

Level Monitor

with analog and high / low alarm outputs



Application examples: Level transmitting to PLC



Level monitoring by triggering a visual device



Level monitoring by triggering an acoustic device

The F-Series is your first and safest choice for field mount indicators in challenging industrial applications. Especially in harsh weather conditions like rain, snow, salty atmospheres and temperatures between -40°C to $+70^{\circ}\text{C}$ (-40°F to 158°F).

Advantages

- Accurate level Indicator with continuous level monitoring.
- Robust aluminum or stainless steel 316L field enclosure (IP67 / Type4X). It is so rugged, even a truck can stand on it!
- 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 or panels!
- Clear dual line display to show level/height, content, percentage filled, 4-20mA input or alarm values.

Features

- Level monitoring with 4 alarm values: low-low, low, high and high-high level alarms.
- Bargraph according the level/height or content.
- Red flashing LED backlight in case of an alarm condition.
- Custom measurement units for level/height and content.
- 1 level input signal: (O)4 - 20mA (HART transparent).
- Active, isolated (passive) or loop powered analog output according to the level/height, content or input retransmission.
- 4 passive transistor or heavy duty, mechanical relay outputs.
- Full Modbus communication RS485, isolated RS485 or RS232.
- Plug-and-play USB-C port for simple remote configuration.
- Easy programming with PC/laptop and free software tool.
- Basic power supply of 10-27V DC, an isolated 12-24VAC / 12-30VDC or isolated 115-230VAC power supply.
- Auto backup of all setting.

The F170 level monitor is the first model in the next generation of F-Series level indicators, monitors, and controllers! These four powerful products that not only include the features of our previous F1-level-Series, but also bring a broad range of enhanced capabilities. The new F-Series level indicators take performance, functionality, and reliability to the next level!

Next Level F-Series	F170	F173	F174	F175
Level Monitor <i>with alarms</i>	Yes			
Level Controller <i>with hysteresis & strapping table</i>	No	Yes		
Advanced Pump Controller <i>with alternating functions</i>	No		Yes, individual setpoints, pump groups, manual & automatic pump switching (pump order or running hours)	
Open Channel Flow Monitor & Totalizer	No			Yes, Dual Flow A/B (linear, table, weir / flume formula)

Introduction

The F170 is a powerful level indicator with continuous level monitoring. Its primary **level indicator** function is to display the measured level input with simultaneous level/height and content indication and a dedicated bargraph. For **level monitoring**, it offers two low and two high level alarm values with ignore function. The F170 has up to 4 outputs which can trigger an acoustic or visual device to monitor the level and an alarm situation.

Power requirements

Basic power supply of 10-27V DC or an isolated power supply of 12-24VAC / 12-30VDC or 115-230VAC. Both isolated supplies, can power the F170, the backlight, activate the relay outputs and offer a regulated 24V DC sensor supply.

Signal input

The F170 accepts input signals from any type of (0)4 - 20mA analog level measurement device and it is HART transparent. The input signal is easy to calibrate, no multimeter required.

Display

The display has six large 18mm (0.71") and eleven 8mm (0.31") digits for level/height, content, percentage filled, 4-20mA input or alarm values. The 20 segment bargraph can be set to level/ height or content. It is even possible to create your own custom measuring units for level/height and content. Each level alarm has an alarm flag indication beside the bargraph. When a control or alarm output is triggered it will be indicated with an R1, R2, R3 and R4 flag on the screen. The bright backlight can be set to be red or flashing red in case of an alarm.



All info at a glance



Easy to install



Easy to program



Know one know them all!



Reliable



User-friendly

Analog output signal

The output can be set to transmit the actual level/height, content or as analog input retransmission. It is updated 8 times / sec. with a filter to smoothen out the signal. The output value can be user defined, e.g. 4mA equals 5m³ and 20mA equals 20.000m³. A test mode is available to verify the performance of the analog output. The analog output is available as isolated loop-powered, active or isolated (passive) output signal.

Alarm outputs

4 configurable alarm outputs with test mode and configurable NO/NC setting, are available to transmit the alarm condition. There are 3 output options:

- Type OM: 3 heavy duty, relay outputs NO-NC.
- Type OS: 4 heavy duty, relay outputs, 2 x NO-NC and 2 x NO.
- Type OT: 4 passive transistor outputs.

Communication

All process data and settings can be read and modified through the Modbus communication ((isolated) RS485/RS232). Easy plug-and-play connection with USB-C for programming with PC/ laptop at your desktop when Modbus is not required in the field.

Configuration

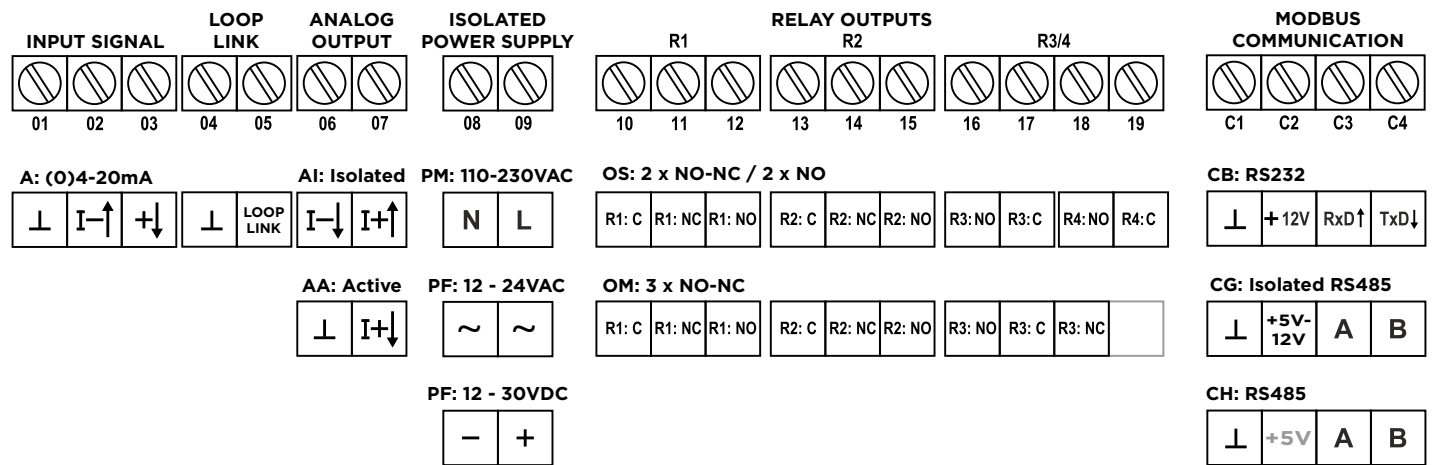
All configuration settings are accessed via a user-friendly operator menu which can be password protected. The settings are clearly indicated with an alphanumeric description, which avoids confusing abbreviations and baffling codes. Once familiar with one F-Series product, you will be able to program all models in the series without the need for a manual. All settings are safely stored in EEPROM memory in the event of sudden power failure.

Remote configuration

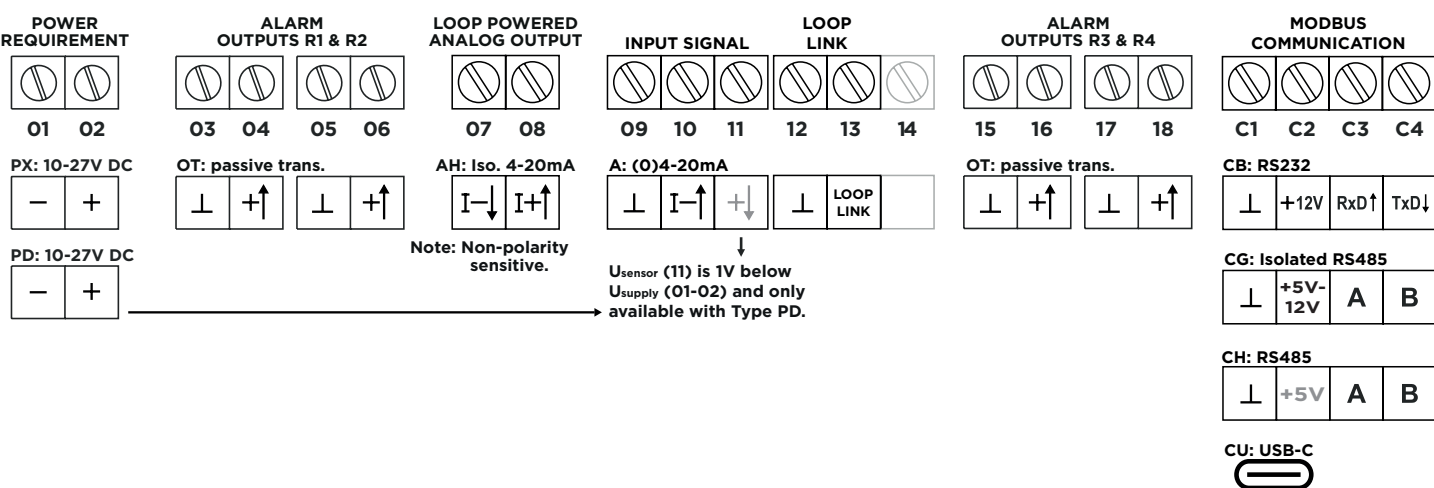
Quick and easy configuration via a PC connection using the free downloadable Configuration Software. Just connect the F170 to your PC/laptop via the USB-C or Modbus communication port. There are special Modbus to USB configuration cables available as accessory.

Terminal connections

For option PF / PM



For option PX / PD

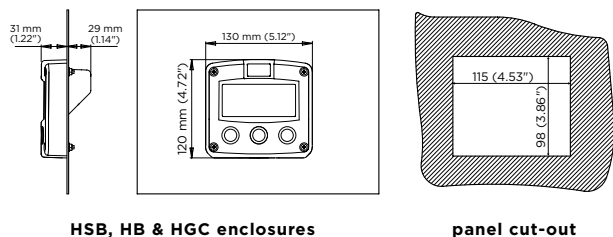


Enclosures

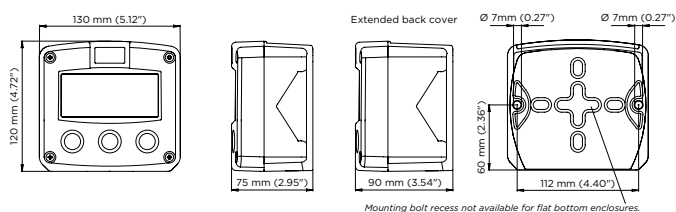
Various types of panel and field mount enclosures can be selected. As standard, the F170 is supplied in a GRP (polyamide) panel mount enclosure, which can be converted to a GRP field mount enclosure by the addition of a back cover. Most popular is our robust aluminum field mount enclosure which is also available with an extended back cover to allow more wire installation space. 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 field mount enclosures have an IP67 / Type 4X rating and various European or U.S. cable gland entry threads available.

Dimensions enclosures

Aluminum & GRP panel mount enclosure

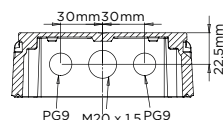
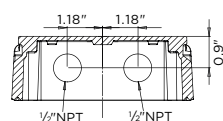
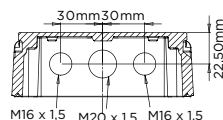
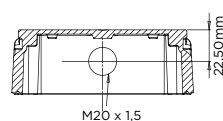
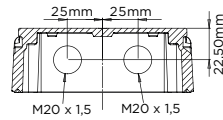
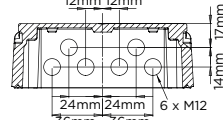
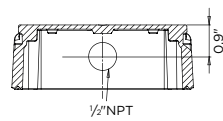
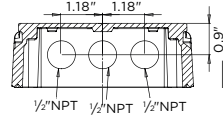
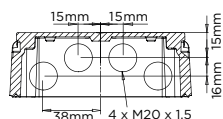
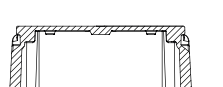


Aluminum, GRP & Stainless steel 316L field mount enclosures

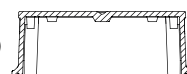
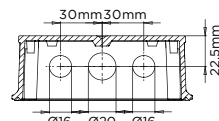
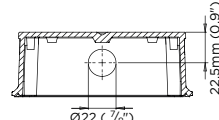
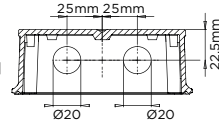
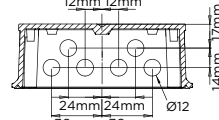
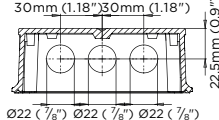
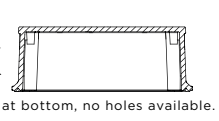
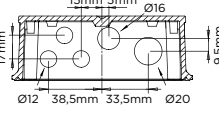


Cable entries

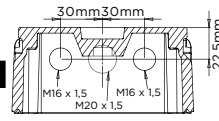
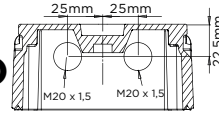
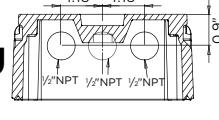
Aluminum / Stainless Steel



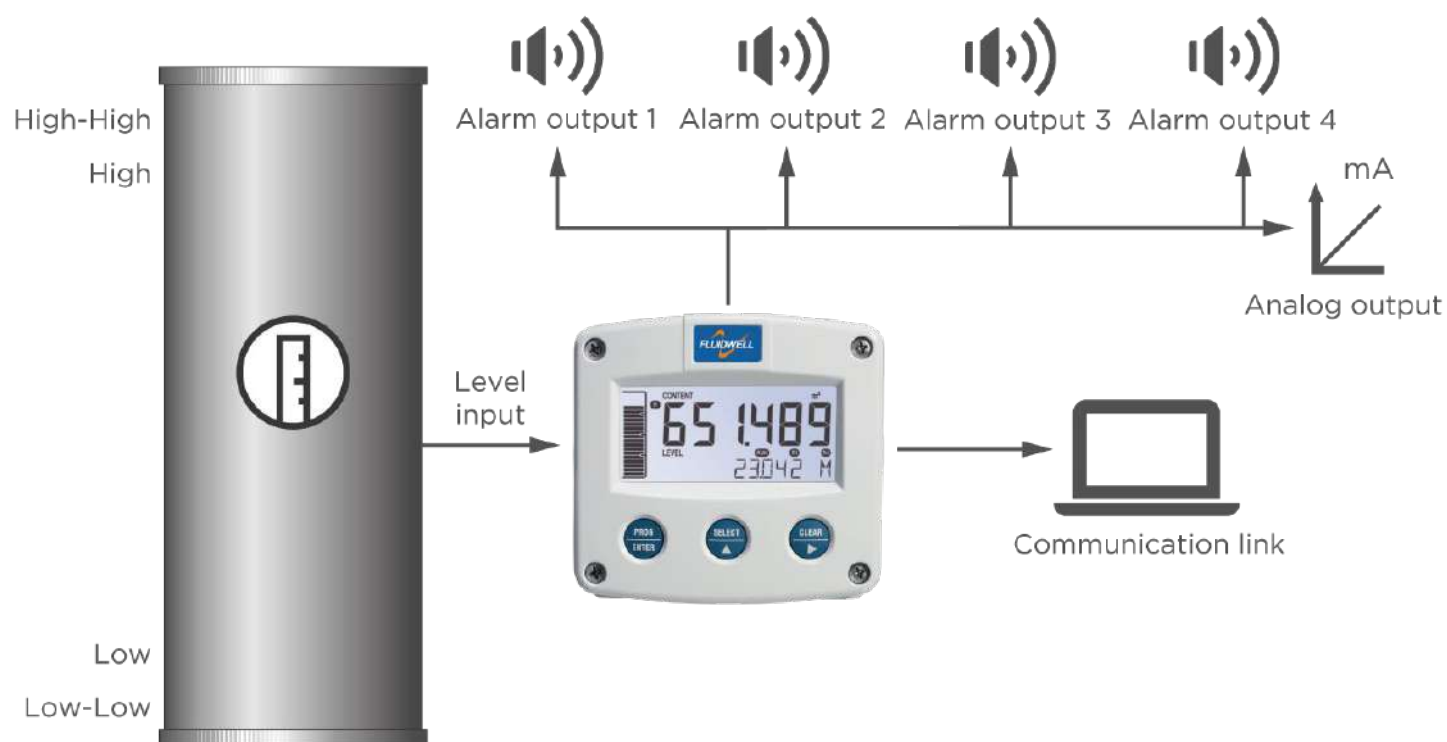
GRP



Extended Aluminum



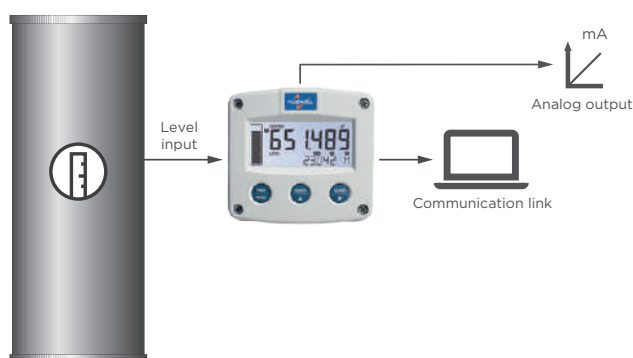
Input / Output overview F170



Application examples F170

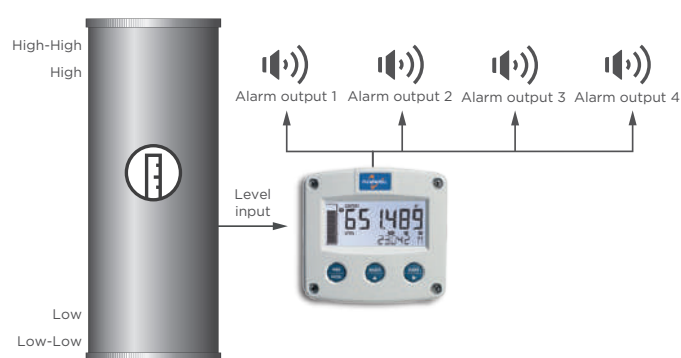
The F170 provides a versatile and reliable package in a strong and weatherproof, field mount enclosure, especially in harsh weather conditions like rain, snow, salty atmospheres and temperatures from -40°C up to +70°C (-40°F up to 158°F).

Thanks to its outstanding versatility, the F170 can be used across a broad range of applications. Here follow some typical examples, combinations between the various application examples are possible, with respect to the number outputs.



Example 1: Level Transmitting

Basic level measurement to display the actual level/height or volumetric content of the tank/silo or when re-transmission of the level via the analog output or serial communication to an automation network is required. The process information on the display can be configured according your preferences: level/height, content, percentage filled or the 4-20mA input signal. A clear bargraph indicates the level/height, or content.



Example 2: Level Monitoring

Level measurement where continuous level monitoring of high and low values is important. Up to 4 passive transistor or heavy duty, relay outputs are available to trigger the alarms devices. In case of an alarm, the bright backlight can be set to be red or flashing red.

Display

Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Dimensions	90 x 40mm (3.5" x 1.6").
Digits	Six 18mm (0.71") and eleven 8mm (0.31") digits. Various symbols and measuring units.
Bargraph	20 segments for level/height or content.
Refresh rate	User definable: fast, 1sec, 3sec, 15sec, 30sec, off.
Type ZB	Transflective LCD with bright LED-backlight. Intensity can be adjusted in the configuration menu. Red (flashing) backlight during alarm conditions. Improved readability in full sunlight and darkness.

Ambient temperature

Safe areas	-40°C to +70°C (-40°F to +158°F).
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Terminal connections

Type	Removable plug-in terminal strip. Wire max. 1.5mm ² and 1.5mm 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	EN 61326-1, EN 61000-6-2, EN 61000-6-3, 47 CFR Part 15
Low voltage	CSA/UL/IEC 61010-1 + A1
RoHS	EN IEC 63000
IP & NEMA	CSA C22.2 No. 94.2-15; UL 50E

Intrinsically Safe (Type XI)

Availability	Contact us for availability and specifications.
ATEX	Gas: II 1 G Ex ia IIB/IIC T4 Ga. Dust: II 1 D Ex ia IIIC T ₂₀₀ 100 °C Da.
IECEx	Gas: Ex ia IIC/IIB T4 Ga. Dust: Ex ia IIIC T ₂₀₀ 100 °C Da.
Ambient Ta	-40°C to +70°C (-40°F to +158°F).
Dust, zone 20	-40°C to +50°C (-40°F to +122°F).

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

GRP wall / field mount enclosures

General	GRP wall/field mount enclosure IP67 / 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 HGD	Cable entry: no holes.
Type HGE	Cable entry: 2 x Ø 16mm and 1 x Ø 20mm.
Type HGF	Cable entry: 1 x Ø 22mm (7/8").
Type HGG	Cable entry: 2 x Ø 20mm.
Type HGH	Cable entry: 6 x Ø 12mm.
Type HGJ	Cable entry: 3 x Ø 22mm (7/8").
Type HGK	Flat bottom, cable entry: no holes.
Type HGQ	Cable entry: 1xØ20mm, 1 x Ø16mm & 3 x Ø12mm.

Aluminum wall / field mount enclosures

General	Die-cast aluminum wall/field mount enclosure IP67 / Type4X with 2-component UV-resistant coating. Extended back cover available.
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.

Stainless steel 316L wall / field mount enclosures

General	Die-cast stainless steel 316L wall / field mount enclosure with flat bottom. IP67 / 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 and 1 x M20.
Type HSO	Cable entry: 2 x M20.
Type HSU	Cable entry: 3 x 1/2"NPT.

Signal inputs - Level sensor

Type A	(0)4 - 20mA. Analog input signal can be scaled to any desired range within 0 - 20mA. The input signal is HART transparent.
Accuracy	Resolution: <0.01mA / 16 bit. Error <0.01% @ 20°C. Low level cut-off programmable and digital filter.
Span	0.00001 - 999,999 with max. 3 decimals.
Offset	-999,999 to 999,999 with max. 3 decimals.
Update time	Four times per second.
Calibration	Easy 4 -20mA input calibration, no multimeter required.
Direction	Sensor direction can be reversed when the open space in a tank is measured rather than the occupied space.
Voltage drop	1V @ 20mA.
Loop Link	Terminal for HART communicator connection.

Signal outputs - Communication option

Function	Reading display information, reading / writing all configuration settings.
Protocol	Modbus ASCII / RTU.
Speed	1200, 2400, 4800, 9600, 9600HP, 19200, 38400, 57600.
Addressing	1 - 247.
Type CB	RS232
Type CG	Isolated RS485 2-wire
Type CH	RS485 2-wire
Type CU	USB-C for remote configuration only (registers as COM-port in Windows).

Signal outputs - Alarm/control outputs

Function	<ul style="list-style-type: none"> Alarm outputs: low-low, low, high, high-high or all. There is an optional clear alarm output function, e.g. to turn off an acoustic alarm.
Test mode	Each output can be activated in setup mode to test the wiring and performance of the outputs.
Signal generation	Inverted (fail-safe) operation and pulsing (0,5 Hz) possible.
Type OM	3 NO-NC (SPDT) heavy duty, mechanical relays. Max. switching power 230V AC / 30V DC, 4A per relay (resistive) / 2A per relay (inductive). Pilot duty: AC: B300, DC: R300. Requires Type PF or PM.
Type OS	2 x NO-NC (SPDT) and 2 x NO (SPST), heavy duty, mechanical relays. Max. switching power 230V AC / 30V DC, 4A per relay (resistive) / 2A per relay (inductive). Pilot duty: AC: B300, DC: R300. Requires Type PF or PM.
Type OT	4 x passive transistor outputs, load max. 27V DC - 300mA. Requires Type AH and PX or PD.

Signal outputs - Analog output

Function	Transmitting the actual level/height, content or analog input retransmission - it can be scaled to any range (e.g. 200m³ to 1200m³).
Test function	For testing during commissioning: Off - 4 - 8 - 12 - 16 - 20mA - full (max. current). Output will return to normal operation when operator leaves test function.
Accuracy	Resolution <0,001mA. Error < 0.03% @ 20°C (typical 45ppm/°C).
Update time	Eight times per second.
Type AA	Active 4 - 20mA output, max. 24V. Max. load 700 Ohm @ 24V. Requires Type PF or PM.
Type AI	Isolated (passive) 4 - 20mA output. Requires Type PF or PM.
Type AH	Passive galvanic isolated output - output loop powered. Requires Type OT and PX or PD.
Supply voltage	10V (lift-off voltage) - 27V DC
Type AI / AH	

Power requirements

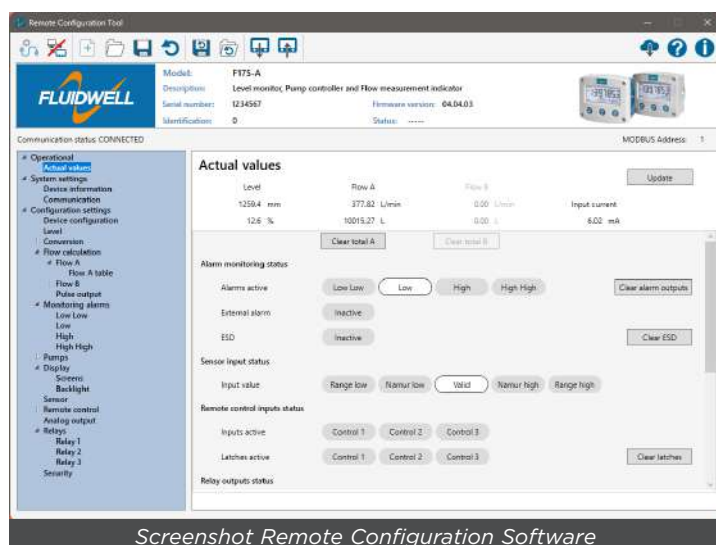
Type AH	Loop powered, analog output. 10 - 27V DC, Min. 3.5mA. Max. load: 700 Ohm @ 24V. Requires Type OT and PX or PD.
Type PD	10 - 27V DC. Power consumption max. 3W, with sensor supply. Requires Type AH and OT.
Type PX	Basic 10 - 27V DC. Power consumption max. 1W, without sensor supply. Requires Type AH and OT.
Type PF	12 - 24V AC $\pm$ 10%; Isolated; 12 - 30V DC $\pm$ 10%; Isolated; Power consumption max. 5 Watt.
Type PM	115 - 230V AC $\pm$ 10%; Isolated; Power consumption max. 5 Watt.

Sensor excitation

Type PX	No sensor supply.
Type PD	U_{sensor} is 1V below U_{supply} - max. 50mA.
Type PF/PM	Regulated 24V DC - max. 50mA.

Remote configuration

Function	Easy remote configuration with a special communication cable and our free software tool.
Type CB	Requires ACE07 cable with RS232 to USB plug.
Type CG/CH	Requires ACE06 cable with RS485 to USB plug.
Type CU	Requires a standard USB-C to USB-A/-C cable.



Screenshot Remote Configuration Software

Remote configuration cable accessories

ACE06	Remote configuration cable (1.8m/5.9ft) for type CG and CH Modbus RS485 communication.
ACE07	Remote configuration cable (1.8m/5.9ft) for type CB Modbus RS232 communication.

Operator functions

Displayed info	<ul style="list-style-type: none"> • Level / height. • Content. • Percentage filled. • Bargraph for level/height or content. • 4 - 20mA input value. • Alarm values: lo-lo / lo / hi / hi-hi. • Alarm setpoints.
Additional functions	<ul style="list-style-type: none"> • Alarm delay. • Alarm value hysteresis. • Configurable safety options: failsafe, test and loopfail options. • Clearing activated alarm outputs.

Level / Height

Units	None, custom, in, Ft, Yd, mm, cm, dm, m or %.
Decimals	0 - 1 - 2 or 3.
Custom unit	Up to 5 characters.

Content

Units	None, custom unit, in ³ , Ft ³ , Yd ³ , Qt, GAL, bbl, cm ³ , dm ³ , m ³ , cL, dL, L, hL or %.
Decimals	0 - 1 - 2 or 3.

Alarm values

Function	Up to four user defined alarm values to monitor the level/height, content, or %.
(Re)setpoints	-999.999 - 999.999 / 0.0% - 100.0%.
Type of alarm	Low-low, low, high, high-high or all level alarms. With alarm delay, ignore time and configurable alarm outputs.

	Description	
Model	F170	Level Monitor with analog and high / low alarm outputs
Input	A	(0)4 - 20mA input.
Analog	AA	Active 4 - 20mA output - requires PF or PM.
	AH	Galvanically isolated, loop powered 4-20mA output - requires OT and PD or PX.
	AI	Isolated (passive) 4 - 20 mA output - requires PF or PM.
Communication	CB	Communication RS 232 - Modbus ASCII / RTU.
	CG	Isolated communication RS 485 - 2wire - Modbus ASCII / RTU.
	CH	Communication RS 485 - 2wire - Modbus ASCII / RTU.
	CU	USB-C (for remote configuration only).
Enclosures	HB	Aluminum panel mount enclosure.
	HGC	GRP panel mount enclosure.
	HSB	Stainless steel 316L panel mount enclosure.
	HGD	GRP field mount - Cable entry: no holes.
	HGE	GRP field mount - Cable entry: 2 x Ø 16mm & 1 x Ø 20mm.
	HGF	GRP field mount - Cable entry: 1 x Ø 22mm (7/8").
	HGG	GRP field mount - Cable entry: 2 x Ø 20mm.
	HGH	GRP field mount - Cable entry: 6 x Ø 12mm.
	HGJ	GRP field mount - Cable entry: 3 x Ø 22mm (7/8").
	HGK	GRP field mount - Flat bottom, cable entry: no holes.
	HGQ	GRP field mount - Cable entry: 1 x Ø 20mm, 1 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 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 1/2"NPT.
	HU	Aluminum field mount - Cable entry: 3 x 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.
	HBO	Extended Alu. field/meter mount - Cable entry: 2 x M20.
	HBU	Extended Alu. field/meter mount - Cable entry: 3 x 1/2"NPT.
	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 1/2"NPT.
Digital	OM	Three NO-NC (SPDT) heavy duty, mechanical relays - requires PF or PM.
	OS	Two NO-NC (SPDT) and two NO (SPST), heavy duty, mechanical relays - requires PF or PM.
	OT	Four passive transistor outputs - requires AH and PD or PX.
Power	PD	10 - 27V DC + sensor supply - Requires AH and OT.
	PF	Isolated 12 - 30V DC / 12 - 24V AC + regulated 24V sensor supply.
	PM	Isolated 115 - 230V AC + regulated 24V sensor supply.
	PX	Basic power supply 10 - 27V DC without sensor supply - requires AH and OT.
Hazardous	XX	Safe area only, according CE.
Options	ZB	Backlight is included as standard.

The **bold** marked text contains the standard configuration: F170-A-AH-CU-HGC-OT-PX-XX-ZB.