Features
- Displays compensated consumption (flow rate), total and accumulated total.
- Supply line: displays temperature and compensated flow rate.
- Return line: displays temperature and compensated flow rate.
- 7 digit resettable total.
- 11 digit accumulated total.
- Analog signal output.
- Very compact design for panel mount, wall mount or field mount applications.
- Operational temperature -30°C up to +80°C (-22°F up to 176°F).
- Rugged aluminum field mount enclosure IP67/NEMA4X.
- Intrinsically Safe II 1 GD EEx ia IIB/IIC T4 T100°C.
- Explosion/flame proof 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.
- Sensor supply 3.2 / 8.2 / 12 / 24V DC.

Signal output
- (0)4 - 20mA / 0 - 10V DC according to compensated consumption (flow rate).

Signal input
Flow
- Reed-switch.
- NAMUR.
- NPN/PNP pulse.
- Sine wave (coil).
- Active pulse signals.

Temperature
- PT100 - 2 or 3 wire.
- (0)4 - 20mA.
- 0 - 10V DC.

Applications
- fuel consumption calculation for diesel engines on board of ships or locomotives, generators or burners. Alternative basic model: F116.
**General information**

**Introduction**

The flowcomputer Model F127 has been developed to calculate corrected differential liquid volume at normal conditions for generic products. A typical application is the measurement of fuel consumption by engines for power generators, e.g. on board ships and locomotives. The usual difficulties encountered in such applications include: pulsating flows, very low consumption readings, vibration and high ambient temperatures. These are all well catered for in the design and operation of the F127. The corrected volumetric flow in each line is calculated using the thermal expansion coefficient algorithm stored in the flowcomputer. The reference temperature can be defined as desired, e.g. 15°C, 20°C or 60°F.

**Display**

The display has large 17mm (0.67”) and 8mm (0.31”) digits which can be set to show flow rate, total and temperature. On-screen engineering units are easily configured from a comprehensive selection. The accumulated total can register up to 11 digits and is backed-up in EEPROM memory every minute.

**Configuration**

All configuration settings are accessed via a simple operator menu which can be pass-code protected. Each setting is clearly indicated with an alphanumerical description, 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 failure.

**Analog output signal**

The calculated consumption (flow rate) is re-transmitted with the (0)4 - 20mA or 0 - 10V DC output signal. The output signal is updated ten times per second with a filter function being available to smoothen out the signal if desired. The output value is user defined in relation to the flow rate, e.g. 4mA equals to 15L/Hr and 20mA equals to 200L/Hr. The output signal can be passive, active or isolated where the passive output type will loop power the F127 as well.

**Signal inputs**

The flowcomputer measures the uncorrected volumetric flow and temperature in both supply and return line. The F127 will accept most pulse input signals for flow. For the temperature measurement, 2 or 3 wire PT100 elements or sensors with a (0)4 - 20mA / 0 - 10V DC output signal can be used.

**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 area**

For hazardous area applications, this model has been ATEX certified Intrinsically Safe Ⅱ1 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 Ⅱ1 2 GD EEx d IIB T5.

**Enclosures**

Various types of enclosures can be selected, all ATEX approved. As standard the F127 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 F127**
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”)

**Total** m³

**Rate** NL/HR
**Typical wiring diagram F127-P-(AP)-CH-EL-PB-TP**

**Typical wiring diagram F127-P-AP-CH-EL-PX-TA**

---

**Terminal Connectors**

- **F100-series**

**Battery Powered**

- **Modbus Communication Type CH:** RS485 - 2 wire

**Output Loop Powered**

- **Modbus Communication Type CH:** RS485 - 2 wire

---

**Terminal Connectors**

- **F100-series**

**Battery Powered**

- **Temperature Input Type TP:** PT100

**Output Loop Powered**

- **Temperature Input Type TA:** (0)4 - 20mA

---

- **Analog Output Type AP:** Passive 4 - 20mA (not used in this example)

- **Flowmeter Input Type:** P pulse

---

*Supply voltage: 1.2 / 3.2V DC to sensor

---

Please note: AP may be used in combination with the battery! AP will power the unit (output loop powered); the battery will be disabled automatically until power is disconnected.

---

*Supply voltage: 1.2 / 3.2V DC to sensor
**Typical wiring diagram F127-P-AI-CI-EL-PD-TA**

- **Terminal Connectors F100-series**: 24V AC / DC Power Supply
- **Temperature input type**: TA (0V - 20mA)
- **Flowmeter input type**: P (pulse)
- **Power supply type**: PD (8 - 24V AC / DC)

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

**Typical wiring diagram F127-P-AA-CB-EL-PM-TP**

- **Terminal Connectors F100-series**: 115 - 230V AC Power Supply
- **Temperature input type**: TP (PT100 3-wire)
- **Flowmeter input type**: P (pulse)
- **Analog output type**: AA: active 4 - 20mA

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

Please note: temperature measurement type TA is not available for power supply type PF / PM.
**Hazardous area applications**

The F127-XI has been ATEX approved by KEMA for use in Intrinsically Safe applications. It is approved according to 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 I.S. power supplies in IIB applications or one I.S. power supply in IIC applications. Full functionality of the F127 remains available, including 4 - 20mA output according to the flow rate and Modbus communication (type CT).

Power supply type PD-XI offers a 8.2V sensor supply e.g. for two Namur sensors. A flame proof enclosure with rating II 2 GD EEx d IIB T5 is available as well. Please contact your supplier for further details.

**Certificate of conformity KEMA 03ATEX1074 X**
Configuration example IIB and IIC - F127-P-AP-CT-EL-TP-XI - Output loop powered

**TERMINAL CONNECTORS**

**F100-series**

<table>
<thead>
<tr>
<th>Supply</th>
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<th>Signal</th>
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</tbody>
</table>

**Temperature input type TP:**

- PT100 3-wire

**Flowmeter input type:**

- P pulse

**Isolator:**

- I.S. Certified Isolator
- TTL to RS232 / RS422 / TTL

**Power Supply**

- e.g. MTL 5025
- Po: max 750mW
- Io: max 250mA
- Uo: max 30V

**Repeater**

- e.g. MTL 5042
- Po: max 850mW
- Io: max 250mA
- Uo: max 30V

**Note:**

- Above values are safety values. Consult the technical specification for operational values.

---

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

---

*Configuration example IIB and IIC - F127-P-AP-CT-EL-TP-XI - Output loop powered*
**Configuration example IIB and IIC - F127-P-AF-CT-EL-PD-TA-XI - Power supply 16 - 30V DC**

**Terminal Connectors**

**F100-series**

**Hazardous Area**

**Safe Area**

- **Modbus communication type CT: TTL**
  - Note: Communication type CT is not allowed in IIC applications.

- **Isolator:** I.S. Certified Isolator TTL to RS232 / RS422 / TTL
  - For example: MTL5051

- **Power supply type PD:** 16 - 30V DC
  - Please note: PD and battery supply (type PC) is NOT allowed in IIC applications.

**Terminal分配**

1. **Common ground**
2. **Signal**
3. **Supply**
4. **Flowmeter input type: P pulse**
5. **Temperature input type TA: (0)4 - 20mA**
6. **Analog output type AF: passive floating 4 - 20mA**
7. **TXD**
8. **RXD**
9. **ISOLATOR: I.S. Certified Isolator**
10. **Power supply type PD:**
    - Uo(max): 30V
    - Io(max): 100mA
    - Po(max): 750mW

**Note:**
- Due to analog output type AF, the unit has to be powered with external power supply type PD.
- Power supply type PD: 16 - 30V DC
- Please note: PD and battery supply (type PC) is NOT allowed in IIC applications.

**Technical Specifications**

- **Ci is negligibly small**
- **Ci = 17nF**
- **Uo(max): 30V**
- **Io(max): 250mA**
- **Po(max): 850mW**
- **Note:** Above values are safety values. Consult the technical specification for operational values.

**Configuration Example**

Due to analog output type AF, the unit has to be powered with external power supply type PD.

**Power supply type PD:**
- Uo(max): 100V
- Io(max): 100mA
- Po(max): 750mW

**Note:**
- For example: MTL5025
- Note: above values are safety values. Consult the technical specification for operational values.

*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 - F127-P-AF-CT-EL-PD-TA-XI - Power supply 16 - 30V DC

TERMINAL CONNECTORS
F100-series

HAZARDOUS AREA

SAFE AREA

Modbus communication type CT: TTL

ISOLATOR: I.S. Certified Isolator TTL to RS232 / RS422 / TTL
For example: MTL5051

Power supply type PD: 16 - 30V DC

Analog output type AF: passive floating 4 - 20mA

Due to analog output type AF, the unit has to be powered with battery type PC or with external power supply type PD.

Power supply type PD: 16 - 30V DC

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

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

#### General

**Display**

<table>
<thead>
<tr>
<th>Type</th>
<th>High intensity reflective numeric and alphanumeric LCD, UV-resistant.</th>
</tr>
</thead>
</table>

**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**

Transreflective 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/PC/PX**

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.

#### 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).

**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.

#### Environment

**Electromagnetic compatibility**

Signal inputs
Flowmeter

<table>
<thead>
<tr>
<th>Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Coil / sine wave (minimum 20mVpp or 80mVpp - sensitivity selectable), NPN/PNP, open collector, reed-switch, Namur, active pulse signals 8, 12 and 24V DC.</td>
</tr>
<tr>
<td>Frequency</td>
<td>Minimum 0 Hz - maximum 7 kHz 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 120 Hz.</td>
</tr>
<tr>
<td>K-Factor</td>
<td>0.000010 - 9,999,999 with variable decimal position.</td>
</tr>
<tr>
<td>Low-pass filter</td>
<td>Available for all pulse signals.</td>
</tr>
<tr>
<td>Option ZF</td>
<td>coil sensitivity 10mVpp.</td>
</tr>
</tbody>
</table>

Temperature

| Accuracy | Resolution: 14 bit. Error < 0.025mA / ± 0.125% FS. Low level cut-off programmable. |
| Update time | Four times per second. |
| Type TA | (0)4 - 20mA. Analog input signal can be scaled to any desired range within 0 - 20mA. |
| Span | 0.0000010 - 9,999,999 with variable decimal position. |
| Offset | 0.00 - 99,999.99 K. |
| Voltage drop | 2.5V @ 20mA. |
| Type TP | 2 or 3 wire PT100. |
| Range | -100°C to +200°C (-148°F to 392°F). Accuracy 0.1°C (0.18°F). |
| Option ZV | Range: -200°C to +800°C (-328°F to 1832°F). Accuracy 0.5°C (0.9°F). |
| Type TU | 0 - 10 V DC. Analog input signal can be scaled to any desired range within 0 - 10V DC. |
| Span | 0.0000010 - 9,999,999 with variable decimal position. |
| Offset | 0.00 - 99,999.99 K. |
| Load impedance | 3kΩ. |

Note
- Type TA / TU are not available for PF and PM.
- For signal TA and TU: power supply to temperature sensor is required; e.g. PD.

Signal outputs

Function

| Function | Transmitting compensated differential 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 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). |

Communication

| Functions | 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 function
- Compensated differential flow rate (consumption).
- Compensated differential total and accumulated total.
- Supply line - Inlet temperature and compensated flow rate.
- Return line - Outlet temperature and compensated flow rate.
- Total can be reset to zero by pressing the CLEAR-key twice.

Total

| Digits | 7 digits. |
| Units | L, m³, GAL, USGAL, KG, lb, bbl, no unit. |
| Decimals | 0 · 1 · 2 or 3. |
| Note | Total can be reset to zero. |

Accumulated total

| Digits | 11 digits. |
| Units / decimals | According to selection for total. |
| Note | Can not be reset to zero. |

Flow rate

| Digits | 7 digits. |
| Units | mL, L, m³, Gallons, KG, Ton, lb, bl, cf, RND, ft³, scf, Nm³, NI, igal · no units. |
| Decimals | 0 · 1 · 2 or 3. |
| Time units | /sec - /min - /hr - /day. |

Line temperature

| Digits | 6 digits. |
| Units | °C, °F or K. |
| Decimals | 1. |

Flow equations

| Type | Corrected liquid volume. |
| Formula | Q_{normal} = Q \times (1 + \alpha (T_{normal} - T)) where \alpha = \text{thermal expansion coefficient.} |
| Normal | Default: 273.15 K - any temperature can be set. |

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:** F127-P-AP-CX-EL-IX-OX-PX-TA-XX-ZX.

<table>
<thead>
<tr>
<th>Ordering information:</th>
<th>F127</th>
<th>-P</th>
<th>-A</th>
<th>-C</th>
<th>-EL</th>
<th>-H</th>
<th>-IX</th>
<th>-OX</th>
<th>-P</th>
<th>-T</th>
<th>-X</th>
<th>-Z</th>
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<tbody>
<tr>
<td>Flowmeter input signal</td>
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<tr>
<td>Analog output signal</td>
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<tr>
<td>Pulse: coil, npn, pnp, namur, reed-switch input.</td>
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<tr>
<td>I.S. floating 4 - 20mA output - requires PC or PD.</td>
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<td>Passive 4 - 20mA output, loop powered unit.</td>
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<td>Active 4 - 20mA output - requires PD, PF or PM.</td>
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<td>Active 0 - 20mA output - requires PD, PF or PM.</td>
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<td>Isolated 4 - 20mA output - requires PB, PD, PF or PM.</td>
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<tr>
<td>Active 0 - 10V DC output - requires PD, PF or PM.</td>
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<td>Communication</td>
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<td>CB Communication RS232 - Modbus RTU.</td>
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<td>CH Communication RS485 - 2-wire - Modbus RTU.</td>
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<td>CI Communication RS485 - 4-wire - Modbus RTU.</td>
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<tr>
<td>CT Intrinsically Safe TTL - Modbus RTU.</td>
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<td>CX No communication.</td>
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<td>Flow equation</td>
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<tr>
<td>Corrected liquid volume.</td>
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<tr>
<td>Panel mount enclosures - IP65 / NEMA4</td>
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<td>Aluminum enclosure.</td>
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<td>GRP enclosure.</td>
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<td>GRP field / wall mount enclosures - IP67 / NEMA4X</td>
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<td>Cable entry: no holes.</td>
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<td>Cable entry: 2 x Ø 16mm &amp; 1 x Ø 20mm.</td>
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<td>Cable entry: 1 x Ø 22mm (1/8”).</td>
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<td>Cable entry: 2 x Ø 20mm.</td>
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<td>Cable entry: 6 x Ø 12mm.</td>
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<td>Cable entry: 3 x Ø 22mm (7/8”).</td>
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<td>Cable entry: no holes.</td>
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<td>Aluminum field / wall mount enclosures - IP67 / NEMA4X</td>
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<td>Cable entry: 2 x PG9 + 1 x M20.</td>
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<td>Cable entry: 2 x M16 + 1 x M20.</td>
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<td>Cable entry: 1 x M20.</td>
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<td>Cable entry: 2 x M20.</td>
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<td>Cable entry: 6 x M32.</td>
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<td>Cable entry: 1 x 1/2”NPT.</td>
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<td>Cable entry: 3 x 1/2”NPT.</td>
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<tr>
<td>Cable entry: no holes.</td>
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<td>ABS field / wall mount enclosures</td>
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<td>Silicone free ABS field enclosure IP65 – Cable entry: no holes (old HD enclosure).</td>
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<td>Additional inputs</td>
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<td>IX No additional input.</td>
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<td>Outputs</td>
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<td>No output.</td>
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<td>Power supply</td>
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<td>Lithium battery powered.</td>
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<td>Lithium battery powered - Intrinsically Safe.</td>
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<td>8 - 24V AC/DC + sensor supply - in combination with XI: 16 - 30V DC.</td>
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<td>24V AC/DC + sensor supply - only available with TP.</td>
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<td>115 - 230V AC + sensor supply - only available with TP.</td>
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<tr>
<td>Basic power supply 8 - 30V DC (no real sensor supply). Unit requires external loop AP.</td>
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<td>Temperature input signal</td>
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<td>TA (0)-10mA input.</td>
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<td>TP PT100 input.</td>
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<td>TU 0 - 10V DC input.</td>
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<td>Hazardous area</td>
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<td>Intrinsically Safe.</td>
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<td>EExd enclosure - 3 keys.</td>
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<td>Safe area only.</td>
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<td>Backlight.</td>
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<td>Coil input 10mVpp.</td>
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<td>PRTD-range -200°C / +800°C.</td>
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<td>No options.</td>
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</table>

The bold marked text contains the standard configuration.

Available Intrinsically Safe.

Specifications are subject to change without notice.

---

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ISO 9001:2000

KEMA

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