

Modbus Display with alarm and analog outputs



Application examples: Extreme cold weather regions



Multi tank monitoring with 1 display



Hot and sandy deserts

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 $+80^{\circ}\text{C}$ (-40°F up to 176°F).

Advantages

- Robust IP67 (NEMA Type4X) field enclosure. It is so rugged, you can even stand on it!
- Intrinsically Safe available - ATEX and IECEx approval for gas and dust applications.
- Programming can be done by your own crew, with the sensible menu-driven structure, saving cost and irritation. Know one, know them all!
- Very diverse mounting possibilities: walls, pipes, panels or directly onto outdoor sensors!

Features

- 9 different product / tank values can be displayed.
- Fully controlled through Modbus communication protocol.
- Displays actual value, product / tank I.D., measuring unit, status and alarm messages.
- Actual values are operator selectable or automatic toggled.
- Acknowledge alarms through communication or after operator interaction.
- Actual value: six large 17mm (0.67") digits.
- LED backlight option.
- Analog output re-transmitting any value set through communication.
- Up to four configurable alarm outputs controlled through communication or related to the actual product / tank values.
- Power requirements: Loop or battery powered, 8 - 30V DC, 8 - 24V AC/DC or 115 - 230V AC.

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. Of 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 password 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.

Hazardous areas

This model has been ATEX and IECEx certified Intrinsically Safe for gas and dust applications, with an allowed ambient temperature of -40°C to +70°C (-40°F to +158°F). A flame proof Ex d enclosure with ATEX certification is also available.



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 electromechanical relay.

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 eight 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.



All info at a glance



Easy to install



Easy to program



Know one know them all!



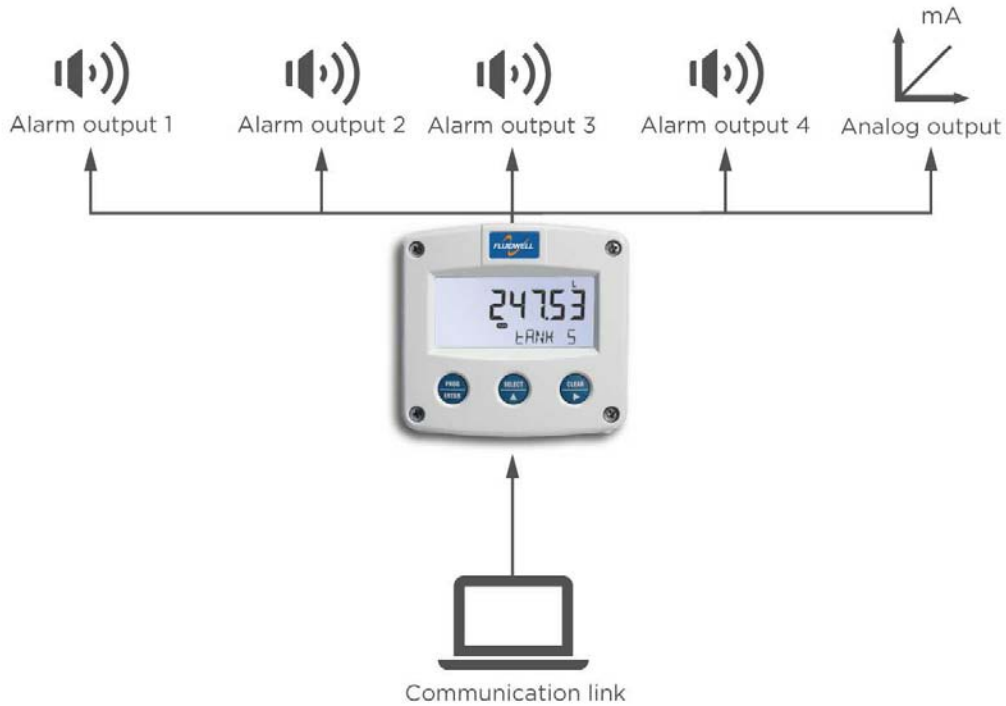
Reliable



User-friendly

Overview application F193

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). Multi tank monitoring and local indication of process parameters where the actual information is provided through a Modbus communication link and not a sensor.



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).

Power requirements

Several power supply options are available to power the F193 and sensor. A battery powered version with a long life lithium battery which will last up to five years. A 4-20mA input loop powered version is available as well. A real sensor supply is offered with the 24V AC/DC or 115-230V AC power requirement options.



Robust, even a truck can stand on it!



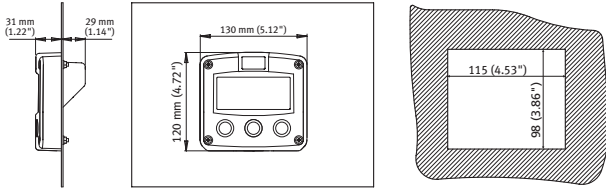
Resistant to harsh weather

Enclosures

Various types of enclosures can be selected, all ATEX and IECEx approved. The F193 is supplied in an GRP panel mount enclosure as standard, which can be converted to an IP67 / NEMA Type4X GRP field mount enclosure by the addition of a back case. Most popular is our rugged aluminum field mount enclosure with IP67 / NEMA Type4X rating. Both EU or U.S. cable gland entry threads are available.

Dimensions enclosures

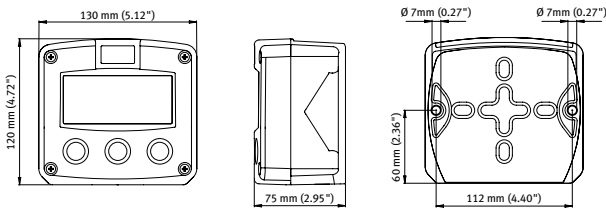
Aluminum & GRP panel mount enclosure



HB & HC enclosures

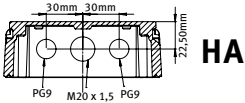
panel cut-out

Aluminum & GRP field / wall mount enclosures

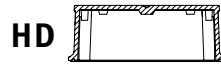


Aluminum

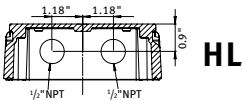
GRP



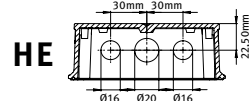
HA



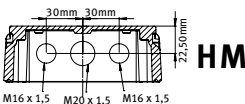
HD



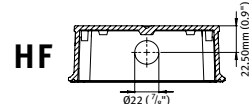
HL



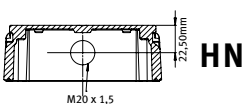
HE



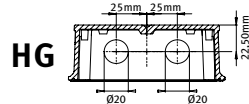
HM



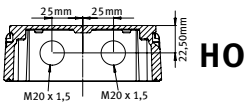
HF



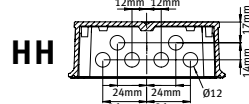
HN



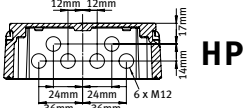
HG



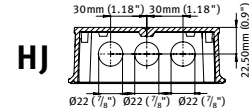
HO



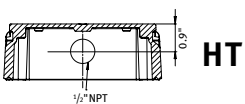
HH



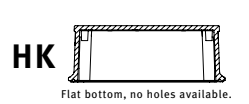
HP



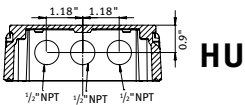
HJ



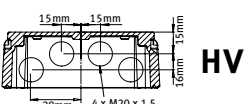
HT



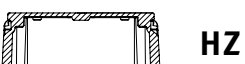
HK



HU



HV



HZ

Terminal connections

COMMUNICATION	26	27	28	29	30	31
CB: RS232	↓	↑	↑	↑	↑	↑
	DTR	RXD	RXD	TXD		
	↑	↑	↑	↑		
CH: RS485 - 2 wire	↓			A	B	
	↓			A	B	Z
CI: RS485 - 4 wire	↓			A	B	Y
	↓			A	B	Z
CT: TTL Internally Safe	↓			DTR	RXD	TXD
	↓			↑	↑	↑

	23	24	25
--	----	----	----

	20	21	22
--	----	----	----

	17	18	19
--	----	----	----

ALARM OUTPUT 3	15	16
OK: active 24V DC	↓	↑
OT: passive trans.	↓	↑

	12	13	14
--	----	----	----

ALARM OUTPUT 2	03	04
OK: active 24V DC	↓	↑
OT: passive trans.	↓	↑
OR: mech. relay	~	~

ALARM OUTPUT 1	05	06
OK: active 24V DC	↓	↑
OT: passive trans.	↓	↑
OR: mech. relay	~	~

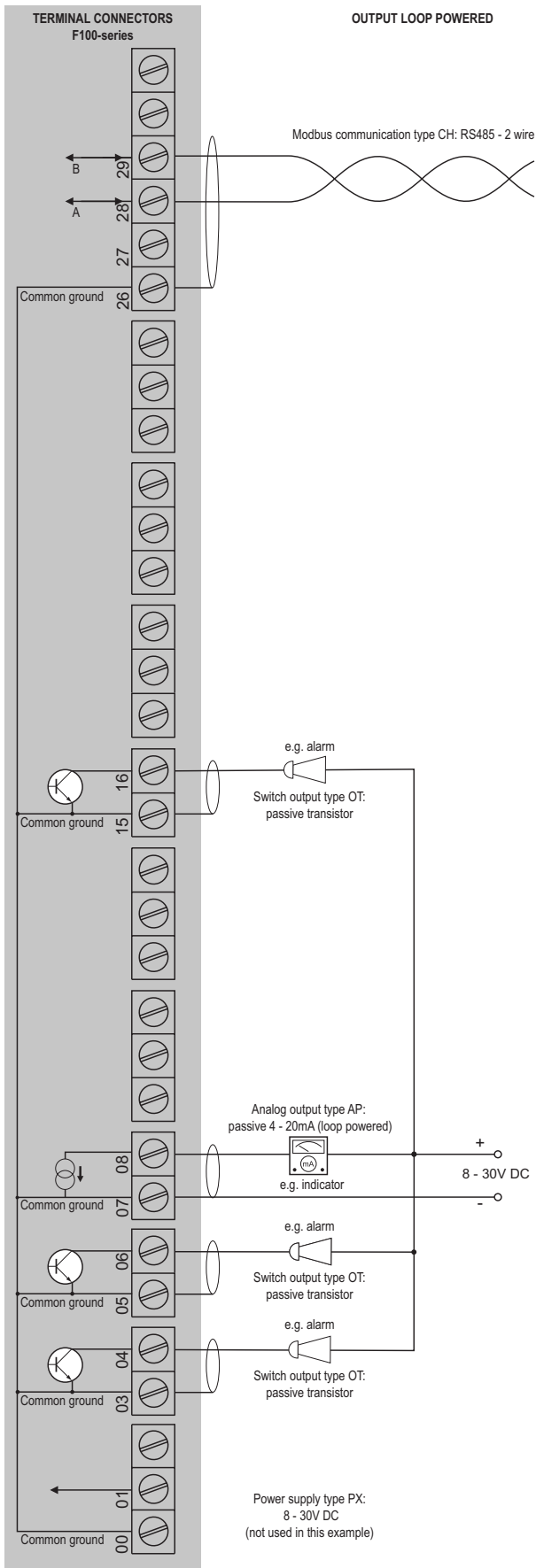
POWER REQUIREMENTS	00	01	02
PB: 8 - 24V AC	~	~	~
PD: 8 - 24V DC	-	+	
PE: 24V AC	~	~	~
PF: 24V DC	-	+	

	07	08
AA: 4 - 20mA	↑	↑
AB: 0 - 20mA	↑	↑
AF: 4 - 20mA	↑	↑
AI: 4 - 20mA	↑	↑
AP: 4 - 20mA	↑	↑
AU: 0 - 10V	↑	↑

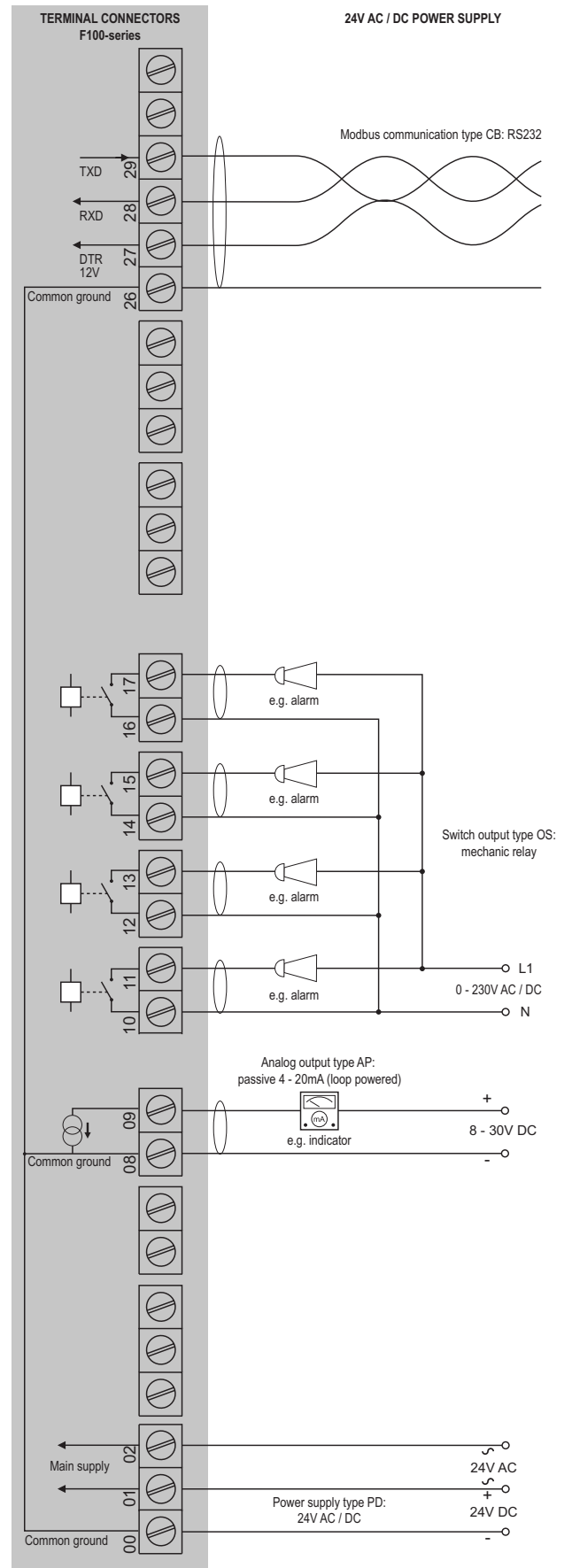
	09	10	11
--	----	----	----

AP: PX: 8 - 30V DC Output loop powered
 PB / PC: battery powered
 Internal long life Lithium battery

Configuration example F193-A-AP-CH-OT-PX-XX-ZX



Configuration example F193-P-AP-CB-OS-PD-XX-ZX



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.

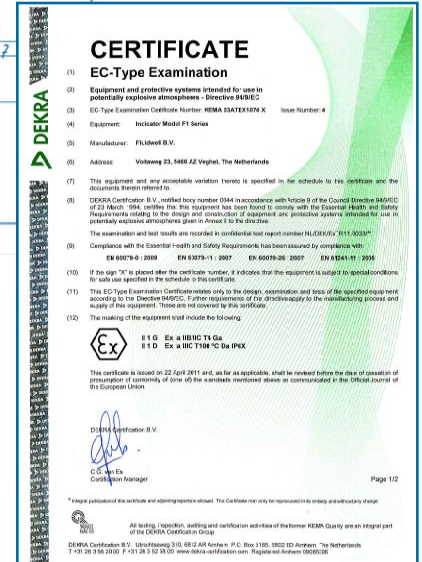
- The IECEx markings for gas and dust applications are:

Ex ia IIC/IIB T4 Ga and Ex ia IIIC T100 °C Da.

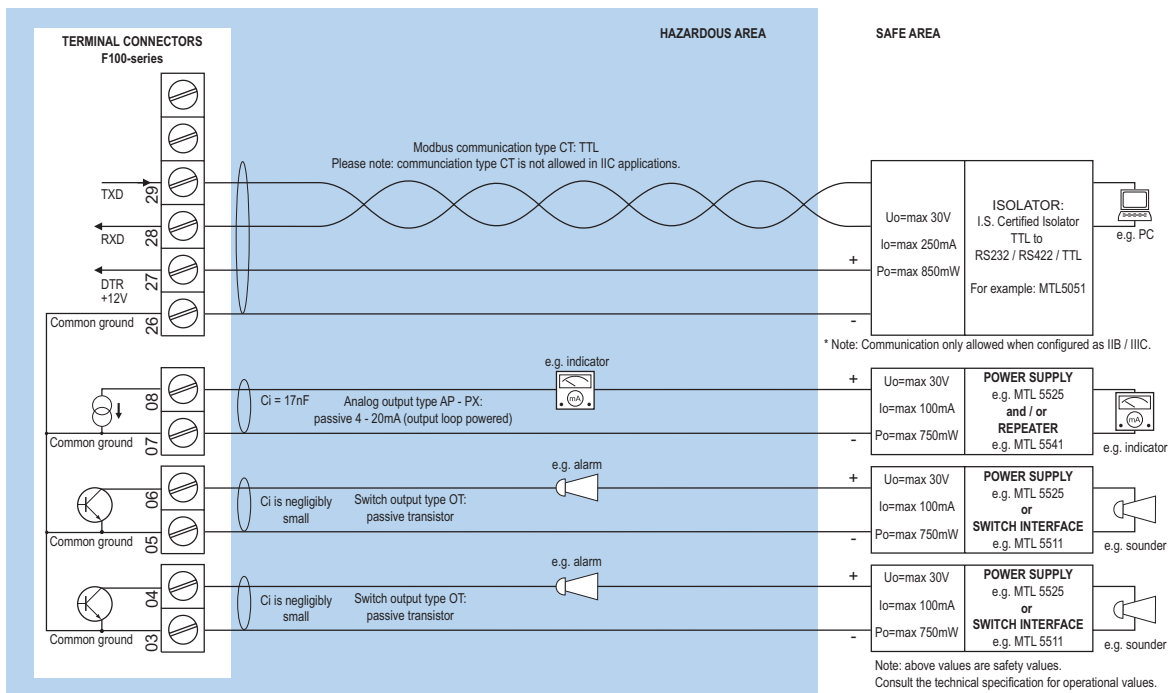
It is allowed to connect up to six barriers in IIB/IIIC applications, the F193 is not suitable for IIC applications. Consult the certificate for the maximum input and output values of the circuits. Full functionality of the F193 remains available, including Modbus communication type CT. An ATEX approved flame proof Ex d enclosure is available as well. Please contact your supplier for further details.

Certificate of conformity KEMA 03ATEX1074 X

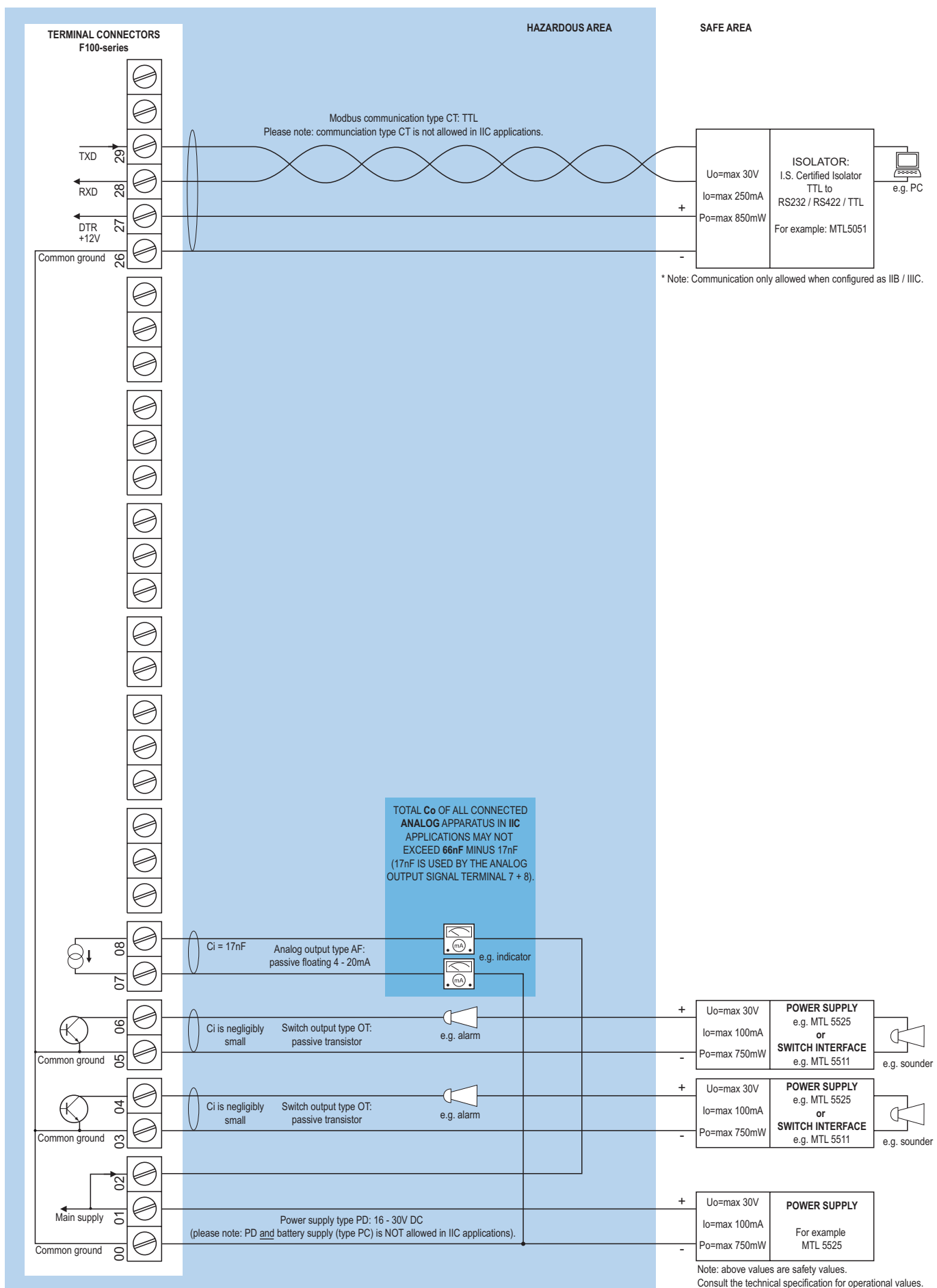
- IECEx DEK 11.0042X



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 requirement 16 - 30V DC



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

Ambient temperature

Safe areas	-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 AP	Analog output loop powered, 8 - 30V DC. Power consumption max 0.5 Watt.
Type PB	Long life Lithium battery - life-time depends upon settings and configuration - up to 5 years. (requires PD or PX)
Type PC	Intrinsically Safe long life lithium battery life-time depends upon settings and configuration - up to 5 years. (requires XI and PD or PX)
Type PD	8 - 24V AC / DC ± 10%. Power consumption max. 5W.
Type PD-XI	16 - 30V DC power consumption max. 1W.
Type PD-OS	20 - 30V DC / 15 - 24V AC power consumption max. 1W.
Type PF	24V AC / DC ± 10%. Power consumption max. 15W.
Type PM	115 - 230V AC ± 10%. Power consumption max. 15W.
Type PX	8 - 30V DC. Power consumption max. 0.75W.
Type ZB	12 - 30V DC ± 10%. Power consumption max. 1.5W.
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 XI	For Intrinsically Safe applications, consult the safety values in the certificate.

Terminal connections

Type	Removable plug-in terminal strip. Wire max. 1.5mm ² and 2.5mm ² .
-------------	---

Data protection

Type	EEPROM backup of all settings. 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 600079-0, IEC 60079-11. IP & NEMA EN 60529 & NEMA 250

Enclosure

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 Type4X 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 HL	Cable entry: 2 x 1/2" NPT.
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 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.

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.

Intrinsically Safe (Type XI)

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

Explosion proof (Type XF)

ATEX	II 2 G / Ex d IIB T5 Gb. II 2 D / Ex t IIIB T100 °C Db.
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.
Note XF	IECEX available on request.

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 - Digital output

Function	Transmitting an alarm condition or to control a device through communication.
Type OA	Three active 24V DC transistor outputs (PNP); max. 50mA per output (requires -PD, PF, PM or PX). Requires min. 24V power supply
Type OR	Two electro-mechanical relay outputs isolated max. switch power 230V AC (N.O.) - 0.5A per relay and one transistor output OT. (requires PF or PM)
Type OS	Four electro-mechanical relay outputs - isolated; max. switch power 230V AC - 0.5A per relay (requires AP and PD with 24V AC / DC).
Type OT	Three passive transistor outputs (NPN) - not isolated. Max. 50V DC - 300mA per output.
Note XI	Intrinsically Safe applications: only two transistor outputs type OT available.

Signal outputs - Analog output

Function	Transmitting any value set through Modbus communication.
Accuracy	10 bit. Error < 0.05%. Analog output signal can be scaled to any desired range.
Update time	Eight times per second.
Type AA	Active 4 - 20mA output (requires PD, PF, PM or PX).
Type AB	Active 0 - 20mA output (requires PD, PF, PM or PX).
Type AF	Passive floating 4 - 20mA output for Intrinsically Safe applications (requires XI + PD).
Type AI	Passive galvanically isolated 4 - 20mA output - also available for battery powered models.
Type AP	Passive 4 - 20mA output - not isolated. Unit will be loop powered.
Type AU	Active 0 - 10V DC output (requires PD, PF, PM or PX). Requires min. 12V power supply.

Operator functions

Displayed info	<ul style="list-style-type: none"> • Nine different product or tank values. • Actual value. • Product / tank I.D. • Alarm messages. • Operator or automatic toggle..
-----------------------	---

Value

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

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.

Cable glands

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.

Intrinsically Safe isolators

ACG01	MTL5511 - One channel pulse or switch output transfer from hazardous area to safe area.
ACG02	MTL5525 - One channel power supply from safe area to hazardous area (e.g. to power the unit with PD or to power a switching or analog device in hazardous area).
ACG03	MTL5541 - One channel 4 - 20mA repeater from hazardous area to safe area.
ACG04	MTL 5051 - Bi-direction serial-data-isolator (for Modbus communication).
ACG05	MTL5516C - Two channel pulse or switch output transfer from hazardous area to safe area.
ACG06	MTL5513 - One channel pulse or switch output transfer from hazardous area to safe area.
ACG07	MTL5546Y - One channel isolated driver bringing 4 - 20mA from safe area to hazardous area, HART transparent, OCD.

		Description	
Model	F193	Modbus display with alarm and analog outputs.	
Input	X	No sensor input signal.	-X
Analog output	AA	Active 4 - 20mA output - requires XX and PD, PF, PM or PX.	-AA
	AB	Active 0 - 20mA output - requires XX and PD, PF, PM or PX.	-AB
	AF	I.S. floating 4 - 20mA output - requires XI + PD.	-AF
	AI	Isolated 4 - 20mA output - requires XX.	-AI
	AP	Passive 4 - 20mA output, loop powered unit.	-AP
	AU	Active 0 - 10V DC output - requires XX and PD, PF, PM or PX.	-AU
Communication	CB	Communication RS 232 - Modbus ASCII / RTU - requires XX.	-CB
	CH	Communication RS 485 - 2wire - Modbus ASCII / RTU - requires XX.	-CH
	CI	Communication RS 485 - 4wire - Modbus ASCII / RTU - requires XX.	-CI
	CT	Intrinsically Safe TTL - Modbus ASCII / RTU - requires XI.	-CT
Enclosures	HB	Aluminum panel mount enclosure.	-HB
	HC	GRP panel mount enclosure.	-HC
	HD	GRP field mount - Cable entry: no holes.	-HD
	HE	GRP field mount - Cable entry: 2 x Ø 16mm & 1 x Ø 20mm.	-HE
	HF	GRP field mount - Cable entry: 1 x Ø 22mm (7/8").	-HF
	HG	GRP field mount - Cable entry: 2 x Ø 20mm.	-HG
	HH	GRP field mount - Cable entry: 6 x Ø 12mm.	-HH
	HJ	GRP field mount - Cable entry: 3 x Ø 22mm (7/8").	-HJ
	HK	GRP field mount - Flat bottom, cable entry: no holes.	-HK
	HA	Aluminum field mount - Cable entry: 2 x PG9 + 1 x M20.	-HA
	HL	Aluminum field mount - Cable entry: 2 x 1/2"NPT.	-HL
	HM	Aluminum field mount - Cable entry: 2 x M16 + 1 x M20.	-HM
	HN	Aluminum field mount - Cable entry: 1 x M20.	-HN
	HO	Aluminum field mount - Cable entry: 2 x M20.	-HO
	HP	Aluminum field mount - Cable entry: 6 x M12.	-HP
	HT	Aluminum field mount - Cable entry: 1 x 1/2"NPT.	-HT
	HU	Aluminum field mount - Cable entry: 3 x 1/2"NPT.	-HU
	HV	Aluminum field mount - Cable entry: 4 x M20.	-HV
	HZ	Aluminum field mount - Cable entry: no holes.	-HZ
Digital output	OA	Three active transistor outputs - requires XX and PD, PF, PM or PX.	-OA
	OR	Two mechanical relay outputs + one OT - requires XX and PF or PM.	-OR
	OS	Four mechanical relay outputs - requires XX, AP and PD.	-OS
	OT	Three passive transistor outputs.	-OT
Power	PD	8 - 24V AC/DC + sensor supply - with XI: 16 - 30V DC.	-PD
	PF	24V AC/DC + sensor supply - requires XX.	-PF
	PM	115 - 230V AC + sensor supply - requires XX.	-PM
	PX	Basic power supply 8 - 30V DC.	-PX
Battery	PB	Additional lithium battery powered (optional) - requires XX and PD or PX.	-PB -P_
	PC	Additional lithium battery powered (optional) - Intrinsically safe - requires XI, and PD or PX.	-PC -P_
Hazardous	XI	Intrinsically safe, according ATEX and IECEx.	-XI
	XF	Ex d enclosure - 3 keys according ATEX.	-XF
	XX	Safe area only.	-XX
Options	ZB	Backlight - requires XX.	-ZB
	ZX	No options.	-ZX

F193 -X -A_ -C_ -H_ -O_ -P_ -X_ -Z_

The **bold** marked text contains the standard configuration: F193-X-AP-CH-HC-OT-PX-XX-ZX.