

Technical Information

Prosonic S FMU90

Ultrasonic measuring technology

Transmitter for 1 or 2 ultrasonic sensors
FDU90/91/91F/92/93/95



Application

- Level measurement and point level measurement of liquids or bulk solids
- Flow measurement in open channels or weirs
- Measuring range up to 45 m (148 ft)
- Pump and rake control
- Optional: advanced pump control (e.g. pump function test)
- Calculation of average, difference or total
- Backwater detection or dirt detection
- Up to 3 totalizers and 3 daily counters
- Counting and time pulses to control external units



Your benefits

- Simple, menu-guided operation with 6-line plain text display, choice of 15 languages
- Envelope curves on the display for straightforward onsite diagnostics
- Easy operation, diagnostics and measuring point documentation with the free "FieldCare" operating program
- Temperature-dependent time-of-flight correction with integrated or external temperature sensors
- Linearization (up to 32 points, user configurable); preprogrammed and accessible for the most common flumes and weirs
- System integration via HART or PROFIBUS DP
- Optional aluminum field housing with ATEX II 3D approval



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Important document information

Symbols used

Safety symbols

DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

CAUTION

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols



Direct current



Alternating current



Direct current and alternating current



Ground connection

A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.



Protective earth (PE)

Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the inside and outside of the device.

- Interior ground terminal; protective earth is connected to the mains supply.
- Exterior ground terminal; device is connected to the plant grounding system.

Symbols for certain types of information and graphics



Tip
Indicates additional information



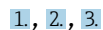
Reference to documentation



Reference to graphic



Notice or individual step to be observed



Series of steps



Result of a step

1, 2, 3, ...

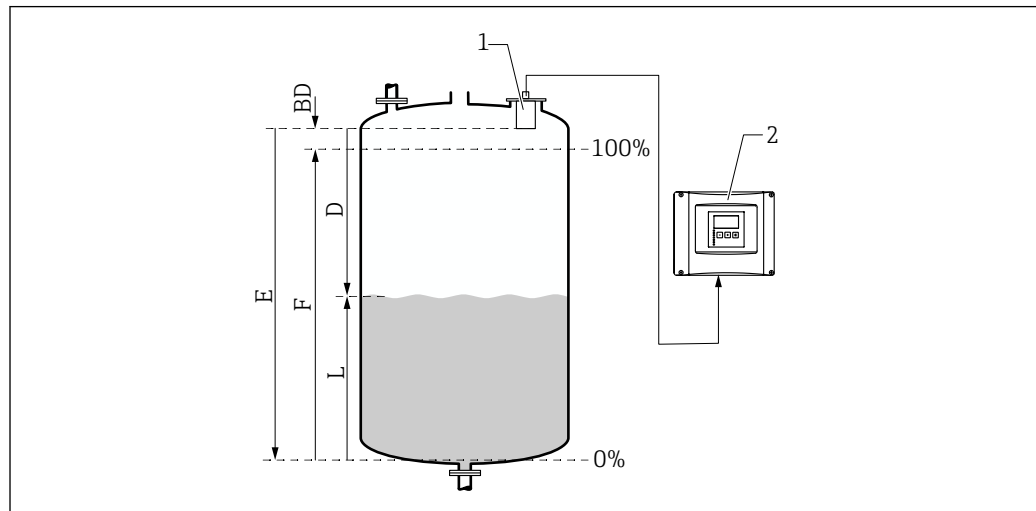
Item numbers

A, B, C, ...

Views

Function and system design

Level measurement



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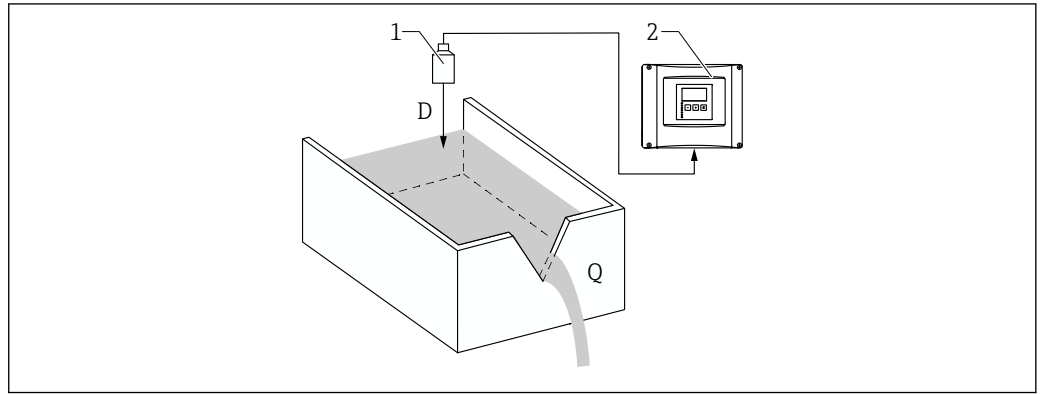
- 1 Prosonic S sensor
- 2 Prosonic S transmitter
- BD Blocking distance
- D Distance between reference point (sensor membrane) and surface of medium
- E Empty distance
- F Span
- L Level

The sensor transmits ultrasonic pulses in the direction of the surface of the medium. There, they are reflected back and received by the sensor. The transmitter measures the time t between the transmission and reception of a pulse. From this time, and using the sonic velocity c , the transmitter calculates the distance D between the reference point (sensor membrane) and the surface of the medium:

$$D = c \cdot t / 2$$

The level L is derived from D . With linearization, the volume V or the mass M is derived from L .

Flow measurement in flumes or weirs



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- 1 Prosonic S sensor
- 2 Prosonic S transmitter
- D Distance between sensor membrane and surface of liquid
- Q Flow

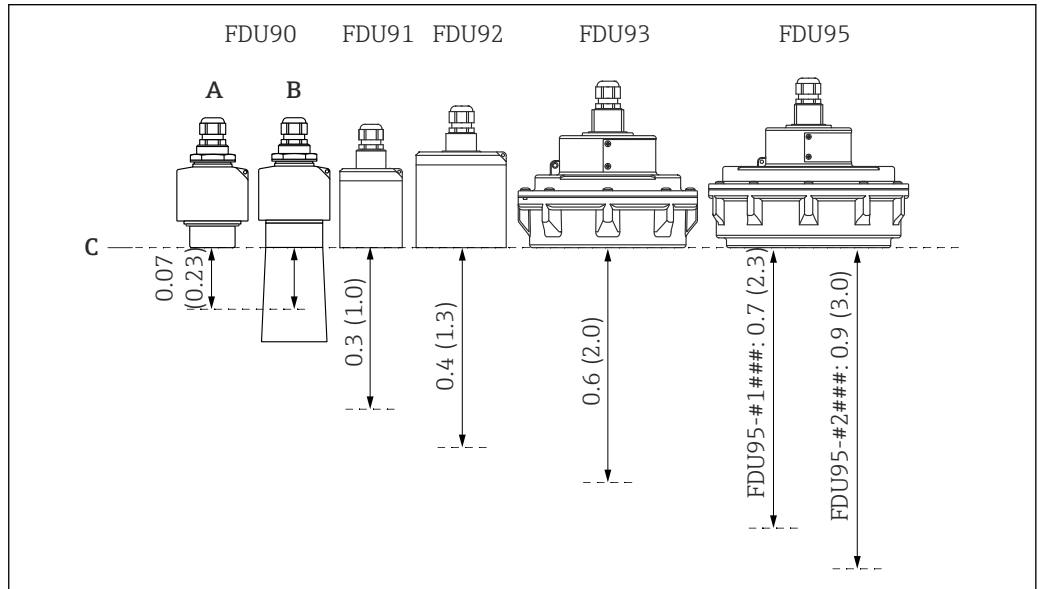
The sensor transmits ultrasonic pulses in the direction of the surface of the liquid. There, they are reflected back and received by the sensor. The transmitter measures the time t between the transmission and reception of a pulse. From this time, and using the sonic velocity c , the transmitter calculates the distance D between the (reference point) sensor membrane and the surface of the liquid:

$$D = c \times t / 2$$

The level L is derived from D . With linearization, the flow Q is derived from L .

Blocking distance

Signals within the blocking distance (BD) range cannot be measured due to the transient response of the sensor.



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- 1 Blocking distance of FDU9x ultrasonic sensors. Engineering unit m (ft)
- A FDU90 without flooding protection tube
- B FDU90 with flooding protection tube
- C Reference point of measurement



Temperature-dependent time-of-flight correction

For sensors without sensor heating

Via the temperature sensors integrated in the ultrasonic sensors

In the case of FDU90 and FDU91 with sensor heating

Via an external temperature sensor, to be connected to the FMU90 transmitter

Interference echo suppression (mapping)	Ensures that interference echoes (e.g. from edges, welds or internal fixtures) are not interpreted as a level echo.
Pump control	Individually configurable for each pump: <ul style="list-style-type: none"> ▪ Pump switching delay, e.g. to prevent overload of the power supply system ▪ Pump backlash times and backlash intervals, e.g. to fully drain shafts or ducts/channels ▪ Reduction of buildup on pump chamber walls by fine adjustment of the switch point
Level linearization	<p>Pre-programmed linearization curves</p> <ul style="list-style-type: none"> ▪ Horizontal cylindrical tank ▪ Spherical tank ▪ Tank with pyramid bottom ▪ Tank with conical bottom ▪ Tank with flat angled bottom <p> The pre-programmed linearization curves are calculated online.</p> <p>Linearization table</p> <ul style="list-style-type: none"> ▪ Manual or semi-automatic entry ▪ Up to 32 "Level/volume" linearization points
Flow linearization	<p>Pre-programmed linearization curves</p> <p>Pre-programmed for devices with flow software:</p> <ul style="list-style-type: none"> ▪ Khafagi-Venturi flume ▪ ISO Venturi flume ▪ BST (British Standard) Venturi flume ▪ Parshall flume ▪ Palmer-Bowlus flume ▪ Rectangular weir ▪ Constricted rectangular weir ▪ NFX (French standard NFX 10-311) rectangular weir ▪ NFX (French standard NFX 10-311) constricted rectangular weir ▪ Trapezoidal weir ▪ Triangular weir ▪ BST (British Standard) triangular weir ▪ NFX (French standard NFX 10-311) triangular weir <p> The pre-programmed linearization curves are calculated online.</p> <p>Linearization formula for flow measurements</p> $Q = C (h^\alpha + \gamma h^\beta)$ <ul style="list-style-type: none"> ▪ h: upstream level ▪ α, β, γ, C: user-definable parameters <p>Linearization table</p> <ul style="list-style-type: none"> ▪ Up to 32 linearization points "upstream level - flow" ▪ Manual or semi-automatic entry
Special functions	<ul style="list-style-type: none"> ▪ Limit detection ▪ Rake control ▪ Alternating pump control or control according to pump rate (standard) ▪ Totalization of flow volume with daily counters and totalizers ▪ Trend detection

For devices with advanced pump control software (FMU90-*2***** or FMU90-*4*****)

- Optional: Advanced pump control with:
 - Alternation according to time of use or starts
 - Pump feedback via digital inputs with stand-by pump function
 - Pump function test after downtime
 - Storm function to prevent unnecessary pump run times
 - Flush control to clean pump chambers
 - Control of pumps according to electricity tariff times via digital input
 - Operating hours alarm or pump alarm
 - Recording of pump data (operating hours, number of starts, last run time)
- Activation of a sampler via time-based or volume-based pulses
- Low flow cut off for flow measurements
- Backwater detection in flumes
- Dirt detection in flumes

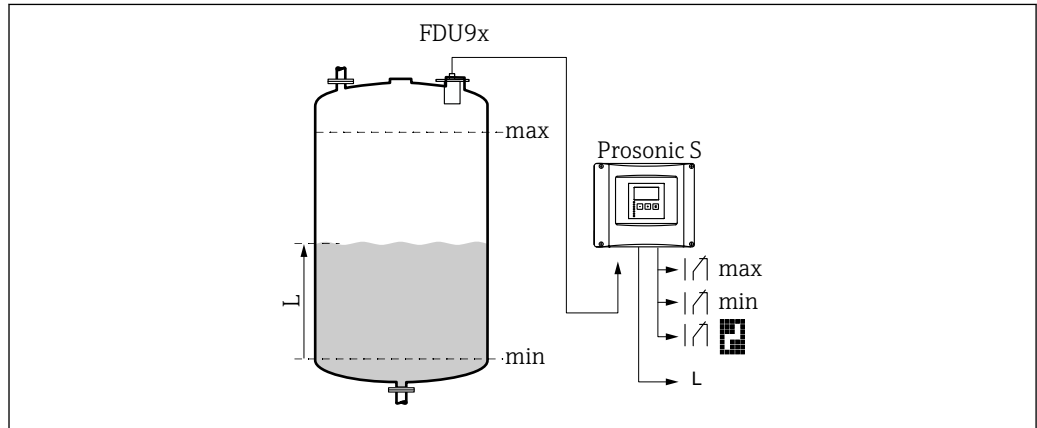
Data logging functions

- Peak indicator of min./max. levels/flows/sensor temperatures
- Last 10 alarms recorded
- Operational state indicated
- Trend graphs for outputs on onsite display
- Operating hours counter

Application examples for level measurement

Level measurement with point level detection and alarm generation

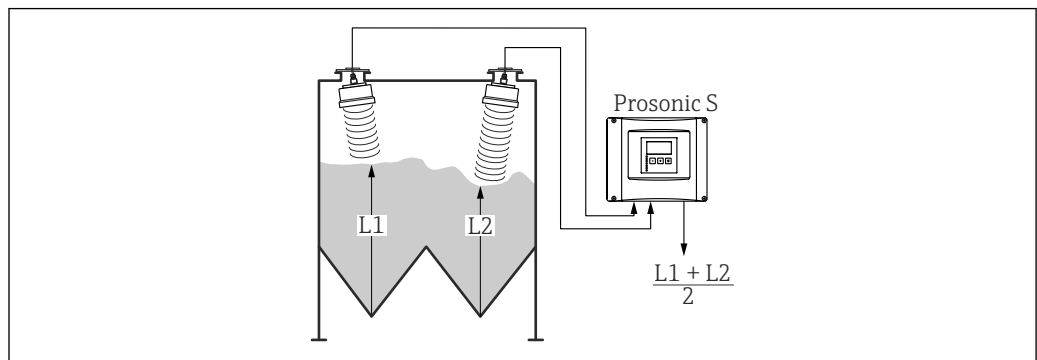
Device version: FMU90 - *1***131*** (1 input, 3 relays, 1 output)



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Average level measurement

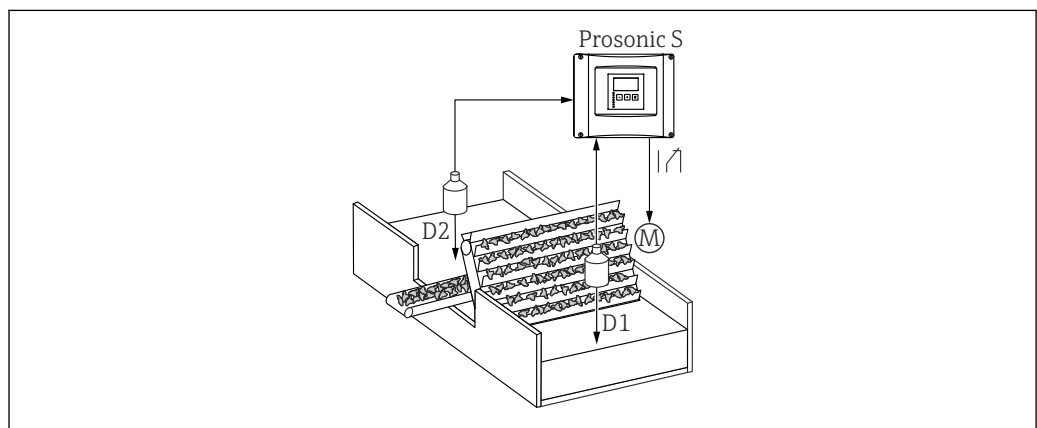
Device version: FMU90 - *1***212*** (2 inputs, 2 outputs)



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Rake control (differential measurement)

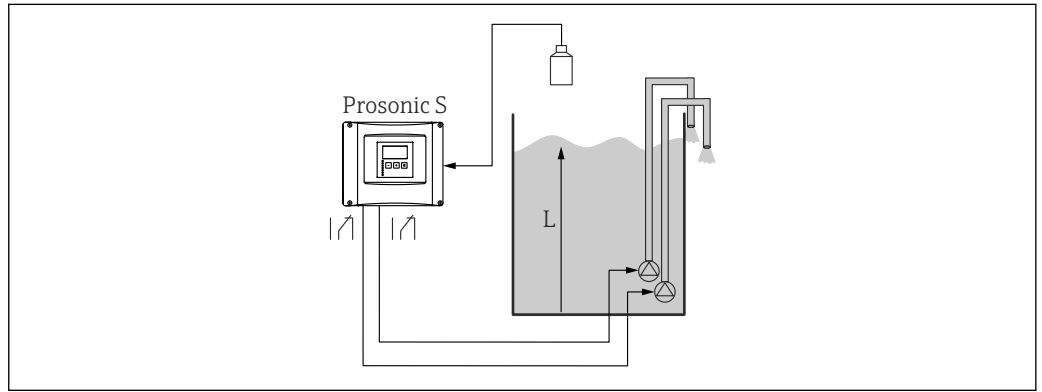
Device version: FMU90 - *1***212*** (2 inputs, 1 relay, 2 outputs)



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Alternating pump control (up to 6 pumps)

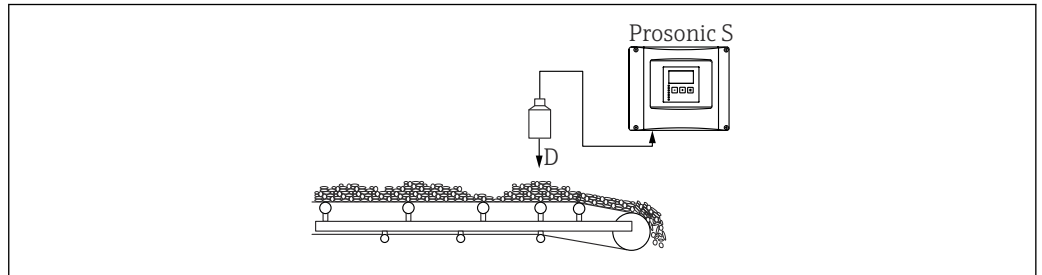
Device version: FMU90 - *1***131*** (1 input, 3 relays)



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Conveyor belt

Device version: FMU90 - *1***111*** (1 input, 1 output)

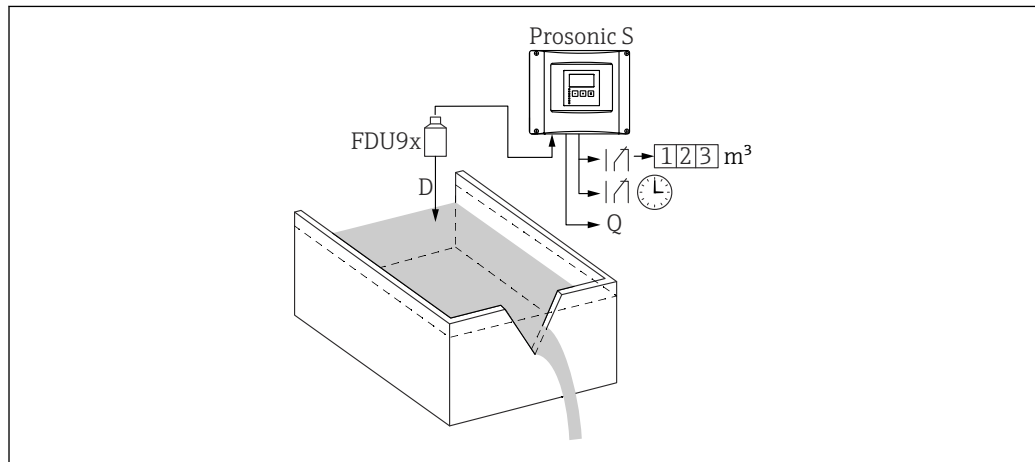


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Application examples for flow measurement

Volume counter + time pulses (e.g. for sampler)

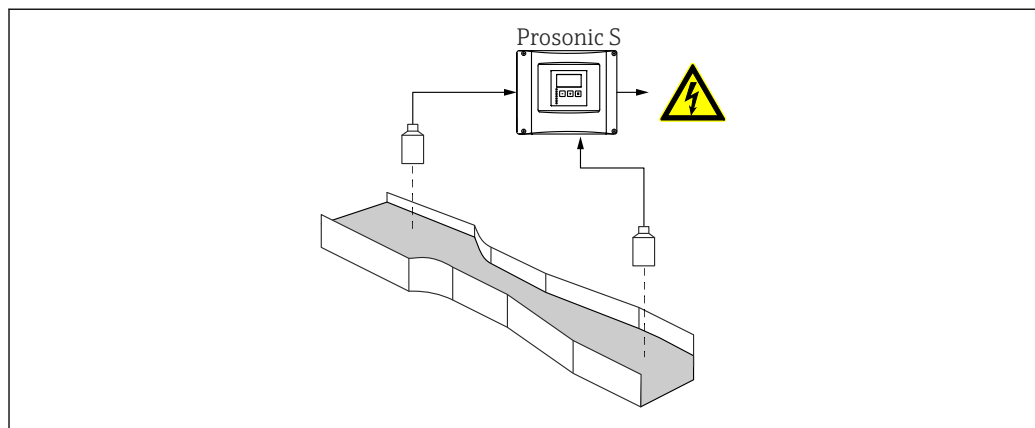
Device version: FMU90 - *2***131**** (1 input, 3 relays, 1 output)



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Backwater alarm/dirt detection

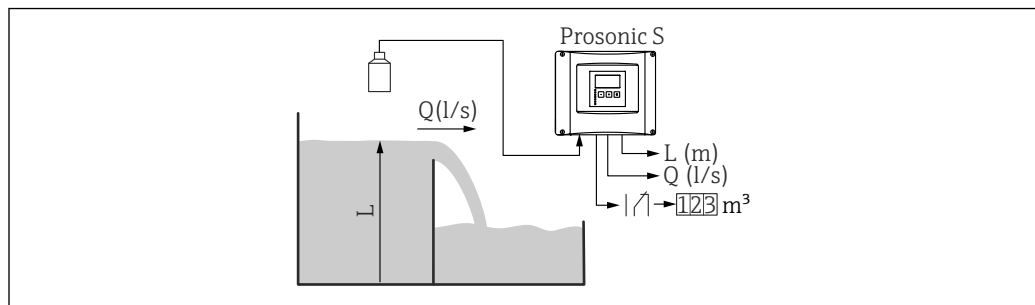
- Device version: FMU90 - *2***212**** (2 inputs, 1 relay, 2 outputs)
- Function: If the "downstream level : upstream level" ratio exceeds or falls below a critical value, an alarm is generated.



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Stormwater overflow basin

- Device version: FMU90 - *2***112**** (1 input, 2 outputs)
- Function: Simultaneous measurement of level L and discharge volume Q with one sensor



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Input

Sensor inputs

Number of sensor inputs

1 or 2; defined in order code 060 (level input)

Connectable sensors

- FDU90 TI01469F
- FDU91 TI01470F
- FDU91F TI01471F
- FDU92 TI01472F
- FDU93 TI01473F
- FDU95 TI01474F



The connected sensor is recognized automatically.

Old connectable sensors

- FDU80
- FDU80F
- FDU81
- FDU81F
- FDU82
- FDU83
- FDU84
- FDU85
- FDU86
- FDU96



- Technical data of FDU8x sensors: TI00189F
- These sensors are no longer available, but can be connected to the Prosonic S transmitter to support existing installations.
- In the case of FDU8x sensors, the sensor type must be specified manually.
- FDU83, FDU84, FDU85 and FDU86 sensors with an ATEX, FM or CSA certificate are not certified for connection to the Prosonic S transmitter.

Input for external point level switches

Number of point level switch inputs

4; to be selected in order code 090 (additional input)

Switching possibilities

External passive point level switch (NC or NO contact)

- 0: < 8 V
- 1: > 16 V

Possible applications

- Pump feedback
For devices with advanced pump control software (FMU90-*3*****B*** or FMU90-*4*****B***)
- Pump tariff control
- Start/stop/reset daily counters for flow measurements
For devices with advanced pump control software (FMU90-*3*****B*** or FMU90-*4*****B***)
- Min/max level detection e.g. using Liquiphant

Input for external temperature sensor**Number of temperature inputs**

1; to be selected in order code 090 (additional input)

Use

Sound time-of-flight correction for FDU90 and FDU91 with sensor heating

Connectable sensors

- Pt100 (3-wire or 4-wire connection)
- Omnigrad S TR61 from Endress+Hauser



A Pt100 with a 2-wire connection may not be used due to insufficient measuring accuracy.

Output

Analog outputs

Number of analog outputs

1 or 2; to be selected in order code 080 (output)

Technical data

- Version: active current output
- Output damping: user-definable: 0 to 1 000 s
- Load: max. 600 Ω ; influence negligible
- Max. ripple: $U_{SS} = 200$ mV at 47 to 125 Hz (measured at 500 Ω)
- Max. noise: $U_{eff} = 2.2$ mV at 0.5 to 10 kHz (measured at 500 Ω)

Output signal

Configurable:

- 4 to 20 mA with HART
- 0 to 20 mA without HART



The HART signal is superimposed on the first analog output. The second analog output does not have a HART signal.

Response to errors

- For 4 to 20 mA setting, choice of:
 - MIN: -10 % (3.6 mA)
 - MAX: 110% (22 mA)
 - HOLD (last current value is kept)
 - User-specific value
- For 0 to 20 mA setting, choice of:
 - MAX: 110 % (21.6 mA)
 - HOLD (last current value is kept)
 - User-specific value

Relays**Number of relays**

1, 3 or 6; to be selected in order code 070 (switch output)

Technical data

- Version: potential-free changeover contact, SPDT, can be inverted
- Switching capacity (DC voltage): 35 V_{DC}, 100 W
- Switching capacity (alternating voltage): 4 A, 250 V, 1 000 VA for cosφ = 0.7

Assignable functions

- Limit value
 - Inband
 - Out of band
 - Limit
- Counting pulse for flow counting
For devices with flow software: FMU90 - *2***** or FMU90 - *4*****
Max. count frequency: 2 Hz
Adjustable pulse length
- Time pulse
For devices with flow software: FMU90 - *2***** or FMU90 - *4*****
Max. frequency: 2 Hz
Adjustable pulse length
- Alarm/diagnostics to indicate:
 - backwater
 - dirt in flume
 - echo loss
- Pump control
 - Individually per pump, or alternating for multiple pumps
 - Acc. to fixed limit value
 - Acc. to pump rate
- Advanced pump control
For devices with advanced pump control: FMU90 - *3***** or FMU90 - *4*****
 - Control of standby pump
 - Storm function to prevent unnecessary pump run times
 - Pump function test
 - Flush control to clean pump chambers
 - Operating hours alarm
 - Pump alarm
- Rake control (difference- or ratio-based control)
- Fieldbus relay (switch directly via the PROFIBUS DP bus)

Assigned LEDs

In the case of devices with a display module, a yellow LED is assigned to each relay

- The LED is lit when the relay is energized.
- The LED of an alarm relay is lit during normal, interference-free operation.
- The LED for a pulse relay flashes briefly at every pulse.

Response to errors

Configurable:

- HOLD (last value is kept)
- Energized
- De-energized
- Current value is used.

Switch-on delay after power failure configurable.

PROFIBUS DP interface

Device version

Order code 080 (output); option 3 (PROFIBUS DP)

Technical data

- Profile: 3.0
- Service Access Points (SAPs): 1
- ID number: 1540 (hex) = 5440 (dec)
- GSD: EH3x1540.gsd
- Addressing: via DIP switches on the device or via software (e.g. DeviceCare/FieldCare)
- Default address: 126
- Bus termination: can be activated/deactivated by a switch in the device
- Locking: the device can be locked by hardware or software

Transmittable values

- Primary values (level or flow, depending on the device version)
- Distances
- Counters
- Temperatures
- Average / difference / total
- Relay status
- Rake control
- Pump control

Function blocks

- 10 Analog Input Blocks (AI)
- 10 Digital Input Blocks (DI)
- 10 Digital Output Blocks (DO)

Supported baud rates

- 9.6 kbaud
- 19.2 kbaud
- 45.45 kbaud
- 93.75 kbaud
- 187.5 kbaud
- 500 kbaud
- 1.5 Mbaud
- 3 Mbaud
- 6 Mbaud
- 12 Mbaud

Power supply

Connection data (alternating voltage)**Device version**

Order code 050 (power supply); option A (90-253VAC)

Technical data

- Supply voltage: 90 to 253 V_{AC} (50/60 Hz)
 - Power consumption: ≤ 23 VA
 - Current consumption: ≤ 100 mA at 230 V_{AC}
-

Connection data (DC voltage)**Device version**

Order code 050 (power supply); option B (10.5-32VDC)

Technical data

- Supply voltage: 10.5 to 32 V_{DC}
 - Power consumption: ≤ 14 W (typically 8 W)
 - Current consumption: ≤ 580 mA at 24 V_{DC}
-

Galvanic isolation

The following terminals are galvanically isolated from one another:

- Power supply
 - Sensor inputs
 - Analog output 1
 - Analog output 2
 - Relay outputs
 - Bus connection (PROFIBUS-DP)
-

Fuse

Accessible in terminal compartment:

- 2 A T / DC
- 400 mA T / AC

Electrical connection

Cable entries

Polycarbonate field housing

Precut openings on the bottom of the housing for the following cable entries:

- M20x1.5 (10 openings)
- M16x1.5 (5 openings)
- M25x1.5 (1 opening)


Aluminum field housing

12 M20x1.5 openings for cable entries on the bottom of the field housing

Cable specification

- **Conductor cross-section:** 0.2 to 2.5 mm² (26 to 14 AWG)
- **Wire sleeve cross-section:** 0.25 to 2.5 mm² (24 to 14 AWG)
- **Min. stripping length:** 10 mm (0.39 in)

Performance characteristics

Reference operating conditions	<ul style="list-style-type: none"> ▪ Temperature: +24 °C (+75 °F) ±5 °C (±9 °F) ▪ Pressure: 960 mbar (14 psi) ±100 mbar (±1.45 psi) ▪ Humidity: 60 % r.F. ±15 % r.F. ▪ Surface of medium: ideally a reflecting surface (e.g. calm, even liquid surface of 1 m² (10.76 ft²)) ▪ Sensor alignment: vertically to surface of medium ▪ No interference echoes in the signal beam ▪ Parameter settings: <ul style="list-style-type: none"> ▪ Tank shape = flat ceiling ▪ Medium property = liquid ▪ Measuring conditions = calm surface
Maximum measured error	Determined under reference operating conditions according to EN 61298-2: ±0.2 % in relation to the maximum sensor span
Measured error	Determined under reference operating conditions; includes linearity, reproducibility and hysteresis: ±2 mm (±0.08 in) + 0.17 % of the measured distance
Measured value resolution	1 mm (0.04 in) with FDU90/FDU91
Measuring frequency	<p>Max. 3 Hz</p> <ul style="list-style-type: none"> ▪ The exact value depends on the application parameters and the device version. ▪ The maximum measuring frequency is reached at: <ul style="list-style-type: none"> ▪ Empty calibration ≤ 2 m (6.6 ft) ▪ Measuring conditions = Test: filter off
Influence of vapor pressure	<p>Negligible if $p_v \leq 50$ mbar (1 psi) at $T = 20$ °C (68 °F)</p> <p>Media that satisfy this condition include:</p> <ul style="list-style-type: none"> ▪ Water ▪ Aqueous solutions ▪ Water/solid solutions ▪ Diluted acids (hydrochloric acid, sulfuric acid, etc.) ▪ Diluted bases (sodium hydroxide solution, etc.) ▪ Oils ▪ Greases ▪ Lime water ▪ Sludges ▪ Pastes <p> Measuring accuracy is compromised in all other cases. Typical media for which this is the case include ethanol, acetone and ammonia. In such cases, please contact Endress+Hauser: http://www.endress.com/contact</p>

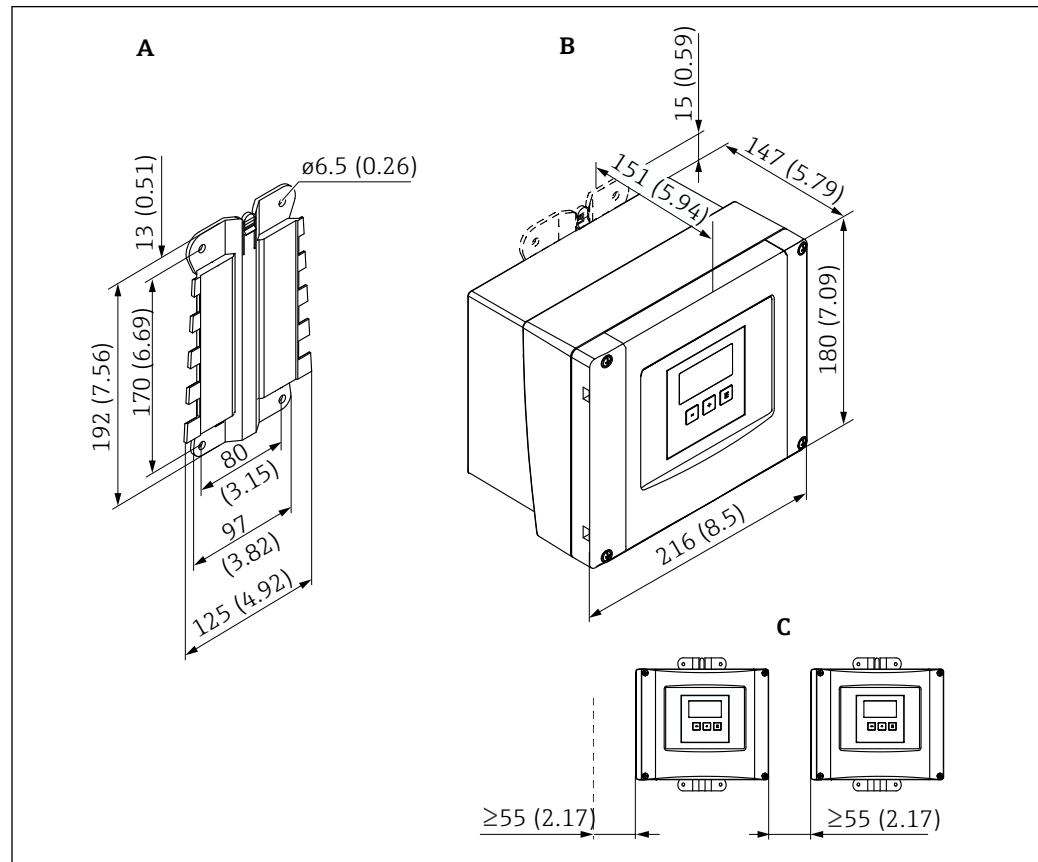
Environment

Ambient temperature	-40 to 60 °C (-40 to 140 °F) <ul style="list-style-type: none"> ■ The functionality of the LCD display becomes limited at $T_A < -20\text{ °C}$ (-4 °F). ■ If the device is operated outdoors in strong sunlight, use a protective cover.
Storage temperature	-40 to 60 °C (-40 to 140 °F)
Climate class	<p>Climate class of polycarbonate field housing</p> <p>DIN EN 60721-3 4K2/4K5/4K6/4Z2/4Z5/4C3/4S4/4M2 (DIN 60721-3 4K2 corresponds to DIN 60654-1 D1)</p> <p>Climate class of aluminum field housing</p> <p>DIN EN 60721-3 4K2/4K5/4K6/4Z2/4Z5/4C3/4S4/4M2 (DIN 60721-3 4K2 corresponds to DIN 60654-1 D1)</p> <p>Climate class of DIN rail housing</p> <p>DIN EN 60721-3 3K3/3Z2/3Z5/3B1/3C2/3S3/3M1 (DIN 60721-3 3K3 corresponds to DIN 60654-1 B2)</p>
Vibration resistance	<p>Vibration resistance of polycarbonate field housing</p> <p>DIN EN 60068-2-64 / IEC 68-2-64; 20 to 2000 Hz; 1.0 (m/s²)²/Hz</p> <p>Vibration resistance of aluminum field housing</p> <p>DIN EN 60068-2-64 / IEC 68-2-64; 20 to 2000 Hz; 1.0 (m/s²)²/Hz</p> <p>Vibration resistance of DIN rail housing</p> <p>DIN EN 60068-2-64 / IEC 68-2-64; 20 to 2000 Hz; 0.5 (m/s²)²/Hz</p>
Degree of protection	<p>Degree of protection of polycarbonate field housing</p> <p>IP66 / NEMA 4x</p> <p>Degree of protection of aluminum field housing</p> <p>IP66 / NEMA 4x</p> <p>Degree of protection of DIN rail housing</p> <p>IP20</p> <p>Degree of protection of remote display</p> <ul style="list-style-type: none"> ■ IP65 / NEMA 4 (at front, if mounted in cabinet door) ■ IP20 (at rear, if mounted in cabinet door)
Electromagnetic compatibility (EMC)	<p>Electromagnetic compatibility in accordance with all of the relevant requirements outlined in the EN 61326 series and NAMUR Recommendation EMC (NE 21). For details, refer to the Declaration of Conformity.</p> <p>With regard to interference emission, the device meets the requirements of class A, and is only designed for use in an "industrial environment".</p>


Mechanical construction

Dimensions

Dimensions of polycarbonate field housing




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 2 Dimensions of Prosonic S with polycarbonate field housing. Unit of measurement mm (in)

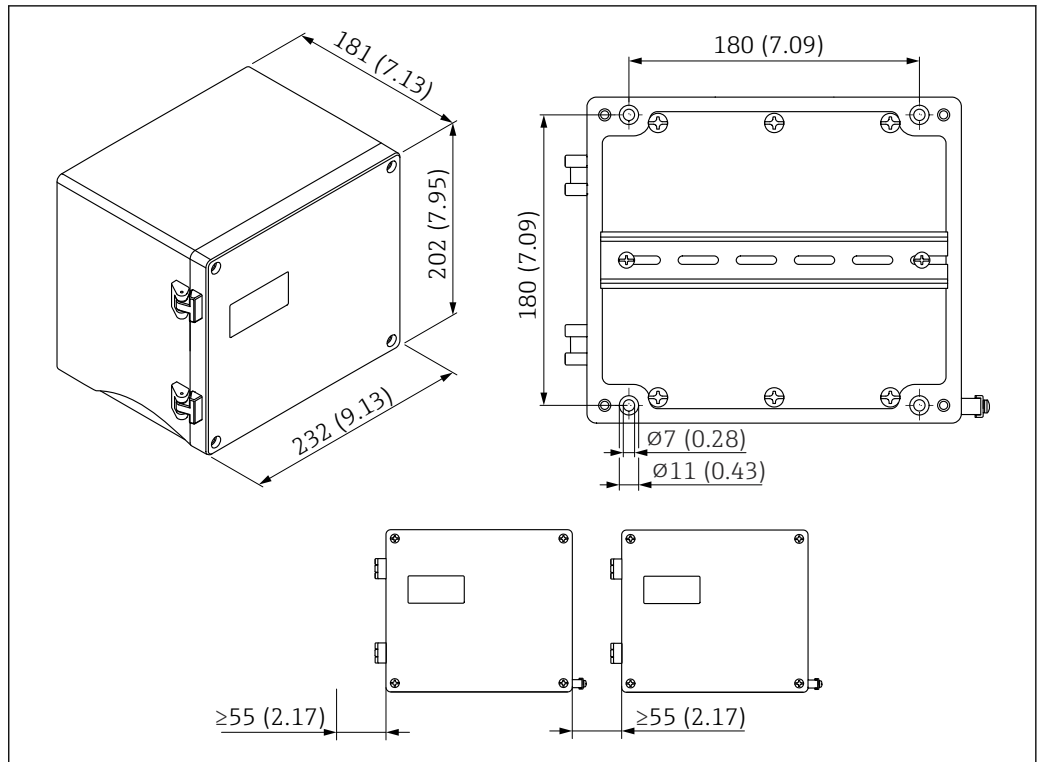
A Housing bracket (supplied), can also be used as a drilling template

B Polycarbonate field housing

C Minimum mounting clearance

 Mount the housing bracket on a level surface so that it cannot become warped or bent. Otherwise it may be difficult or impossible to mount the polycarbonate field housing.

Dimensions of the aluminum field housing



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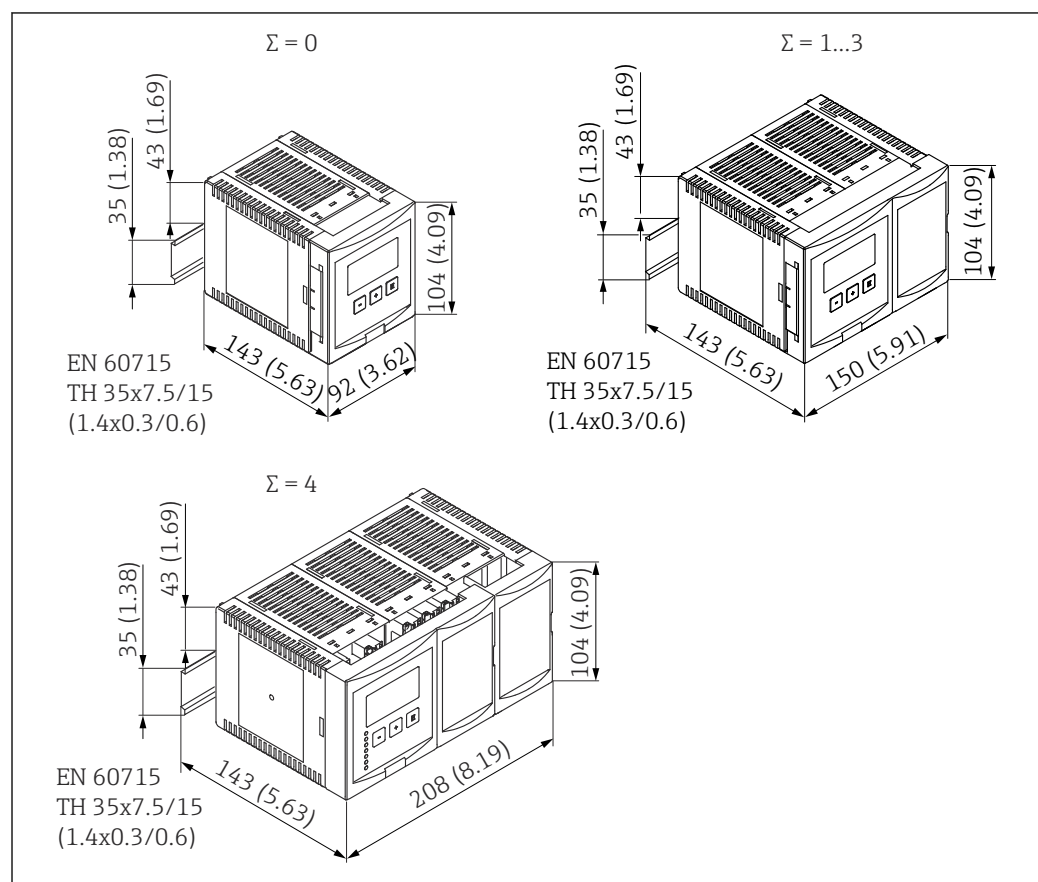
3 Dimensions of Prosonic S with aluminum field housing. Unit of measurement mm (in)

Dimensions of the DIN rail housing

Determining the dimensions of the DIN rail housing

1. Using the product structure, determine the options for features 060, 070, 080 and 090.
2. Using the list (see below) determine which additional connection areas are provided (in addition to the basic connection area).
3. Take the dimensions from the dimensional drawing according to the number of additional connection areas.

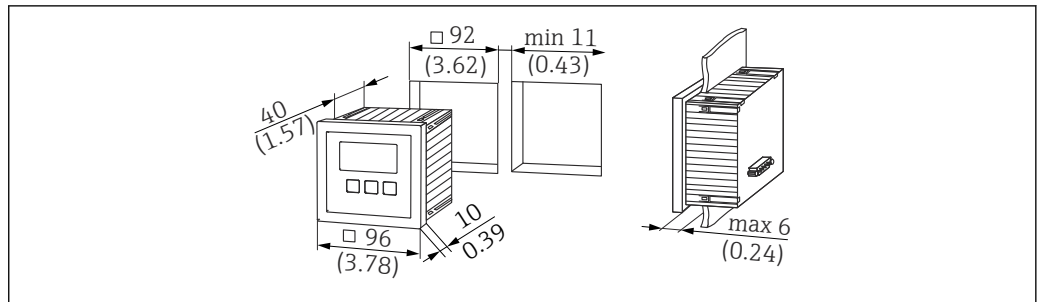
- **Terminal area for additional inputs and outputs**
Provided with: feature 60; option 2 and/or feature 80; option 2
- **Terminal area for relays**
Provided with: feature 70, option 3 or 6
- **Terminal area for PROFIBUS DP**
Provided with: feature 80, option 3
- **Terminal area for switch inputs and temperature inputs**
Provided with feature 90, option B



4 Dimensions of Prosonic S with DIN rail housing

Σ Number of additional terminal areas

Dimensions of remote display and operating module



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5 Dimensions of remote display and operating module for cabinet door installation. Unit of measurement mm (in)

Weight

Weight of polycarbonate field housing

Approx. 1.6 to 1.8 kg (3.53 to 3.97 lb) depending on device version

Weight of aluminum field housing

Approx. 6 kg (13.23 lb)

Weight of DIN rail housing

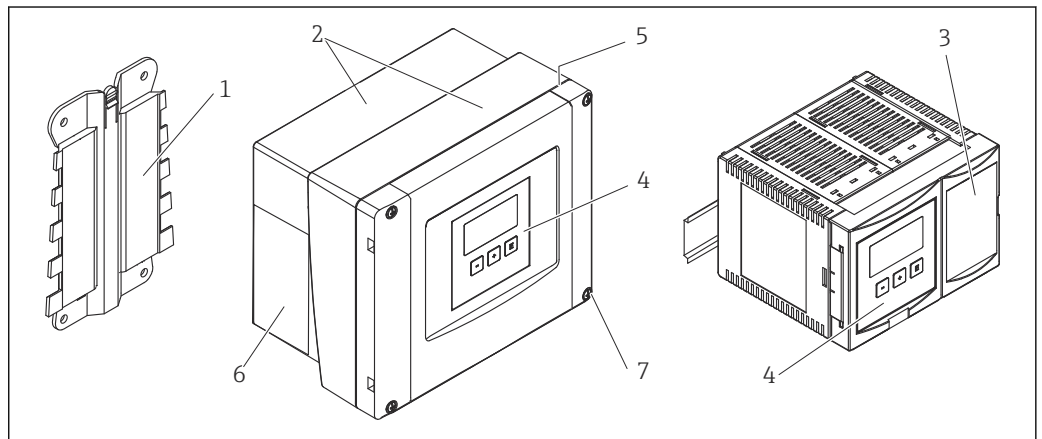
Approx. 0.7 kg (1.54 lb) depending on device version

Weight of remote display and operating module

Approx. 0.5 kg (1.10 lb)

Materials

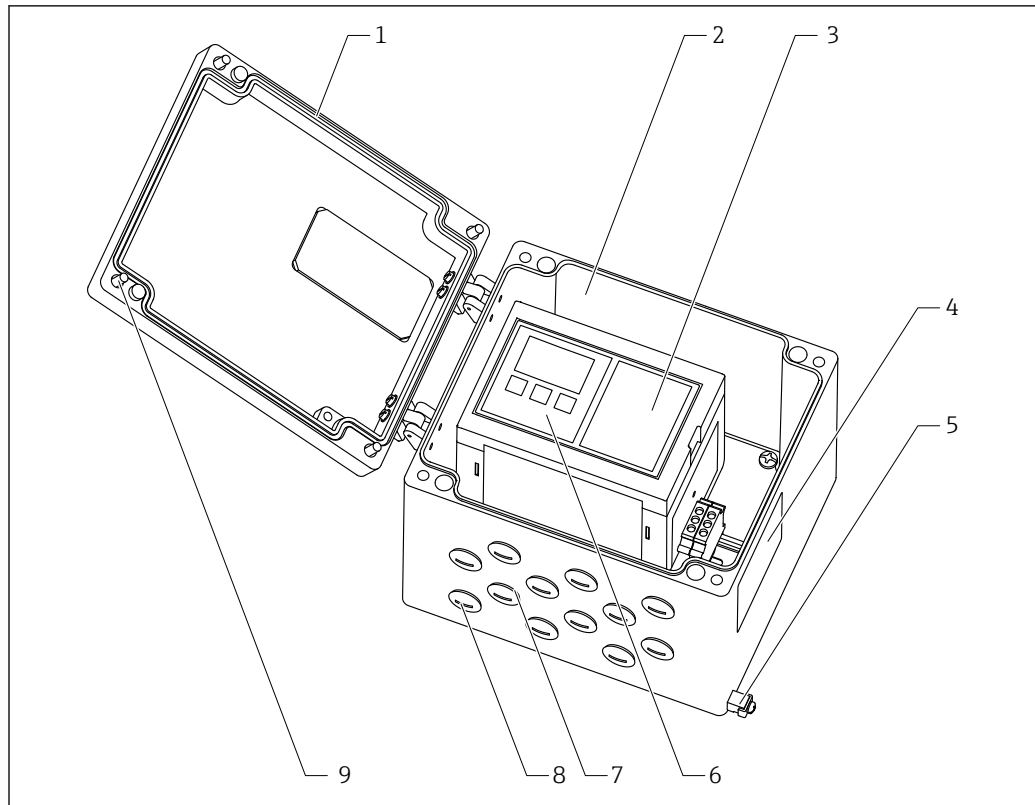
Materials: polycarbonate field housing and DIN rail housing



A0034920

6 Components of polycarbonate field housing with DIN rail housing

- 1 Housing bracket: PC-FR
- 2 Field housing: PC-FR
- 3 DIN rail housing: PBT-GF
- 4 Display and operating module: PC
- 5 Seal: PUR soft foam
- 6 Nameplate: polyester
- 7 Screws: A4 (1.4578)

Materials: aluminum field housing with DIN rail housing

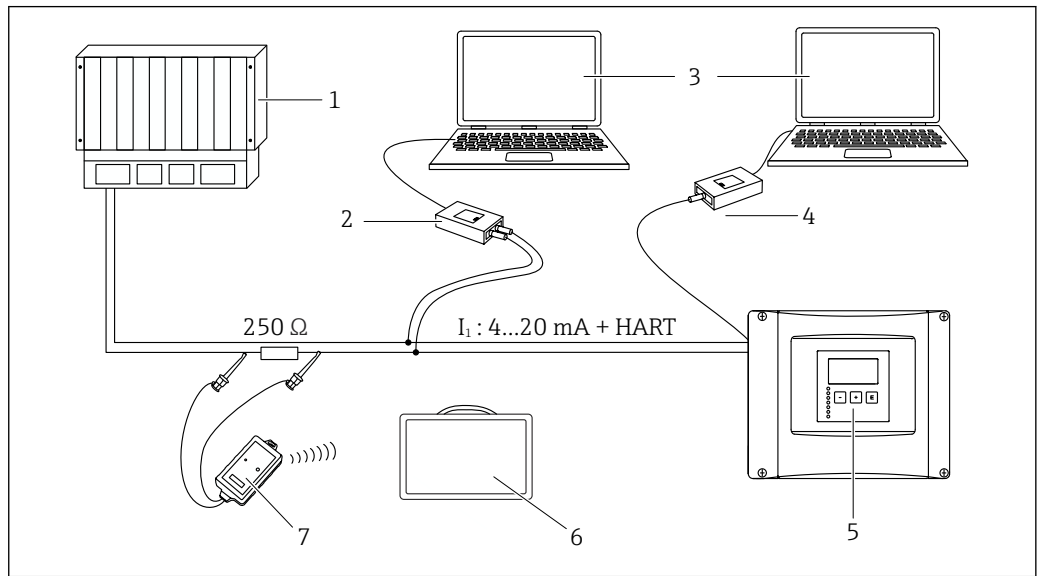
A0033634

▣ 7 Components of aluminum field housing with DIN rail housing

- 1 Seal: silicone
- 2 Aluminum field housing: EN AC-ALSi12 (Fe)
- 3 DIN rail housing: PBT-GF
- 4 Nameplate: polyester
- 5 Ground connection: A2 (1.4305), A2 (1.4301) and A2 (1.4310); base: A2 1.4305; clamp: A2 1.4301; spring washer: A2 1.4310; screw M5: A2
- 6 Display and operating module: PC
- 7 Dummy plug: nickel-plated brass
- 8 O-ring: EPDM 70 + PTFE
- 9 Screws: A2

Operability

HART operation methods

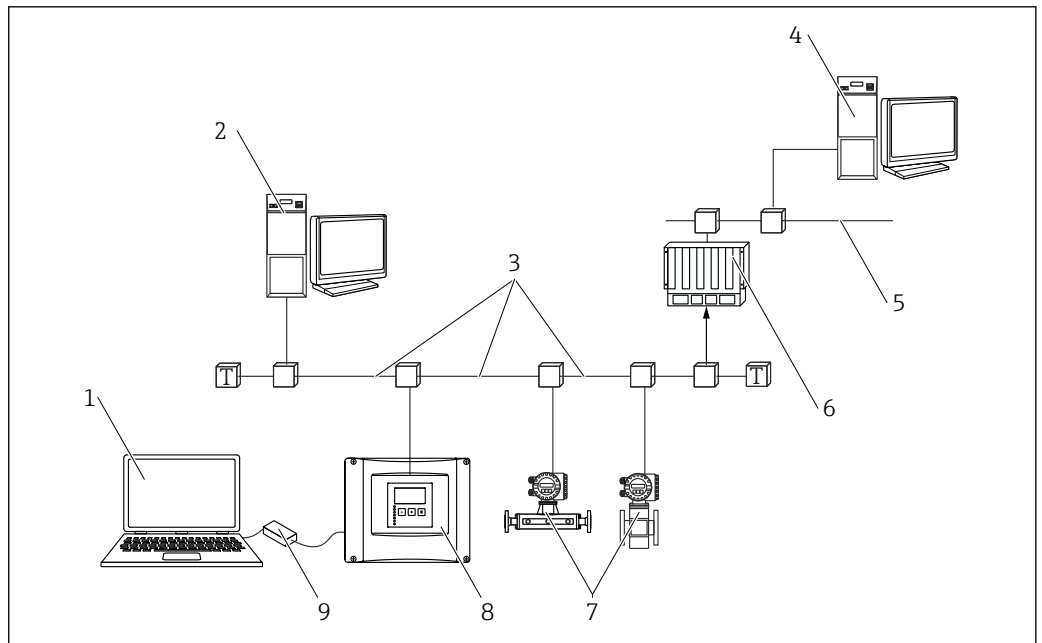


A0034891

8 HART operation methods

- 1 PLC, API
- 2 Commubox FXA195 (USB), HART protocol
- 3 DeviceCare/FieldCare
- 4 Commubox FXA291 (service interface)
- 5 Display and operating module on Prosonic S (if available)
- 6 Field Xpert SMT70/SMT77
- 7 VIATOR Bluetooth modem with connecting cable

Operation method, PROFIBUS DP



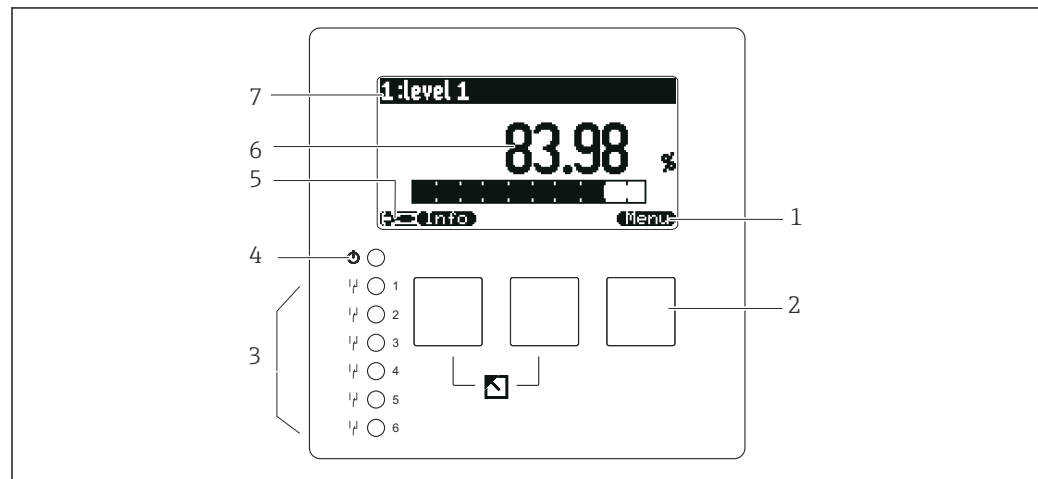
A0034892

9 Operation method, PROFIBUS DP

- 1 Computer with DeviceCare/FieldCare
- 2 Computer with DeviceCare/FieldCare
- 3 PROFIBUS DP
- 4 Computer with DeviceCare/FieldCare
- 5 Ethernet
- 6 PLC
- 7 Field devices
- 8 Prosonic S transmitter
- 9 Commubox FXA291

Display and operating module: overview

Elements of the display and operating module



A0034921

- 1 Soft key symbols
- 2 Keys
- 3 Light emitting diodes to indicate the relay switching states
- 4 LED to indicate the operational state
- 5 Display symbol
- 6 Parameter value with unit (here: primary value)
- 7 Name of displayed parameter

Versions of the display and operating module

Depends on order code 040 (operation)

- Option C (illuminated display + keypad):
Display and operating module is integrated in transmitter
- E (illuminated display + keypad, 96x96, panel mounting, front IP65): display and operating module is separate from the transmitter; cable: 3 m (9.8 ft) included in the delivery.

Display and operating elements

Keys

- The function of the key depends on the current position within the operating menu.
- The current key function is indicated by soft key symbols on the bottom line of the display.

i In the case of the aluminum field housing, the keys are only accessible when the housing is open.

Light emitting diodes (LEDs)

- 1 LED indicates the operational state of the device.
- Up to 6 LEDs indicate the switching state of the relays.

i In the case of the aluminum field housing, the LEDs are only visible when the housing is open.

Operating concept

Dynamic operating menu

Only function groups that are relevant for the device version and installation environment are displayed in the menu. The "Basic setup" submenu guides the user through the entire commissioning procedure.

Locking operation

- Via the lock switch in the terminal compartment
- Via a key combination at the operating module
- By entering a locking code via the software (e.g. "FieldCare")

Certificates and approvals



Currently available certificates and approvals can be called up via the product configurator.

CE mark

The measuring system meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

RoHS

The measuring system is not compliant with the substance restrictions of the Restriction on Hazardous Substances Directive 2011/65/EU (RoHS 2).

RCM-Tick marking

The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products are labelled with the RCM- Tick marking on the name plate.



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EAC conformity

The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied. Endress +Hauser confirms successful testing of the device by affixing to it the EAC mark.

Ex approval

- Available Ex approvals: see Product Configurator
- Associated Safety Instructions: (→ 33)



FDU9x sensors with an Ex approval can be connected to the FMU90 transmitter without an Ex approval.

Other standards and guidelines

EN 60529

Degrees of protection provided by enclosures (IP code)

EN 61326 series

EMC product family standard for electrical equipment for measurement, control and laboratory use

NAMUR

User association of automation technology in process industries

US Standard UL 61010-1

CSA General Purpose devices FMU9x-N***** have been tested according to US Standard UL 61010-1, 2nd edition.

Ordering information

Ordering information

Detailed ordering information is available for your nearest sales organization www.addresses.endress.com or in the Product Configurator under www.endress.com :

1. Click Corporate
2. Select the country
3. Click Products
4. Select the product using the filters and search field
5. Open the product page

The Configuration button to the right of the product image opens the Product Configurator.

Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Scope of delivery

- Ordered version of the device
- Brief Operating Instructions
- For certified device versions: Safety Instructions (XAs)
- For device versions with field housing for flow measurements (FMU90-*21***** and FMU90-*41*****):
2 sealing screws

Accessories

Communication-specific accessories

Commubox FXA195 HART

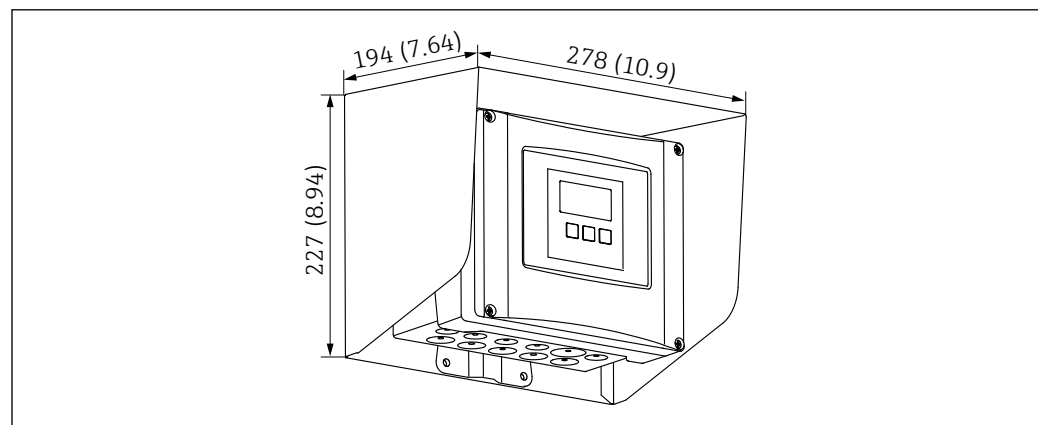
- For intrinsically safe HART communication with FieldCare or DeviceCare via the USB interface
- Additional information: Technical Information TI00404F

Commubox FXA291

- Connects the CDI interface (Common Data Interface) of Endress+Hauser devices with the USB port of a computer.
- Order number: 51516983
- Additional information: Technical Information TI00405C

Device-specific accessories

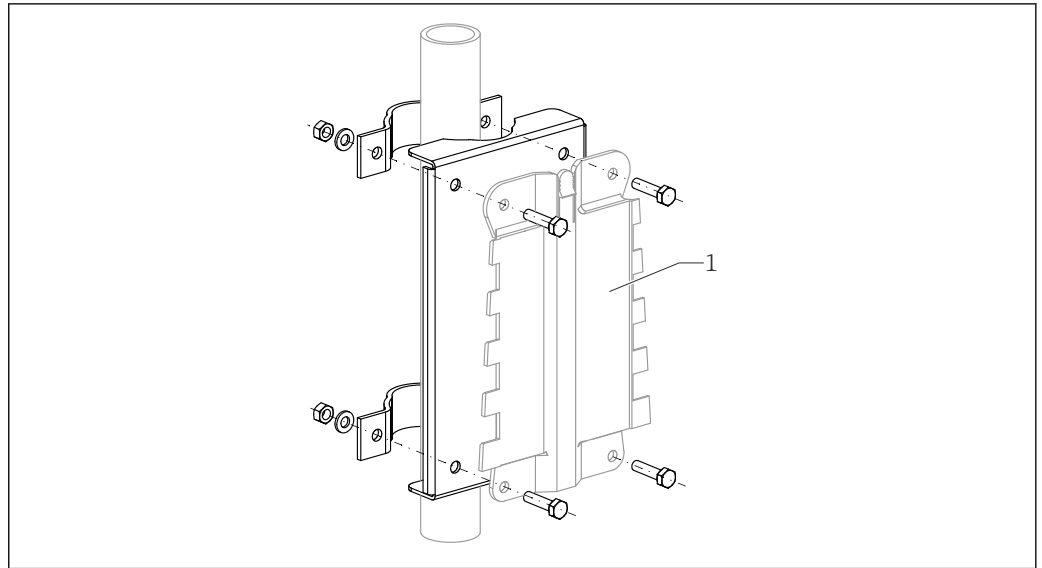
Weather protection cover for polycarbonate field housing



 10 Weather protection cover for polycarbonate field housing. Unit of measurement mm (in)

- Material: 316Ti (1.4571)
- Mounting and fixing: using the Prosonic S housing bracket
- Order number: 52024477

Mounting plate for polycarbonate field housing

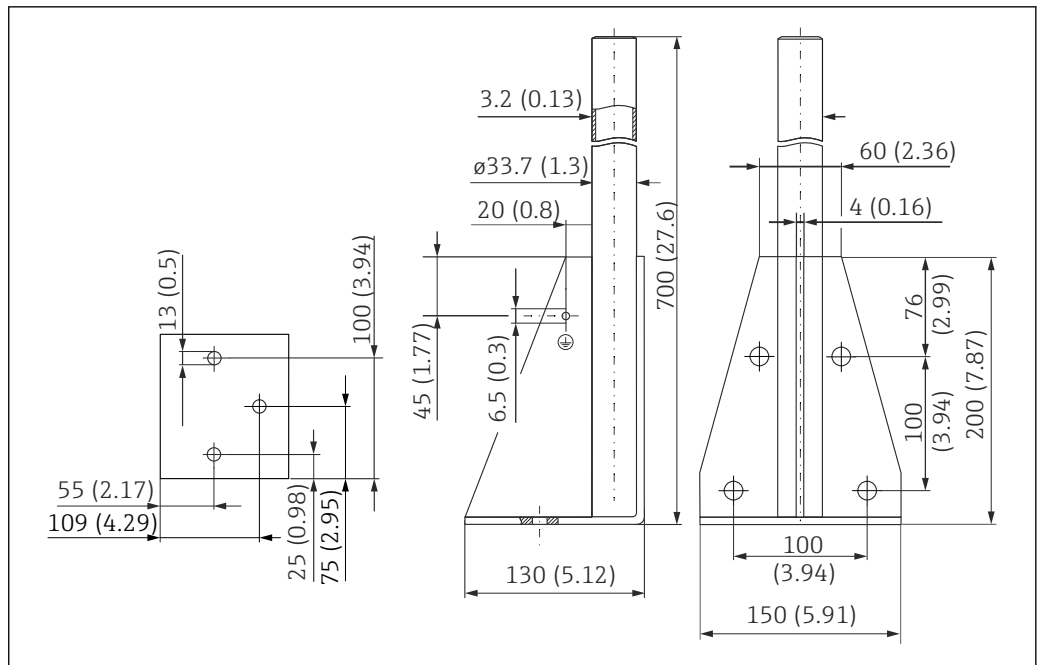


A0034923

11 Mounting plate for polycarbonate field housing

- Compatible with the Prosonic S housing bracket
- Pipe diameter: 25 to 50 mm (1 to 2 in)
- Dimensions: 210 x 110 mm (8.27 x 4.33 in)
- Material: 316Ti (1.4571)
- Mounting accessories: fastening clips, screws and nuts are supplied.
- Order number: 52024478

Frame, 700 mm (27.6 in)



A0037799

12 Dimensions. Unit of measurement mm (in)

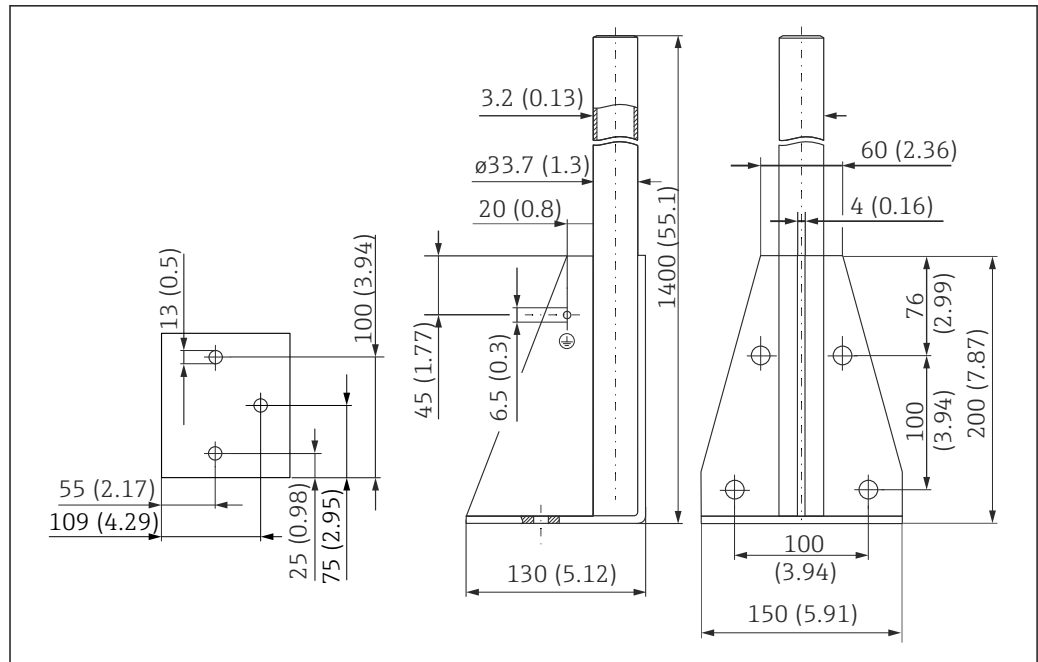
Weight:
4.0 kg (8.82 lb)

Material
316L (1.4404)

Order number

71452327

Frame, 1400 mm (55.1 in)



A0037800

13 Dimensions. Unit of measurement mm (in)

Weight:

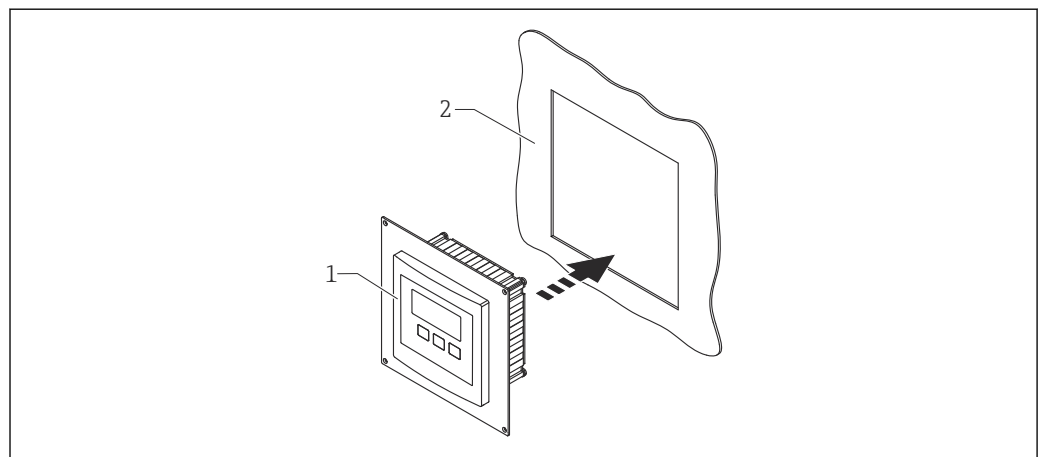
6.0 kg (13.23 lb)

Material

316L (1.4404)

Order number

71452326

Adapter plate for remote display

A0035916

14 Use of adapter plate

- 1 Remote display of Prosonic S FMU9x with adapter plate
- 2 Installation opening of the remote display of the FMU6x predecessor transmitter

To mount the remote display of the Prosonic S FMU9x in the housing of the larger remote display of the FMU86x predecessor

- Dimensions: 144 x 144 mm (5.7 x 5.7 in)
- Material: 304 (1.4301)
- Order number: 52027441

HAW562 surge arrester

Reduces residual voltages from upstream lightning arresters; limits surges induced or generated in the system

Additional information: Technical Information TI01012K

Extension cables for sensors



- Maximum permissible total length (sensor cable + extension cable): 300 m (984 ft)
- The sensor cable and extension cable are the same type of cable.

FDU90/FDU91 without sensor heater

- Cable type: LiYCY 2x(0.75)
- Material: PVC
- Ambient temperature:
- Order number: 71027742

FDU90/FDU91 with sensor heater

- Cable type: LiYY 2x(0.75)D+2x0.75
- Material: PVC
- Ambient temperature: -40 to +105 °C (-40 to +221 °F)
- Order number: 71027746

FDU92

- Cable type: LiYCY 2x(0.75)
- Material: PVC
- Ambient temperature: -40 to +105 °C (-40 to +221 °F)
- Order number: 71027742

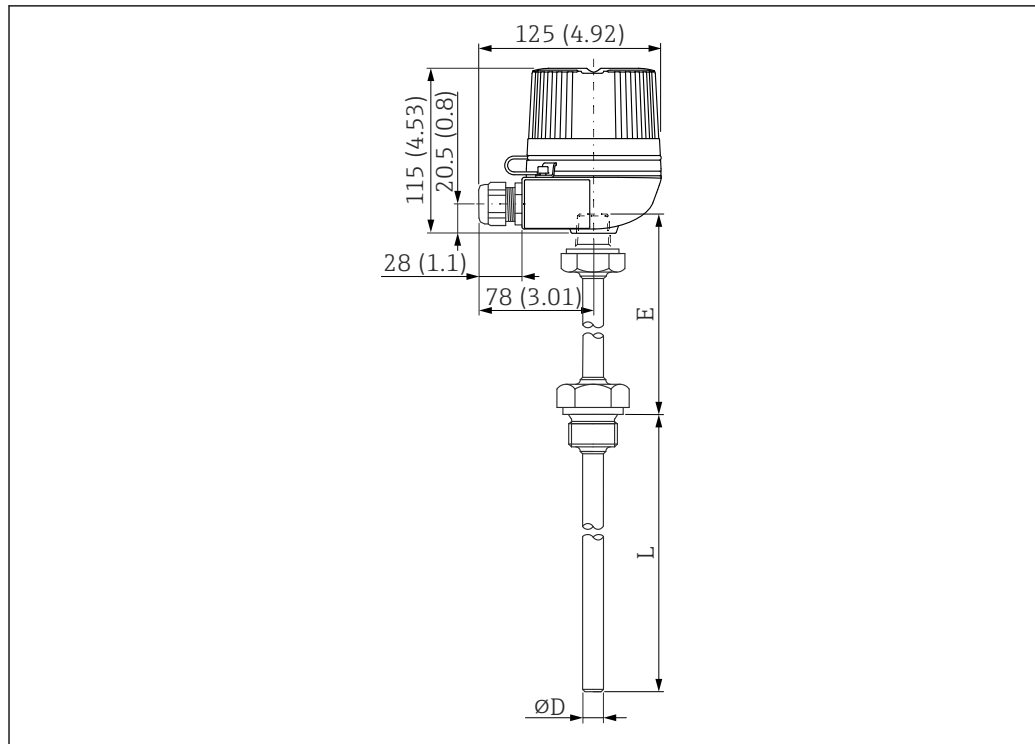
FDU91F/FDU93/FDU95

- Cable type: LiYY 2x(0.75)D+1x0.75
- Material: PVC
- Ambient temperature: -40 to +105 °C (-40 to +221 °F)
- Order number: 71027743

FDU95

- Cable type: Li2G2G 2x(0.75)D+1x0.75
- Material: silicone
- Ambient temperature: -40 to +150 °C (-40 to +302 °F)
- Order number: 71027745

Temperature sensor Omnigrad S TR61



A0035035

15 Structure of the Omnigrad S TR61; dimensions: mm (in)

- Replacement for FMT131-R* (non-hazardous area)
TR61-ABAD0BHSCC2B
- Replacement for FMT131-J* (ATEX II 2G EEx m II T6/T5)
TR61-EBAD0BHSCC2B
- Additional information: Technical Information TI01029T

Supplementary documentation



For an overview of the scope of the associated Technical Documentation, refer to the following:

- The *W@M Device Viewer*: enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

Technical Information	<p>Technical Information for ultrasonic sensors:</p> <ul style="list-style-type: none"> ■ FDU90 TI01469F ■ FDU91 TI01470F ■ FDU91F TI01471F ■ FDU92 TI01472F ■ FDU93 TI01473F ■ FDU95 TI01474F
Operating Instructions	<p>BA00288F</p> <ul style="list-style-type: none"> ■ Output: HART ■ Application: <ul style="list-style-type: none"> ■ Level measurement ■ Alternating pump control ■ Rake control ■ Device versions: <ul style="list-style-type: none"> ■ FMU90 - *1*****1**** ■ FMU90 - *1*****2**** <p>BA00289F</p> <ul style="list-style-type: none"> ■ Output: HART ■ Application: <ul style="list-style-type: none"> ■ Flow measurement ■ Backwater and dirt detection ■ Daily counters and totalizers ■ Device versions: <ul style="list-style-type: none"> ■ FMU90 - *2*****1**** ■ FMU90 - *4*****1**** ■ FMU90 - *2*****2**** ■ FMU90 - *4*****2**** <p>BA00292F</p> <ul style="list-style-type: none"> ■ Output: PROFIBUS DP ■ Application: <ul style="list-style-type: none"> ■ Level measurement ■ Alternating pump control ■ Rake control ■ Device versions: <ul style="list-style-type: none"> ■ FMU90 - *3*****3**** <p>BA00293F</p> <ul style="list-style-type: none"> ■ Output: PROFIBUS DP ■ Application: <ul style="list-style-type: none"> ■ Flow measurement ■ Backwater and dirt detection ■ Daily counters and totalizers ■ Device versions: <ul style="list-style-type: none"> ■ FMU90 - *2*****3**** ■ FMU90 - *4*****3****
Description of Device Parameters	<p>GP01151F</p> <p>Description of the parameters of all the versions of the Prosonic S FMU90</p>
Slot/Index lists (PROFIBUS DP)	<p>BA00333F</p> <p>Slot/Index lists for all the parameters of the Prosonic S FMU90 (Profibus DP)</p>
Safety Instructions	<p>XA00326F</p> <p>Safety Instructions for ATEX II 3D</p>



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