Level Measurement
silometer FMX 770

Commutec transmitter for Smart sensors with Intensor protocol
With level measurement function
With intrinsically safe sensor circuits

Silometer FMX 770
19" Racksyst card in
Monorack II housing

Application

The Silometer FMX 770 is a 19" Racksyst card designed for the connection of Smart sensors with INTENSOR protocol. It provides the following functions:

- Individual measuring point for configuration and display of parameters from the connected sensor
- Level measurement point, e.g. for hydrostatic pressure sensors
- INTENSOR/Rackbus interface for integration into process control systems.

The Silometer FMX 770 can be connected to the Micropilot microwave transmitter, Deltabar differential pressure transmitter, or Cerabar S pressure transmitter. Capacitance and other sensors will be available later.

Features and Benefits

- Suitable for smart sensors with INTENSOR protocol – provides power for Deltabar and Cerabar S sensors
- Direct configuration and display of sensor parameters – at the unit or via Rackbus
- Uniform configuration via proven operating matrix
- Additional level measurement functions with calibration correction for changing products
- Intrinsically safe sensor inputs; standard 4…20 mA signal output, limit value relays and alarm relay
- Simple exchange of transmitter or sensor without recalibration thanks to redundant parameter storage.
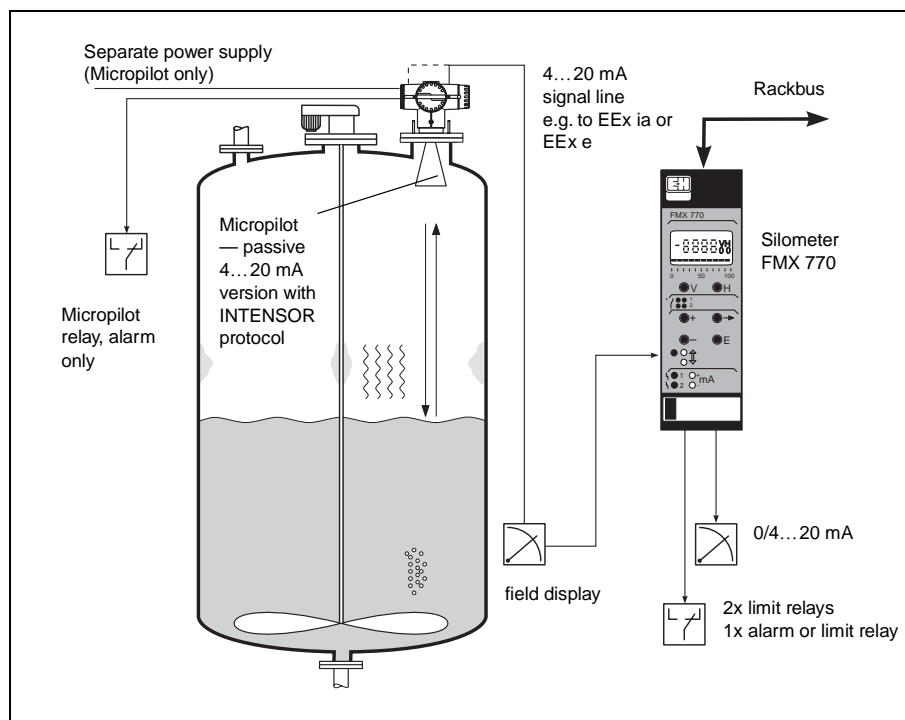
Endress+Hauser

Nothing beats know-how

Measuring System

Measuring system comprising:
- Silometer FMX 770 transmitter
- Smart sensor, e.g. Micropilot FMR 130

EEx e wiring is possible with the standard Micropilot instrument

Measuring System

A working system comprises:

- Silometer FMX 770
- Smart sensor with INTENSOR protocol.

In addition, for applications with calibration correction:

- external limit switch, e.g. Liquiphant.

Smart Sensors

The following Smart sensors can be connected to the Silometer FMX 770:

- Cerabar S pressure transmitter – version 1.x
- Deltabar PMD and FMD differential pressure transmitter – version 3.x
- Micropilot FMR microwave transmitter – version 1.4 onwards.

Signal Input Circuit

The Silometer FMX 770 supplies power to the Smart sensor over the 4…20 mA signal line. A superimposed pulsed signal on the same line provides bidirectional digital communication. The signal line is intrinsically safe and electrically isolated from the transmitter supply and the outputs.

For the Micropilot, power is supplied by a separate power unit: the passive 4…20 mA version only can be used.

Output Signals

The Silometer FMX 770 has a standard 0/4…20 mA and 0/2…10 V analogue output, which is proportional to level or volume, as well as two independent, freely programmable limit relays which can be operated in minimum or maximum fail-safe mode. All outputs are assigned to the level measurement functions.

left:
Level measurement with
① capacitance probe (in preparation) or
② hydrostatic pressure sensor (in preparation)

right:
Level measurement in a closed tank with
③ Deltabar FMD differential pressure transmitter
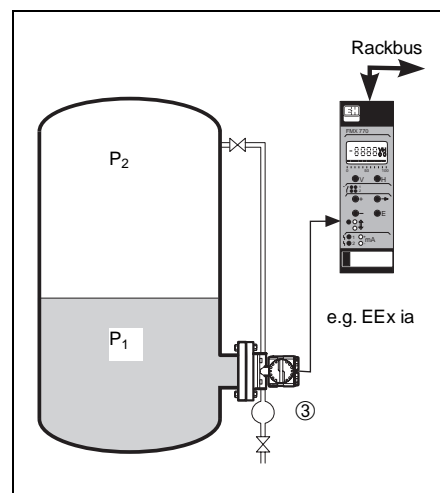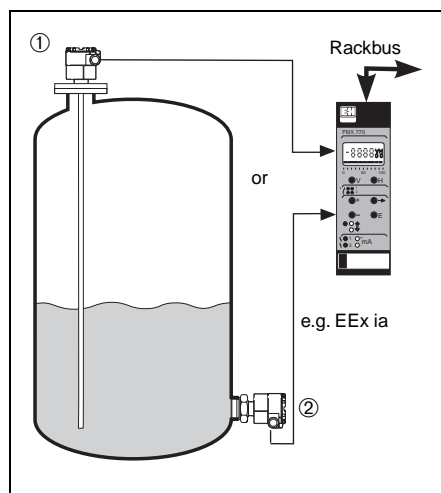
Operating Principle

Operation and Display

The Silometer FMX 770 serves primarily as an operating and display unit for the connected Smart sensor. This may be configured:

- for an individual measuring point: via the front panel keys
- when integrated into a Rackbus system: via an operating program.

The Silometer scans the parameters in the sensor and maps them into its own matrix. If a parameter is modified, the change is immediately registered by the smart sensor. To ensure that the measured value is always up-to-date, it is scanned more frequently than the others.

Operation and display function for flow measurement with orifice plate and Deltabar PMD differential pressure transmitter – the flowrate is displayed in technical units
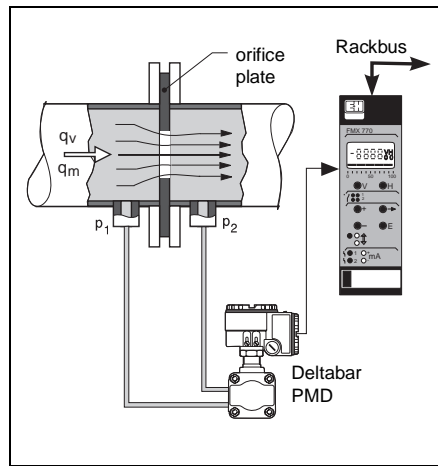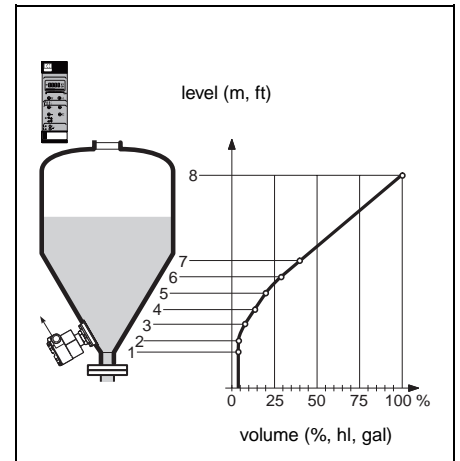
Level Measurement

The Silometer FMX 770 can also be configured to measure level. This function is primarily for pressure transmitters or capacitance probes. The unit is calibrated by either filling and emptying the tank or by calculating the pressure head. The measured value is used to drive the analogue outputs and limit relays.
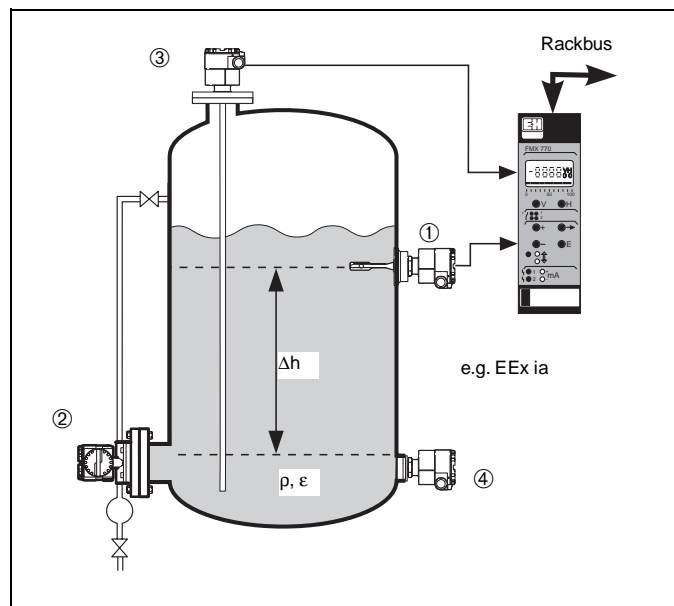
Calibration correction for change in product (density or dielectric constant change)
① Liquiphant external limit switch
② Deltabar FMD differential pressure transmitter
③ Capacitive probe
④ Hydrostatic pressure sensor

Volume measurement: up to 30 points can be entered in the linearisation table. The values are determined by controlled filling or from tank drawings

Volume Measurement

Volume is calculated from level by entering, either manually or semi-automatically, a vessel characteristic which describes the shape of the vessel. For horizontal cylinders a pre-stored characteristic can be selected at the push of a button.

Calibration correction

For hydrostatic level measurement, a change in product density can be corrected for by an external limit switch, e.g. Liquiphant, mounted at a known height above the sensor. When the product level triggers the switch, the density is calculated and the level corrected.

- For capactitance probes the same arrangement can be used to compensate for changes in dielectric constants.
- A neutral switch can also be used as the external limit switch.

Upload and Download

The operating matrices of both Smart sensor and transmitter are stored in the Silometer FMX 770:

- sensor data in an EEPROM
- transmitter data in a plug-in data module.

Should either device fail, its replacement is quickly programmed by downloading the data or transferring the data module.

Operation

Silometer FMX 770
front panel with
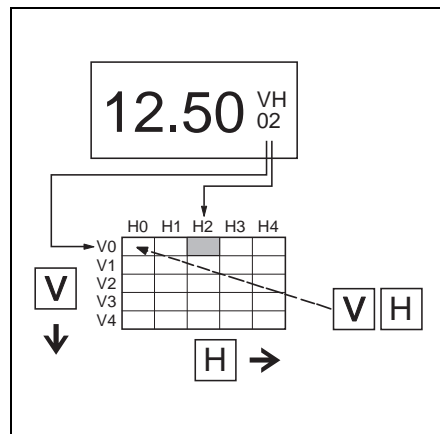operation and display
elements
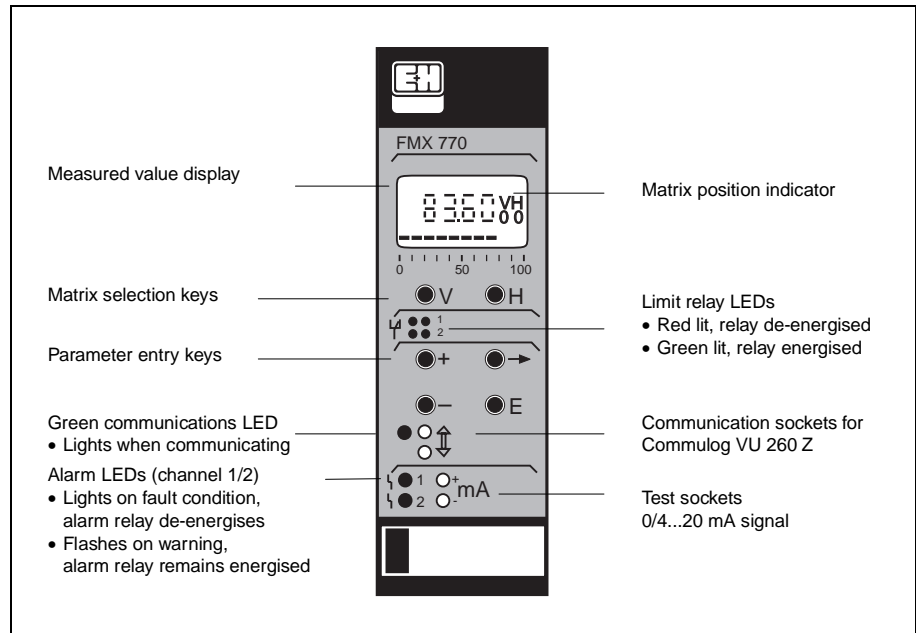
Configuration at Front Panel

The Silometer FMX 770 transmitter and
connected Smart sensor can be
configured at the front panel:

- The keys V and H access a parameter
  matrix defined by vertical and
  horizontal positions. The other keys
  are used to enter parameters
- The selected matrix field and
  parameter are indicated in the
  LC-display
- A continuous display of level or
  volume etc, is available during
  operation
- A 10-step LCD bar strip indicates level
  or volume as a function of the
  analogue output.

Endress+Hauser
operating matrix

Blind Transmitter Version

A version without keys and display is
available for operation via Rackbus only.

Operational Status

The operational status of the transmitter
is indicated by means of seven LEDs:

- The green and red LEDs in the central
  field indicate the limit relay status:
  red de-energised, green energised
- The green LED below lights when the
  Silometer is communicating with the
  Commulog VU 260 Z handheld
  terminal or the ZA computer gateway
- The red LEDs in the diagnostics field
  flash to indicate a warning or light if a
 fault condition occurs on channel 1 or
  channel 2.

Self-Monitoring and Diagnosis

The Silometer FMX 770 possesses a
continuous monitoring system. On fault
condition:

- An alarm relay with potential-free
  changeover contact de-energises
- The analogue output switches to −10%
  or +110% of the signal range or holds
  the last value
- The limit relays de-energise or follow
  the analogue output
- An error code can be read from the
  matrix position V9H0: the associated
  text can be read with the Commulog
  VU 260 Z or via a personal computer
- The current output can be monitored
  at the test sockets on the front panel –
  analogue signals can also be
  simulated to check connected
  instrumentation.

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System Integration

The Silometer communicates with a supervisory system via the Rackbus and Gateway ZA
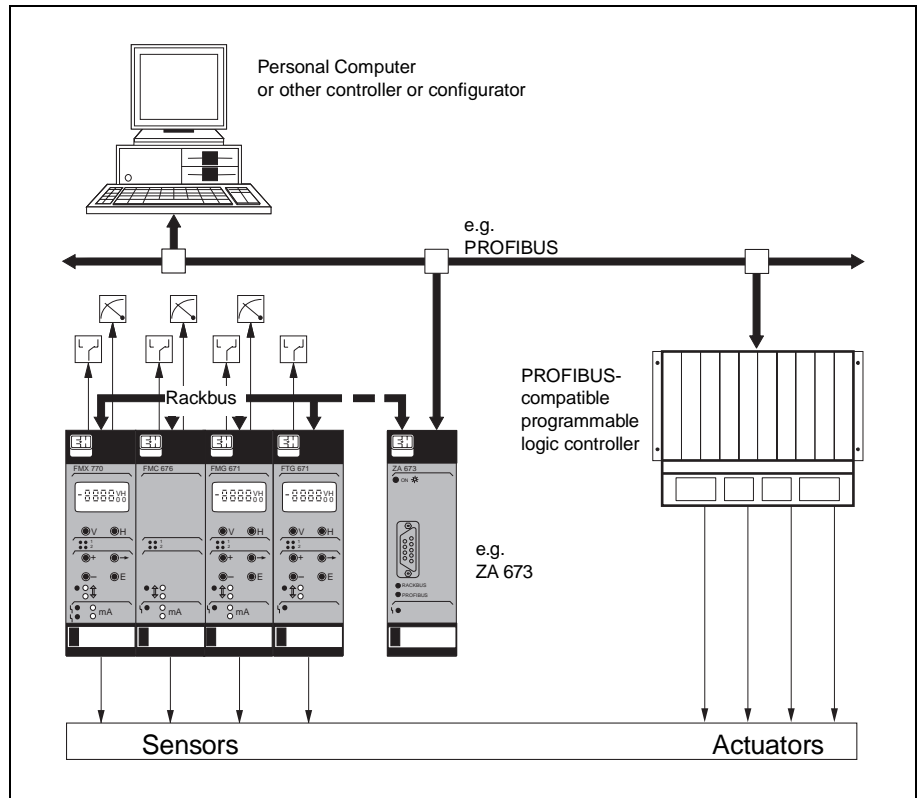
Process Control Systems

Silometer FMX 770 transmitters are easily integrated into supervisory control systems.

- Parameters are addressed over the Rackbus by the ZA gateway which presents them in appropriate format to the connected network

- Up to 64 Commutec transmitters (max. 128 measuring points) can be individually controlled and operated on-line from the control room. Each is accessed via a unique address

- Gateways and operating programs are available for a variety of
  - fieldbuses, e.g.
    ZA 672 Modbus/RS-232C
    ZA 673 Profibus
    ZA 674 FIP
  - programmable logic controllers (PLC),
  - process control systems (PCS) and
  - personal computers (PC).

The resulting dialogue between supervisory controller and subordinate transmitters makes for a safer and more flexible plant organisation.

Commutec operating programs provide an overview of process variations for small and medium-sized plants

Installation

Mounting

Racksyst plug-in cards must be installed outside explosive hazardous areas in a rack or protective housing. Endress+Hauser can provide the following alternatives:

- 19" rack (84 HP wide) for mounting up to 12 transmitters in the control room
- Half 19" wide field housing with Protection IP 65 for five 7 HP transmitters and a power supply unit
- Monorack II housing (7 HP) for single or multiple mounting on a local control panel.

Fieldhousing

Monorack-II housing

Connection of Instrumentation

The negative terminals of the output signals and 24 V supply are connected to the circuit zero of the Silometer.

- For instruments with a non-isolated input (eg. HTA 470 Z): only one instrument can be directly connected to the current output
- Several instruments can be connected to the voltage output in parallel, if their potentials are all related to the negative terminal of the 24 V supply
- There is no restriction on potential-free instruments, except for the minimum or maximum load.

Electrical Connection

- The Smart sensor must be connected with a separate two-core, screened cable. The cable is to be grounded at the Smart sensor. If the sensor is not operating in a hazardous area, it is also possible to ground both ends of the cable.
- Standard installation cable can be used for all other connections.

Connection diagram for Silometer FMX 770
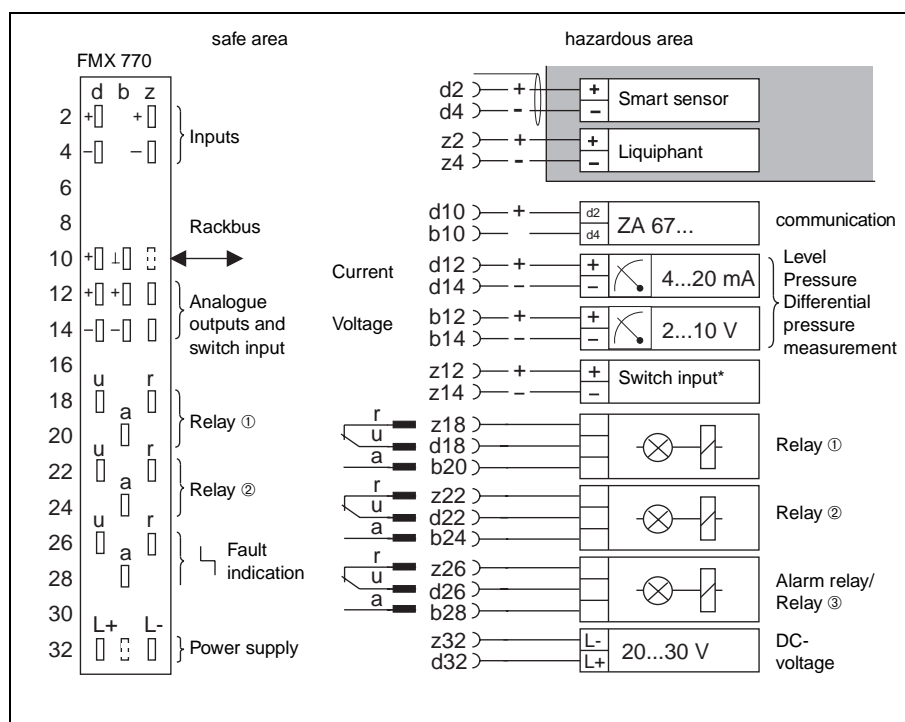
Technical Data

Dimensions in mm of plug-in card
1" = 25.4 mm
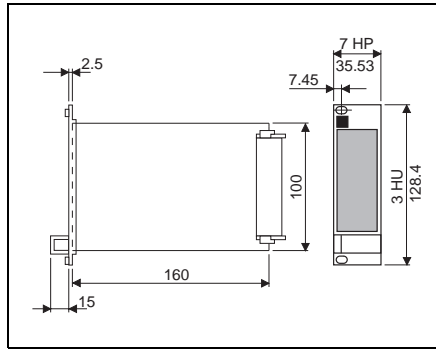
Construction
- Design: 19", 7 HP, Racksyst II* plug-in card to DIN 41 494 (Europa card)

- Front panel: black synthetic with blue field inlay, grip and markings

- Ingress protection (DIN 40 050): Front panel IP 20 Card IP 00

- Dimensions: see diagram

- Weight: approx. 0.3 kg

- Multipoint plug: conforming to DIN 41 612, Part 3, Type F (25-pole)
  - Coding pins in positions 2 and 10
  - Rack installation kit 25/2.

Environment
- Operating temperature: 0 °C...+70 °C Storage temperature: −25 °C...+85 °C

- Climatic class to DIN 40 040: KSE

- Vibration test, e.g. to GL, DNV or LR: f = 2.0 Hz to 13.2 Hz; a = ± 1 mm f = 13.2 Hz to 100 Hz; 0.7 g

- Electromagnetic compatibility to EN 50 081-1 — emission EN 50 082-2 — immunity and NAMUR recommendations

Electrical Connection
- Power supply: 24 V DC (20 V…30 V);
  - residual ripple 2 Vpp, within tolerance

- Supply current: max. 150 mA

- Power consumption: max. 3.6 W at 24 V

- Protection against reverse polarity and overloading.

Signal Inputs
Electrically isolated from the rest of the circuitry.
- Protection [EEx ia] IIC

- Input 1 for Smart sensor with INTENSOR protocol
  - Cerabar S pressure transmitter
  - Deltabar PMD/FMD differential pressure transmitter
  - Micropilot FMR microwave transmitter, passive 4…20 mA version
  - others in preparation
Supplies power to Deltabar and Cerabar S

- Input 2 for calibration correction with external limit switch, switchable, $z2$, $z4$ with PFM signal for Liquiphant or $z12$, $z14$ for neutral switch (not suitable for hazardous areas),
  - output voltage (no load): 10.5V…12.5 V.
  - output voltage U_z at fault: max. 16.2 V short-circuit current I_k: max. 10 mA
The neutral switch must close when covered by product.

- Transmission delay sensor-transmitter: ca. 1 s

Signal Outputs
- Current output: 0...20 mA/4...20 mA selectable, R_L max. 500 Ω

- Voltage output: 0…10 V/2…10 V selectable, R_L min. 10 kΩ

- Limit relays
Two independent relays each with a potential-free change-over contact. Switch-on and switch-off points fully adjustable.
Fail-safe mode selectable, minimum or maximum
Relay 2 assignable to external limit switch

- Alarm relay: relay with potential-free change-over contact, assignable as third limit relay

- Switching capacity: alternating current: max.2.5 A, max. 250 VAC, max. 600 VA at cos $\varphi = 1$, max. 300 VA at cos $\varphi \geq 0.7$ direct current: max. 100 VDC, max. 100 W

- Rackbus: Baudrate 19 200 bits/s, 2-core cable

Certificates (in preparation)
- Explosion protection: PTB [EEx ia] IIC; CSA; RIIS
- Overspill protection (Germany)

*Type II Racksyst cards cannot be installed in Type I Monorack housings

Product Structure

Silometer FMX 770

Certificate (in preparation)
R no certificate
A PTB Certificate of Conformity [EEx ia] IIC
F Approval for use as overspill protection (Germany)
S CSA Intrinsic Safety IS
V RIIS [Ex ia] IIC

Version
1 With display and front panel keys
2 Blind version for Rackbus operation

FMX 770-			product designation

Supplementary Documentation

☐ Racksyst planning hints for rack-mounting or Racksyst field housings and self-adhesive connection schematics

☐ Monorack II System Housing
Technical Information TI 183F/00/e

☐ Cerabar S Pressure Transmitter
Technical Information TI 216P/00/e, TI 217P/00/e

☐ Deltabar Differential Pressure Transmitter
Technical Information SI 015F/00/e

☐ Micropilot FMR 130
Technical Information TI 200F/00/e

☐ Commulog VU 260 Z Handheld Terminal
Technical Information TI 140/00/e

☐ ZA 672 Modbus Gateway
Technical Information TI 148/00/e

☐ ZA 673 PROFIBUS Gateway
Technical Information TI 162F/00/e

☐ ZA 674 FIP Gateway
Technical Information TI 167F/00/e

☐ Commutec Operating Program
Technical Information TI 113/00/e

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