Sensor supply: 3.2 / 8.2 / 12 / 24V DC.
- Auto backup of settings and running totals.

Introduction

The F018 is a local indicator with linearization, that displays the actual flow rate, resettable total and non-resettable accumulated total. The F-Series is known worldwide as a range of user-friendly indicators. The F018 is even more impressive. The HART communication with specific DD allows you to communicate in an easy way with other smart field devices and control / monitoring systems.

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.

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 all series without a manual.

Power requirements

Several power inputs are available to power the F018 and Flowmeter. As standard the F018 can be loop powered via the isolated, two-wire, analog output. The battery powered version with a long life lithium battery is both available for safe area and intrinsically safe applications. The basic 8 - 30V DC (PX) can power the F018, but doesn't offer a real sensor supply when the backlight requires at least 20V DC. A real sensor supply of 8.2, 12 or 24V is optional available with type PD (16 - 30V DC).



Backlight

For those applications where readability during day and night is an issue, a white backlight is available with red (flashing) backlight during alarm conditions. Good readings in full sunlight and darkness. Also available Intrinsically Safe.

Linearization

In addition to the average K-Factor or Span, fifteen linearization points can be entered with their frequencies or values. The unit will interpolate between these points greatly enhancing accuracy in any flow range, even for very low frequency applications. This linearization affects all displayed information as well as the signal outputs.

Analog output signal

The linearized flow rate is re-transmitted with the galvanically isolated 4 - 20mA output signal. With the output signal a filter function is available to smoothen out the signal if desired. The F018 can even be powered via the loop-current.

Pulse / Alarm outputs

One digital output is available, that can be set as an alarm output to transmit the flow rate alarm or as a scaled/unscaled pulse output. The alarm output can be set to switch for a low, high or both alarms! The scaled pulse output reflects the count on the accumulated display. The pulse width is user defined from 0.001 up to 10 seconds. The unscaled pulse output retransmits the incoming pulse signal. The maximum output frequency is 500Hz. The output is a passive NPN signal.



All info
at a glance



Easy
to install



Easy
to program



Know one
know them all!



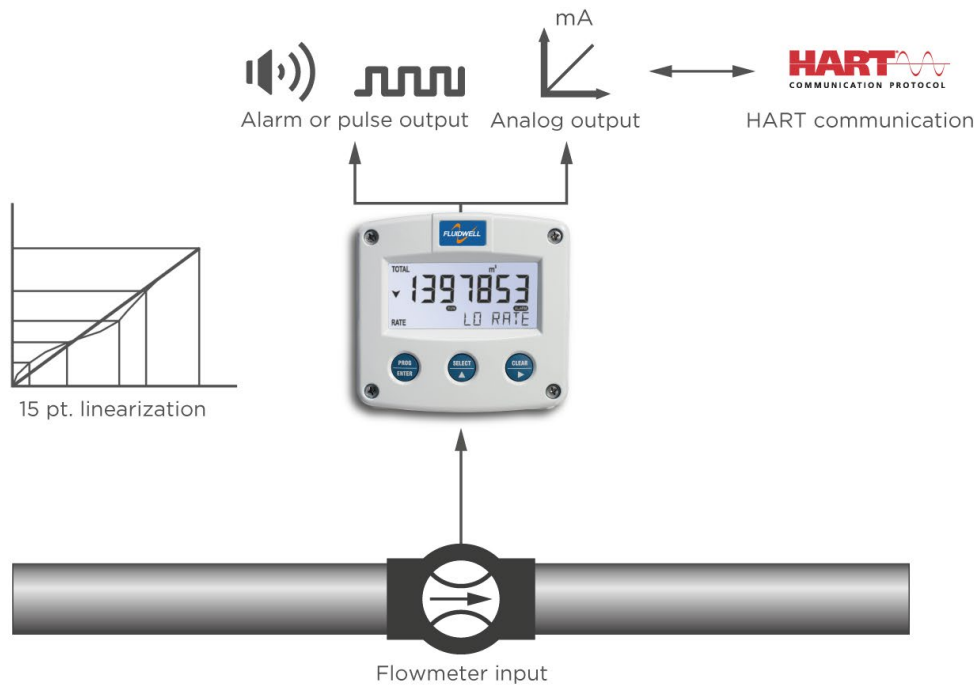
Reliable



User-friendly

Overview application F018

The F-Series is your first and safest choice for field mount indicators in safe and hazardous area applications. Especially in harsh weather conditions like rain, snow, salty atmospheres and temperatures between -40°C up to +80°C (-40°F up to 176°F). Flow rate monitoring with a precise calculation over the full measurement range, where re-transmission of the totalizer and monitoring of the flow rate function and HART communication is required. Alternative basic models: F016, F112, F118 or the explosion proof E018 with HART communication.



Signal input

The F018 accepts most pulse input signals for volumetric flow or mass flow measurement.

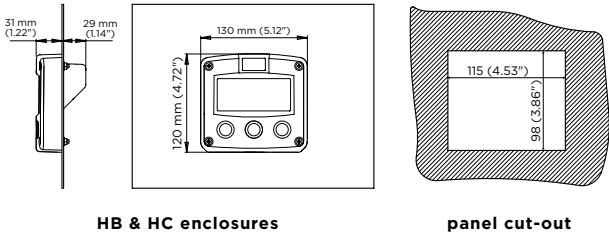
Type of signal	Resistance	Low Pass filter (LP)	Max. frequency	Max. frequency Low Pass filter (LP)	Min. amplitude p-p	Remark
NPN	100kΩ pull-up	100kΩ pull-up	6kHz Threshold 1.2V	1.2kHz		Open collector
REED	1MΩ pull-up	1MΩ pull-up	600Hz Threshold 1.2V	120Hz		
PNP	47KΩ pull-down	100KΩ pull-down	6kHz Threshold 1.2V	1.2kHz		
NAMUR	820Ω pull-down	-	4kHz	-		External power required
COIL LO	-	-		-	90mV _{pp}	Default sensitivity
COIL-HI	-	-	-	-	20mV _{pp}	Sensitive for interference!
COIL-HI (Type ZF)					10mV _{pp}	
COIL-HI (Type ZG)					5mV _{pp}	
ACTIVE 8.2V DC	3K9Ω		10kHz Threshold 4V			External power required
ACTIVE 12V DC	4KΩ		10kHz Threshold 6V			External power required
ACTIVE 24V DC	3KΩ		10kHz Threshold 12V			External power required

Enclosures

Various types of enclosures can be selected, all ATEX, IECEx, FM and CSA approved. The F018 is supplied in an GRP panel mount enclosure as standard, which can be converted to an IP67 / NEMA 4X GRP field mount enclosure by the addition of a back case. Most popular is our robust aluminum field mount enclosure which is also available with an extended backcover with undrilled preparation for direct meter mounting at the back side. It is so rugged, even a truck can stand on it! For the most challenging environments we have a durable high grade Stainless steel 316L enclosure. All enclosures have a IP67 / NEMA Type4X rating and EU or U.S. cable gland entry threads available.

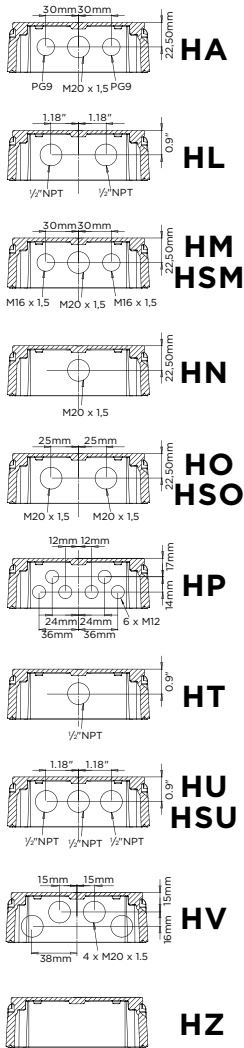
Dimensions enclosures

Aluminum & GRP panel mount enclosure

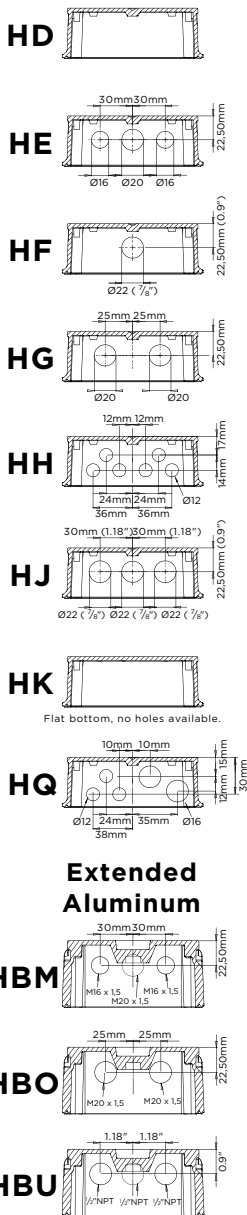


Cable entries

Aluminum / Stainless Steel

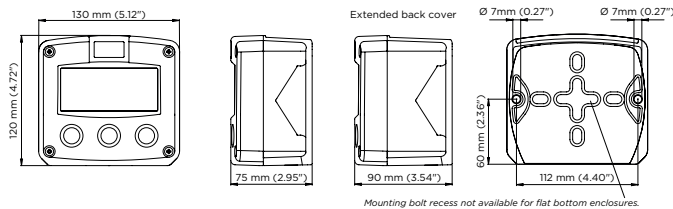


GRP

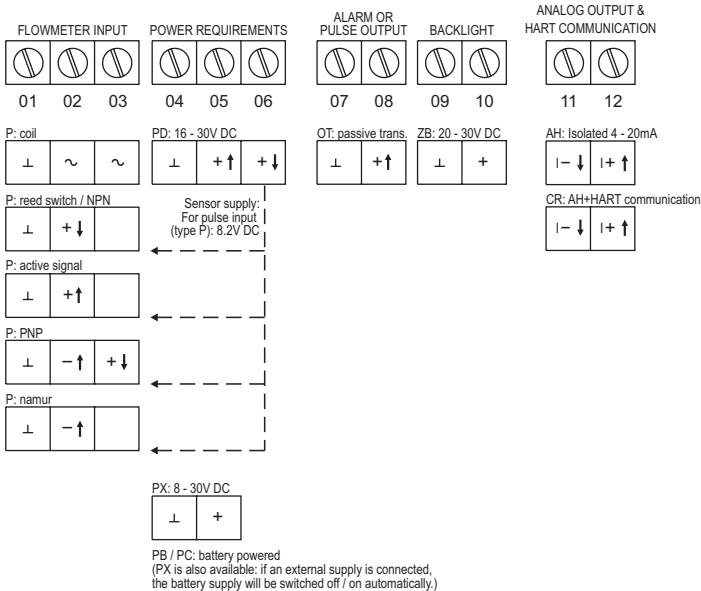


Extended Aluminum

Aluminum, GRP & Stainless steel 316L field mount enclosures



Terminal connections
PB/PC - PD - PX

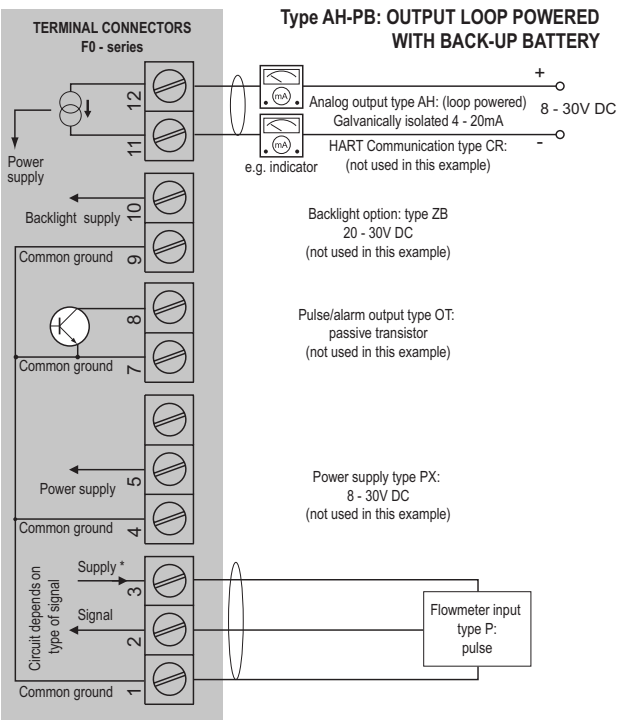


HART Communication

All process data and every single menu setting can easily be read and modified via the HART communication link with a free downloadable device-specific DD. This guarantees that they will operate hassle free with other registered DD enabled host systems. Fluidwell lifts the user-friendly configuration to the next level! The HART functionality is also Intrinsically Safe available.

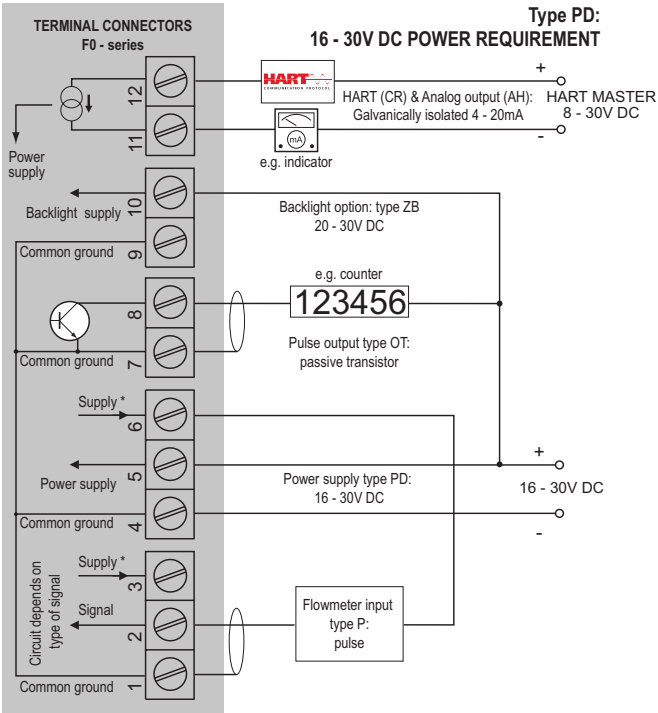


Configuration example F018-P-AH-CX-PB-(PX)-XX-(ZB)



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

Configuration example F018-P-AH-OT-PD-XX-ZB



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

Hazardous area applications

The F018 has been certified according to ATEX and IECEx by DEKRA and according to 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). For equipment category 1 D (EPL Da), -40°C to +50°C (-40°F to +122°F).

- The ATEX markings for gas and dust applications are:

Gas: **II 1 G Ex ia IIC T4 Ga.**
Dust: **II 1 D Ex ia IIIC T₂₀₀ 100 °C Da.**

- The IECEx markings for gas and dust applications are:

Gas: **Ex ia IIC T4 Ga**
Dust: **Ex ia IIIC T₂₀₀ 100 °C Da.**

- The CSA c-us markings are:

IS Class I/II/III, Division 1, Groups A to G T4.
Class 1 Zone 0 AEx ia IIC T4 Ga.
Ex ia IIC T4 Ga.

- The FM markings are:

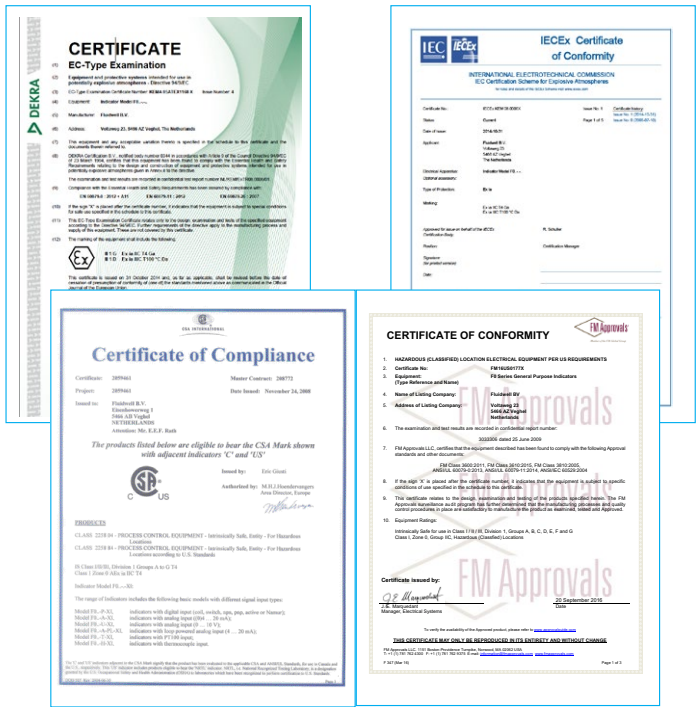
IS, Class I, II, III, Division 1, Groups A to G T4.
Class I, Zone 0, AEx ia IIC T4

It is allowed to connect up to three I.S. power supplies to power the unit, sensor and backlight. Consult the certificate for the maximum input and output values of the circuits. The F018-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. Please contact your supplier for further details.

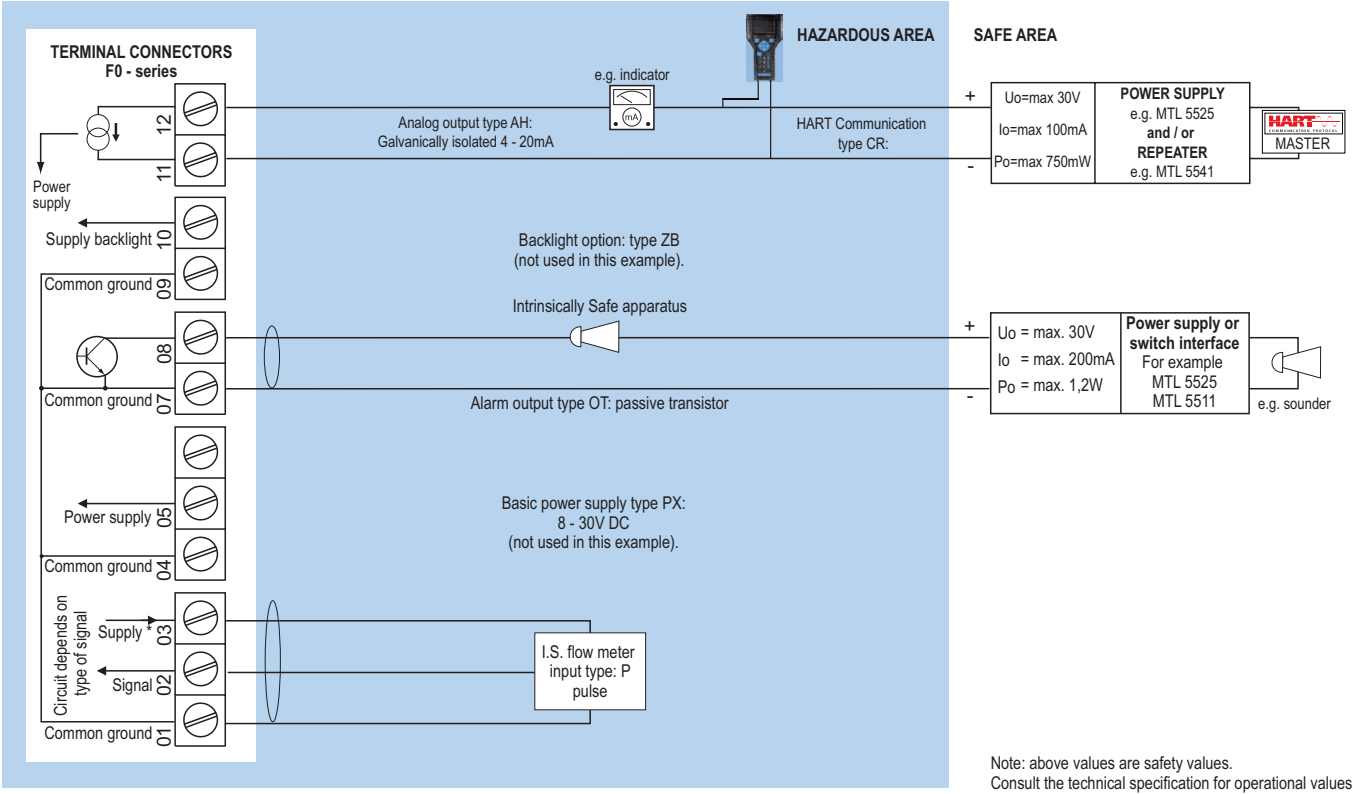
Note: Extended aluminum enclosures are not available with CSA c-us and FM approvals.

Certificate of conformity KEMA 05ATEX1168 X • IECEx KEM 08.0006X

• CSA.08.2059461

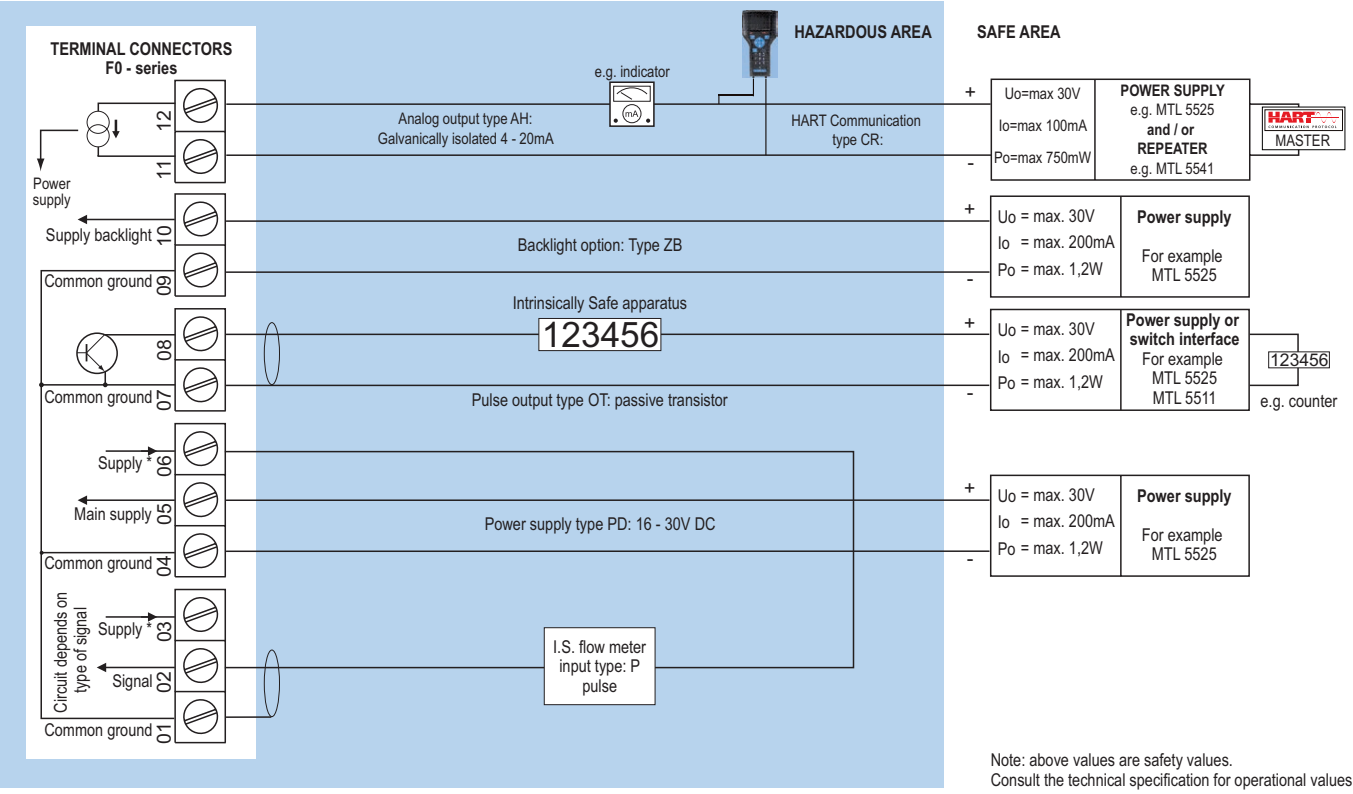


Configuration example Ex ia IIC / IIIC - F018-P-AH-CR-OT-PX-XI - Output loop powered



* Sensor supply voltage for pulse flow meter 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 Ex ia IIC / IIIC - F018-P-AH-CR-OT-PD-XI-ZB - Power requirement 16 - 30V DC



* 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.

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 white LED-backlight; Red (flashing) backlight during alarm conditions. Intensity and alarm response selected through the keyboard. Good readings in full sunlight and darkness. Also available Intrinsically Safe.

Ambient temperature

Safe areas	-40°C to +80°C (-40°F to +176°F).
EPL Ga / 1G	-40°C to +70°C (-40°F to +158°F).
EPL Da / 1D	-40°C to +50°C (-40°F to +122°F). max. dust layer thickness: 200mm.
EPL Db / 2D	-40°C to +70°C (-40°F to +158°F). max. dust layer thickness: 5mm.

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. (requires XI)
Type PD	16 - 30V DC. power consumption max. 1W.
Type PX	8 - 30V DC. Power consumption max. 0.3W.
Type ZB	20 - 30V DC. Power consumption max. 1W.
Type AH	10 - 30V DC. Power consumption max. 0.7 Watt.
Note PB/PF/PM	Not available Intrinsically Safe.
Note XI	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 PB/PC/PX	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.

Terminal connections

Type	Removable plug-in terminal strip. Wire max. 1.5mm ² and 2.5mm ²
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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 2014/30/EU, FCC 47 CFR part 15.
Low voltage	Directive 2014/35/EU
RoHS	Directive 2011/65/EU
ATEX / IECEx	Directive 2014/34/EU, IEC 60079-0, IEC 60079-11. IP & NEMA EN 60529 & NEMA 250
FM	FM Class No. 3600, FM Class No. 3610.
CSA	CSA 22.2 No. 157-92.
IP & NEMA	EN 60529 & NEMA 250.

Intrinsically Safe (Type XI)

ATEX	Gas: II 1 G Ex ia IIC T4 Ga. Dust: II 1 D Ex ia IIIC T ₂₀₀ 100 °C Da.
IECEx	Gas: Ex ia IIC T4 Ga. Dust: Ex ia IIIC T ₂₀₀ 100 °C Da.
CSA c-us	IS Class I/II/III, Division 1, Groups A to G T4. Class 1 Zone 0 AEx ia IIC T4 Ga.
FM	IS, Class I, II, III, Division 1, Groups A to G T4. Class I, Zone 0, AEx ia IIC T4
Note	Extended aluminum enclosures are not available with CSAC-us and FM approvals.
CSA c-us/FM	

Enclosure

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

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 Type4X.
Weight	600 gr.
Type HC	GRP panel mount enclosure IP65 / NEMA Type4X, UV-resistant and flame retardant.
Weight	450 gr.
Type HSB	Die-cast stainless steel 316L IP67/NEMA Type4X.
Weight	1150gr.

GRP wall / field mount enclosures

General	GRP wall/field mount enclosure IP67 / NEMA Type4X, 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.
Type HQ	Cable entry: 2 x Ø 16mm & 3 x Ø 12mm.

Aluminum wall / field mount enclosures

General	Die-cast aluminum wall/field mount enclosure IP67 / NEMA Type4X with 2-component UV-resistant coating. Extended back cover available with undrilled preparation for direct meter mounting.
Dimensions	130 x 120 x 75mm (5.12" x 4.72" x 2.95") - W x H x D. 130 x 120 x 90mm (5.12" x 4.72" x 3.54") - W x H x D.
Weight	1100 gr. / extended enclosure: 1310 gr.
Type HA	Cable entry: 2 x PG9 and 1 x M20.
Type HL	Cable entry: 2 x 1/2" NPT.
Type HM/HBM	Cable entry: 2 x M16 and 1 x M20.
Type HN	Cable entry: 1 x M20.
Type HO/HBO	Cable entry: 2 x M20.
Type HP	Cable entry: 6 x M12.
Type HT	Cable entry: 1 x 1/2" NPT.
Type HU/HBU	Cable entry: 3 x 1/2" NPT.
Type HV	Cable entry: 4 x M20.
Type HZ	Cable entry: no holes.
Note	Extended aluminum enclosures are not available with CSAC-us and FM approvals.
CSA c-us/FM	

Stainless steel 316L wall / field mount enclosures

General	Die-cast stainless steel 316L wall / field mount enclosure with flat bottom. IP67 / NEMA Type4X.
Dimensions	130 x 120 x 75mm (5.12" x 4.72" x 2.95") - W x H x D.
Weight	2700 gr.
Type HSM	Cable entry: 2 x M16 + 1 x M20.
Type HSO	Cable entry: 2 x M20.
Type HSU	Cable entry: 3 x 1/2"NPT.

Signal inputs - Flowmeter

Linearization	Fifteen free definable linearization positions with interpolation function.
Type P	Coil / sine wave (HI: 20mVpp or LO: 90mVpp - sensitivity selectable), NPN/PNP, open collector, reed switch, Namur, active pulse signals 8 - 12 and 24V DC.
Frequency	Minimum 0Hz - maximum 6kHz 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.
Retransmission	Frequency max. 500Hz.
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 - Analog output

Function	Transmitting linearized flow rate.
Accuracy	12 bit. maximum stepsize 0.01mA. Analog output signal can be scaled to any desired range.
Type AH	Galvanically isolated, loop powered 4 - 20mA output for Intrinsically Safe applications.
Linear overrang	-0.125% +0.1% ... +3.125% + 0.1% / 3.8mA ... 20.5mA.
Max. current	106.125% / 21.0mA.
Multidrop current	Parked @ 4.0mA.

Signal output - Digital output

Function	<ul style="list-style-type: none"> Pulse output - transmitting accumulated total. Input pulse retransmission (squared). Alarm output: low, high or both alarms.
Frequency	Max. 500Hz. Pulse width user definable between 1msec up to 10 seconds.
Type OT	One passive transistor output (NPN) - not isolated. Max. 50V DC - 300mA per output.

HART Communication

Function	Reading display information, reading / writing all configuration settings.
Type CR	HART Communication protocol, Revision 7.0.
Liftoff voltage	10V.
Loop resistance	Typical 250Ohm. Min. 120Ohm. Max. 666Ohm @ 24V.
Addressing	Selectable 0 ... 63.

Operator functions

Displayed info	<ul style="list-style-type: none"> Linearized flow rate and / or total. Linearized total and accumulated total. Alarm values low - high flow rate. Alarm values can be entered (can be disabled). Total can be reset to zero by pressing the CLEAR-key twice.
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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	l/sec - l/min - l/hr - nm ³ /sec - nm ³ /min - nm ³ /hr - nm ³ /day - g/sec - g/min - g/hr - kg/sec - kg/min - kg/hr - kg/day - ton/min - ton/hr - ton/day - gal/sec - gal/min - gal/hr - gal/day - bbl/sec - bbl/min - bbl/hr - bbl/day - lb/sec - lb/min - lb/hr - lb/day - cf/sec - cf/min - cf/hr - rev/sec - rev/min - none.
Decimals	0 - 1 - 2 or 3.

Alarm values

Digits	7 digits.
Units	According to selection for flow rate.
Decimals	According to selection for flow rate.
Time units	According to selection for flow rate.
Type of alarm	Low and high flow rate alarm. Includes alarm delay time and configurable alarm output.

Description		
Model	F018	Flow monitor / totalizer with linearization, pulse/alarm and analog outputs and HART communication.
Input	P	Pulse input, e.g., coil, npn, pnp.
Analog output	AH	Galvanically isolated, loop powered 4-20mA output.
Commu- nication	CR	HART Communication.
	CX	No communication.
Enclosures	HB	Aluminum panel mount enclosure.
	HC	GRP panel mount enclosure.
	HSB	Stainless steel 316L panel mount enclosure.
	HD	GRP field mount - Cable entry: no holes.
	HE	GRP field mount - Cable entry: 2 x Ø 16mm & 1 x Ø 20mm.
	HF	GRP field mount - Cable entry: 1 x Ø 22mm ($\frac{7}{8}$ ").
	HG	GRP field mount - Cable entry: 2 x Ø 20mm.
	HH	GRP field mount - Cable entry: 6 x Ø 12mm.
	HJ	GRP field mount - Cable entry: 3 x Ø 22mm ($\frac{7}{8}$ ").
	HK	GRP field mount, flat bottom - Cable entry: no holes.
	HQ	GRP field mount - Cable entry: 2 x Ø 16mm & 3 x Ø 12mm.
	HA	Aluminum field mount - Cable entry: 2 x PG9 + 1 x M20.
	HL	Aluminum field mount - Cable entry: 2 x $\frac{1}{2}$ "NPT.
	HM	Aluminum field mount - Cable entry: 2 x M16 + 1 x M20.
	HN	Aluminum field mount - Cable entry: 1 x M20.
	HO	Aluminum field mount - Cable entry: 2 x M20.
	HP	Aluminum field mount - Cable entry: 6 x M12.
	HT	Aluminum field mount - Cable entry: 1 x $\frac{1}{2}$ "NPT.
	HU	Aluminum field mount - Cable entry: 3 x $\frac{1}{2}$ "NPT.
	HV	Aluminum field mount - Cable entry: 4 x M20.
	HZ	Aluminum field mount - Cable entry: no holes.
	HBM	Extended Alu. field/meter mount - Cable entry: 2 x M16 + 1 x M20 (not with CSAc-us / FM approvals).
	HBO	Extended Alu. field/meter mount - Cable entry: 2 x M20 (not with CSAc-us / FM approvals).
	HBU	Extended Alu. field/meter mount - Cable entry: 3 x $\frac{1}{2}$ "NPT (not with CSAc-us / FM approvals).
	HSM	Stainless steel 316L field mount - Cable entry: 2 x M16 + 1 x M20.
	HSO	Stainless steel 316L field mount - Cable entry: 2 x M20.
	HSU	Stainless steel 316L field mount - Cable entry: 3 x $\frac{1}{2}$ "NPT.
Digital output	OT	One passive transistor output.
Power	PD	16 - 30 V DC + sensor supply.
	PX	Basic power supply 8 - 30V DC.
Battery	PB	Additional lithium battery powered (opt.) - requires XX.
	PC	Additional lithium battery powered (opt.) - Intrins. safe - requires XI.
Hazard- ous	XI	Intrinsically safe, according ATEX, IECEx, CSA c-us and FM.
	XX	Safe area only, according CE / UKCA.
Options	ZB	Backlight.
	ZF	Coil input 10mVpp.
	ZG	Coil input 5mVpp.
	ZX	No options.

The **bold** marked text contains the standard configuration: F018-P-AH-CX-HC-OT-PX-XX-ZX.

