

Technical Information

Prosonic S FMU90

Transmitter for the ultrasonic sensors FDU91/92/93/95/96 in housing for field or top-hat rail mounting



Application for level measurement

- Continuous, non-contact level measurement of fluids, pastes, sludge and powdery to coarse bulk materials with 1 or 2 ultrasonic sensors
- Measuring range up to 70 m (depending on sensor and material measured)
- Level limit detection (up to 6 relays)
- Pump control (alternating)
- Screen and rake control
- Calculations: average, difference, sum

Application for flow measurement

- Flow measurement in open channels and measuring weirs with 1 or 2 ultrasonic sensors
- Simultaneous measurement of level and flow in a stormwater overflow basin with only 1 sensor
- Flow measurement with back water detection (2 sensors) or sludge detection
- Up to 3 (non-resettable) totalizers and 3 (resettable) counters configurable
- Counting or time pulse output for control of external units

Your benefits

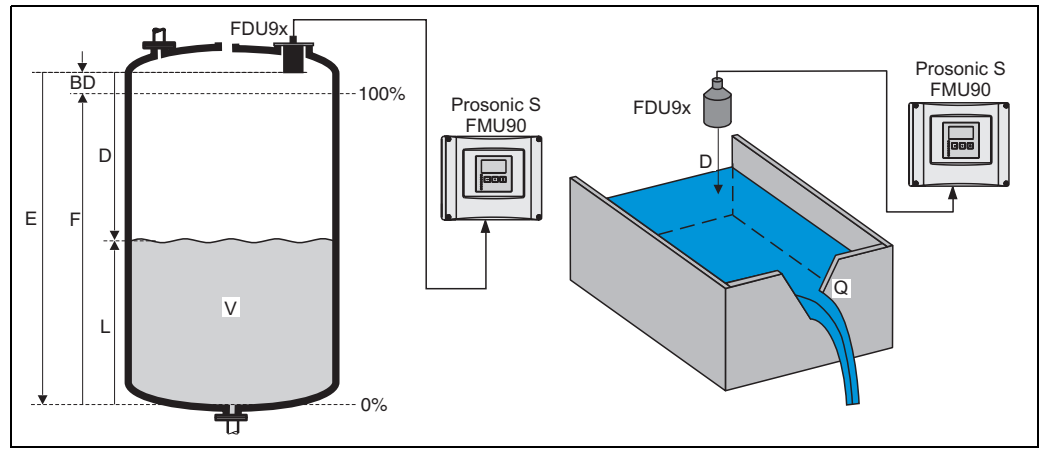
- Simple, menu-guided operation with 6-line plain text display
- Envelope curves on the display for quick and simple diagnosis
- Easy operation, diagnosis and measuring point documentation with the supplied "ToF-Tool - FieldTool Package" operating program.
- Temperature dependent time-of-flight correction via the integrated temperature measurement in the sensors
- Linearisation (up to 32 points, freely configurable)
- Linearisation tables for the most common flumes and weirs pre-programmed and selectable
- Online calculation of the flume-/weir-flows via integrated flow curves
- System integration via HART or PROFIBUS DP
- Automatic detection of the sensors FDU91/92/93/95/96
- The sensors of the former series FDU8x can be connected
- adjustable to the individual requirements via product structure

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Function and system design

Measuring principle



BD: blocking distance; **D:** distance from sensor membrane to fluid surface; **E:** empty distance **F:** span (full distance); **L:** level; **V:** volume (or mass); **Q:** flow

The sensor transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The transmitter Prosonic S measures the time t between pulse transmission and reception. From t (and the velocity of sound c) it calculates the distance D from the sensor membrane to the product surface:

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

From D results the desired measuring value:

- level L
- volume V
- flow Q across measuring weirs or open channels

Blocking distance

The span F may not extend into the blocking distance BD . Level echos from the blocking distance can not be evaluated due to the transient characteristics of the sensor. The blocking distances of the individual sensors are given in the following documents:

- TI 396F for the sensors FDU 91/92/93/95/96
- TI 189F for the sensors FDU 80/80F/81/81F/82/83/84/85/86

Time-of-flight correction

In order to compensate for temperature dependent time-of-flight changes, a temperature sensor is integrated in every sensor.

Interference echo suppression

The interference echo suppression feature of the Prosonic S ensures that interference echos (e.g. from edges, welded joints and installations) are not interpreted as a level echo.

Pump control

individually configurable for each pump:

- pump switching delay, e.g. to prevent overload of the power supply system
- backlash time and backlash interval, e.g. for complete draining of shafts or channels
- crust reduction at pump shaft walls by fine adjustment of the switch point

Linearisation**Pre-programmed linearisation curves***Types of vessels*

- horizontal, cylindrical tank
- spherical tank
- tank with pyramidal bottom
- tank with conical bottom
- tank with flat, inclined bottom

Flow curves for flumes and weirs¹

- Khafagi-Venturi flume
- ISO-Venturi flume
- BST²-Venturi flume
- Parshall flume
- Palmer-Bowlus flume
- Rectangular weir
- Rectangular constricted weir
- NFX³ rectangular weir
- NFX³ rectangular constricted weir
- Trapezoidal weir
- V-notch weir
- BST² V-notch wier
- NFX³ V-notch weir

The pre-programmed linearisation curves are calculated on-line.

Linearisation formula for flow measurements¹

$$Q = C (h^\alpha + \gamma h^\beta)$$

"h" is the upstream level. The parameters α , β , γ and C can be freely programmed by the user.

Linearisation table

consisting of up to 32 linearisation points; to be entered manually or half-automatically.

Special functions

- limit detection
- rake control
- alternating pump control or control according to pump rate
- totalising of the flow volume with (resettable) counters and (non-resettable) totalisers¹
- triggering of a sampler by time or quantity pulses¹
- low flow cut off¹
- backwater detection in flumes¹
- sludge detection in flumes¹
- trend detection

Datalog functions**Basic version**

- Peak hold indicator of the min./max. levels or flows and the min./max. temperatures at the sensors
- Recording of the last 10 alarms
- Indication of the operating status
- Trend indication of the outputs on the on-site display
- Indication of the operating hours

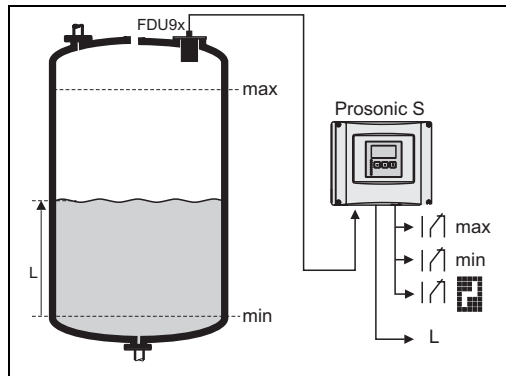
1) for instrument versions with flow software (FMU90 - *2******)

2) BST: British Standard

3) French standard NFX 10-311

Application examples for level measurements

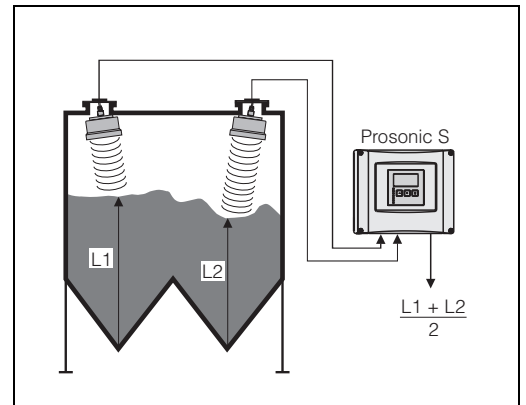
Level measurement with limit detection and alarm output



L00-FMU90xxx-15-00-00-xx-010

Order code e.g.: FMU90 - *1***131****
(1 input, 3 relays, 1 outputs)

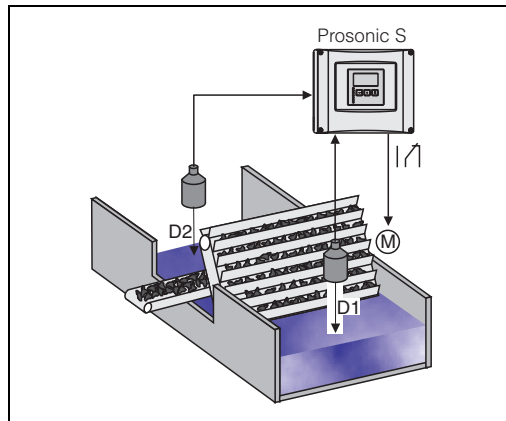
Average level measurement



L00-FMU190xxx-15-00-00-xx-003

Order code e.g.: FMU90 - *1***212****
(2 inputs, 2 outputs)

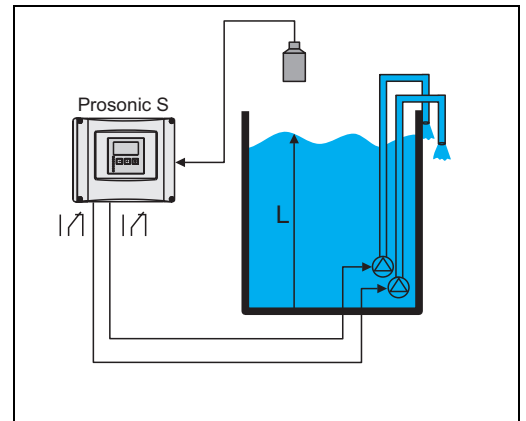
Rake control (differential measurement)



L00-FMU90xxx-15-00-00-xx-004

Order code e.g.: FMU90 - *1***212****
(2 inputs, 1 relay, 2 outputs)

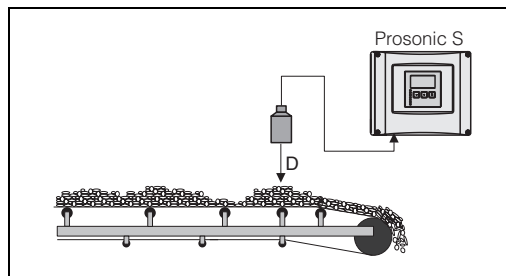
Alternating pump control (up to 6 pumps)



L00-FMU190xxx-15-00-00-xx-007

Order code e.g.: FMU90 - *1***131****
(1 input, 3 relays)

Conveyor belt

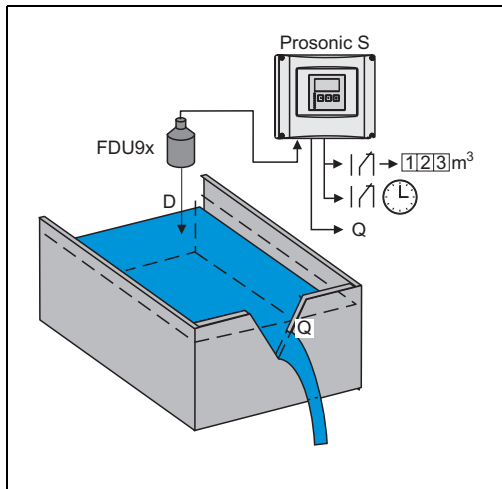


L00-FMU90xxx-15-00-00-xx-005

Order code e.g.: FMU90 - *1***111****
(1 input, 1 output)

Application examples for flow measurements

Pulses for volume counter + time pulses (e.g. for sampler)

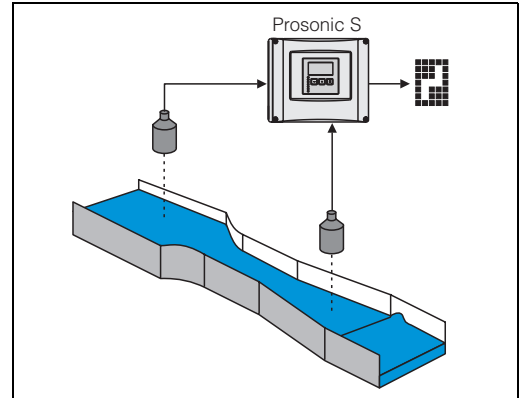


L00-FMU90xxx-15-00-00-xx-011

Order code e.g.: FMU90 - *2***131****
(1 input, 3 relays, 1 output)

Flow measurement with backwater alarm or sludge detection

If the ratio "downstream level:upstream level" rises above or falls below a critical value, an alarm will be generated.

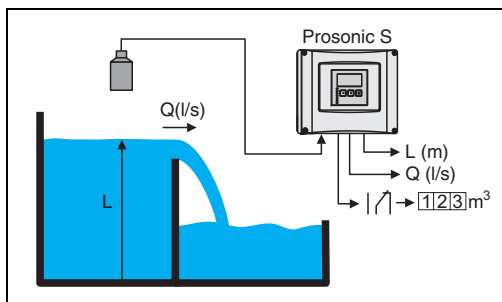


L00-FMU90xxx-15-00-00-xx-008

Order code e.g.: FMU90 - *2***212****
(2 inputs, 1 relay, 2 outputs)

Stormwater overflow bassin

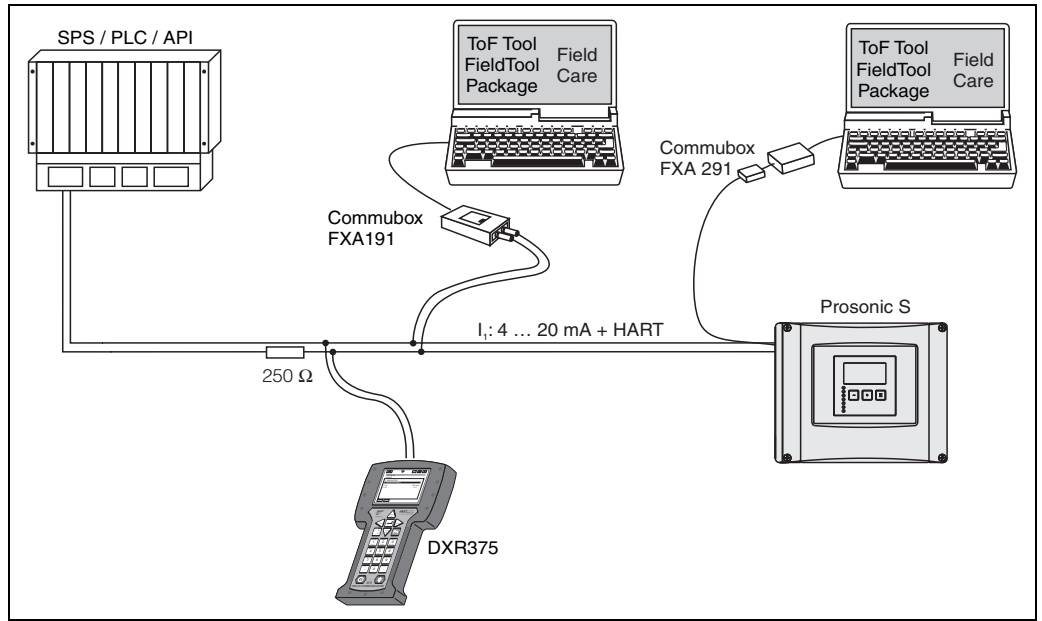
Simultaneous measurement of level L and flow Q with 1 sensor.



L00-FMU90xxx-15-00-00-xx-006

Order code e.g.: FMU90 - *2***112****
(1 input, 2 outputs)

System integration HART



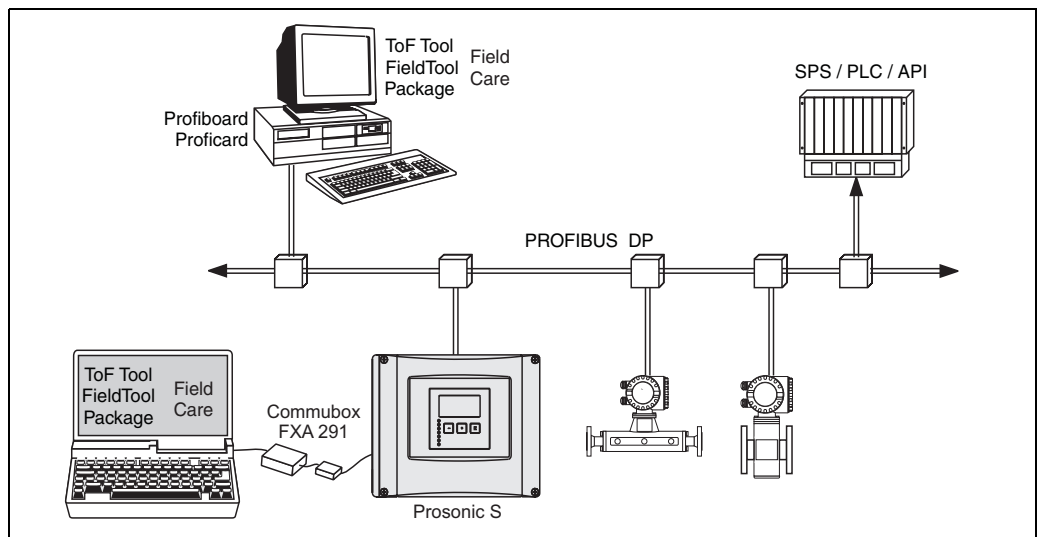
L00-FMU90xxx-14-00-00-xx-009

In the standard version a HART signal is superimposed onto the first output current. In order to use the HART communication, the circuit must contain a communication resistor of 250Ω.

Operating options

- via the operating and display module at the Prosonic S
- via the service interface of the Prosonic S with the Commubox FXA291 and the operating program "ToF Tool - FieldTool Package" or "FieldCare"
- via the HART protocol with the Commubox FXA191 and the operating program "ToF Tool - FieldTool Package" or "FieldCare"
- via the HART handheld terminal DXR375

System integration PROFIBUS DP



L00-FMU90xxx-14-00-00-xx-010

Operating options

- via the display and operating module at the Prosonic S
- via the service interface with the Commubox FXA291 and the operating program "ToF Tool - FieldTool Package" or "FieldCare"
- via PROFIBUS DP with Profibus card and the operating program "ToF Tool - FieldTool Package" or "FieldCare"

Input

Sensor inputs

Depending on the instrument version, 1 or 2 of the sensors FDU91, FDU92, FDU93, FDU95 and FDU96 can be connected. The Prosonic S identifies these sensors automatically.

Sensor	FDU91	FDU92	FDU93	FDU95	FDU96
max. range ¹ in liquids	10 m	20 m	25 m	-	-
max. range ¹ in solids	5 m	10 m	15 m	45 m	70 m

- 1) This table gives the maximum range. The range depends on the measuring conditions. For an estimation see Technical Information TI 396F, chapter "Input".

In order to support existing installations, the sensors of the former series FDU8x can be connected as well. The type of sensor must be entered manually.

Sensor	FDU80 FDU80F	FDU81 FDU81F	FDU82	FDU83	FDU84	FDU85	FDU86
max. range ¹ in liquids	5 m	9 m	20 m	25 m	-	-	-
max. range ¹ in solids	2 m	5 m	10 m	15 m	25 m	45 m	70 m

- 1) This table gives the maximum range. The range depends on the measuring conditions. For an estimation see Technical Information TI 189F, chapter "Planning Recommendations".

Output

Analogue outputs

Number	1 or 2, depending on instrument version
Output signal	configurable at the instrument: <ul style="list-style-type: none"> ■ 4 ... 20 mA with HART¹ ■ 0 ... 20 mA without HART
Signal on alarm	<ul style="list-style-type: none"> ■ for setting 4 ... 20 mA, selectable: <ul style="list-style-type: none"> - -10% (3,6 mA) - 110% (22 mA) - HOLD (last current value is held) - user specific ■ for setting 0 ... 20 mA: <ul style="list-style-type: none"> - 110% (21,6 mA) - HOLD (last current value is held) - user specific
Output damping	freely selectable, 0 ... 1000 s
Load	max. 600 Ω , influence negligible
max. ripple	$U_{SS} = 200$ mV at 47 ... 125 Hz (measured at 500 Ω)
max. noise	$U_{eff} = 2,2$ mV at 500 Hz... 10 kHz (measured at 500 Ω)

1) The HART signal is assigned to the first analogue output. The second analogue output does not carry a HART signal.

Relay outputs

Number	1, 3 or 6; depending on the instrument version
Type	potential-free relay, SPDT, can be inverted
Assignable functions	<ul style="list-style-type: none"> ■ limit (inband, out-of-band, trend, level limit) ■ counting pulse (pulse width adjustable) ■ time pulse (pulse width adjustable) ■ alarm/diagnosis (e.g. indication of backwater¹, sludge¹, echo loss etc.) ■ pump control (alternating/fixed limit/pump rate) ■ rake control (difference or relative measurement)
Switching power	<ul style="list-style-type: none"> ■ DC voltage: 35 V_{DC}, 100 W ■ AC voltage: 4 A, 250 V, 100 VA at $\cos\phi = 0,7$
State on error	selectable: <ul style="list-style-type: none"> ■ HOLD (last value is held) ■ energised ■ de-energised ■ present value is used
Behaviour after power failure	switch-on delay selectable
LEDs ²	A yellow LED on the front panel is allocated to each relay, which lights if the relay is energised. The LED of an alarm relay lights during normal operation. The LED for a pulse relay briefly flashes at every pulse.

1) for instrument versions with flow software (FMU90 - *2*****)

2) for instrument versions with display and operating module

PROFIBUS DP interface

Profile	3.0
Transmittable values	<ul style="list-style-type: none">■ main value (level or flow, depending on the instrument version)■ distances■ counters■ temperatures■ average/difference/sum
Function blocks	<ul style="list-style-type: none">■ 10 Analog Input Blocks (AI)
Supported baud rates	<ul style="list-style-type: none">■ 9.6 kbaud■ 19.2 kbaud■ 93.75 kbaud■ 187.5 kbaud■ 500 kbaud■ 1.5 Mbaud■ 3 Mbaud■ 6 Mbaud■ 12 Mbaud
Addressing	via dip switches at the instrument or via software (e.g. ToF Tool)

Auxiliary energy

Supply voltage/ Power consumption/ Current consumption

Instrument version	Supply voltage	Power consumption	Current consumption
AC voltage (FMU90 - ****A*****)	90 ... 253 V _{AC} (50/60 Hz)	max. 23 VA	max. 100 mA at 230 V _{AC}
DC voltage (FMU90 - ****B*****)	10,5 ... 32 V _{DC}	max. 14 W (typically 8 W)	max. 580 mA at 24 V _{DC}

Galvanic isolation

The following terminals are galvanically isolated from each other:

- auxiliary energy
- sensor inputs
- analogue output 1
- analogue output 2
- relay outputs
- bus connection (PROFIBUS DP)

Fuse

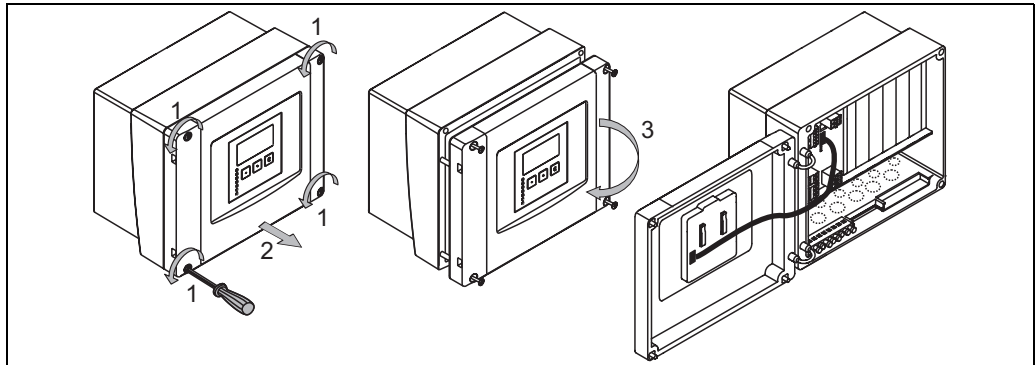
- 2 A T /DC
- 400 mA T /AC

accessible in the terminal compartment

Electrical connection

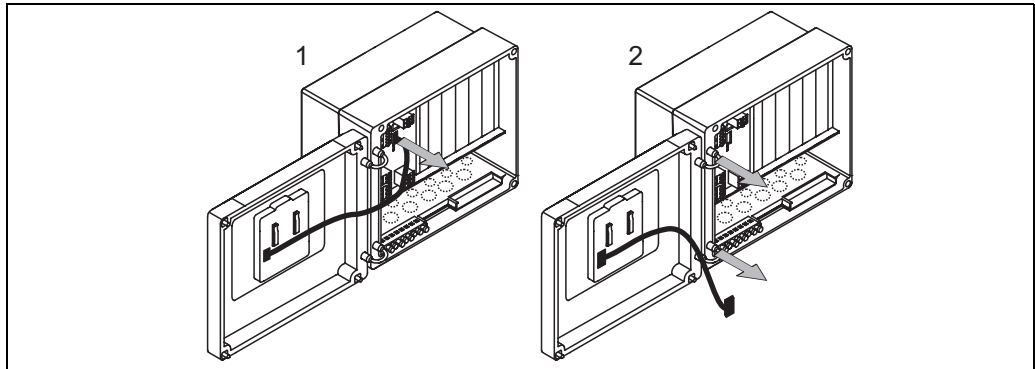
Terminal compartment of the field housing

The field housing has a separate terminal compartment. It can be opened after opening the four screws of the lid.



L00-FMU90xxx-04-00-00-xx-002

For easier wiring, the lid can be completely removed by unplugging the display plug and pulling the hinges vertically:



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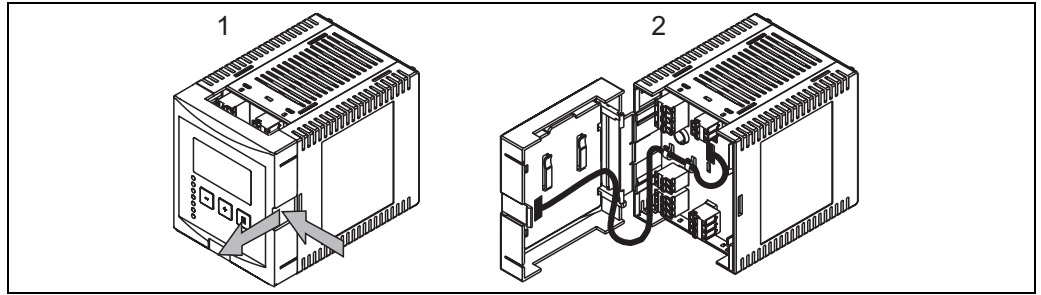
Cable entries of the field housing

On the bottom of the housing the following openings for cable entries are pre-stamped:

- M20x1,5 (10 openings)
- M16x1,5 (5 openings)
- M25x1,5 (1 openings)

A suitable cutting device must be used for cutting out the openings.

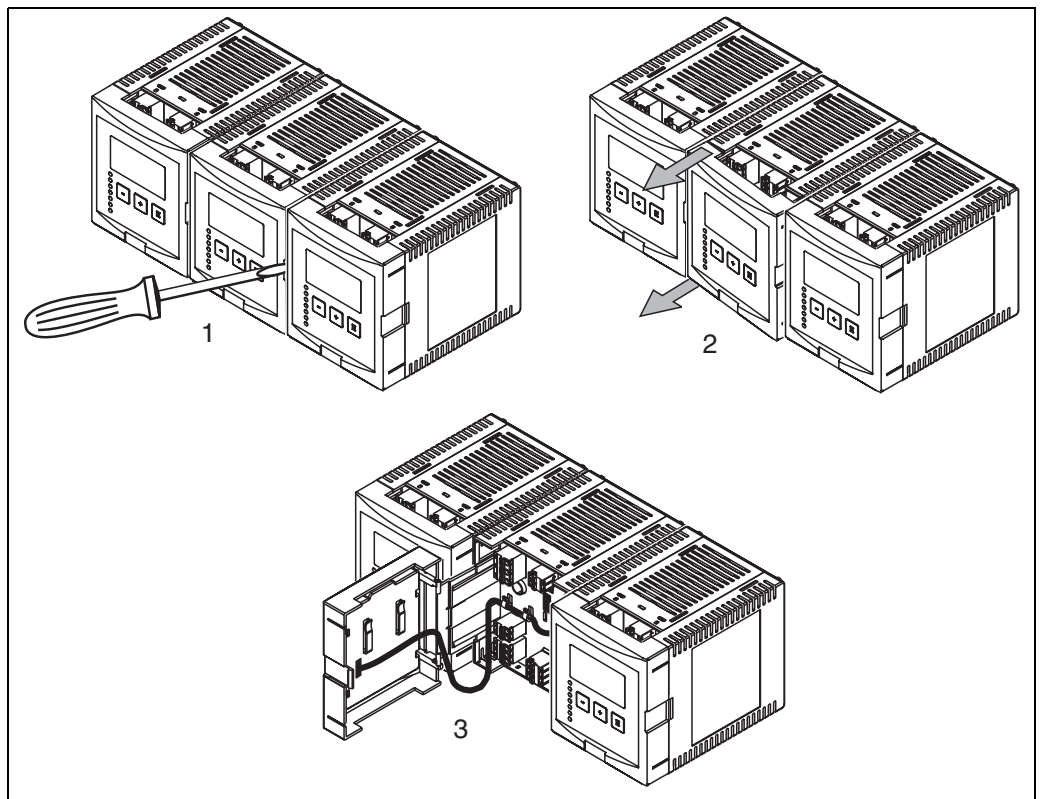
Terminal compartment of the housing for top hat rail **Single instrument**



100-fmu90xxx-04-00-00-xx-003

The cover can be unlocked by slightly pressing onto the clip.

Several instruments mounted side by side



100-fmu90xxx-04-00-00-xx-012

1. Open the locking clip of the cover (e.g. by a screwdriver).
2. Pull the cover out by approx. 2 cm.
3. The cover can now be opened.



Note!
The cables can be inserted into the housing both from above and from below.

Terminals

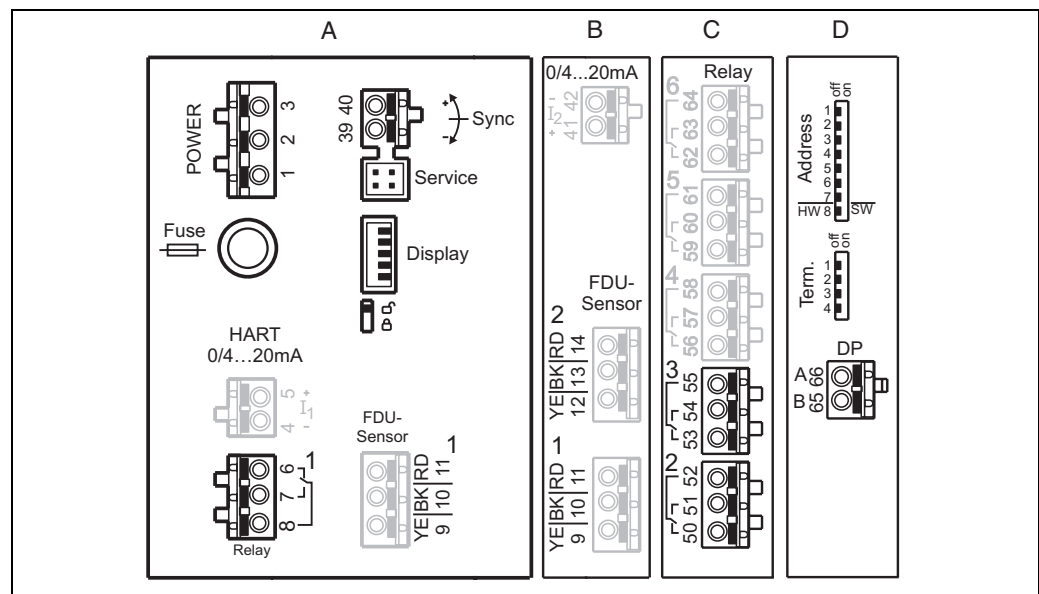
Removable spring-force terminals for connection of the cables are supplied in the terminal compartment of the housing. Connection is performed according to the "plug and play principle", i.e. rigid conductors or flexible conductors with cable and sleeve can directly be inserted and are contacted automatically.

Conductor cross section	0,2 mm ² - 2,5 mm ²
Cable and sleeve cross section	0,25 mm ² - 2,5 mm ²
Stripping length	10 mm

Terminal assignment

The terminal configuration depends on the instrument version ordered. There is a basic terminal area, which is present in every instrument version. Additional optional terminal areas are only present if the respective option has been selected in the product structure.

Terminal area	present for the following instrument versions	
basic area	A	for all versions
optional areas	B	for instrument versions with 2 sensor inputs and/or 2 analogue outputs (FMU90 - *****2***** and/or FMU90 - *****2*****)
	C	for instrument versions with 3 or 6 relays (FMU90 - *****3***** oder FMU90 - *****6*****)
	D	for instrument versions with PROFIBUS DP interface (FMU90 - *****3*****)

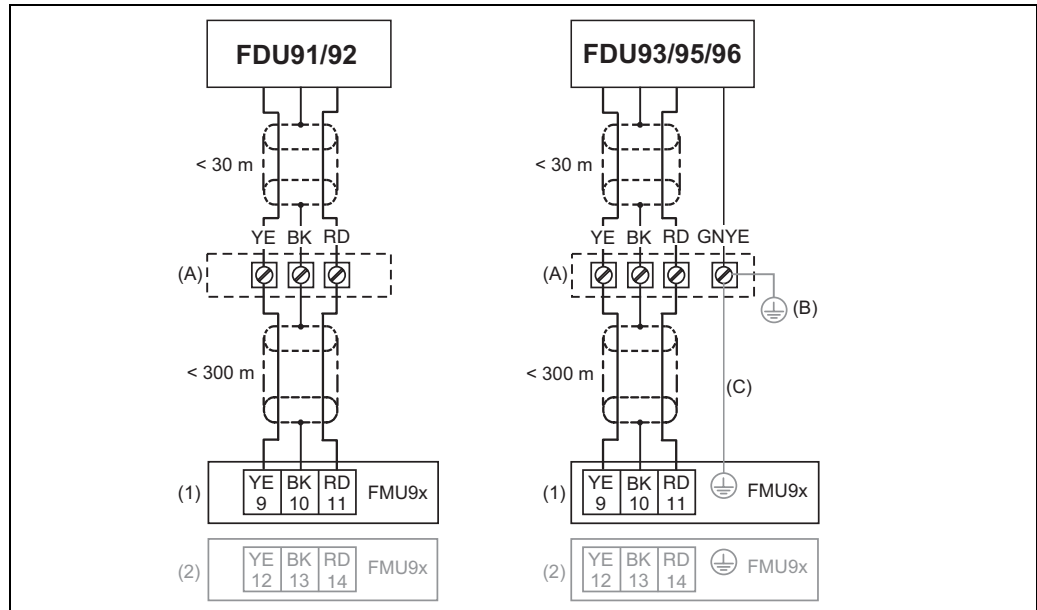


Terminals of the Prosonic S; the terminals depicted in grey are not present in every instrument version.
A: basic terminal area; **B-D:** optional terminal areas (present if the respective option has been selected in the product structure)

Terminals	Meaning	Terminal area	Remarks
Auxiliary energy			
1, 2	Auxiliary energy	A	depending on instrument version: <ul style="list-style-type: none"> ■ 90 ... 253 V_{AC} ■ 10,5 ... 32 V_{DC}
3	Potential equalisation	A	
Analogue outputs			
4, 5	Analogue output 1; 4 ... 20 mA with HART/ 0 ... 20 mA w/o HART	A	not present for the PROFIBUS DP version
41, 42	Analogue output 2 (optional); 4 ... 20 mA/ 0 ... 20 mA	B	only for the version with two analogue outputs
Relay outputs			
6, 7, 8	Relay 1	A	
50, 51, 52	Relay 2 (optional)	C	only for the versions with 3 or 6 relays
53, 54, 55	Relay 3 (optional)	C	only for the versions with 3 or 6 relays
56, 57, 58	Relay 4 (optional)	C	only for the version with 6 relays
59, 60, 61	Relay 5 (optional)	C	only for the version with 6 relays
62, 63, 64	Relay 6 (optional)	C	only for the version with 6 relays
Bus communication			
65, 66	PROFIBUS DP connection (optional)	D	only for the PROFIBUS DP version
Synchronisation			
39, 40	Synchronisation	A	
Level inputs			
9 (YE), 10 (BK), 11 (RD)	Sensor 1 (FDU8x/9x) ¹		<ul style="list-style-type: none"> ■ A: for versions with 1 sensor input ■ B: for versions with 2 sensor inputs²
12 (YE), 13 (BK), 14 (RD)	Sensor 2 (FDU8x/9x) ¹ (optional)	B	only for the version with 2 sensor inputs

- 1) The colours of the strands of the sensor cable must correspond to the terminal designation: **RD**: red; **BK**: black; **YE**: yellow
- 2) In this case, terminals 9/10/11 are not present on terminal area A.

**Connection of the sensors
FDU9x**



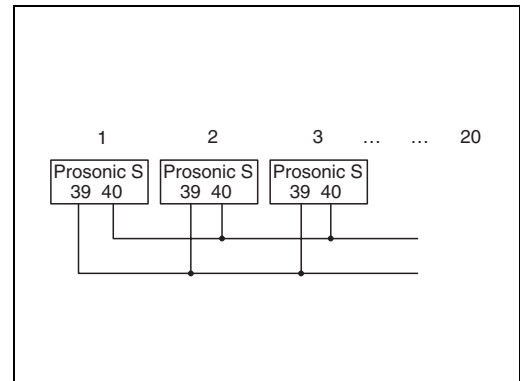
L00-FMU90zcx-04-00-00-zx-002

(A): Terminal box (recommended or cable lengths > 30 m); **(B):** Grounding at the terminal box; **(C):** Grounding at the transmitter or in the control room; **(1):** Terminals for sensor input 1 at the FMU9x; **(2):** Terminals for sensor input 2 at the FMU9x (optional)

For details refer to Technical Information TI 396F.

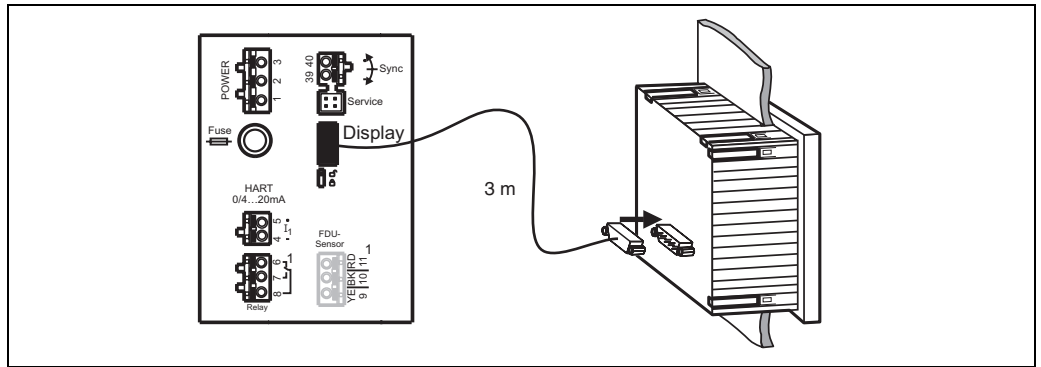
Synchronisation line

- If wiring several Prosonic S, which for example are mounted in one cabinet, and if the sensor cables run in parallel, the synchronisation terminals (39 and 40) must be interconnected.
- Up to 20 instruments can be synchronised in this way.
- If there are more than 20 instruments, groups must be formed, each containing a maximum of 20 instruments. For the instruments within each group, the sensor cables may run in parallel. The sensor cables of different groups must be separated from each other.
- Usual commercial screened cable can be used for synchronisation;
max. length: 10 m;
cable diameter: 2 x 0.75 mm²
- Instruments of the Prosonic FMU86x family can also be connected to the synchronisation line.



L00-FMU90zcx-04-00-00-zx-004

Connection of the separate display and operating module



For the version of the Prosonic S with a separate display for cabinet door mounting, a connecting cable (3 m) is supplied. The cable must be connected to the display plug of the Prosonic S.

Performance characteristics

Reference operating conditions

- Temperature = 24 ± 5 °C
- Pressure = 960 ± 100 mbar
- Relative humidity = 60 ± 15 %
- Ideally reflecting surface, sensor vertically aligned (e.g. calm, plane liquid surface of 1 m^2)
- No interference echoes within the signal beam
- Settings of the application parameters:
 - tank shape = flat ceiling
 - medium property = liquid
 - process condition = calm surface

Measuring uncertainty¹ $\pm 0,2$ % of the maximum span of the sensor

Typical accuracy² ± 2 mm + 0,17 % of the measured distance

Measured value resolution 1 mm with FDU91

Measuring frequency max. 3 Hz
 The exact value depends on the settings of the application parameters and the instrument version (1- or 2-channel).

1) according to NAMUR EN 61298-2
 2) after calibration

Ambient conditions

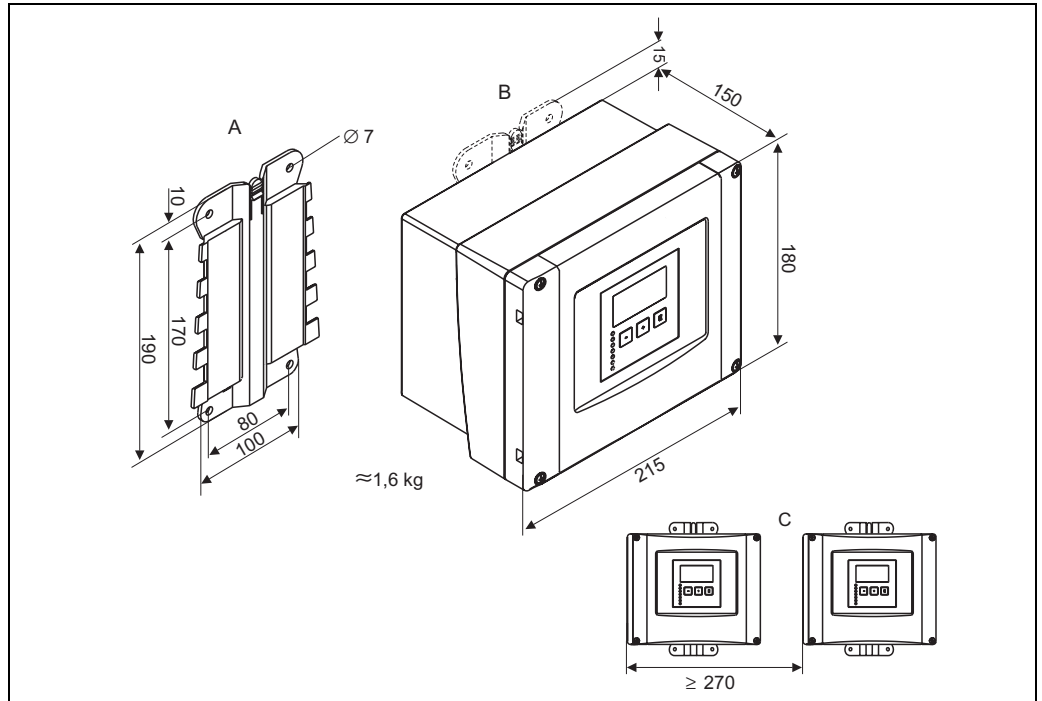
Ambient temperature	-40 ... 60 °C The functionality of the LC display becomes restricted at $T_U < -20$ °C. If the device is operated outdoors in strong sunlight, a protective cover should be used (s. chapter "Accessories").
Storage temperature	-40 ... 60 °C
Climate class	<ul style="list-style-type: none"> ■ Field housing: according to DIN EN 60721-3 4K2/4K5/4K6/4Z2/4Z5/4C3/4S4/4M2 (DIN 60721-3 4K2 corresponds to DIN 60654-1 D1) ■ Housing for top-hat rail mounting: according to DIN EN 60721-3 3K3/3Z2/3Z5/3B1/3C2/3S3/3M1 (DIN 60721-3 3K3 corresponds to DIN 60654-1 B2)
Vibration resistance	<ul style="list-style-type: none"> ■ Housing for top-hat rail: DIN EN 600068-2-64 / IEC 68-2-64; 20 ... 20000 Hz; 0,5 (m/s²)²/Hz ■ Field housing: DIN EN 600068-2-64 / IEC 68-2-64; 20 ... 20000 Hz; 1,0 (m/s²)²/Hz
Ingress protection	<ul style="list-style-type: none"> ■ Field housing: IP66 / NEMA 4x ■ Housing for top-hat rail: IP20 ■ separate display: <ul style="list-style-type: none"> – IP65 / NEMA 4 (front panel , if mounted in cabinet door) – IP20 (rear panel, if mounted in cabinet door)
Electromagnetic compatibility (EMC)	<ul style="list-style-type: none"> ■ Interference emission to EN 61326; Equipment class A ■ Interference immunity to EN 61326; Annex A (Industrial) and NAMUR recommendation EMC (NE21)

Mechanical construction

Housing versions

- Field housing; optionally with integrated display and operating module
- Housing for top-hat rail mounting; optionally with integrated display and operating module
- Housing for top-hat rail mounting with separated display and operating module for cabinet door mounting

Dimensions of the field housing



Dimensions in mm

A: mounting help and drilling template (supplied); **B:** Field housing

The dimensions of the field housing are equal for all instrument versions.



Hinweis!

The mounting help must be mounted on a plane surface and must not become bent. Otherwise the mounting of the field housing may be difficult or impossible.

Dimensions of the housing for top-hat rail

The dimensions of the housing for top-hat rail depend on the instrument version. The version determines, which terminal areas the Prosonic S contains. The dimensions are influenced by the following features of the product structure:

- 60: Level input
- 70: Switch output
- 80: Output

In order to determine the dimensions of a specific version, perform the following steps:

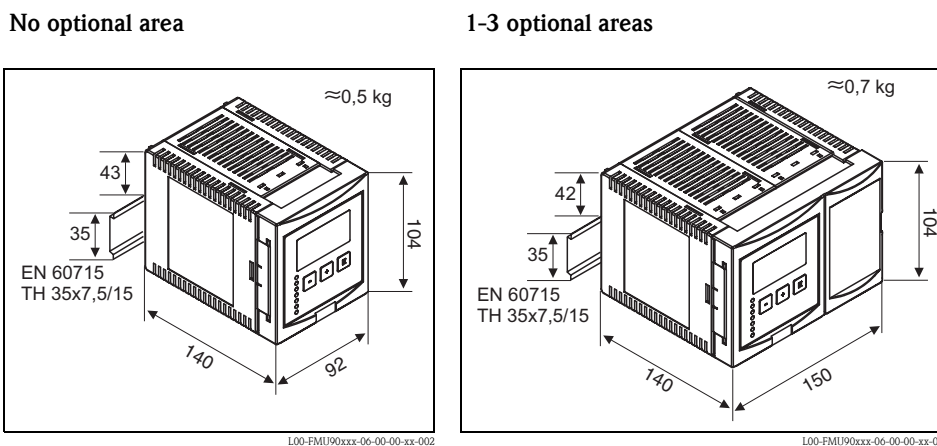
1. Using the product structure, determine the options of the features 60, 70 and 80 of the desired instrument version.

	10	20	30	40	50	60	70	80	90	100	110	120
FMU90 -												

2. Using the following table, determine how many optional terminal areas this instrument version contains.

Feature and option of the product structure	denotes the following option	present?
feature 60; option 2 and/or feature 80, option 2	2 sensor inputs and/or 2 analogue outputs	
feature 70, option 3 or 6	3 o 6 relays	
feature 80, option 3	PROFIBUS DP interface	
sum =		

3. The appropriate dimensions are given in the following diagram:



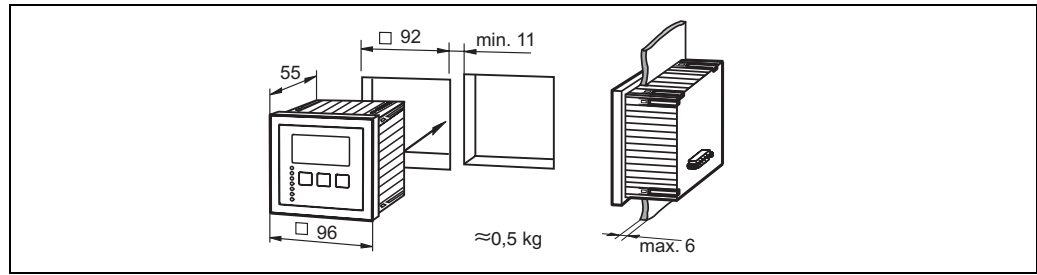
Example

		10	20	30	40	50	60	70	80	90	100	110	120
FMU90-	R	1	2	A	A	2	3	2	A	A	1	A	

feature and option of the product structure	denotes the following option	present?
feature 60; option 2 and/or feature 80, option 2	2 sensor inputs and/or 2 analogue outputs	yes
feature 70, option 3 or 6	3 or 6 relays	yes
feature 80, option 3	PROFIBUS DP interface	no
	sum =	2

2 optional terminal areas
=> Version B: 104 mm x 150 mm x 140 mm

Dimensions of the separate display and operating module



Dimensions in mm

Weight

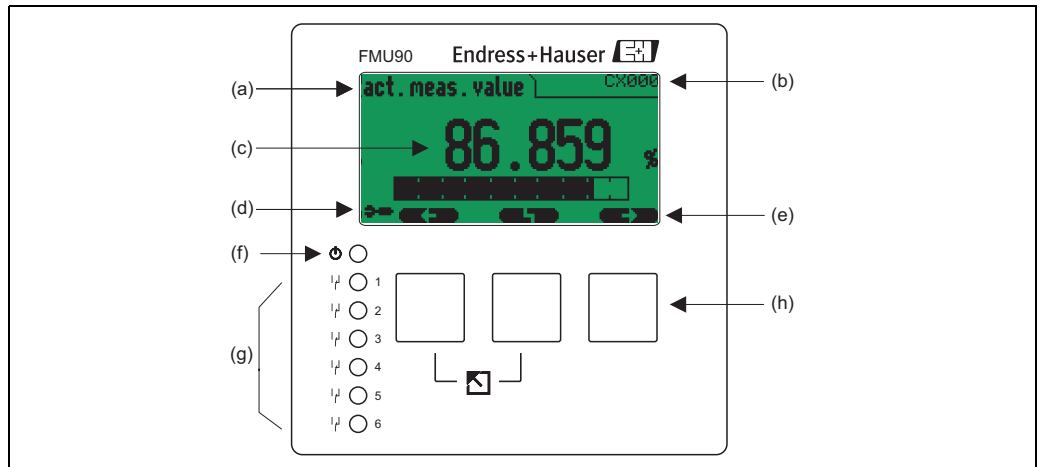
Housing version	Weight
Field housing	approx.. 1,6 ... 1,8 kg; depending on instrument version
Housing for top-hat rail	approx. 0,5 ... 0,7 kg; depending on instrument version (s. section: "Dimensions of the housing for top hat rail")
separate display and operating module	approx. 0,5 kg

Materials

- Field housing: PC
- Housing for top-hat rail: PBT

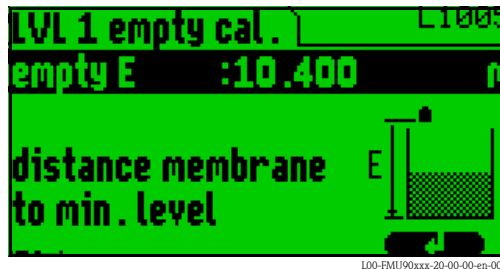
Human interface

Display and operating module

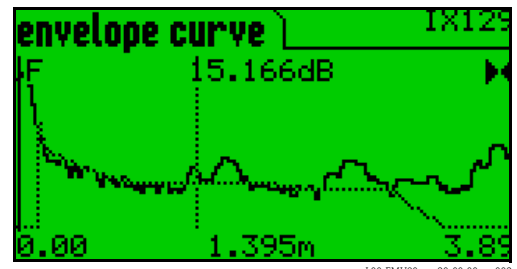


(a): name of the function displayed; (b): position code of the function displayed; (c): value of the function, including unit; (d): display symbols; (e): softkey symbols; (f): LED indicating the operating state; (g): LEDs indicating the switching states of the relays; (h): keys

Display (Examples)



Display of a function including help text and descriptive graphic



Display of the envelope curve including the mapping. The level echo and the empty distance are marked.

Keys (softkey operation)

The function of the keys depends on the current position within the operating menu (softkey functionality). The key functions are indicated by softkey symbols in the bottom line of the display.

LEDs

- 1 LED (a) indicates the operating state ("normal operation", "alarm" or "warning")
- 6 LEDs (b) indicate the switching state of the relays (LED glows if the respective relay is energised)

Illuminated display

An illuminated display is available as an option (s. feature 40 of the product structure)

Operating menu

The Prosonic S has got a dynamical operating menu. Only those functions are visible which are relevant for the instrument version and installation environment at hand.

Quick Setup


The operating menu contains Quick Setups for easy commissioning of level and flow measurements and menus for adjusting pump and rake controls. The Quick Setups and menus guide the user through the complete commissioning procedure.

Locking of the instrument

The instrument can be locked against parameter changes in the following ways:

- Locking switch in the terminal compartment
- Key combination at the operating module
- Input of a locking code via software (e.g. "ToF Tool" or "FieldCare")

Certificates and Approvals

CE mark	The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the instrument passing the required tests by attaching the CE-mark.
Ex approval	<p>The available certificates are listed in the ordering information. Note the associated safety instructions (XA) and control or installation drawings (ZD).</p> <p> Note! Sensors FDU9x with Ex-approval can be connected to the transmitter FMU90 without Ex-approval.</p>
External standards and guidelines	<p>EN 60529 Protection class of housing (IP code)</p> <p>EN 61326 Electromagnetic compatibility (EMC requirements)</p> <p>NAMUR Standards committee for measurement and control in the chemical industry</p>

Ordering information

Product structure

10	Approval										
	R	Non-hazarous area									
	J	ATEX II 3D (in preparation)									
	N	CSA General Purpose (in preparation)									
20	Application										
	1	Level + pump control, alternating									
	2	Flow + totalizer + level + sample control + preprogrammed OCM flow curves									
30	Housing, material										
	1	Field mounting PC, IP66 NEMA 4x									
	2	DIN rail mounting PBT, IP20									
40	Operation										
	A	Display + keypad									
	C	Illuminated display + keypad									
	D	Display + keypad, 96x96, cabinet door mounting, front IP65									
	E	Illuminated display + keypad, 96x96, cabinet door mounting, front IP65									
	K	w/o display, via communication									
50	Power supply										
	A	90-253 VAC									
	B	10,5-32 VDC									
60	Level input										
	1	1x sensor FDU9x/8x									
	2	2x sensor FDU9x/8x									
70	Switch output										
	1	1x relay, SPDT									
	3	3x relay, SPDT									
	6	6x relay, SPDT									
80	Output										
	1	1x 0/4-20mA HART									
	2	2x 0/4-20mA HART									
	3	PROFIBUS DP									
90	Additional input										
	A	w/o additional input									
100	Datalog function										
	A	Basic version									
110	Languages										
	1	de, en, nl, fr, es, it									
	3	en, zh, ja (in preparation)									
120	Additional option										
	A	Basic version									
FMU90 -											complete product designation

Scope of delivery

- Instrument according to the version ordered
- Operating program: ToF Tool - FieldTool Package
- Operating Instructions (depending on communication version, see chapter "Supplementary documentation")
- for certified instrument versions: Safety Instructions (XAs) or Control Drawings (ZDs) (s. chapter "Supplementary documentation")

Accessories

Commubox FXA191

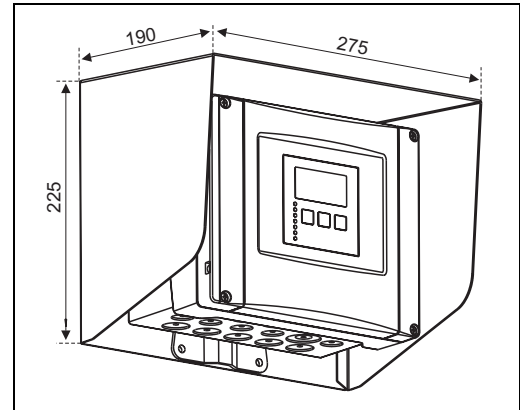
For intrinsically safe communication between the HART protocol and the RS232 interface of a PC. Further Information can be found in Technical Information TI 237F.

Commubox FXA291

For the intrinsically safe communication between the service interface of the Prosonic S and the RS232 interface of a PC.

Protection cover for Prosonic S

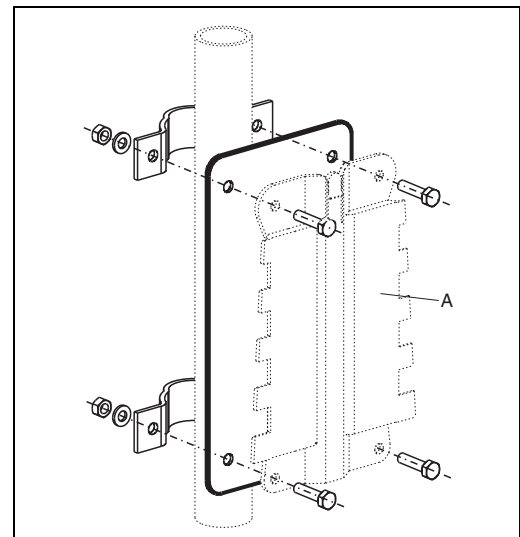
- Material: 316Ti/1.4571
- to be mounted by the mounting help of the Prosonic S
- Order-Code: 52024477



L00-FMU90xxx-06-00-00-xx-003

Mounting plate for the field housing

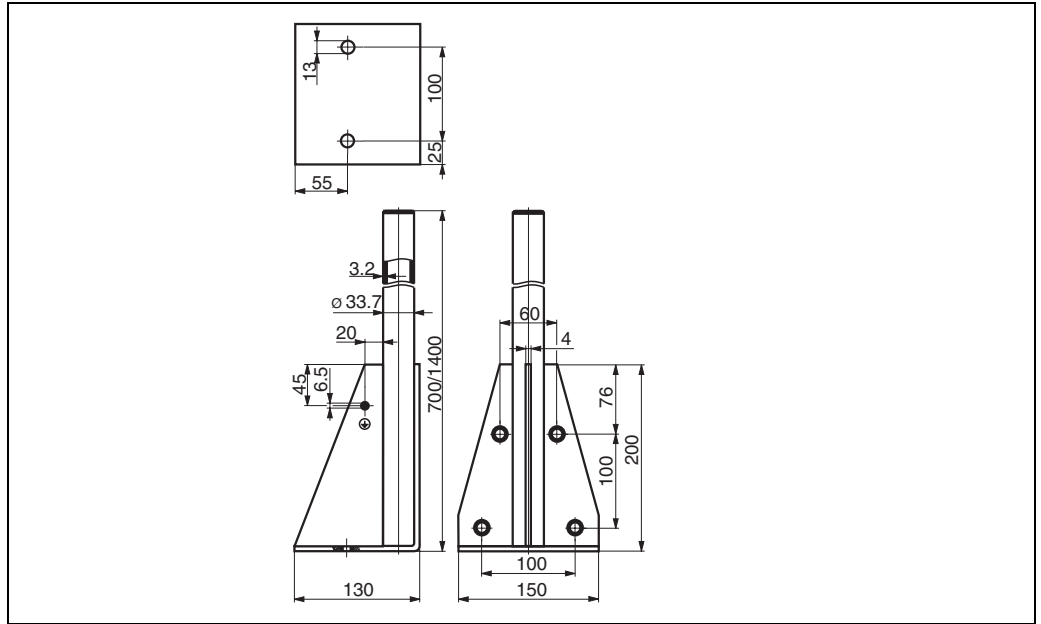
- suited for the mounting help of the Prosonic S
- for 1" - 2" tubes
- Dimensions: 210 mm x 110 mm
- Material: 316Ti/1.4571
- fixing clips, screws and nuts are supplied
- Order code: 52024478



L00-FMU90xxx-00-00-00-xx-001

A: mounting help of the field housing

Mounting bracket



L00-FMU14x-00-00-yy-005

Height	Material	Order Code
700 mm	galv. steel	919791-0000
700 mm	316 Ti	919791-0001
1400 mm	galv. steel	919791-0002
1400 mm	316 Ti	919791-0003

Overvoltage protection (in IP66 housing)

- Overvoltage protection for the mains voltage and up to 3 signal outputs
- Dimensions of housing: 292mm x 253 mm x 106 mm
- Order Code: 215095-0001

Supplementary documentation

Innovation booklet **IN 003**
 Ultrasonic measurement - the solution for your application

Technical Information **TI 396F**
 Technical Information for the ultrasonic sensors FDU91/FDU92/FDU93/FDU95/FDU96

**Operating Instructions
 (for transmitter FMU90)** Depending on the instrument version, the following Operating Instructions are supplied together with the instrument:

Instrument version	Application	Output	Operating Instructions
FMU90 - *1*****1**** FMU90 - *1*****2****	Level + pump control, alternating	HART	BA 288F
FMU90 - *1*****3****		PROFIBUS DP	BA 292F
FMU90 - *2*****1**** FMU90 - *2*****2****	Flow + totaliser + level + sample control + preprogrammed OCM flow curves	HART	BA 288F BA 289F
FMU90 - *2*****3****		PROFIBUS DP	BA 292F BA 293F

These Operating Instructions describe installation and commissioning of the respective version of the Prosonic S. It contains those functions from the operating menu, which are required for a standard measuring task. Additional functions are contained in the "Description of Instrument Functions" (BA 290F).

**Description of Instrument
 Functions** **BA290F**
 contains a detailed description of **all** functions of the Prosonic S and is valid for all instrument versions. A PDF file of this document can be found

- on the CD-ROM of the "ToF-Tool - FieldTool Package", which is supplied together with the FMU90
- in the Internet at "www.endress.com"

Safety Instructions (XA) in preparation

Control Drawings (ZD) in preparation

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