

# MODBUS DISPLAY

## WITH ALARM AND ANALOG OUTPUTS



### Features

- Fully controlled through Modbus ASCII / RTU communication protocol.
- Nine different product or tank values can be displayed.
- Displays actual value, product / tank I.D., measuring unit, status and alarm messages.
- Actual values are operator selectable or with the automatic toggle function.
- Alarms can be terminated through communication or after operator interaction.
- Actual value: six large 17mm (0.67") digits.
- Backup of settings in EEPROM memory.
- Operational temperature -40°C up to +80°C (-40°F up to 176°F).
- Intrinsically Safe - ATEX and IECEx approval for gas and dust applications.
- Explosion/flame proof  $\text{Ex}$  II 2 GD EEx d IIB T5.
- Loop or battery powered, 8 - 24V AC/DC or 115 - 230V AC.
- Very compact design for panel mount, wall mount or field mount applications.
- Rugged aluminum or GRP field mount enclosure IP67 / NEMA4X.

### Signal output

- 4 - 20mA / 0 - 10 V DC output re-transmitting any value set through communication - the output can be scaled to any previously set range.
- Up to four configurable alarm outputs controlled through communication or related to the actual product / tank values.

### Signal input

- None.

### Applications

- Local indication and monitoring of process parameters where the actual information is provided through a Modbus communication link and not a sensor.

## General information

### Introduction

The F193 is a versatile large digit Modbus display. All displayed information and signal outputs are controlled through the Modbus ASCII / RTU communication protocol. Information of nine different tanks or products can be displayed with an automatic toggle function or can be selected by the operator. Off-course, it can also be selected and locked through communication. A wide range of options further enhance this models capabilities, including Intrinsic Safety for hazardous area applications.

### Display

The display has large 17mm segments which can be set to show actual value. On-screen engineering units are easily configured from a comprehensive menu, whilst different units for product / tank I.D. can be displayed simultaneously. The status and alarm messages can register up to 11 digits.

### Configuration

All configuration settings are accessed via a simple operator menu which can be passcode 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 loss.

### Analog output signal

Also available is an (0)4 - 20mA or 0 - 10V DC output signal, fully controlled through the communication. For security reasons, all outputs can be switched-off automatically in case of a communication break-down. The output signal is updated ten times per second with a filter function being available to smooth the signal if desired. The output signal can be passive, active or isolated where the passive output type will loop power the F193 as well.

### Alarm outputs

Up to four control or alarm outputs can be controlled directly or being linked to an alarm status of the nine products: an alarm message will be displayed and the related relay(s) switched. The output signal can be a passive NPN, active PNP or an isolated electro-mechanical relay.

### Communication

All displayed information and signal outputs are controlled through the Modbus ASCII / RTU communication protocol (RS232 / RS485). Full Modbus functionality remains available for the Intrinsically Safe version (TTL).

### Hazardous areas

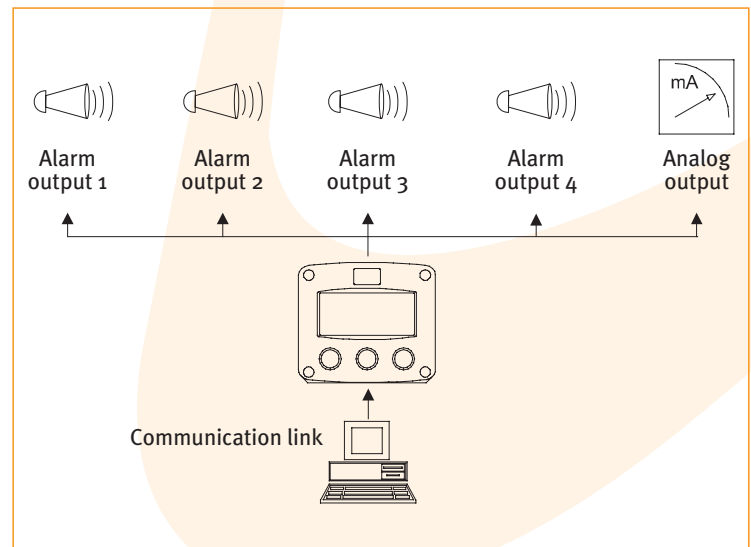
This model has been ATEX and IECEx certified Intrinsically Safe for gas and dust applications, with an allowed operational temperature of -40°C to +70°C (-40°F to +158°F).

A flame proof enclosure with ATEX certification offers the rating  $\text{Ex}$  II 2 GD EEx d IIB T5.

### Enclosures

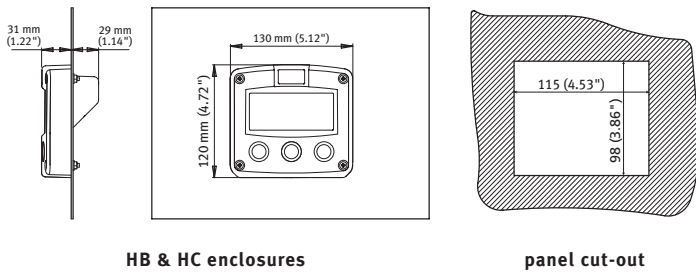
Various types of enclosures can be selected, all ATEX and IECEx approved. As standard the F110 is supplied in an GRP panel mount enclosure, which can be converted to an IP67 / NEMA 4X GRP field mount enclosure by the addition of a back case. Most popular is our rugged aluminum field mount enclosure with IP67 / NEMA 4X rating. Both European or U.S. cable gland entry threads are available.

## Overview application F193

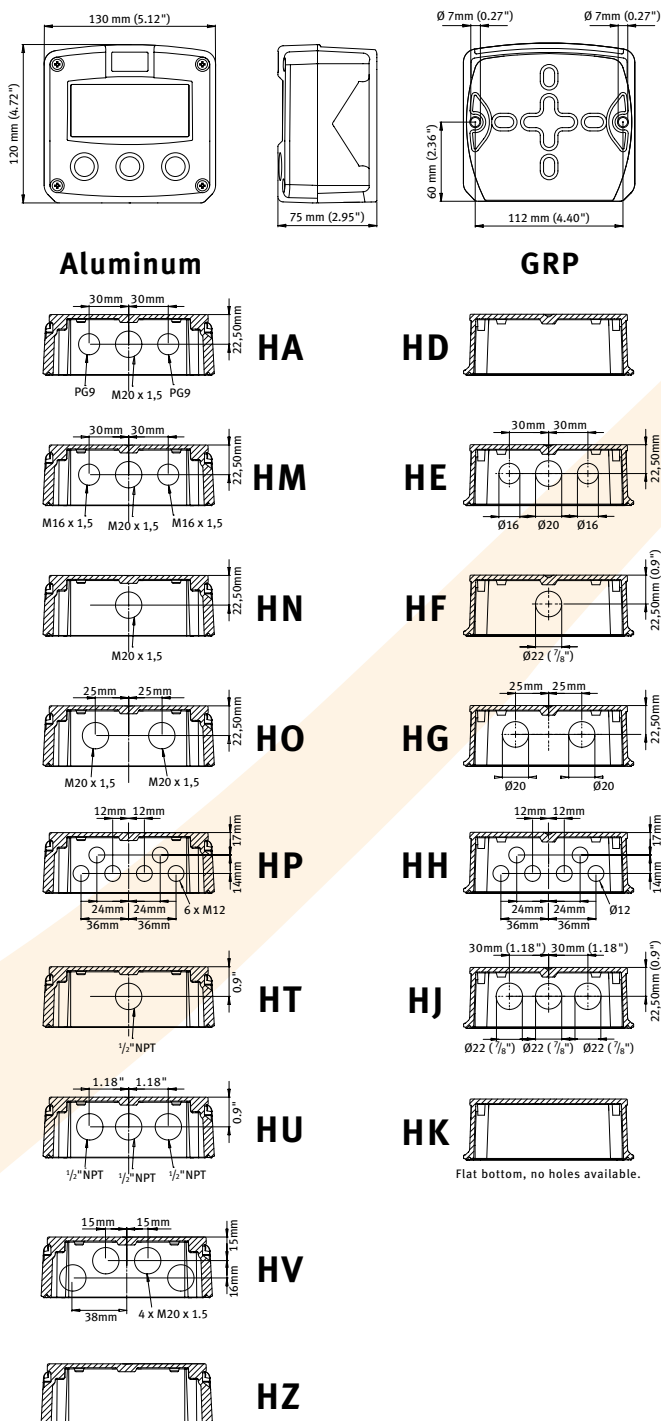


## Dimensions enclosures

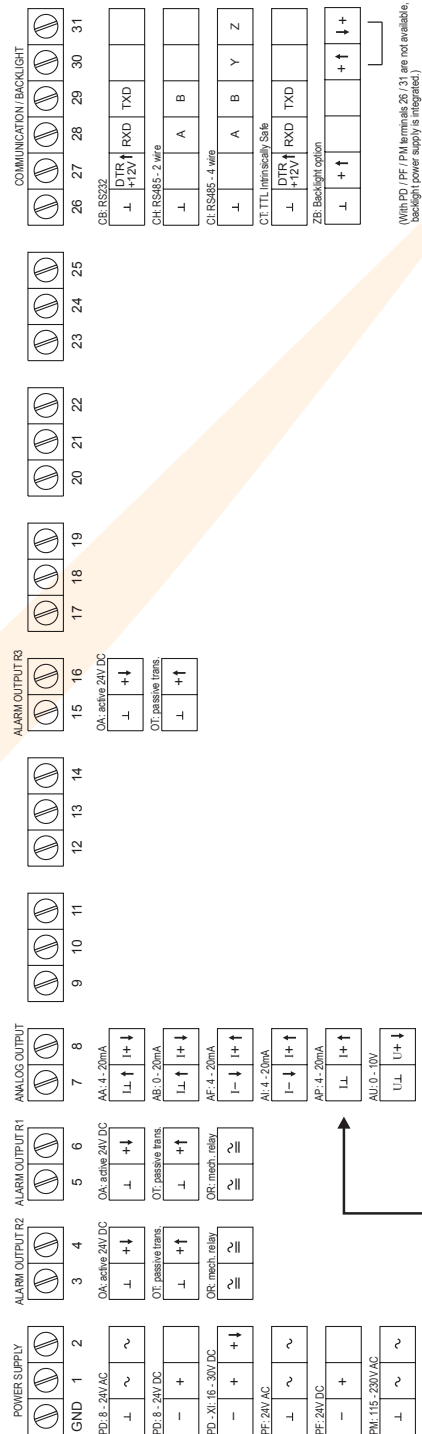
### Aluminum & GRP panel mount enclosure



### Aluminum & GRP field / wall mount enclosures



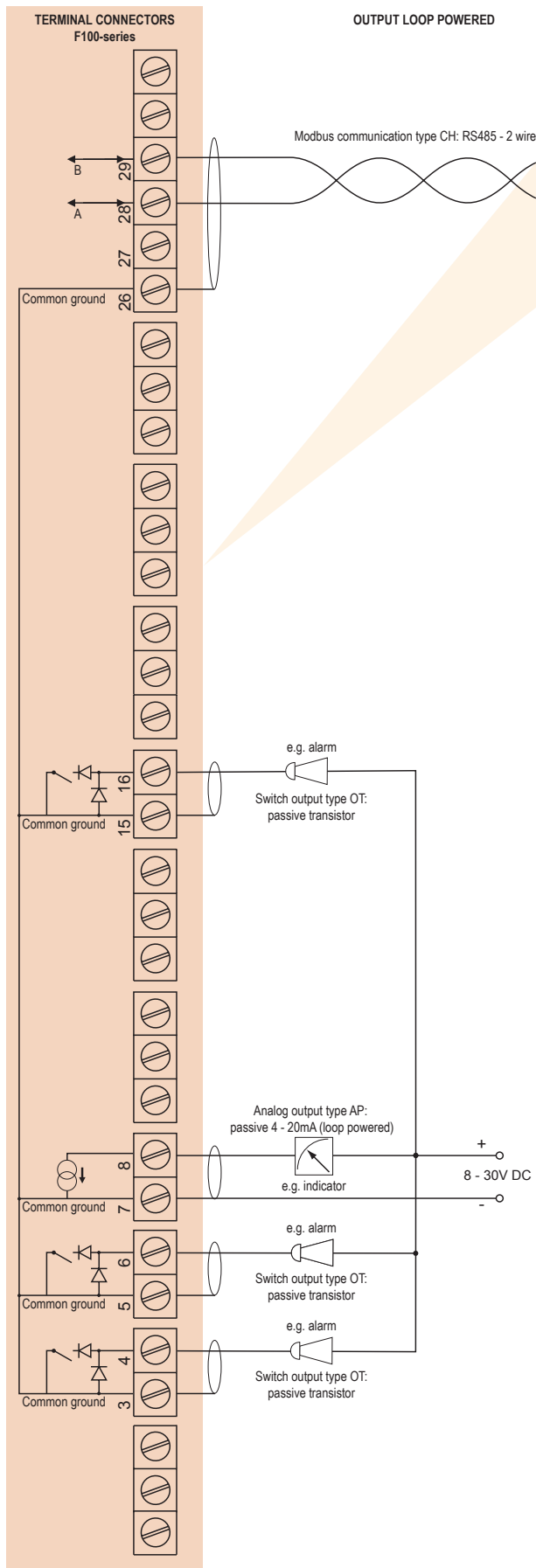
## Terminal connections



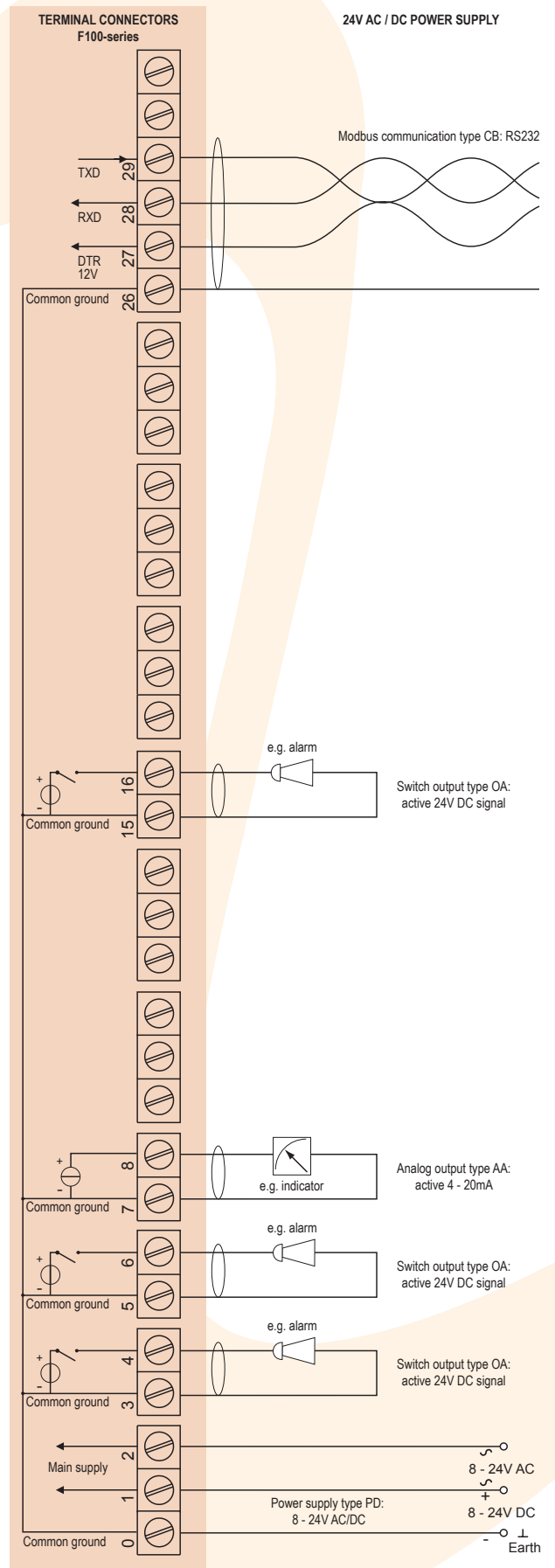
### Display example - 90 x 40mm (3.5" x 1.6")



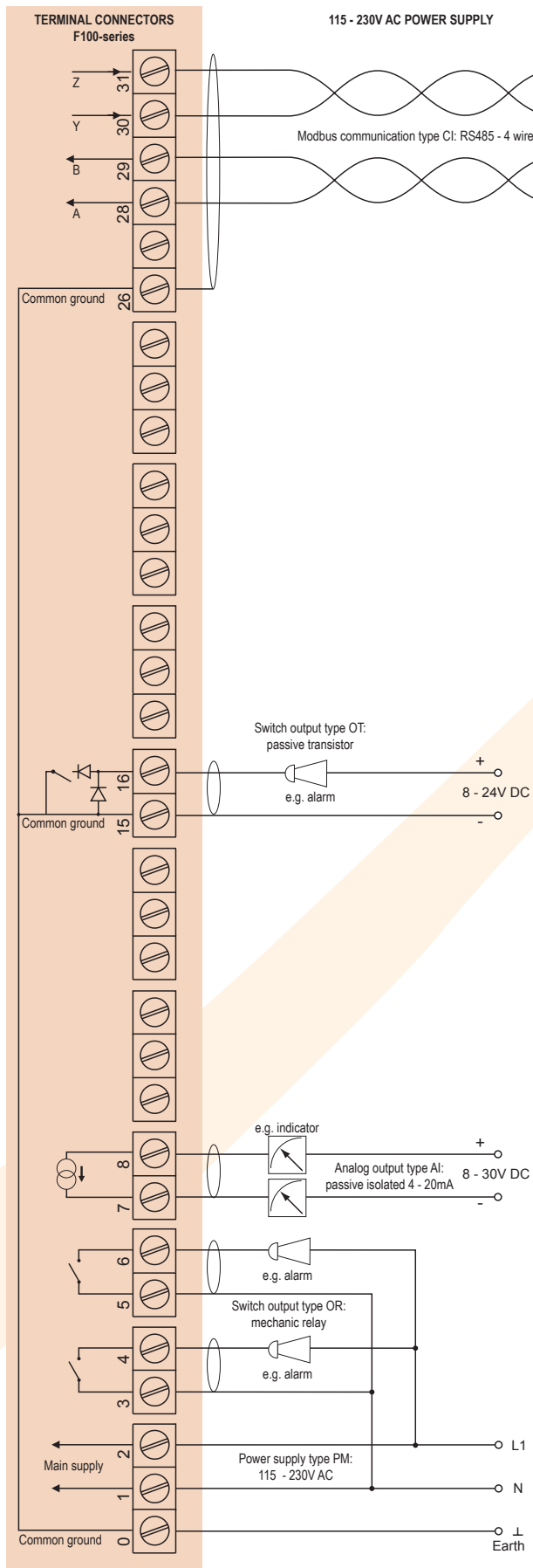
Typical wiring diagram F193-AP-CH-OT-PX



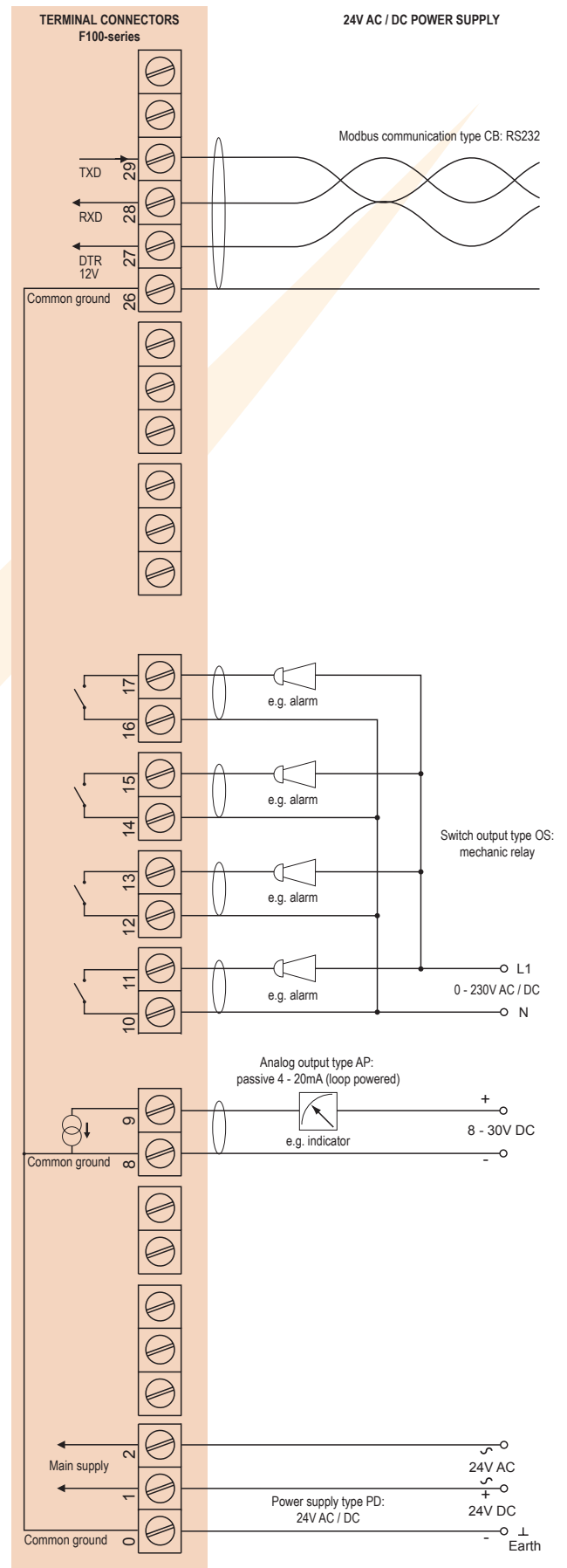
Typical wiring diagram F193-AA-CB-OA-PD



Typical wiring diagram F193-AI-CI-OR-PM



Typical wiring diagram F193-AP-CB-OS-PD





## Hazardous area applications

The F193-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 six barriers in IIB/IIC applications, the F193 is not suitable for IIC applications. Consult the certificate for the maximum input and output values of the circuits. Full functionality of the F193 remains available, including Modbus communication type CT.

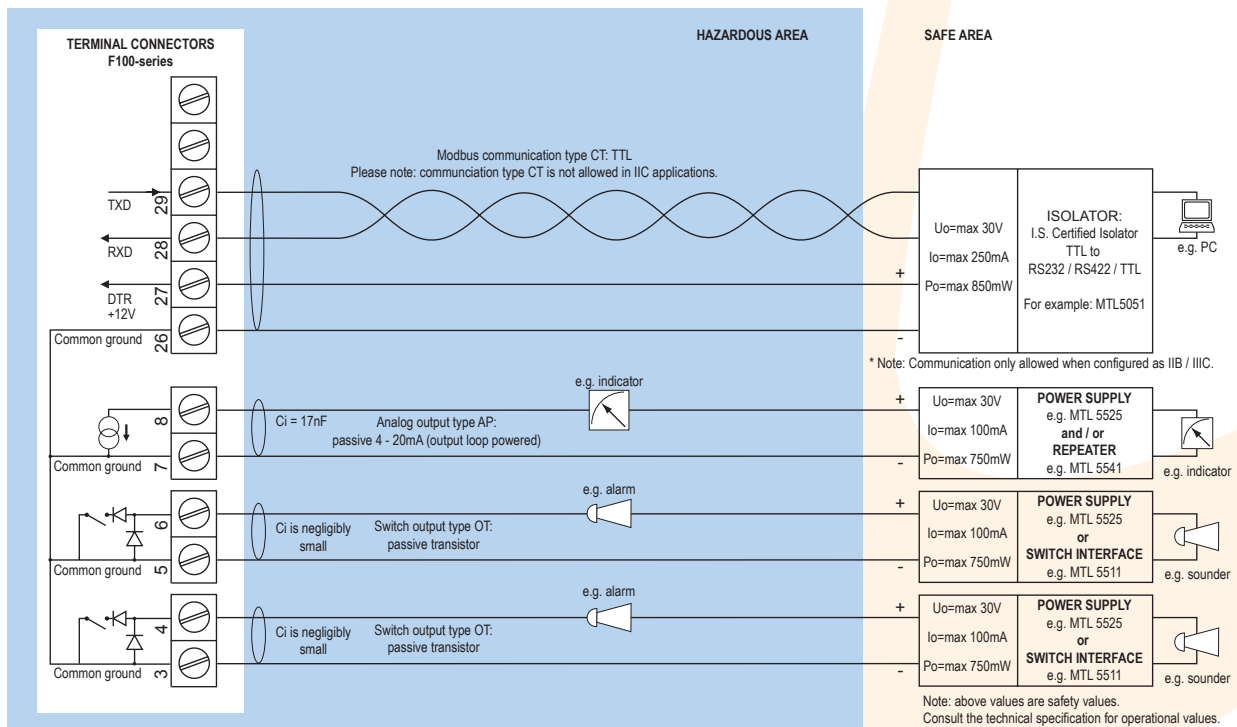
A flame proof enclosure is available as well with rating ATEX **II 2 GD EEx d IIB T5**. Please contact your supplier for further details.

## Certificate of conformity KEMA 03ATEX1074 X

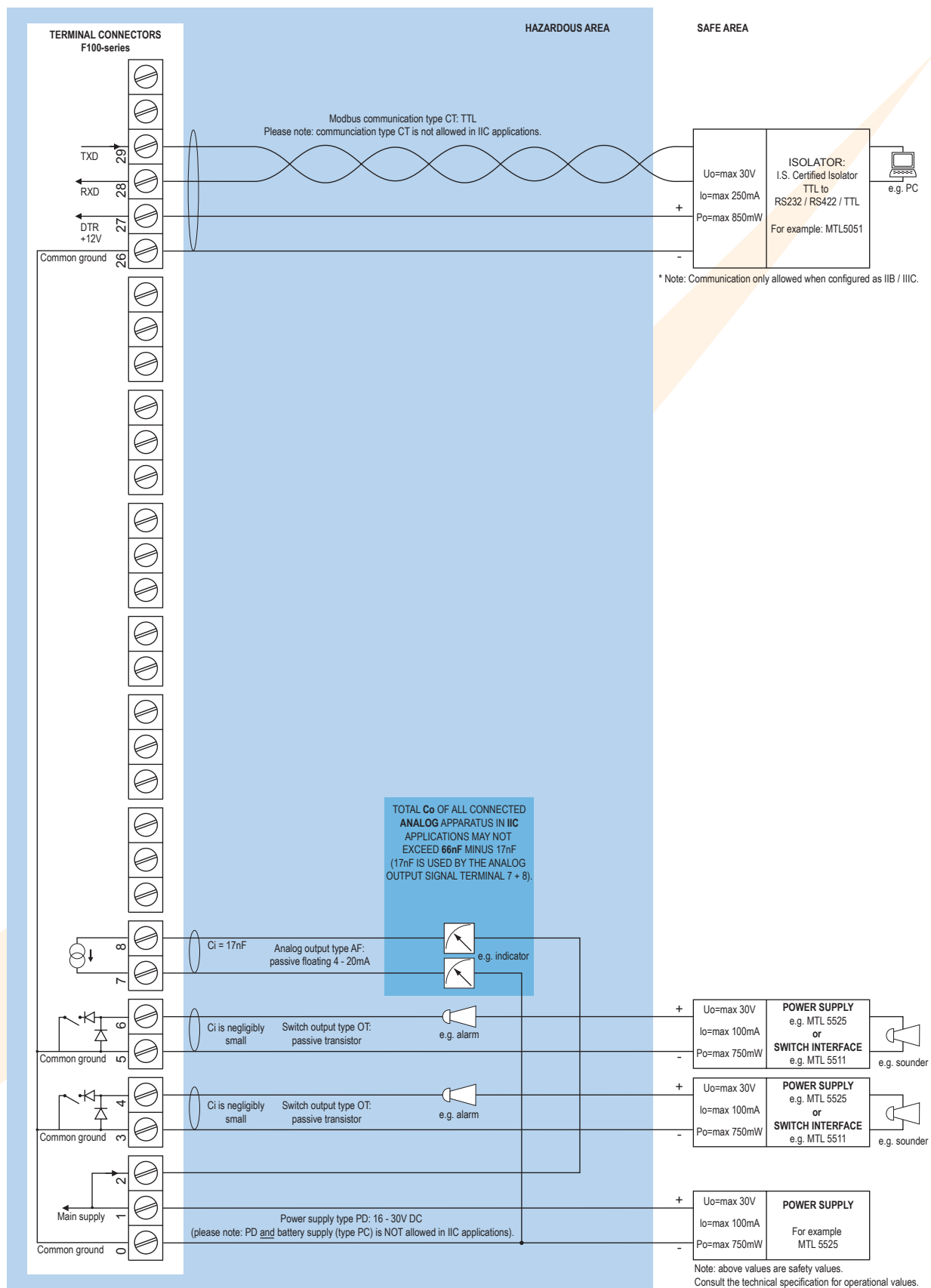
• IECEx DEK 11.0042X



## Configuration example IIB / IIIC and IIIC - F193-AP-CT-OT-PX-XI - Output loop powered



## Configuration example IIB / IIIC and IIIC - F193-AF-CT-OT-PD-XI - Power supply 16 - 30V DC



## 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.
Option ZB	Transflective LCD with green LED backlight. Good readings in full sunlight and darkness.
Note ZB	Only available for safe area applications with type PD / PF / PM.

#### 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 $\pm$ 10%. Power consumption max. 10 Watt. Intrinsically Safe: 16 - 30V DC; power consumption max. 0.75 Watt.
Type PF	24V AC / DC $\pm$ 10%. Power consumption max. 15 Watt.
Type PM	115 - 230V AC $\pm$ 10%. Power consumption max. 15 Watt.
Type PX	8 - 30V DC. Power consumption max. 0.5 Watt.
Type ZB	Internally powered with type PD / PF / PM. Power consumption max. 1 Watt.
Note PB/PF/PM	Not available 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.

#### Terminal connections

Type	Removable plug-in terminal strip. Wire max. 1.5mm <sup>2</sup> and 2.5mm <sup>2</sup> .
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#### Data protection

Type	EEPROM backup of all settings. 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-resistant 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

### Intrinsically Safe (Type XI)

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

### Explosion proof (Type XF)

ATEX certification	 II 1 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).
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## Signal inputs

### Communication

Function	Writing display information, controlling the analog and alarm outputs, reading / writing all settings.
Protocol	Modbus ASCII / 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.

## Signal outputs

### Analog output

Function	Transmitting any value set through communication.
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, PF or PM).
Type AB	Active 0 - 20mA output (requires PD, PF or PM).
Type AF	Passive floating 4 - 20mA output for Intrinsically Safe applications (requires XI + PC or PD).
Type AI	Passive galvanically isolated 4 - 20mA output - also available for battery powered models (requires PB, PD, PF or PM).
Type AP	Passive 4 - 20mA output - not isolated. Unit will be loop powered.
Type AU	Active 0 - 10V DC output (requires PD, PF or PM).

### Alarm outputs

Function	Transmitting an alarm condition or to control a device through communication.
Frequency	Max. 64Hz. Pulse length user definable between 7.8 msec up to 2 seconds.
Type OA	Three active 24V DC transistor outputs (PNP); max. 50mA per output (requires PD, PF or PM).
Type OR	Two electro-mechanical relay outputs isolated (N.O.) - max. switch power 230V AC - 0.5A (requires PF or PM) and one transistor output OT or OA.
Type OS	Four electro-mechanical relay outputs - isolated; max. switch power 230V AC - 0.5A per relay (requires AP and PD).
Type OT	Three passive transistor outputs (NPN) - not isolated. Max. 50V DC - 300mA per output.
Note	Intrinsically Safe applications: only two transistor outputs type OT available.

## Operational

### Operator functions

Displayed functions	<ul style="list-style-type: none"> <li>• Nine different product or tank values.</li> <li>• Actual value.</li> <li>• Product / tank I.D.</li> <li>• Alarm messages.</li> </ul>
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### Value

Digits	7 digits.
Units	L, m3, GAL, USGAL, kg, lb, bbl, no unit.
Decimals	0 - 1 - 2 or 3.

## Accessories

### Mounting accessories

ACFo2	Stainless steel wall mounting kit.
ACFo5	Stainless steel pipe mounting kit (worm gear clamps not included).
ACFo6	Two stainless steel worm gear clamps Ø 44 - 56mm.
ACFo7	Two stainless steel worm gear clamps Ø 58 - 75mm.
ACFo8	Two stainless steel worm gear clamps Ø 77 - 95mm.
ACFo9	Two stainless steel worm gear clamps Ø 106 - 138mm.
ACF10	Customized Grevopal tagplates for ACFo2 and ACFo5, including stainless steel screws. Dimension: 95mm x 12.5mm (3.75" x 0.50").

### Cable gland accessories

ACF20	For HA enclosure, includes O-rings.
ACF25	For HE enclosure, includes locknuts and O-rings.
ACF26	For HF enclosure, includes locknuts and O-rings.
ACF27	For HG enclosure, includes locknuts and O-rings.
ACF28	For HH enclosure, includes locknuts and O-rings.
ACF29	For HJ enclosure, includes locknuts and O-rings.
ACF32	For HM enclosure, includes O-rings.
ACF33	For HN enclosure, includes O-rings.
ACF34	For HO enclosure, includes O-rings.
ACF35	For HP enclosure, includes O-rings.
ACF39	For HT enclosure, includes O-rings.
ACF40	For HU enclosure, includes O-rings.

### Blind plug accessories

ACF50	For HA enclosure, includes O-rings.
ACF55	For HE enclosure, includes locknuts and O-rings.
ACF56	For HF enclosure, includes locknuts and O-rings.
ACF57	For HG enclosure, includes locknuts and O-rings.
ACF58	For HH enclosure, includes locknuts and O-rings.
ACF59	For HJ enclosure, includes locknuts and O-rings.
ACF62	For HM enclosure, includes O-rings.
ACF63	For HN enclosure, includes O-rings.
ACF64	For HO enclosure, includes O-rings.
ACF65	For HP enclosure, includes O-rings.
ACF69	For HT enclosure, includes O-rings.
ACF70	For HU enclosure, includes O-rings.

## Ordering information

Standard configuration: F193-X-AP-CH-EX-HC-IX-OT-PX-TX-XX-ZX.

Ordering information:		F193	X	-A	-C	-EX	-H	-IX	-O	-P	-TX	-X	-Z
<b>Sensor input signal</b>													
X	☒	No sensor input signal.											
<b>Analog output signal</b>													
AA		Active 4 - 20mA output - requires PD, PF or PM.											
AB		Active 0 - 20mA output - requires PD, PF or PM.											
AF	☒	I.S. floating 4 - 20mA output - requires XI + PC or PD.											
AI		Isolated 4 - 20mA output - requires PB, PD, PF or PM.											
AP	☒	Passive 4 - 20mA output, loop powered unit.											
AU		Active 0 - 10V DC output - requires PD, PF or PM.											
<b>Communication</b>													
CB		Communication RS232 - Modbus ASCII / RTU.											
CH		Communication RS485 - 2-wire - Modbus ASCII / RTU.											
CI		Communication RS485 - 4-wire - Modbus ASCII / RTU.											
CT	☒	Intrinsically Safe TTL - Modbus ASCII / RTU.											
<b>Flow equations</b>													
EX	☒	No flow equations.											
<b>Panel mount enclosures - IP65 / NEMA4X</b>													
HB	☒	Aluminum enclosure.											
HC	☒	GRP enclosure.											
<b>GRP field / wall mount enclosures - IP67 / NEMA4X</b>													
HD	☒	Cable entry: no holes.											
HE	☒	Cable entry: 2 x Ø 16mm & 1 x Ø 20mm.											
HF	☒	Cable entry: 1 x Ø 22mm (7/8").											
HG	☒	Cable entry: 2 x Ø 20mm.											
HH	☒	Cable entry: 6 x Ø 12mm.											
HJ	☒	Cable entry: 3 x Ø 22mm (7/8").											
HK		Flat bottom, cable entry: no holes.											
<b>Aluminum field / wall mount enclosures - IP67 / NEMA4X</b>													
HA	☒	Cable entry: 2 x PG9 & 1 x M20.											
HM	☒	Cable entry: 2 x M16 & 1 x M20.											
HN	☒	Cable entry: 1 x M20.											
HO	☒	Cable entry: 2 x M20.											
HP	☒	Cable entry: 6 x M12.											
HT	☒	Cable entry: 1 x 1/2"NPT.											
HU	☒	Cable entry: 3 x 1/2"NPT.											
HV	☒	Cable entry: 4 x M20.											
HZ	☒	Cable entry: no holes.											
<b>ABS field / wall mount enclosures - IP65</b>													
HS	☒	Silicone free ABS field enclosure IP65 – Cable entry: no holes (old HD enclosure).											
<b>Additional inputs</b>													
IX	☒	No additional input.											
<b>Outputs</b>													
OA		Three active transistor outputs - requires PD, PF or PM.											
OR		Two mechanical relay outputs + one OT or OA - requires PF or PM.											
OS		Four mechanical relay outputs - requires AP and PD.											
OT	☒	Three passive transistor outputs - standard configuration.											
<b>Power supply</b>													
PB		Lithium battery powered.											
PC	☒	Lithium battery powered - Intrinsically Safe.											
PD	☒	8 - 24V AC / DC + sensor supply - with XI: 16 - 30V DC.											
PF		24V AC / DC + sensor supply.											
PM		115 - 230V AC + sensor supply.											
PX	☒	No power supply option. Unit requires external loop AP.											
<b>Temperature input signal</b>													
TX	☒	No temperature input signal.											
<b>Hazardous area</b>													
XI	☒	Intrinsically Safe, according ATEX and IECEx.											
XF		EExd enclosure - 3 keys.											
XX		Safe area only.											
<b>Other options</b>													
ZB		Backlight.											
ZX	☒	No options.											

The bold marked text contains the standard configuration.

ⓘ Available Intrinsically Safe.

Specifications are subject to change without notice.