DATASHEET F120 - FLOW RATE CONTROLLER

FLOW RATE CONTROLLER

WITH ANALOG CONTROL OUTPUT AND HIGH / LOW ALARMS

Features

- Controls the desired volume or mass flow.
- Displays flow rate, alarms, setpoint and total.
- Large 17mm (0.67") digits.
- Safety mode input to place the controller in a safe predefined position.
- External reset / keylock
- Analog output to control a valve.
- Two alarm values can be entered in %: low and high flow rate alarm.
- Bumpless switching between 2 operation modes: Hand and Auto.
- Green LED-backlight.
- Very compact design for panel mount, wall mount or field mount applications.
- Operational temperature -30°C up to +80°C (-22°F up to 178°F).
- Intrinsically Safe
  Ex II 1 GD EEx ia IIB/IIC T4 T100°C.
- Explosion/flame proof Ex II 2 GD EEx d IIB T5.
- Full Modbus communication RS232/485/TTL.
- Loop or battery powered, 8 - 24V AC / DC or 115 - 230V AC power supply.

Signal output

- (0)4 - 20mA / 0 - 10V DC control output.
- Two alarm outputs for low and high flow rate alarm.

Signal input

Flow

- Reed-switch.
- NAMUR.
- NPN/PNP pulse.
- Sine wave (coil).
- Active pulse signals.
- (0)4 - 20mA.
- 0 - 10V DC.

Status

- Safety mode input.
- External reset / keylock

Applications

- The F120 is designed to offer outstanding control performance and provide a reliable solution for a wide variety of flow control applications; such as chemical processing, plastic manufacturing and the aggregates and cement industry.

General information

Introduction

The F120 is part of the Fluidwell process controller family and is the alternative for local control loops. The single loop flow controller accepts most pulse inputs from flowmeters and has a 4 - 20mA output for controlling a pump or valve.

Operational

There are two operation modes:
Hand: the control output can be manually changed, there is no loop connection.
Auto: the setpoint can be set and/or changed, corresponding with the process value of flow.

Display

The display has large 17mm segments which show flow rate, setpoint, alarms and total (resettable). On-screen engineering units are easily configured from a comprehensive selection.

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, therefore avoiding 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

The flow rate is controlled via the (0)4 - 20mA or 0 - 10V DC output signal. The output signal is updated ten times per second. The output signal can be passive, active or isolated where the passive output type will loop power the F120 as well.

Signal input

The F120 will accept most pulse and analog input signals for flow or mass flow. The input signal type can be selected by the user in the configuration menu without having to adjust any sensitive mechanical dip-switches or jumpers. The analog input versions are even available as 4 - 20mA input loop powered displays.

Alarm output

Two fixed alarm outputs are available to transmit the flow rate alarm condition, 1 low and 1 high alarm output. The output signals can be a passive NPN, active PNP or an isolated electro-mechanical relay. If there is a no-flow the alarm output will be disabled.

Safety mode

The F120 has a safety mode that keeps on transmitting a pre-defined value as long as the contact is made. After releasing the contact, the former value and function will be reinstalled.

Communication

All process data and settings can be read and modified manually or through the Modbus communication link (RS232 / RS485).
Full Modbus functionality remains available for the Intrinsically Safe version (TTL).

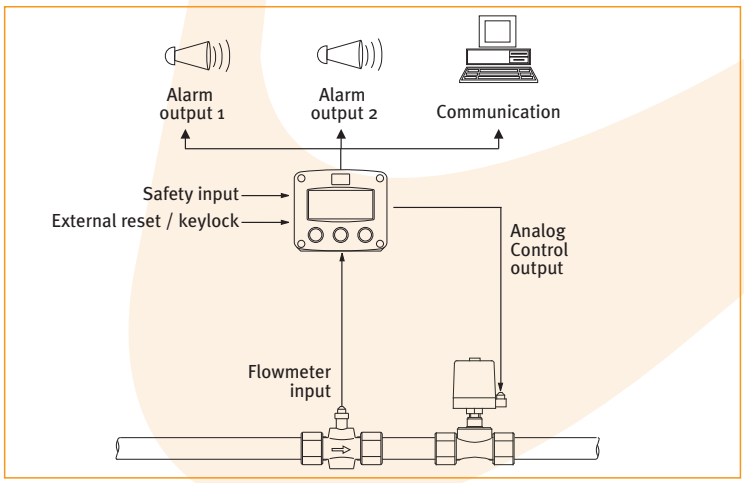
Hazardous areas

For hazardous area applications, this model has been ATEX certified Intrinsically Safe Ex II 1 GD EEx ia IIB / IIC T4 T100°C with an allowed operational temperature of -30°C to +70°C (-22°F to +158°F). A flame proof enclosure is also available with the rating Ex II 2 GD EEx d IIB T5.

Enclosures

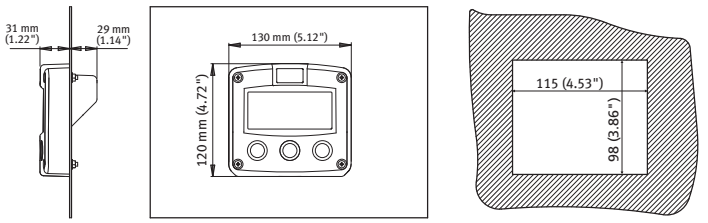
All enclosures are ATEX approved. As standard the F120 is supplied in an GRP panel mount enclosure, which can be converted to an IP67 / NEMA 4X ABS field mount enclosure by the addition of a back case. Most popular is our rugged aluminum field mount enclosure

Overview application F120



Dimensions enclosures

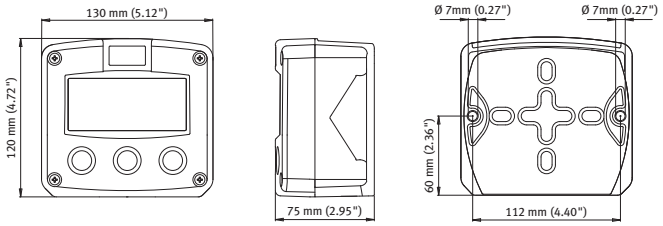
Aluminum & GRP panel mount enclosure



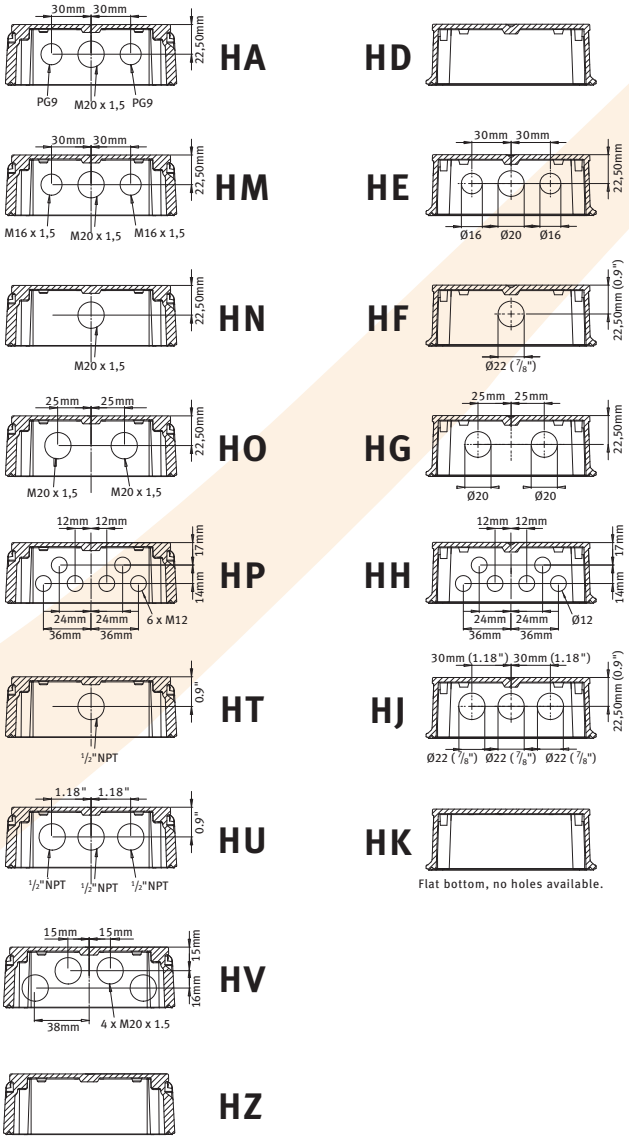
HB & HC enclosures

panel cut-out

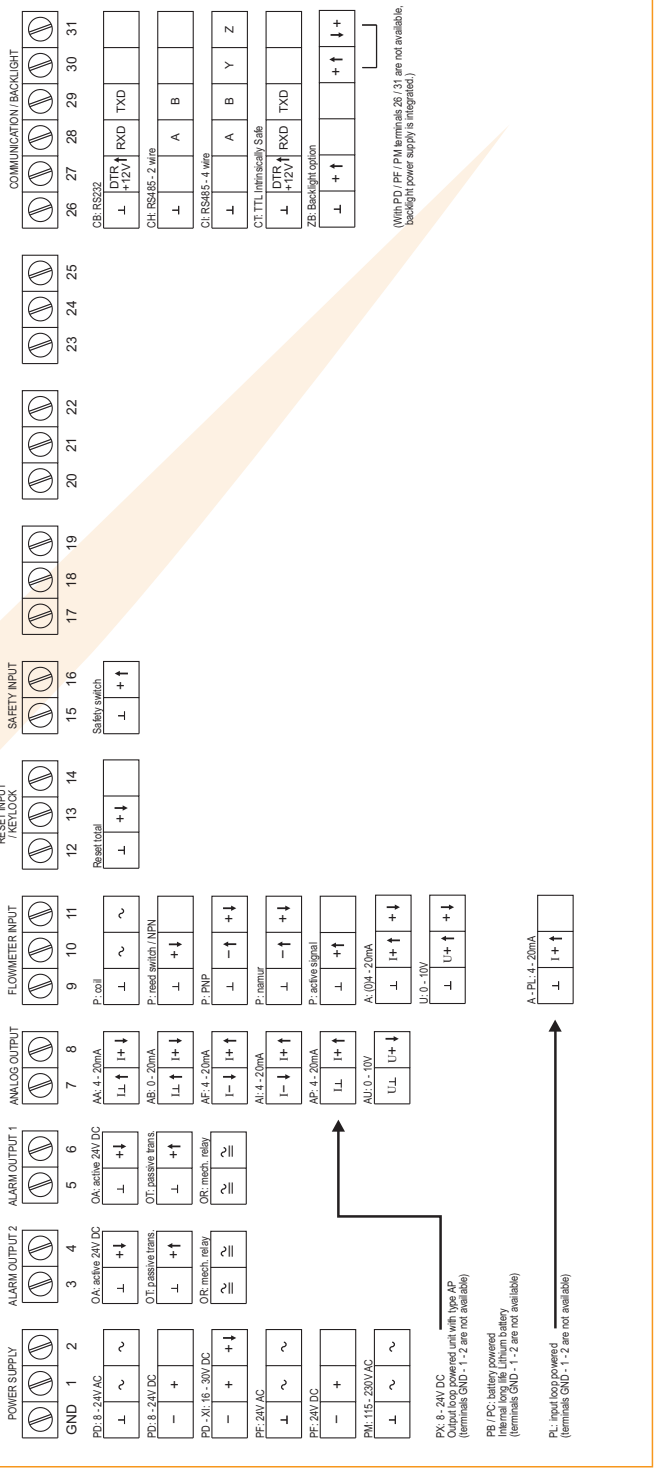
Aluminum & GRP field / wall mount enclosures



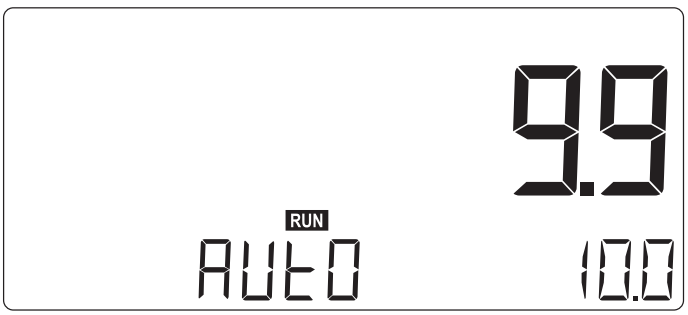
Aluminum | **GRP**



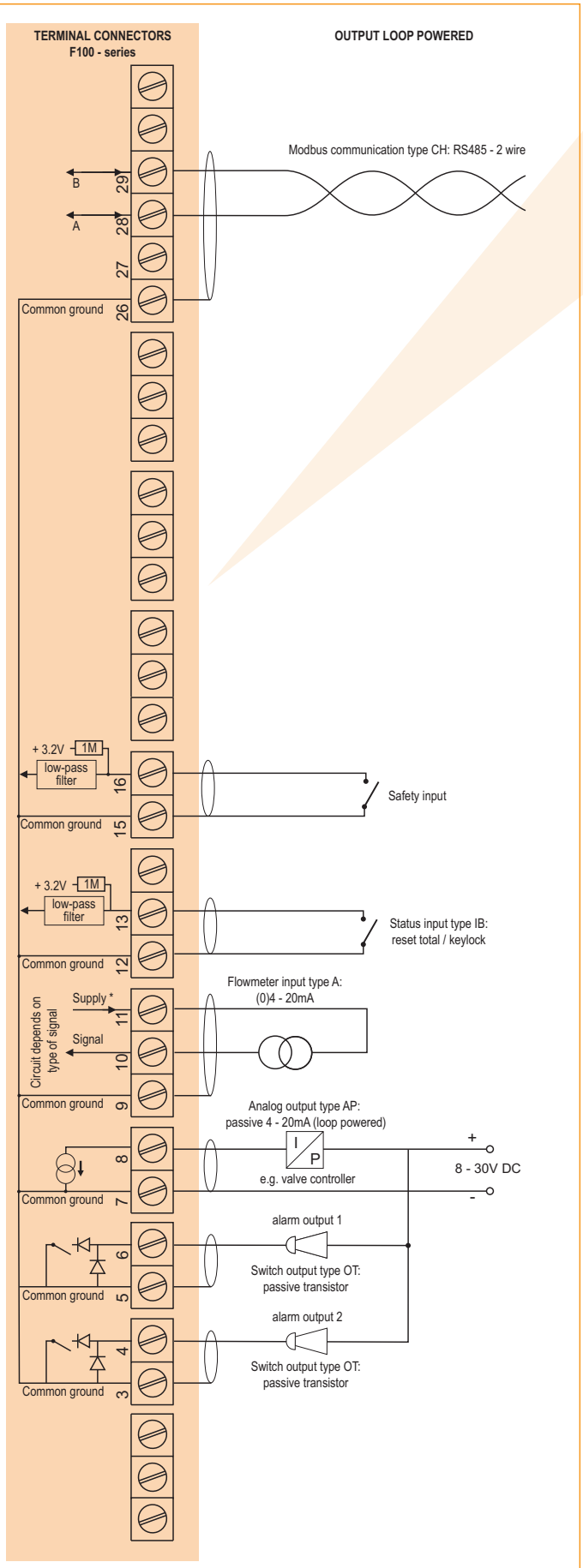
Terminal connections



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

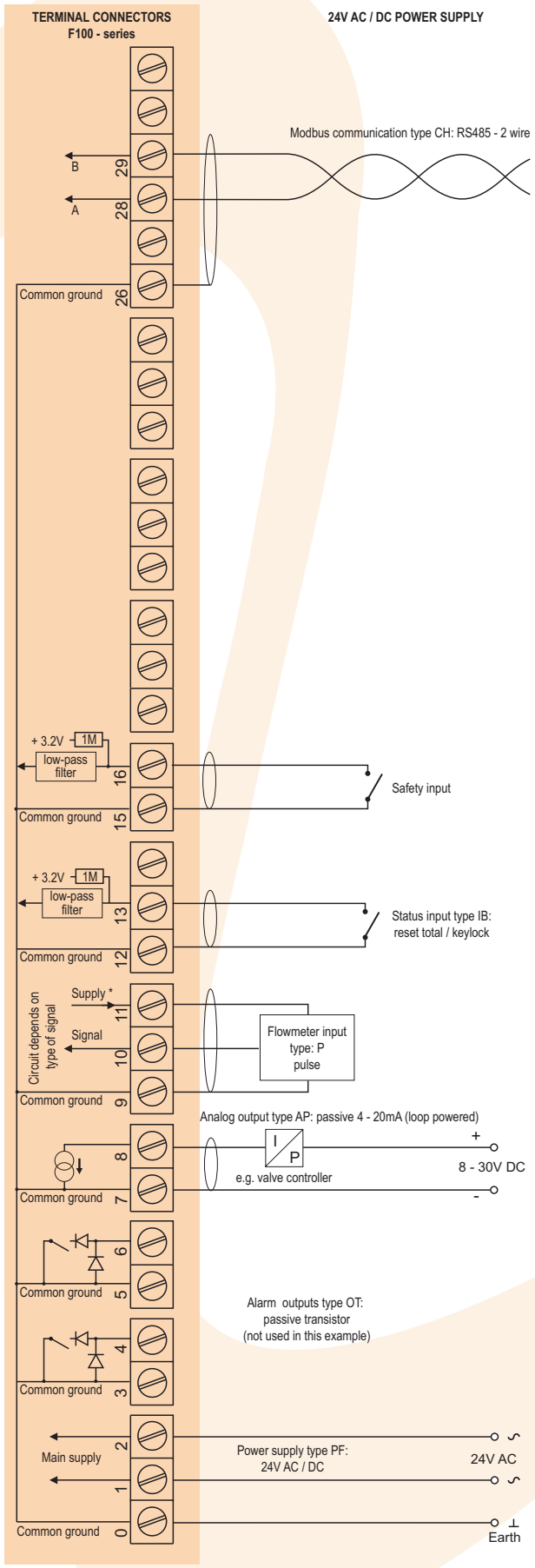


Typical wiring diagram F120-A-AP-CH-OT-IB-PX



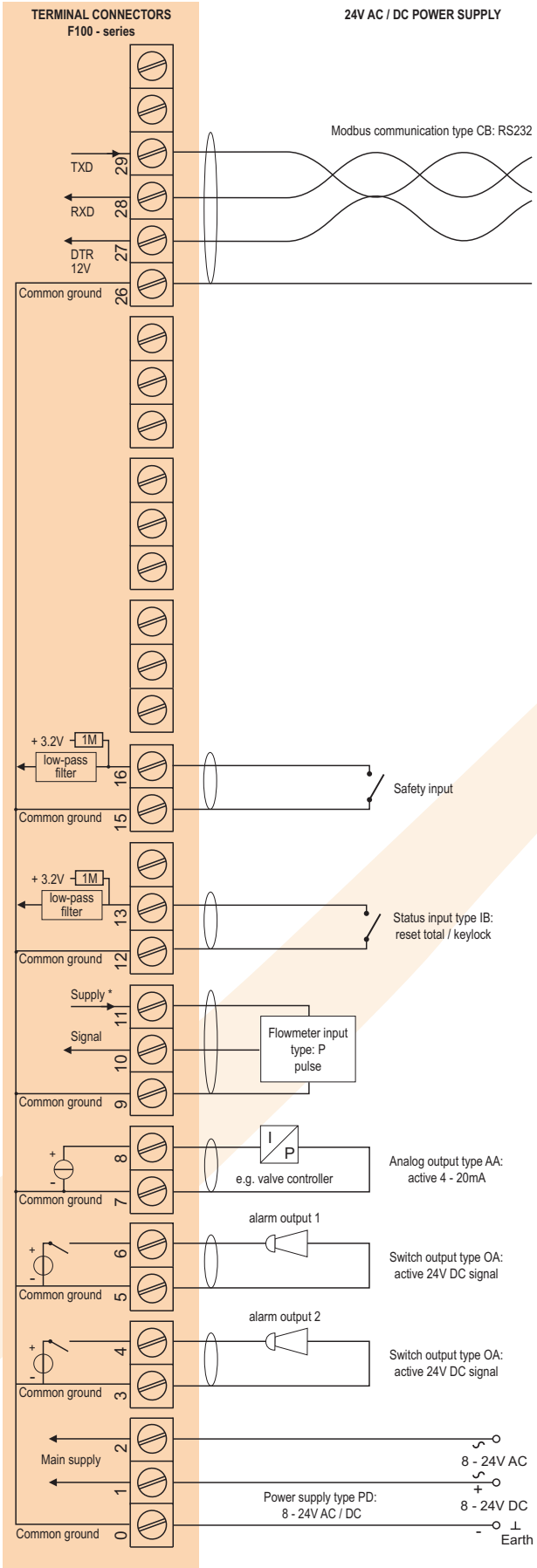
*Supply voltage: 1.2 / 3.2V DC to sensor

Typical wiring diagram F120-P-AP-CH-IB-PF



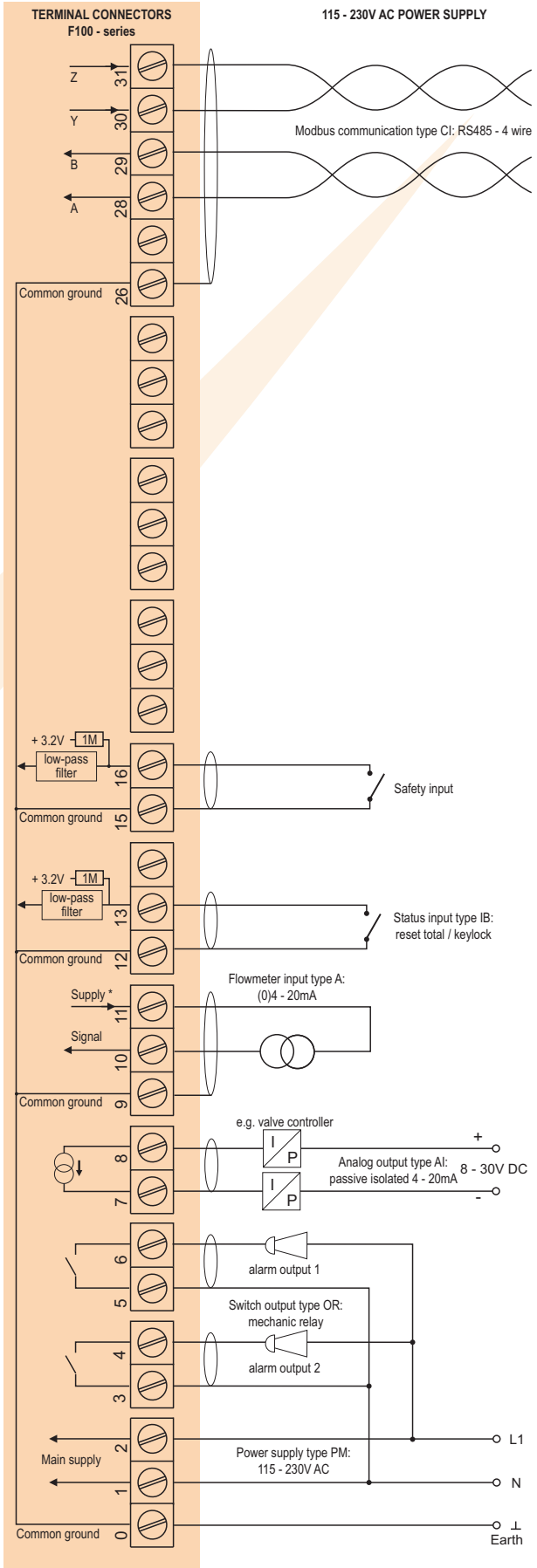
*Supply voltage: 1.2 / 3.2 / 8.2 / 12 / 24V DC to sensor

Typical wiring diagram F120-P-AA-CB-IB-OA-PD



*Supply voltage: 1.2 / 3.2 / 8.2 / 12 / 24V DC to sensor

Typical wiring diagram F120-A-AI-CI-IB-OR-PM



*Supply voltage: 1.2 / 3.2 / 8.2 / 12 / 24V DC to sensor

Hazardous area applications

The F120-XI has been ATEX approved by the KEMA for use in Intrinsically Safe applications. It is approved according to Ex II 1 GD EEx ia IIB/IIC T4 T100°C for gas and dust applications with an operational temperature range of -30°C to +70°C (-22°F to + 158°F). It is allowed to connect up to six barriers in IIB applications or one barrier in IIC applications.
Full functionallity of the F120 remains available, including 8.2V sensor excitation for e.g. Namur sensors (type PD) and the Modbus communication type CT.
A flame proof enclosure is available as well with rating ATEX Ex II 2 GD EEx d IIB T5. Please contact your supplier for further details.

Certificate of conformity KEMA 03ATEX1074 X

KEMA

(1) **EC-TYPE EXAMINATION CERTIFICATE**

(2) Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC

(3) EC-Type Examination Certificate Number: **KEMA 03ATEX1074 X** Issue Number: **2**

(4) Equipment: **Indicator Model F1 Series**

(5) Manufacturer: **Fluidwell B.V.**

(6) Address: **Eisenhowerweg 1, 5466 AB Veghel, The Netherlands**

(7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) KEMA Quality B.V., notified body number 0344 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

The examination and test results are recorded in confidential test report number 2092823.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014 : 1997 + A1, A2 EN 50020 : 2002
EN 50281-1-1 : 1998 + A1 EN 50284 : 1999

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment according to the Directive 94/9/EC. Further requirements of the directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

Ex II 1 GD EEx ia IIB/IIC T4 T 100 °C

This certificate is issued on 11 September 2006 and, as far as applicable, shall be revised before the date of cessation of presumption of conformity of (one of) the standards mentioned above as communicated in the Official Journal of the European Union.

KEMA Quality B.V.

C.G. van Es
Certification Manager

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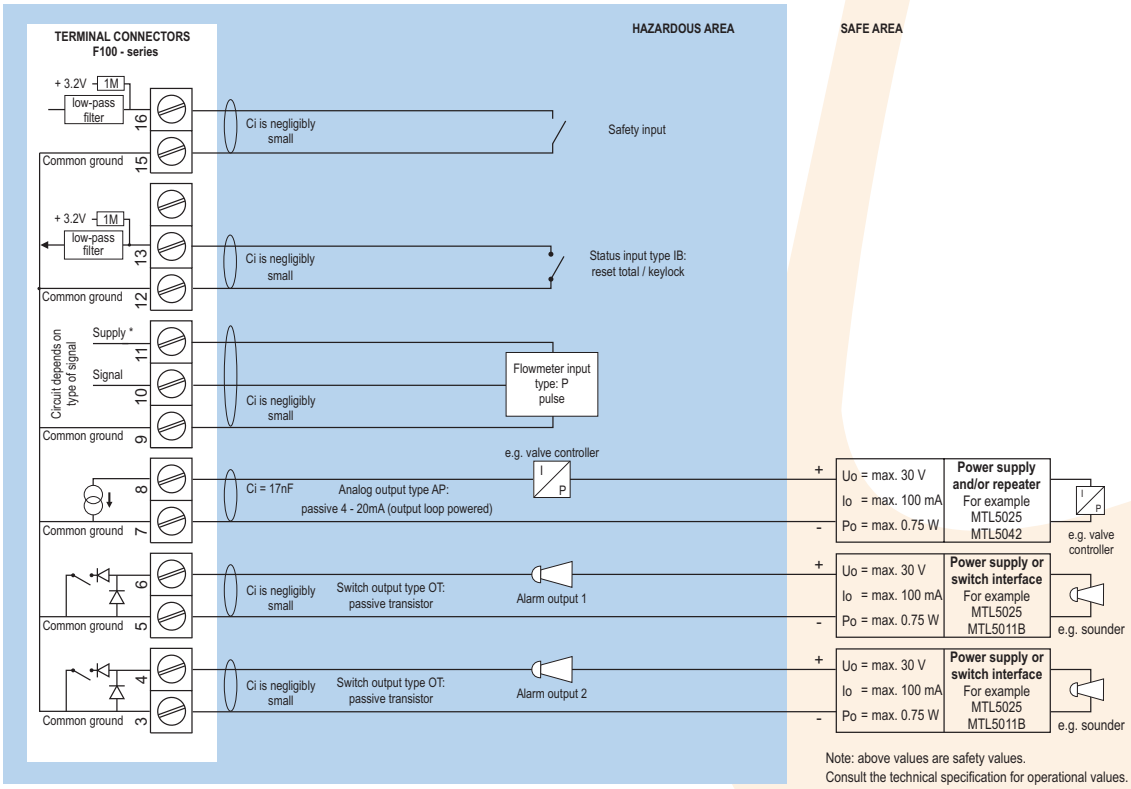
KEMA Quality B.V. Utrechtseweg 310, 6812 AR Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
T +31 26 3 56 20 00 F +31 26 3 52 58 00 customer@kema.com www.kema.com Registered Arnhem 09085396

Experience you can trust.

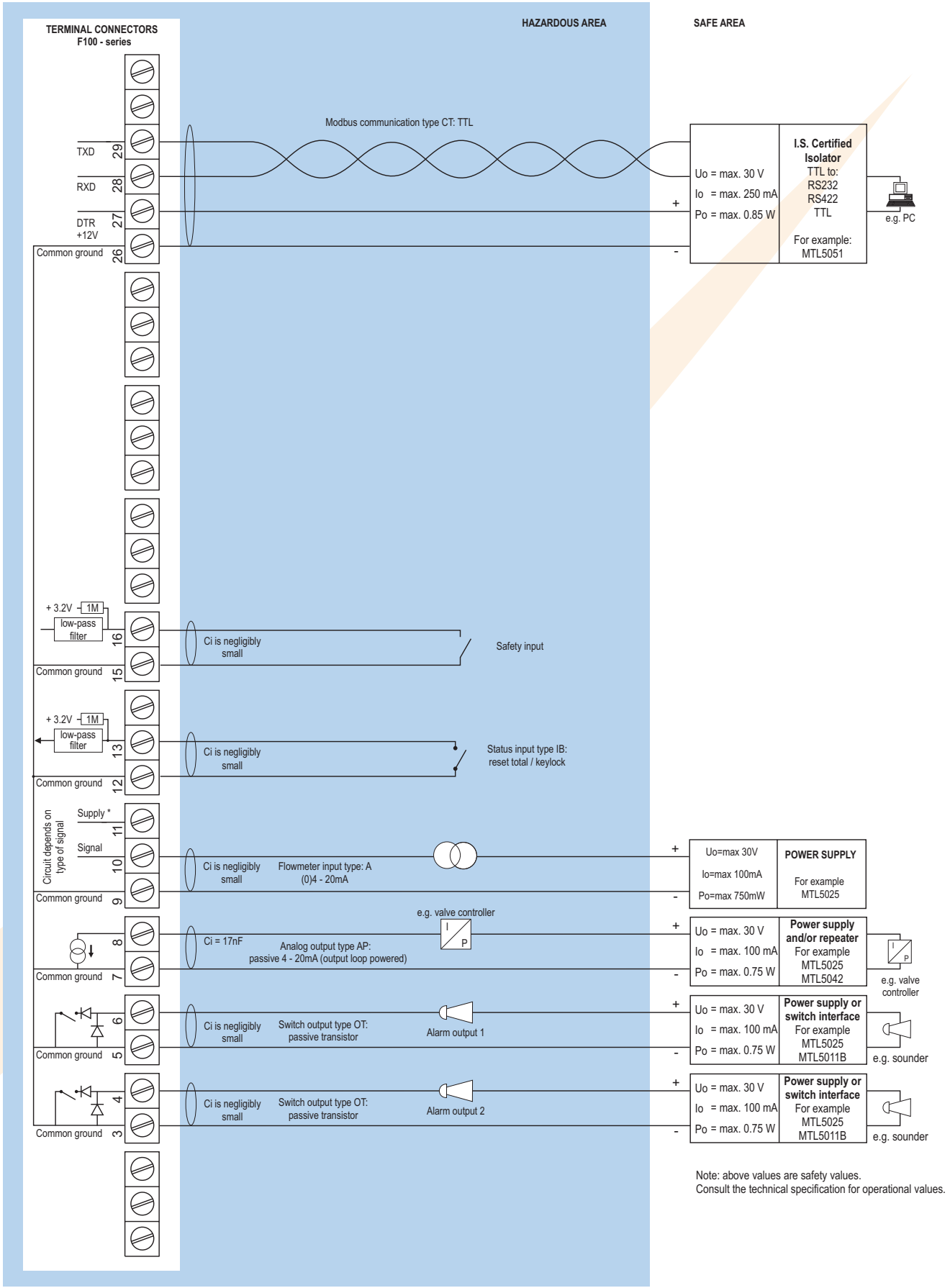
Configuration example IIB and IIC
F120-P-AP-IB-OT-PX-XI - Output loop powered unit



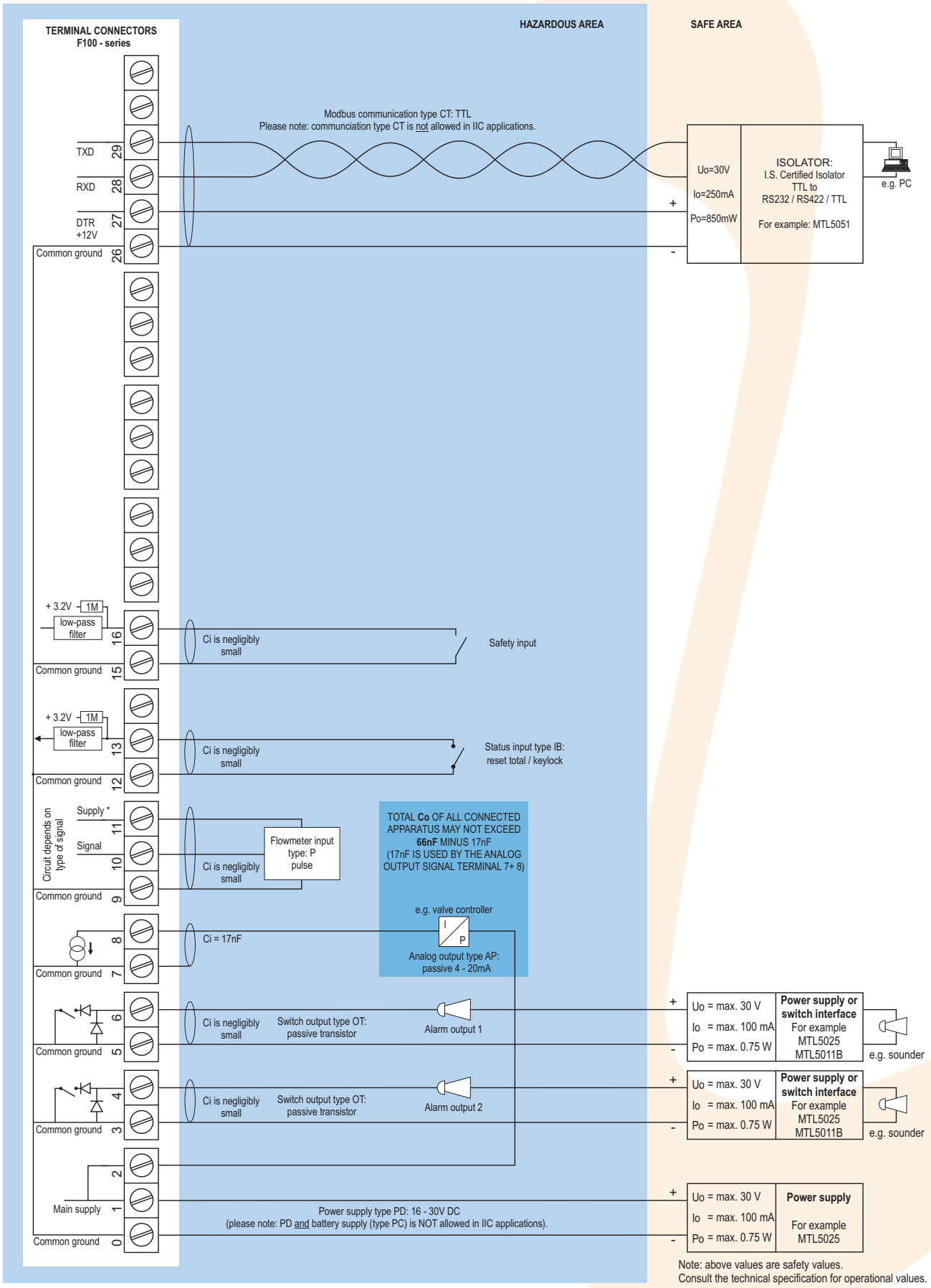
* Note sensor supply voltage: 1.2 V DC for coil sensors or 3.2V DC for other pulse sensors.

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

Configuration example IIB - F120-A-AP-CT-IB-OT-PX-XI - Output loop powered unit

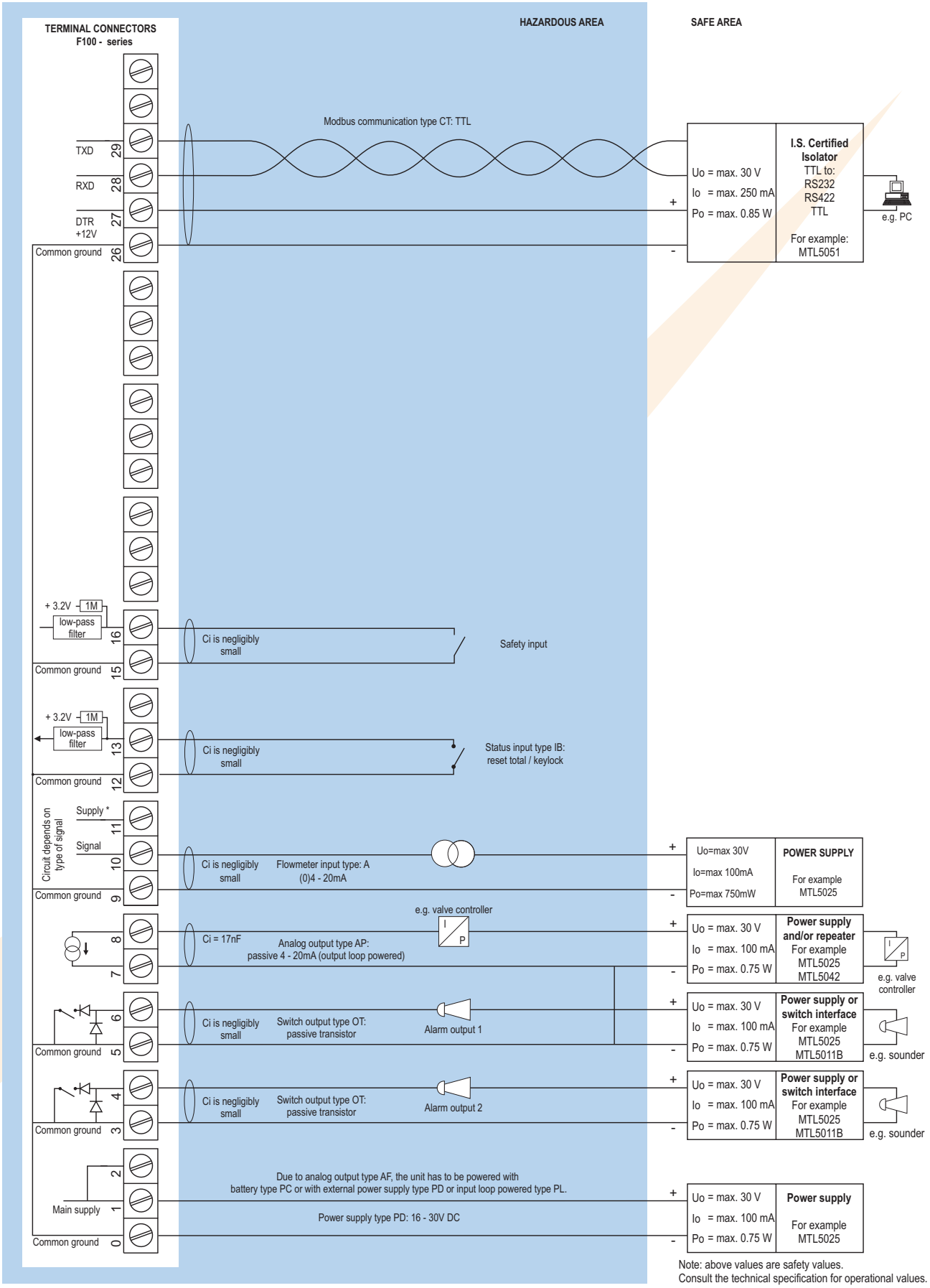


Configuration example IIB - F120-P-AP-CT-IB-OT-PD-XI - Power supply 16 - 30V DC



* Note power supply type PD: the supply voltage to pulse sensors is maximum 8.7V (Uo=max 8.7V Io=max 25mA Po=max 150mW) and to analog sensors as connected to terminal 1 (internally linked).

Configuration example IIB and IIC - F120-A-AF-CT-IB-OT-PD-XI - Power supply 16 - 30V DC



* Note power supply type PD: the supply voltage to pulse sensors is maximum 8.7V (Uo=max 8.7V Io=max 25mA Po=max 150mW) and to analog sensors as connected to terminal 1 (internally linked).

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. - 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.

Operating temperature	
Operational	-30°C to +80°C (-22°F to +178°F).
Intrinsically Safe	-30°C to +70°C (-22°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 ± 10%. Power consumption max. 10 Watt. Intrinsically Safe: 16 - 30V DC; power consumption max. 0.75 Watt.
Type PF	24V AC / DC ± 10%. Power consumption max. 15 Watt.
Type PL	Input loop powered from sensor signal 4 - 20mA (type "A") - requires types AI or AF and OT.
Type PM	115 - 230V AC ± 10%. Power consumption max. 15 Watt.
Type PX	8 - 30V DC. Power consumption max. 0.5 Watt.
Type ZB	12 - 24V DC ± 10% or type PD / PF / PM. Power consumption max. 1 Watt.
Note PB/PF/PM	Not availble 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.

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	1.2 / 3.2 / 8.2 / 12 / 24V DC - max. 50mA @ 24V DC.
Type PD-XI	1.2 / 3.2 / 8.2V DC - max. 7mA @ 8.2V DC and mains power supply voltage (as connected to terminal 1).
Note	In case PD-XI and signal A or U: the sensor supply voltage is according to the power supply voltage connected to terminal 1. Also terminal 2 offers the same voltage.
Type PF / PM	1.2 / 3.2 / 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.

Hazardous area	
Intrinsically Safe Type XI	ATEX approval ref.: Ⓔx II 1 GD EEx ia IIB/IIC T4 T100°C. Maximum ambient +70°C (158°F).
Explosion proof Type XF	ATEX approval ref.: Ⓔx II 2 GD EEx d IIB T5. Dimensions of enclosure: 300 x 250 x 200mm (11.8" x 9.9" x 7.9") L x H x D.
Weight	appr. 15 Kg.

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

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 4.
Weight	600 gr.
Type HC	GRP panel mount enclosure IP65 / NEMA 4, 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.

Signal inputs

Flowmeter	
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.
Type A	(0)4 - 20mA. Analog input signal can be scaled to any desired range within 0 - 20mA.
Type U	0 - 10V DC. Analog input signal can be scaled to any desired range within 0 - 10V DC.
Accuracy	Resolution: 14 bit. Error < 0.025mA / ± 0.125% FS. Low level cut-off programmable.
Span	0.000010 - 9,999,999 with variable decimal position.
Update time	Four times per second.
Voltage drop	Type A: 2.5V @ 20mA.
Load impedance	Type U: 3kΩ.
Relationship	Linear and square root calculation.
Note	For signal type A and U: external power to sensor is required; e.g. type PD.

External inputs	
Function	Safety input (terminal 15 - 16).
Description	Terminal input to activate the predefined safety flow rate. Internally pulled-up switch contact - NPN.
Function Type IB	External reset / keylock (terminal 12 - 13).
Description	Terminal input to reset total remotely / keylock. Internally pulled-up switch contact - NPN.
Duration	Minimum pulse duration 100msec.

Signal outputs

Analog output	
Function	Controlling the flow rate.
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 /pulse output	
Function	Low or high flow rate alarm output. Alarm value limits: 0 - 100%.
Frequency	Max. 64Hz. Pulse length user definable between 7.8 msec up to 2 seconds.
Type OA	Two active 24V DC transistor outputs (PNP); max. 50mA per output (requires AA + 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).
Type OT	Two passive transistor outputs (NPN) - not isolated. Max. 50V DC - 300mA per output.

Communication option	
Function	Reading display information, reading / writing all configuration settings.
Protocol	Modbus 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.

Operational

Operator functions	
Displayed functions	• Flow rate setpoint. • Flowrate. • Total. • Low flow rate alarm value. • High flow rate alarm value. • Operation modes: Hand and Auto. • Safety mode.

Flowrate	
Digits	7 digits.
Units	mL, L, m^3, Gallons, KG, Ton, lb, bl, cf, RND, ft^3, scf, Nm^3, Nl, igal - no units.
Decimals	0 - 1 - 2 or 3.
Time units	/sec - /min - /hr - /day.

Control Parameters	
Operation mode	Hand and Auto.
Control action	Direct / Reverse.
Proportional band	0.1 to 999,9%.
Integral time	0.1 to 6,000.0 s or OFF (0.0).
Safety output	-5.0 to 105.0% (0) = Run / (1) = Safety output.
Control output limiter	-5.0 to 105.0% for both high and low limits.

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").

Ordering information

Standard configuration: F120-P-AP-CX-EX-HC-IX-OT-PX-TX-XX-ZX.

Ordering information:		F120 -_	-A _	-C _	-EX	-H _	-IX	-O _	-P _	-TX	-X _	-Z _
Flowmeter input signal												
A	Ex	(o)4 - 20mA input.										
P	Ex	**Pulse input: coil, npn, pnp, namur, reed-switch.**										
U	Ex	0 - 10V DC input.										
Analog output signal												
AA		Active 4 - 20mA output - requires OA + PD, PF or PM.										
AB		Active 0 - 20mA output - requires OA + PD, PF or PM.										
AF	Ex	I.S. floating 4 - 20mA output - requires XI + PC or PD.										
AI		Isolated 4 - 20mA output - requires PB, PD, PF or PM.										
AP	Ex	**Passive 4 - 20mA output, loop powered unit.**										
AU		Active 0 - 10V DC output - requires OA + PD, PF or PM.										
Communication												
CB		Communication RS232 - Modbus RTU.										
CH		Communication RS485 - 2-wire - Modbus RTU.										
CI		Communication RS485 - 4-wire - Modbus RTU.										
CT	Ex	Intrinsically Safe TTL - Modbus RTU.										
CX	Ex	**No communication.**										
Flow equations												
EX	Ex	**No flow equations.**										
Panel mount enclosures - IP65 / NEMA4												
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												
HS	Ex	Silicone free ABS field enclosure IP65 – Cable entry: no holes (old HD enclosure).										
Additional inputs												
IB	Ex	Terminal input to reset total / keylock.										
IX	Ex	**No additional input.**										
Outputs												
OA		Two active transistor outputs - requires AA, AB or AU and PD, PF or PM.										
OR		Two mechanical relay outputs - requires PF or PM.										
OT	Ex	**Two passive transistor outputs - standard configuration.**										
Power supply												
PB		Lithium battery powered.										
PC	Ex	Lithium battery powered - Intrinsically Safe.										
PD	Ex	8 - 24V AC/DC + sensor supply - with XI: 16 - 30V DC.										
PF		24V AC/DC + sensor supply.										
PL	Ex	Input loop powered from sensor signal type "A" - requires AI or AF and OT.										
PM		115 - 230V AC + sensor supply.										
PX	Ex	**Basic power supply 8 - 30V DC (no real sensor supply). Unit requires external loop AP.**										
Temperature input signal												
TX	Ex	**No temperature input signal.**										
Hazardous area												
XI	Ex	Intrinsically Safe, according ATEX.										
XF		EExd enclosure - 3 keys.										
XX		**Safe area only.**										
Other options												
ZB		Backlight.										
ZF	Ex	Coil input 10mVpp.										
ZX	Ex	**No options.**										

The bold marked text contains the standard configuration.

Ex Available Intrinsically Safe.

Specifications are subject to change without notice.

KEMA CERTIFICATE ISO 9001:2008 DUTCH COUNCIL FOR ACCREDITATION C 013

Fluidwell bv
P.O. Box 6
5460 AA - Veghel - The Netherlands
Tel.: +31 (0)413 343786
Fax.: +31 (0)413 363443
sales@fluidwell.com
Internet: www.fluidwell.com

Ex CE

SCHWING

Vertrieb: Schwing Verfahrenstechnik GmbH
Oderstraße 7
47506 Neukirchen -Vluyn - Germany
Tel.: +49 (0) 2845 930-0
Fax: +49 (0) 2845 930-100
E-mail: info@schwing-pmt.de
http://www.schwing-pmt.de