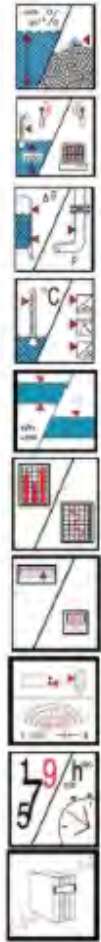# Ultrasonic Level Measurement
Sonicont
USD 050/080/100/150

Compact transmitters for non-contact level measurement of fluids, pastes and coarse bulk materials

Application

- Continuous, non-contact level measurement in fluids,
- pastes, sullages and coarse bulk materials
- Flow measurement in open channels and measuring
- weirs
- System integration via:
  - HART (standard), 4...20mA
  - PROFIBUS PA
  - Foundation Fieldbus
- Maximum measuring range:
- USD 050:
  - 5 m in fluids
  - 2 m in bulk materials
- USD 080:
  - 8 m in fluids
  - 3,5 m in bulk materials
- USD 100:
  - 10 m in fluids
  - 5 m in bulk materials
- USD 150:
  - 15 m in fluids
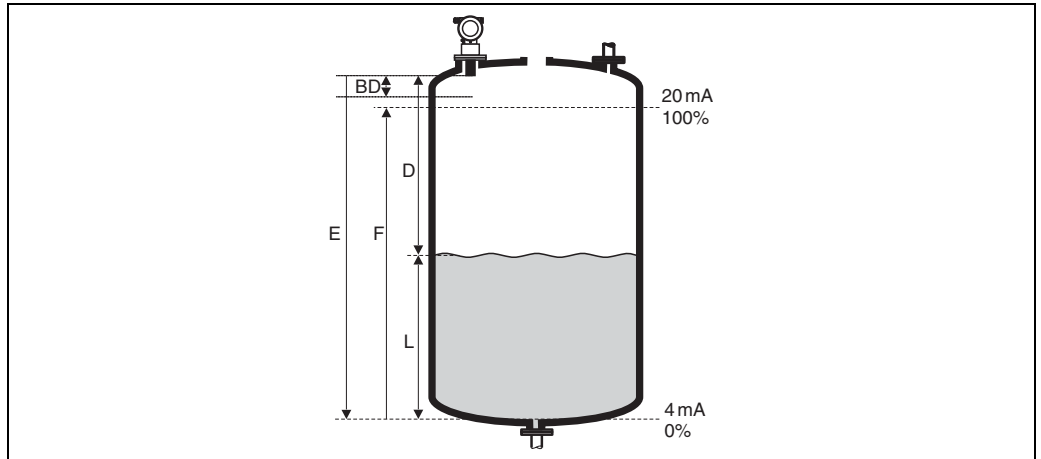- 7 m in bulk materials

Features and benefits

- Quick and simple commissioning via menu-guided onsite operation with four-line plain text display
- Envelope curves on the on-site display for simple diagnosis
- Easy remote operation, diagnosis and measuring point
- documentation with the supplied ToF Tool operating program.
- Suitable for explosion hazardous areas (Gas-Ex, Dust-Ex)
- Linearisation function (up to 32 points) for conversion
- of the measured value into any unit of length, volume or flow rate
- Non-contact measurement method minimizes service requirements
- optional remote display and operation (up to 20 m from transmitter)
- Installation possible from thread G 1½" or 1½ NPT upwards
- Integrated temperature sensor for automatic correction of the temperature dependent sound velocity

ACS Control-System GmbH
Know How mit System

Table of contents

Function and system design

L00-FMU4x-15-00-00-de-001

E: *Empty distance;* **F:** *Span (full distance);* **D:** *Distance from sensor membrane – product surface;* **L:** *Level;* **BD:** *Blocking distance*

Sensor	BD	Max. range fluids	Max. range bulk materials
USD 050	0.25 m	5 m	2 m
USD 080	0.35 m	8 m	3.5 m
USD 100	0.4 m	10 m	5 m
USD 150	0.6 m	15 m	7 m

Time–of–flight method

The sensor of the Sonicont transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The Sonicont measures the time t between pulse transmission and reception. The instrument uses the time t (and the velocity of sound c) to calculate the distance D between the sensor membrane and the product surface:

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

As the device knows the empty distance E from a user entry, it can calculate the level as follows:

$$L = E - D$$

An integrated temperature sensor compensates for changes in the velocity of sound caused by temperature changes.

Interference echo suppression

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

Calibration

Enter the empty distance E and the span F to calibrate the device.

Blocking distance

Span F may not extend into the blocking distance BD. Level echos from the blocking distance cannot be evaluated due to the transient characteristics of the sensor.

Equipment architecture

4...20 mA output with HART protocol

The complete measuring system consists of:

L00-FMxxxxxx-14-00-06-en-007
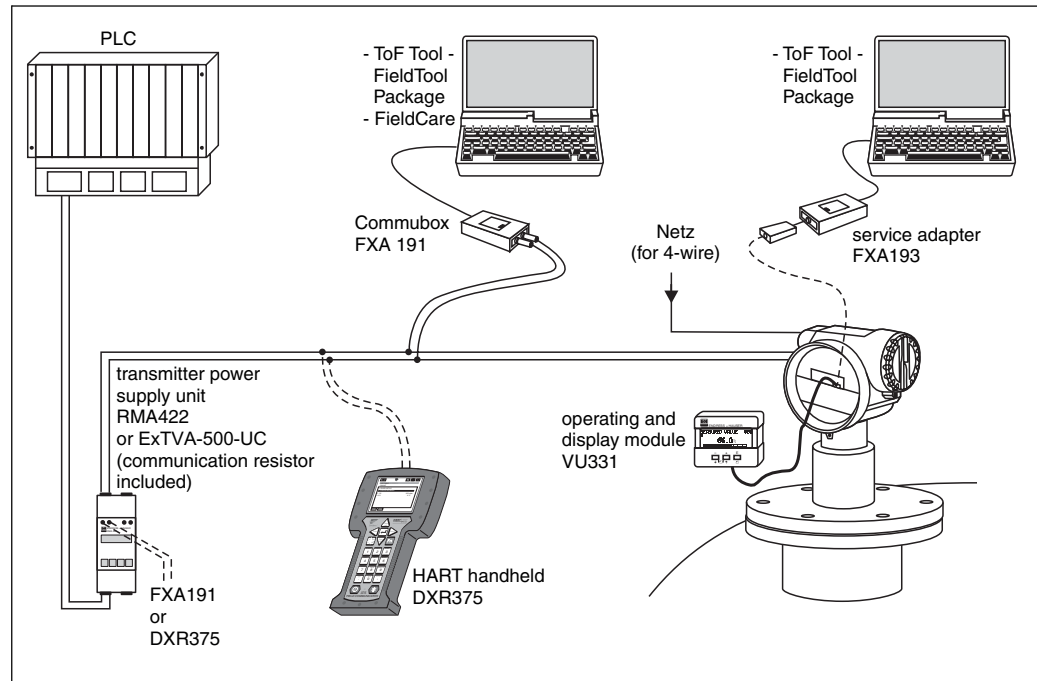
If the HART communication resistor is not built into the supply unit, it is necessary to insert a communication resistor of 250 Ω into the 2-wire line.

On-site operation

- with display and operating module VU 331
- with a Personal Computer, FXA 193 and the operating software ToF Tool

Remote operation

- with HART handheld terminal DXR 375
- with a Personal Computer, Commubox FXA 191 and the operating software COMMUWIN II respectively ToF Tool.

System integration using PROFIBUS PA

A maximum of 32 transmitters (8 if mounted in an explosion hazardous location EEx ia IIC according to FISCO–model) can be connected to the bus.The segment coupler provides the operating voltage to the bus. Both on-site as well as remote operation are possible.

L00-FMxxXXXX-14-00-06-en-001
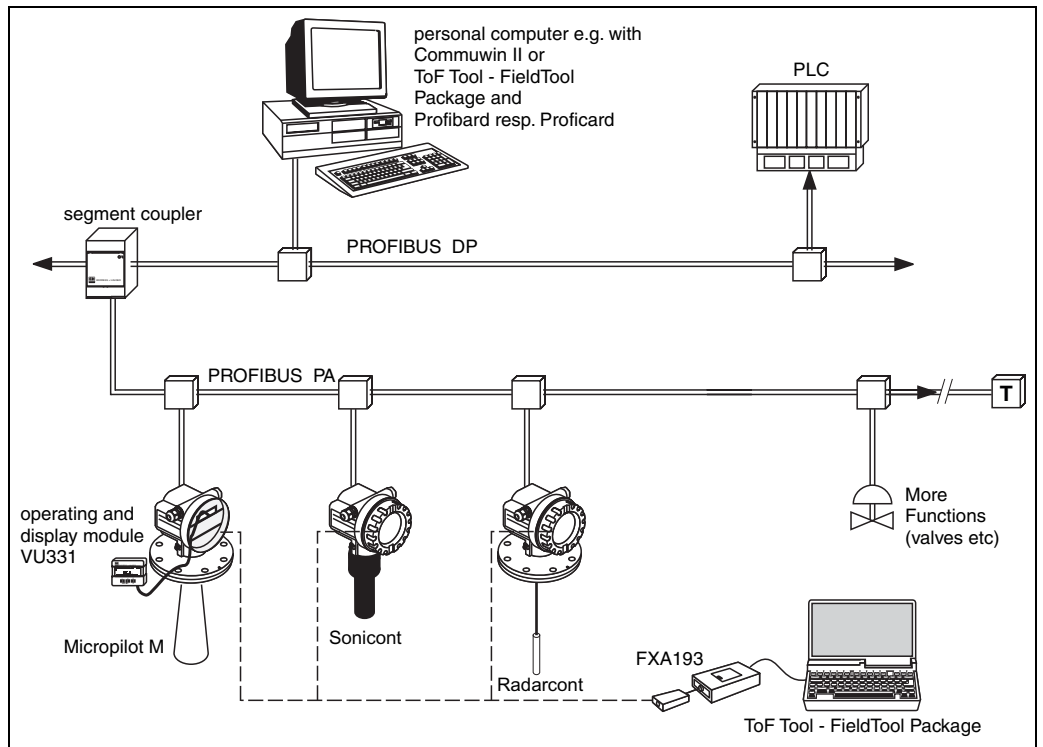
System integration using Foundation Fieldbus (FF)

A maximum of 32 transmitters (standard or EEx d) can be connected to the bus. For protection class EEx ia: the maximum number of transmitters depends on the established rules and standards for intrinsically safe circuits (EN 60070–14) and proof of instrinsic safety. Both on-site and remote operation are possible.

L00-FMxxXXXX-14-00-06-en-003
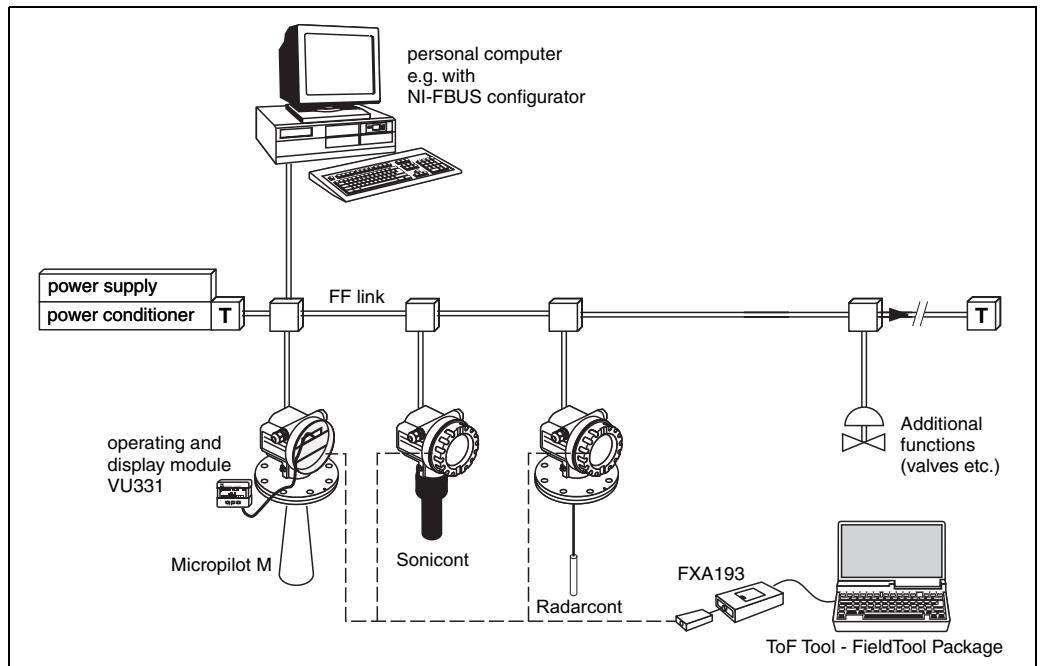
System integration using ACS-CONTROL-SYSTEM Rackbus

You can interconnect a maximum of 64 devices with HART protocol to a Rackbus. Use an FXN 672 interface module for each device. You can integrate this bus into a higher-level bus by using a ZA gateway. Gateways are available for MODBUS, FIP, PROFIBUS, INTERBUS etc. Both on-site and remote operation are possible.
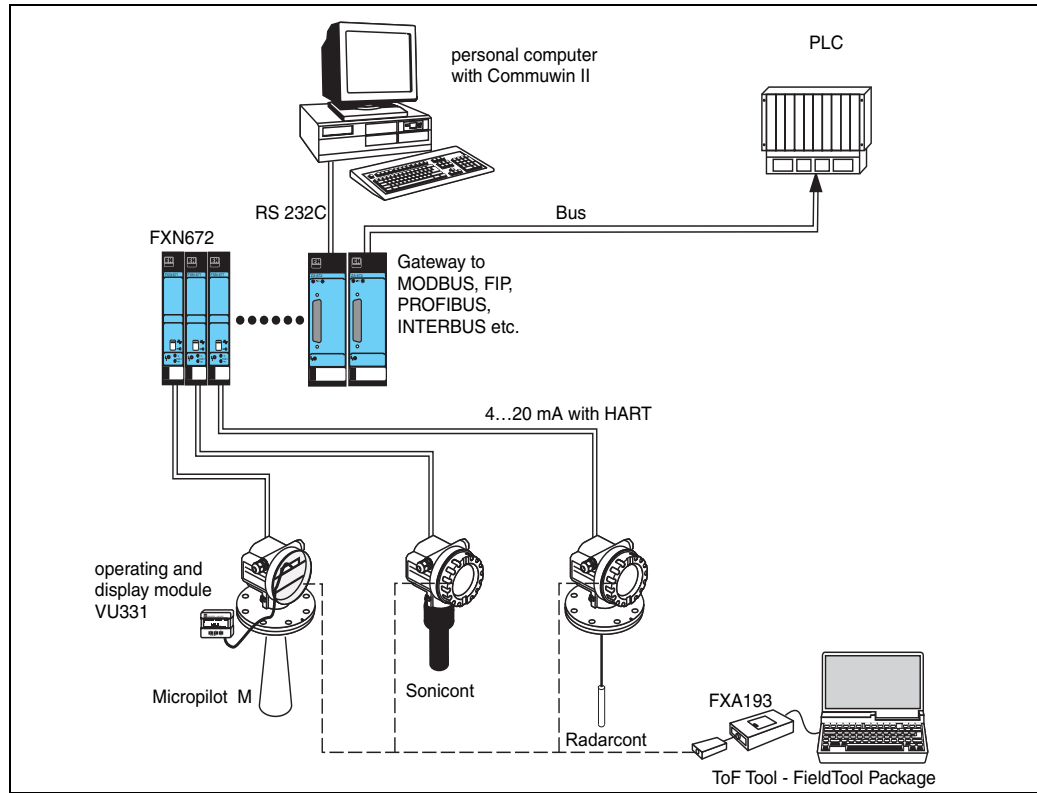
L00-FMxxXXXX-14-00-06-en-006

System integration via Fieldgate

Vendor Managed Inventory

By using Fieldgates to interrogate tank or silo levels remotely, suppliers of raw materials can provide their regular customers with information about the current supplies at any time and, for example, account for them in their own production planning. For their part, the Fieldgates monitor the configured level limits and, if required, automatically activate the next supply. The spectrum of options here ranges from a simple purchasing requisition via e-mail through to fully automatic order administration by coupling XML data into the planning systems on both sides.

Remote maintenance of measuring equipment

Fieldgates not only transfer the current measured values, they also alert the responsible standby personnel, if required, via e-mail or SMS. In the event of an alarm or also when performing routine checks, service technicians can diagnose and configure connected HART devices remotely. All that is required for this is the corresponding HART operating software (e.g. ToF Tool – FieldTool Package, FieldCare, ...) for the connected device. Fieldgate passes on the information transparently, so that all options for the respective operating software are available remotely. Some on-site service operations can be avoided by using remote diagnosis and remote configuration and all others can at least be better planned and prepared.

L00-FXA520xx-14-00-06-en-009
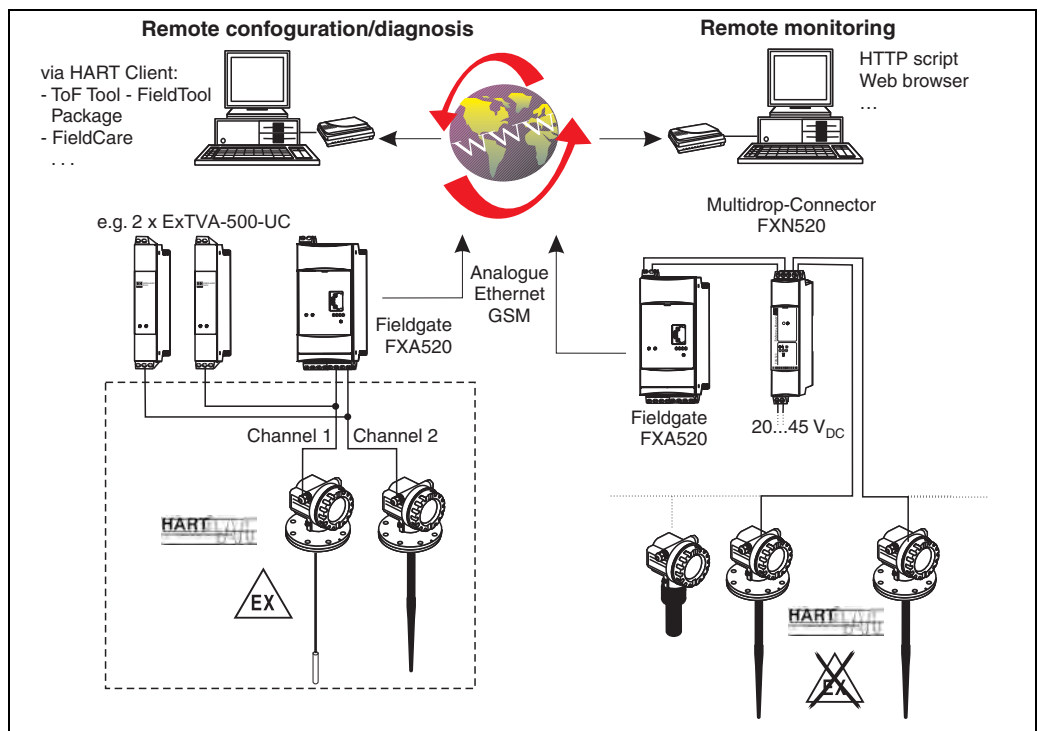
✎ Note!
The number of instruments which can be connected in mutidrop mode can be calculated by the "FieldNetCalc" program which is available from your ACS organisation. A description of this program can be found in Technical Information TI 400F (Multidrop Conncecto FXN520).

Input

Measured variable

The distance D between the sensor membrane and the product surface is measured.

Using the linearisation function, the device uses D to calculate:
- level L in any units
- volume V in any units
- flow Q across measuring weirs or open channels in any units

Measuring range

The measuring range is limited by the range of a sensor. The sensor range is, in turn, dependent on the operating conditions. To estimate the actual range, proceed as follows (see also the calculation example in the diagram):

1. Determine which of the influences shown in the following table are appropriate for your process.

2. Add the corresponding attenuation values.

3. From the total attenuation, use the diagram to calculate the range.

Fluid surface	Attenuation
Calm	0 dB
Waves	5 ... 10 dB
Strong turbulence (e.g. stirrers)	10 ... 20 dB
Foaming	Ask ACS

Bulk material surface	Attenuation
Hard, rough (e.g. rubble)	40 dB
Soft (e.g. peat, dust-covered clinker)	40 ... 60 dB

Dust	Attenuation
No dust formation	0 dB
Little dust formation	5 dB
Heavy dust formation	5 ... 20 dB

Filling curtain in detection range	Attenuation
None	0 dB
Small quantities	5 ... 10 dB
Large quantities	10 ... 40 dB

Temperature difference between sensor and product surface	Attenuation
to 20 °C	0 dB
to 40 °C	5 ... 10 dB
to 80 °C	10 ... 20 dB

L00-FMU4xxxx-05-00-00-en-002
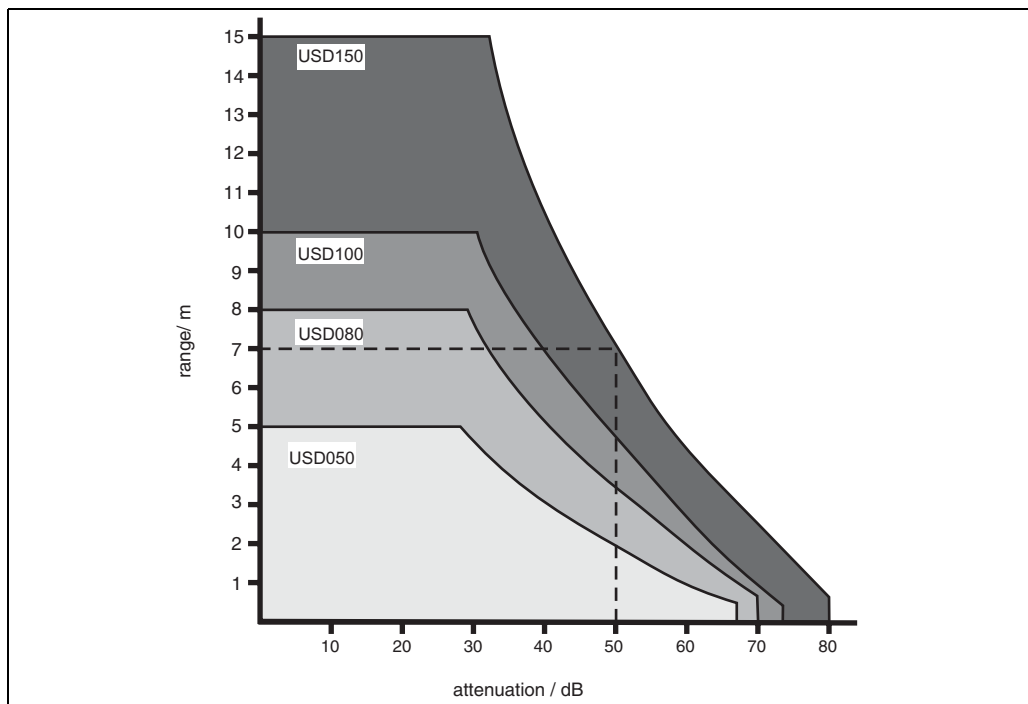
Example (for USD 150)

For typical solid applications, a certain amount of dust coverage is normally present. Therefore, the following range results from the table and the diagram

- Dust-covered rubble   approx. 50 dB
- no dust formation   0 dB
- No filling curtain in
  detection range   0 dB
- Temperature diff. < 20°C   0 dB
                               approx. 50 dB   => range approx. 7 m

These measuring conditions have been taken into account during the calculation of the maximum measuring range in solid applications.

Operating frequency

Sensor	Operating frequency
USD 050	approx. 70 kHz
USD 080	approx. 50 kHz
USD 100	approx. 42 kHz
USD 150	approx. 35 kHz

Output

|	
Output signal	according to the instrument version ordered: ■ 4...20 mA with HART protocol ■ PROFIBUS PA ■ Foundation Fieldbus (FF)
Signal on alarm	Error information can be accessed via the following interfaces: ■ On-site display (error symbol, error code and plain text description) ■ Current output (error current configurable) ■ Digital interface
Load HART	Minimum load for HART communication: 250 Ω
Output damping	Freely selectable, 0 ... 255 s
Linearisation	The linearisation function of the Sonicont allows conversion of the measured value into any unit of length or volume. In open channels or measuring weirs, also a flow linearistion is possible (calculation of the flow from the measured level). The linearisation table for calculating the volume in an horizontal cylindrical tank is preprogrammed. You can also enter any number of other tables containing up to 32 value pairs either manually or semi-automatically (by filling the vessel under controlled conditions). The supplied ToF Tool operating program can automatically calculate the table for any tank, weir or flume and upload it into the device. Flow curves for open channels can be calculated and entered into the instrument by the ToT Tool as well.

Auxiliary energy

Terminal compartment

In the F12 housing, the terminals are located underneath the housing cover. In the T12 housing, they are under the cover of the separate terminal compartment.

F12 housing

sealed terminal compartment

T12 housing
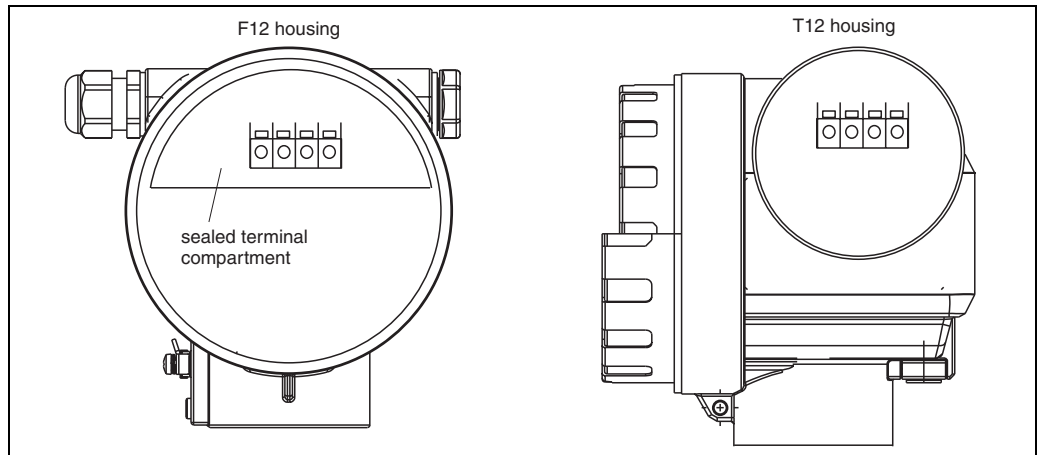
L00-FMR2xxxx-04-00-00-en-001

Terminal assignment

4 ... 20 mA with HART, 2-wire
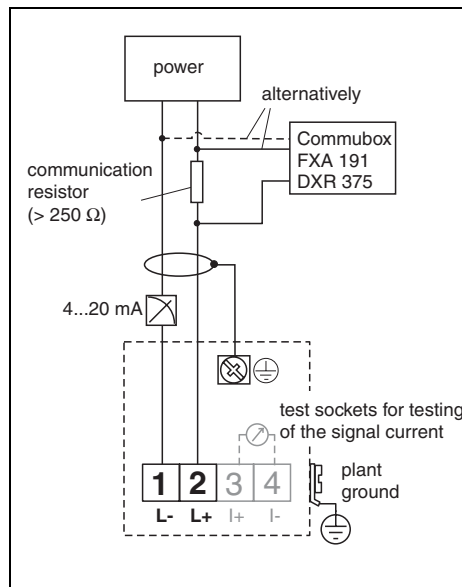
4 ... 20 mA active with HART, 4-wire

power

alternatively

Commubox
FXA 191
DXR 375

communication
resistor
(> 250 Ω)

4...20 mA

test sockets for testing
of the signal current

plant
ground

1	**2**	3	4
L-	L+	I+	I-

L00-FMxxxxxx-04-00-00-en-015

DC

AC / DC

display unit,
recorder, PCS

power

alternatively

Commubox
FXA 191
DXR 375

communication
resistor
(> 250 Ω)

4...20mA

5	6		1	2
I+	I-		L1/L+	N/L-

plant
ground
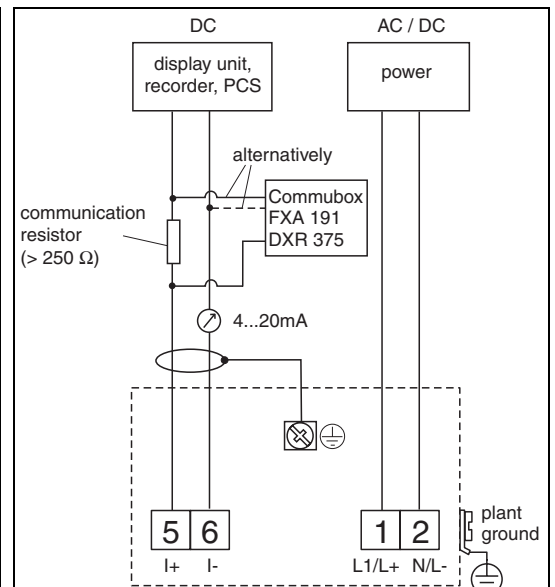
L00-FMxxxxxx-04-00-00-en-011

- Connect the connecting line to the screw terminals (line cross-sections of 0.5 ... 2.5mm) in the terminal compartment.
- Use 2-wire twisted pair cable with screen for the connection.
- Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device (see also Technical Information TI 241F/00/en "EMC Test Procedures")

PROFIBUS PA	Foundation Fieldbus

L00-FMxxxxxx-04-00-00-en-012

L00-FMxxxxxx-04-00-00-en-013
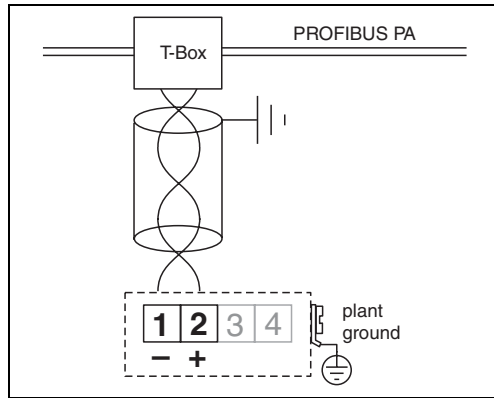
The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy. Use 2-wire twisted pair cable with screen.

Refer to the following operating manuals for information on cable types, and how to set up and ground the network:
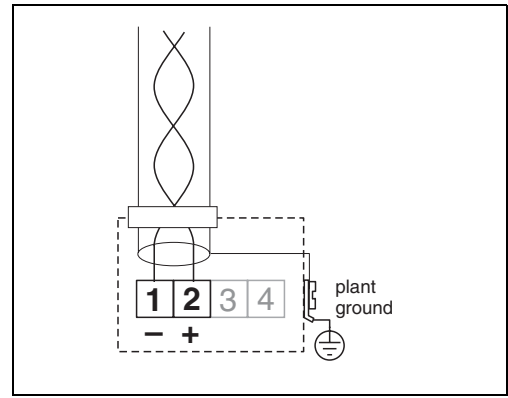- BA 198F/00/de „PROFIBIS -DP/-PA, Guidelines for planning and commissioning"
- BA 013S/04/en „Foundation Fieldbus, Installation and Commissioning Guidelines"

Fieldbus plug connectors

For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector (PROFIBUS PA plug)

L00-FMxxxxxx-04-00-00-yy-016

Pin	Meaning
1	Ground
2	Signal +
3	Signal –
4	not connected

Pin assignment of the 7/8" plug connector (FOUNDATION Fieldbus plug)

L00-FMxxxxxx-04-00-00-yy-017

Pin	Meaning
1	Signal –
2	Signal +
3	not connected
4	ground

Supply voltage

HART, 2-wire

The following values are the voltages across the terminals directly at the instrument:

Version		Current consumption	Terminal voltage minimum	Terminal voltage maximum
2-wire HART	Standard	4 mA	14 V	36 V
		20 mA	8 V	36 V
	EEx ia	4 mA	14 V	30 V
		20 mA	8 V	30 V
	EEx d	4 mA	14 V	30 V
		20 mA	11 V	30 V
Fixed current, adjustable, e.g. for solar power operation (measured value via HART)	Standard	11 mA	10 V	36 V
	EEx ia	11 mA	10 V	30 V
Fixed current for HART multidrop mode	Standard	4 mA[1]	14 V	36 V
	EEx ia	4 mA[1]	14 V	30 V

1)   Start-up current 11 mA

HART, 4-wire, active

Version	Voltage	max. load
DC	10,5 ... 32 V	600 Ω
AC 50/60 Hz	90 ... 253 V	600 Ω

Cable entry

- Cable gland: M20x1.5 (recommended cable diameter 6 ... 10 mm)
- Cable entry G ½ or ½ NPT
- PROFIBUS–PA M12 plug
- Fieldbus Foundation 7/8" plug

Power consumption

Version	Power consumption
2-wire	51 mW ... 800 mW
4-wire AC	max. 4VA
4-wire DC; USD 050/080	330 mW ... 830 mW
4-wire DC; USD 100/150	600 mW ... 1 W

Current consumption (2-wire-instruments)

Communication	Current consumption
HART	3,6 ... 22 mA
PROFIBUS PA	max. 13 mA
Foundation Fieldbus	max. 15 mA

HART ripple	47...125 Hz: Vpp = 200 mV (measured at 500 Ω)
Max. noise HART	500 Hz...10 kHz: Vrms = 2.2 mV (measured at 500 Ω)
Galvanic isolation	With 4-wire devices, the evaluation electronics and mains voltage are galvanically isolated from each other.

Performance characteristics

Reaction time

The reaction time depends on the parameter settings (min. 0.5s for 4-wire devices, min. 2s for 2-wire devices).

Reference operating conditions

- Temperature = +20 °C
- Pressure = 1013 mbar abs.
- Humidity = 50 %
- Ideal reflective surface (e.g. calm, smooth fluid surface)
- No interference reflections within signal beam
- Set application parameters:
  - Tank shape = flat ceiling
  - Medium property = liquid
  - process conditions = calm surface

Measured value resolution

Sensor	Measured value resolution
USD 050	1 mm
USD 080	1 mm
USD 100	2 mm
USD 150	2 mm

Pulse frequency

- 2-wire devices: max. 0.5 Hz
- 4-wire devices: max. 2 Hz

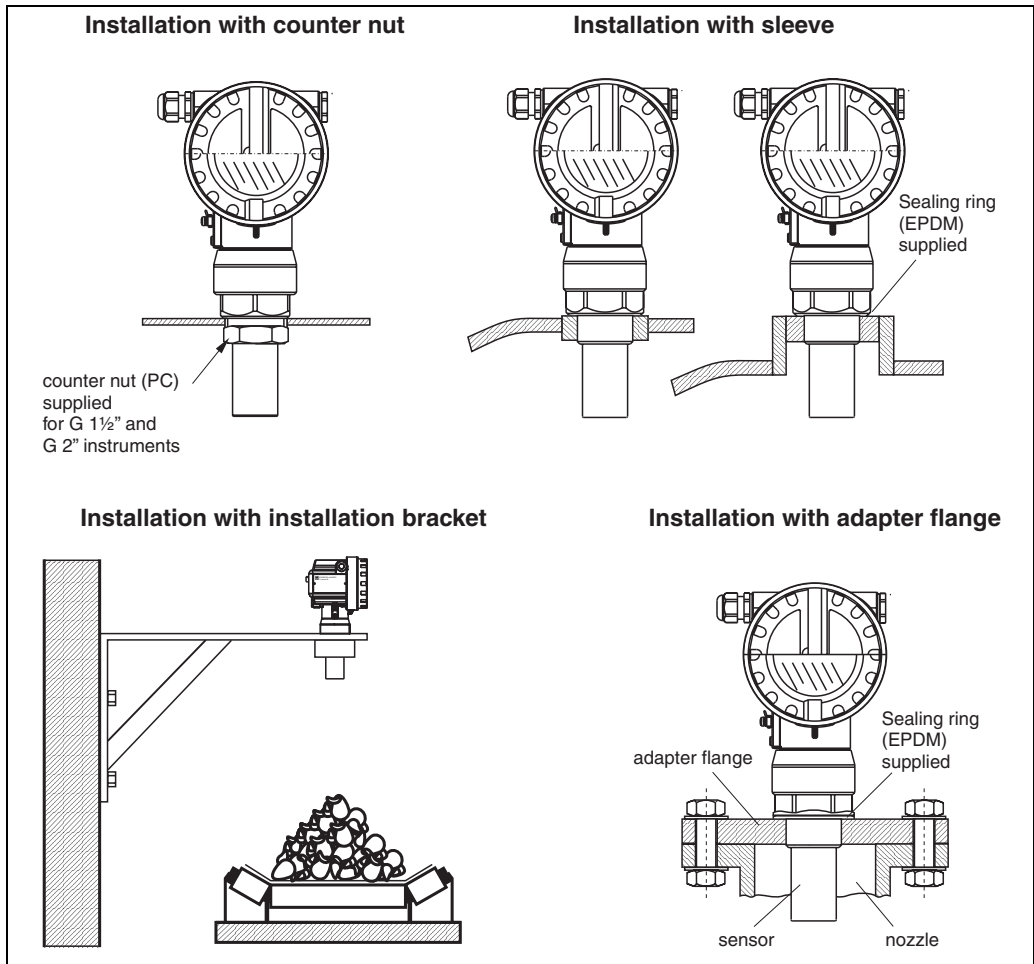The exact values are dependent on the type of device and the parameter settings.

Measuring error

Typical specifications for reference operating conditions (include linearity, repeatability, and hysteresis):

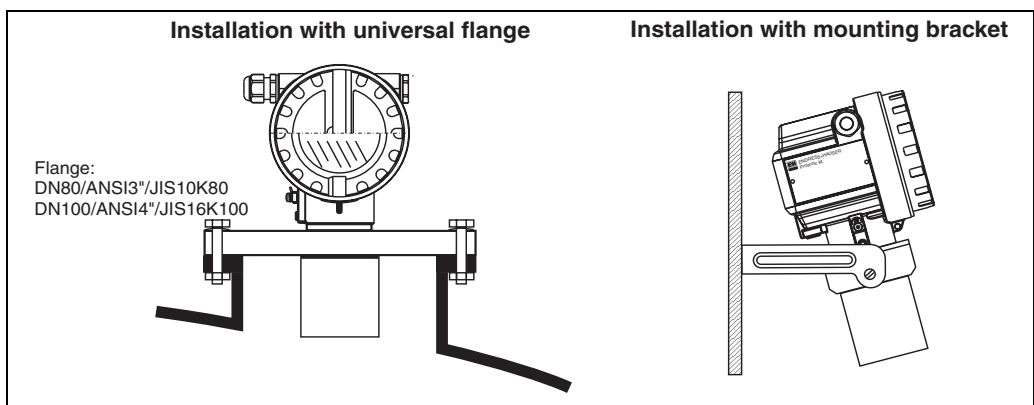| Sensor	Measuring error
USD 050	±2mm or 0.2% of set measuring distance (empty calibration)[1]
USD 080	± 2 mm or 0,2% of set measuring distance (empty calibration)[1]
USD 100	± 4 mm or 0,2% of set measuring distance (empty calibration)[1]
USD 150	± 4 mm or 0,2% of set measuring distance (empty calibration)[1]

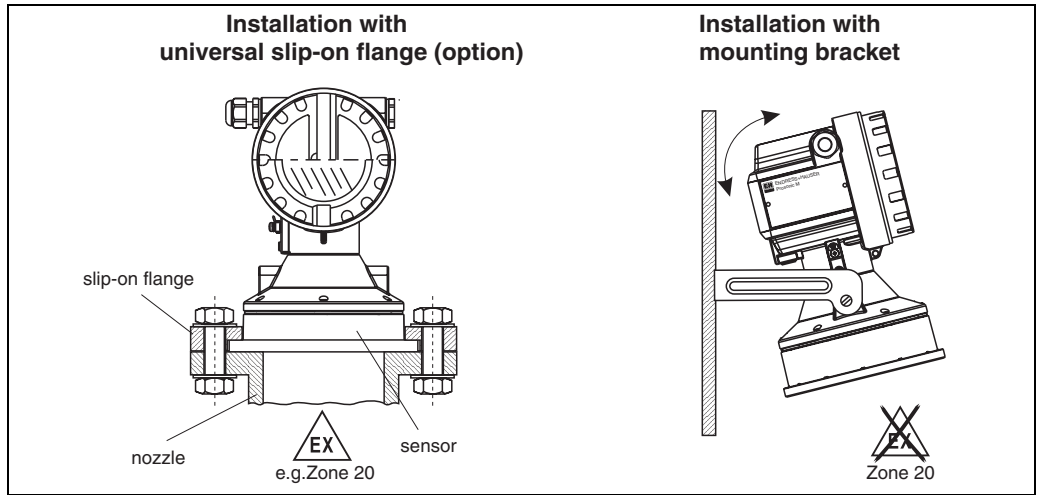[1]whichever is greater

Installation conditions

Installation with counter nut

Installation with sleeve

Sealing ring (EPDM) supplied

counter nut (PC)
supplied
for G 1½" and
G 2" instruments

Installation with installation bracket

Installation with adapter flange

Sealing ring (EPDM) supplied

adapter flange

sensor   nozzle

L00-FMU4xxxx-17-00-00-en-002

For installation bracket or adapter flange s. chapter "Accessories".

Installation with universal flange

Installation with mounting bracket

Flange:
DN80/ANSI3"/JIS10K80
DN100/ANSI4"/JIS16K100

L00-FMU42xxxx-17-00-00-en-001

Installation variants USD 150

**Installation with
universal slip-on flange (option)**

slip-on flange

nozzle

/EX\
e.g.Zone 20

sensor

**Installation with
mounting bracket**

Zone 20

L00-FMU43xxxx-17-00-00-en-001

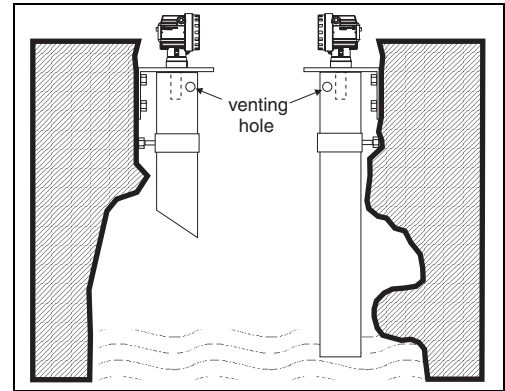**Installation conditions for
level measurements**

1/6D

D

L

α

r
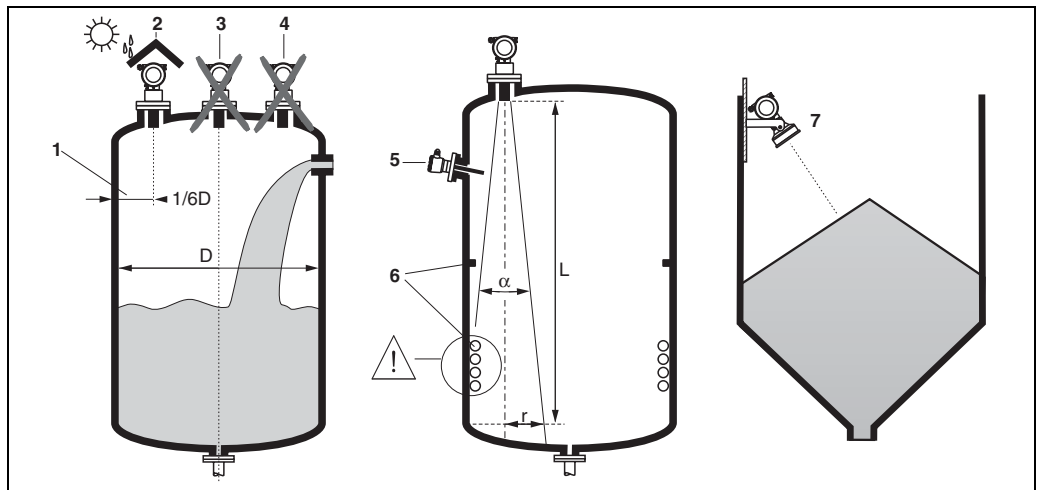
L00-FMU4xxxx-17-00-00-de-005

- Do not install the sensor in the middle of the tank (3). We recommend leaving a distance between the sensor and the tank wall (1) measuring 1/6 of the tank diameter.
- Use a protective cover, in order to protect the device from direct sun or rain (2).
- Avoid measurements through the filling curtain (4).
- Make sure that equipment (5) such as limit switches, temperature sensors, etc. are not located within the emitting angle α. In particular, symmetrical equipment (6) such as heating coils, baffles etc. can influence measurement.
- Align the sensor so that it is vertical to the product surface (7).
- Never install two ultrasonic measuring devices in a tank, as the two signals may affect each other.
- To estimate the detection range, use the 3 dB emitting angle α.

Sensor	α	L_{max}	r_{max}
USD 050	11°	5 m	0,48 m
USD 080	11°	8 m	0,77 m
USD 100	11°	10 m	0,96 m
USD 150	6°	15 m	0,79 m

Installation in narrow shafts

In narrow shafts with strong interference echoes, we recommend using an ultrasound guide pipe (e.g. PE or PVC wastewater pipe) with a minimum diameter of 100 mm.
Make sure that the pipe is not soiled by accumulated dirt. If necessary, clean the pipe at regular intervals.
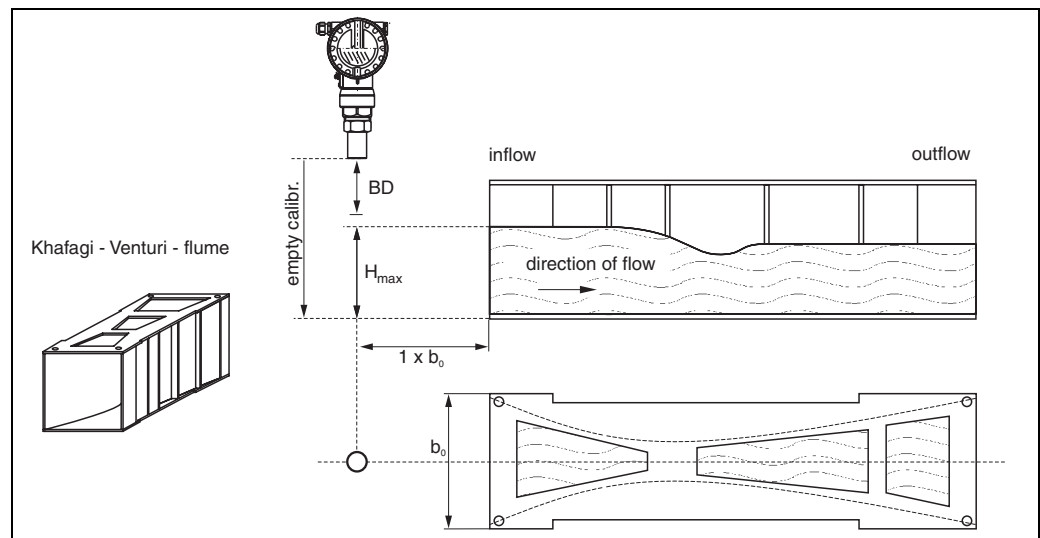

L00-FMU4xxxx-17-00-00-en-010

**Installation conditions for flow measurements**

- Install the Sonicont at the inflow side, as close above the maximum water level H_{max} as possible (take into account the blocking distance BD).
- Position the Sonicont in the middle of the channel or weir.
- Align the sensor membrane parallel to the water surface.
- Keep to the installation distance of the channel or weir.
- You can enter the "Flow to Level" linearisation curve ("Q/h curve") using ToF Tool or manually via the on-site display.

Example: Khafagi-Venturi flume
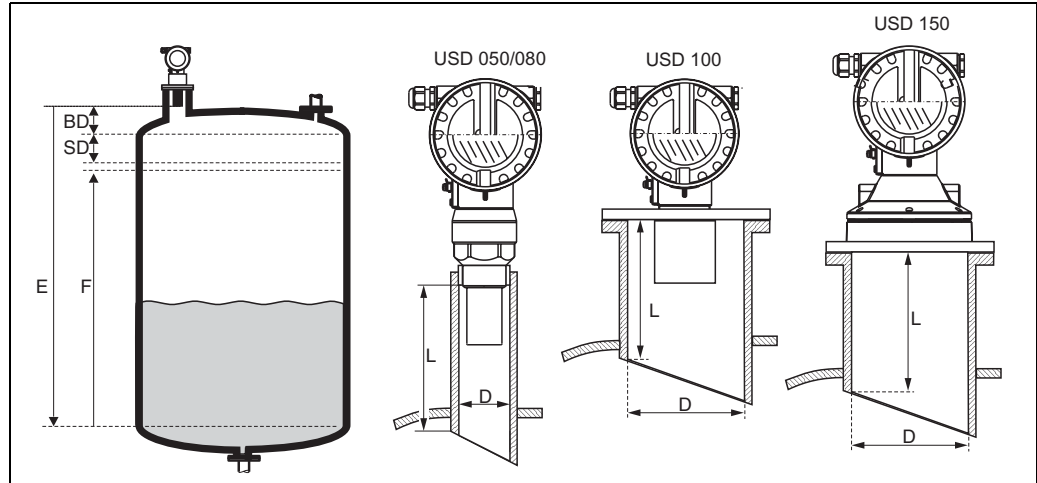

L00-FMU4xxxx-17-00-00-en-003

Example: Triangular weir

min. 2 H$_{max}$

α

H$_{max}$ (= full calibr.)

min. 2 H$_{max}$

BD

min. 3 H$_{max}$

empty calibr.
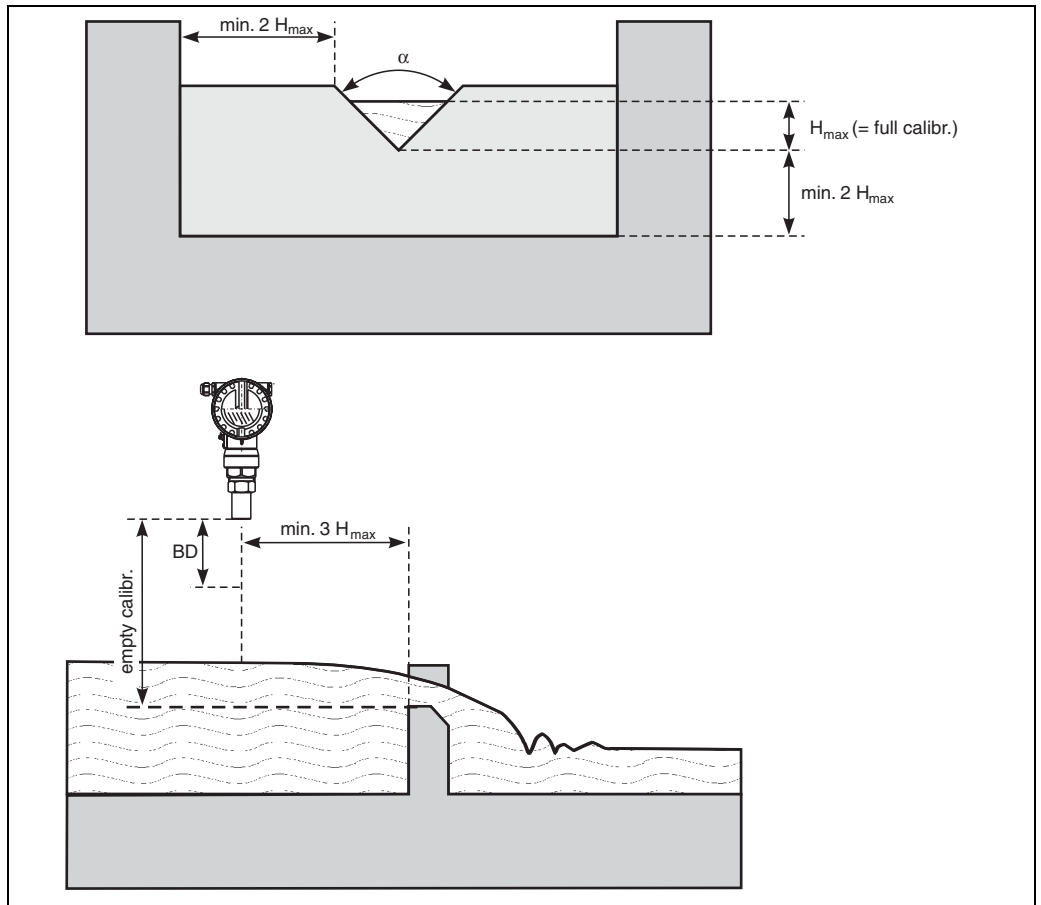
L00-FMU4xxxx-17-00-00-en-012

**Blocking distance,
nozzle installation**

Install the Sonicont at a height so that the blocking distance BD is not undershot, even at maximum fill level. Use a pipe nozzle if you cannot maintain the blocking distance in any other way. The interior of the nozzle must be smooth and may not contain any edges or welded joints. In particular, there should be no burr on the inside of the tank side nozzle end. Note the specified limits for nozzle diameter and length. To minimise disturbing factors, we recommend an angled socket edge (ideally 45°).

L00-FMU4xxxx-17-00-00-en-004

BD: *blocking distance;* **SD:** *safety distance;* **E:** *empty calibration;* **F:** *full calibration (span);* **D:** *nozzle diameter;* **L:** *nozzle length*

Sensor	BD	Max. range liquids	Max. range bulk materials	nozzle diameter	max. nozzle length
USD 050	0.25 m	5 m	2 m	50 mm	ca. 80 mm
				80 mm	ca. 240 mm
				100 mm	ca. 300 mm
USD 080	0.35 m	8 m	3.5 m	80 mm	ca. 240 mm
				100 mm	ca. 300 mm
USD 100	0.4 m	10 m	5 m	80 mm	ca. 250 mm
				100 mm	ca. 300 mm
USD 150	0.6 m	15 m	7 m	min. 100 mm	ca. 300 mm

Caution!
If the blocking distance is undershot, it may cause device malfunction.

Note!
In order to notice if the level approaches the blocking distance, you can specify a safety distance (SD). If the level is within this safety distance, the Sonicont outputs a warning or alarm message.

Ambient conditions

Ambient temperature	–40 °C ... +80 °C The functionality of the LC display becomes restricted at Tu<–20 °C and Tu>+60 °C. If the device is operated outdoors in strong sunlight, you should use a protective cover.
Storage temperature	–40 °C ... +80 °C
Resistance to alternating temperature cycles	to DIN EN 60068-2-14; Nb test : +80°C/–40°C, 1 K/min, 100 cycles
Climate class	DIN EN 60068-2-38 (Test Z/AD) DIN/IEC 68 T2-30Db

Ingress protection	▪ With closed housing, tested according to
	  – IP 68, NEMA 6P (24h at 1.83m under water surface)
	  – IP 66, NEMA 4x
	▪ With open housing: IP 20, NEMA 1 (also ingress protection of the display)
	
	Caution!
	Degree of protection IP 68 NEMA 6P applies for M12 PROFIBUS-PA plugs only when the PROFIBUS cable is plugged in.

Vibration resistance	DIN EN 60068-2-64 / IEC 68-2-64: 20…2000 Hz, 1 $(m/s^2)^2$/Hz; 3 x 100 min
Electromagnetic compatibility (EMC)	▪ Interference emission to EN 61326, Equipment Class B ▪ Interference immunity to EN 61326, Appendix A (Industrial) and NAMUR Recommendation NE 21 (EMC). ▪ A standard installation cable is sufficient if only the analogue signal is used. Use a screened cable when working with a superimposed communication signal (HART).

Process conditions

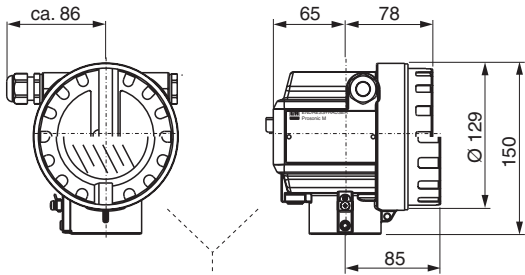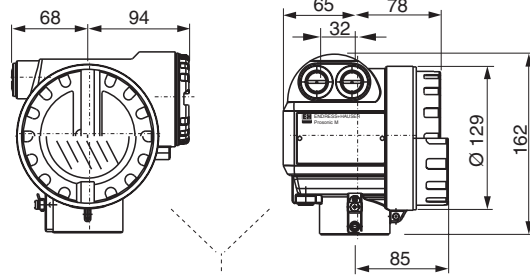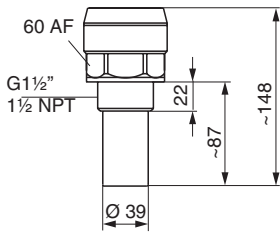|	
Process temperature	–40°C ... +80°C A temperature sensor is integrated in the sensor for correction of the temperature-dependent time-of-flight.
Process pressure	▪ USD 050/080: 0.7 bar ... 3 bar abs. ▪ USD 100/150: 0.7 bar ... 2.5 bar abs. Note! For pressures less than 0.7 bar please contact ACS-CONTROL-SYSTEM

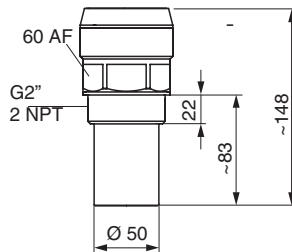# Mechanical construction

Design / dimensions

F12 housing

ca. 86 | 65 | 78 | Ø 129 | 150 | 85

T12 housing

68 | 94 | 65 | 78 | 32 | Ø 129 | 162 | 85

USD 050

60 AF
G1½"
1½ NPT
22
~87
~148
Ø 39

USD 080

60 AF
G2"
2 NPT
22
~83
~148
Ø 50

USD 100 with universal flange

Flange:
DN80/ANSI3"/JIS10K80
DN100/ANSI4"/JIS16K100
suitable for PN16
acc. to DIN/EN 1092 part1
~85
~110
Ø 70
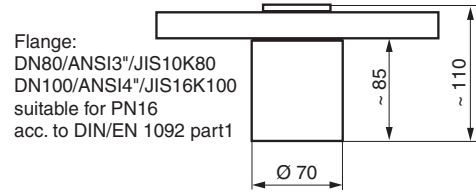
USD 100 with mounting bracket

F12/T12
30
M8
105
75
119
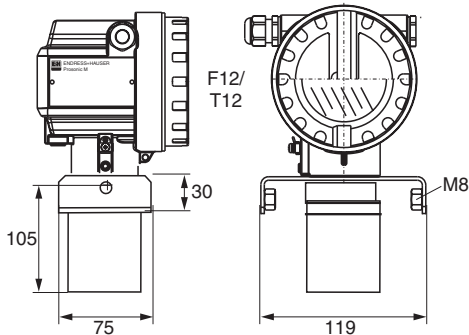
USD 150 with mounting bracket

F12
75
89
158
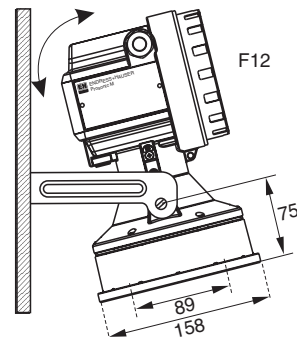
USD 150 with slip-on flange

~86
65
78
Ø 129
150
~248
2 x M8
85
Ø 230

ANSI 4" DN 100
Alternatively, a separate flange can be used.

Mounting bracket for USD 100/150

119
25
120
~123
40
40
2
25
11

L00-FMU4xxxx-06-00-00-en-003

Weight	
Sensor	**Weight**
USD 050	approx. 2,5 kg
USD 080	approx. 2,6 kg
USD 100	approx. 3 kg
USD 150	approx. 3,5 kg

Housing design

Types of housings

- F12 housing with sealed terminal compartment for standard or EEx ia applications
- T12 housing with separate terminal compartment and explosionproof encapsulation

Material

Aluminium, seawater resistant, chromed, powder-coated

Cover

- Aluminium, for version without on-site display
- Inspection glass for version with on-site display. This version cannot be supplied together with the ATEX II 1/2 D certificate.

**Process connection, sealing material, sensor material**

Sensor	Process connection	Material in contact with process
USD 050	▪ Thread G 1½" ▪ Thread NPT 1½" – 11.5	Sensor: PVDF Seal: EPDM
USD 080	▪ Thread 2" ▪ Thread NPT 2" – 11,5	Sensor: PVDF Seal: EPDM
USD 100	▪ Universal flange DN 80 / ANSI 3" / JIS10K80 ▪ Universal flange DN 100 / ANSI 4" / JIS16K100 ▪ Mounting bracket	Sensor: PVDF Seal: VITON or EPDM Flange: PP, PVDF or SS 316L
USD 150	▪ Universal flange DN 100 / ANSI 4" / JIS16K100 ▪ Mounting bracket	Sensor: UP and SS 316Ti Seal: EPDM Flange: PP or SS 316Ti

Human interface

Display and operating elements

The LCD module VU 331 for display and operation is located beneath the housing cover. The measured value is legible through the glass in the cover. Open the cover to operate the device.
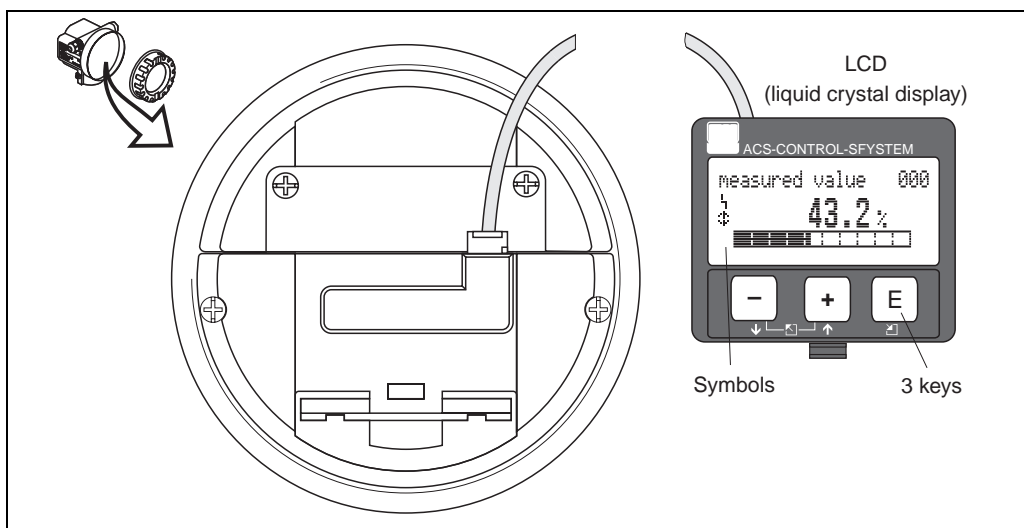
L00-FMxxxxxxx-07-00-00-en-001

Symbol in display	continuous	flashing	Communication	Security Locking
Meaning	Alarm	Warning	Communication	Security Locking

Function of the keys

| Key(s)	Meaning
+ or ↑	Navigate upwards in the selection list Edit numeric value within a function
− or ↓	Navigate downwards in the selection list Edit numeric value within a function
− + or ↰	Navigate to the left within a function group
E	Navigate to the right within a function group, confirmation.
+ and E or − and E	Contrast settings of the LCD
+ and − and E	Hardware lock / unlock After a hardware lock, an operation of the instrument via display or communication is not possible! The hardware can only be unlocked via the display. An unlock parameter must be entered to do so.

On-site operation

Operation with VU 331

The LC-Display VU 331 allows configuration via 3 keys directly at the instrument. All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration procedure.
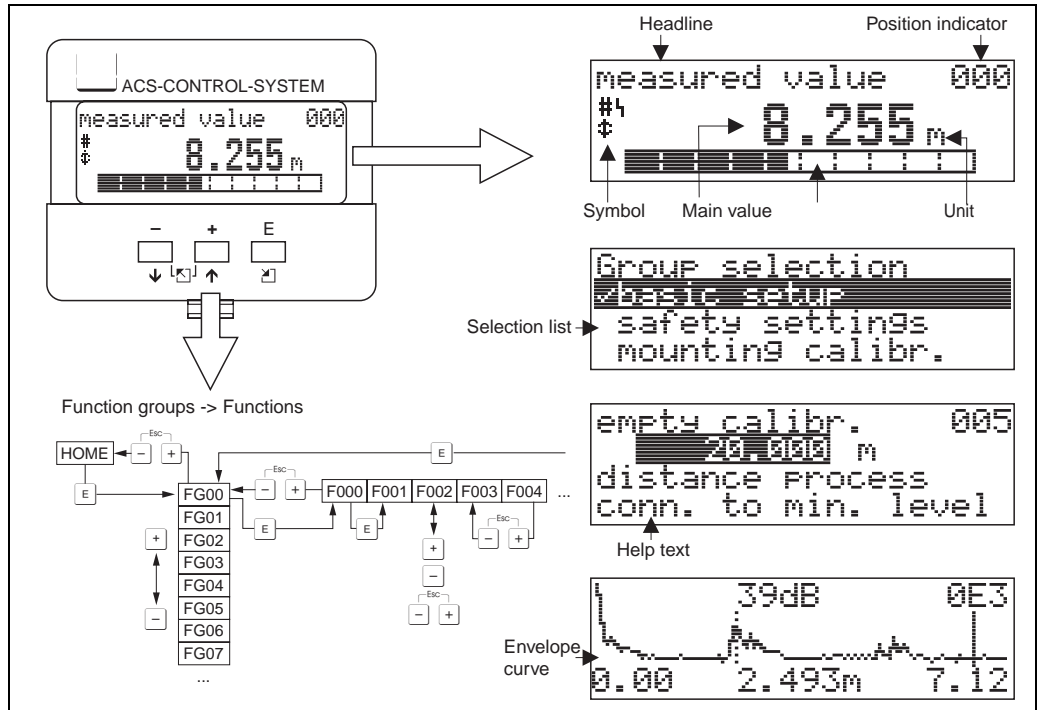
L00-FMU4xxxx-07-00-00-en-004

Operation with the handheld terminal DXR 375

On devices with HART communication, you can also access the menu using the handheld terminal DXR 375.
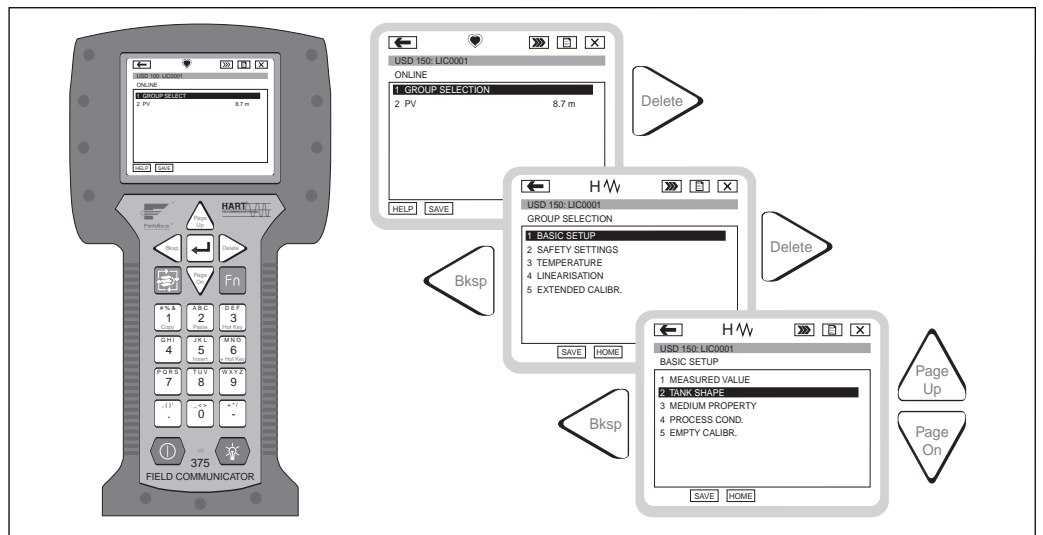
L00-FMU4xxxx-07-00-00-de-005

Remote operation	**Operation with ToF Tool**

The ToF Tool is a graphical operation software for instruments from **ACS**. It is used to support commissioning, securing of data, signal analysis and documentation of the instruments. It is compatible with the following operating systems: WinNT4.0, Win2000 and WinXP.

The ToF Tool supports the following functions:
- Online configuration of transmitters
- Signal analysis via envelope curve
- Linearisation table (graphically supported creation, editing, importing and exporting)
- Loading and saving of instrument data (Upload/Download)
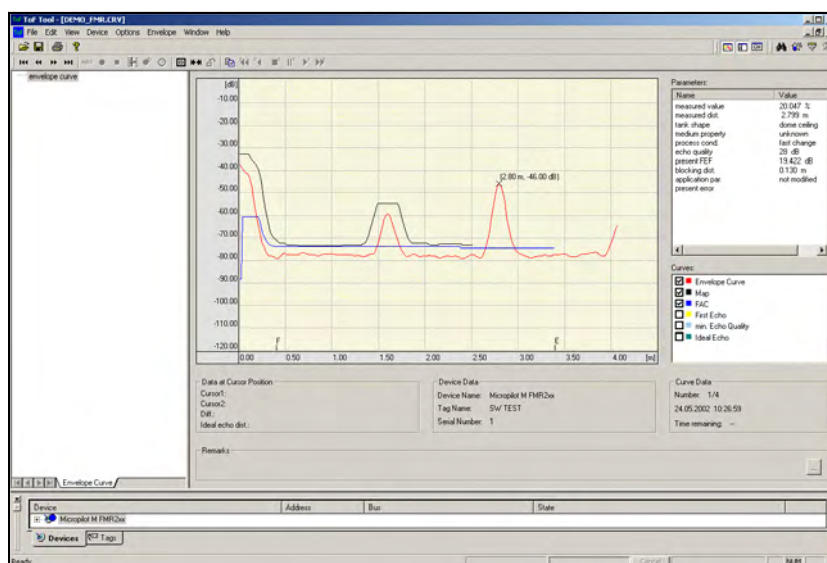- Documentation of measuring point

Connection options
- HART with Commubox FXA 191 (available as accessory)
- PROFIBUS PA
- Service-interface with adapter FXA 193 (available as accessory)

Menu-guided commissioning:
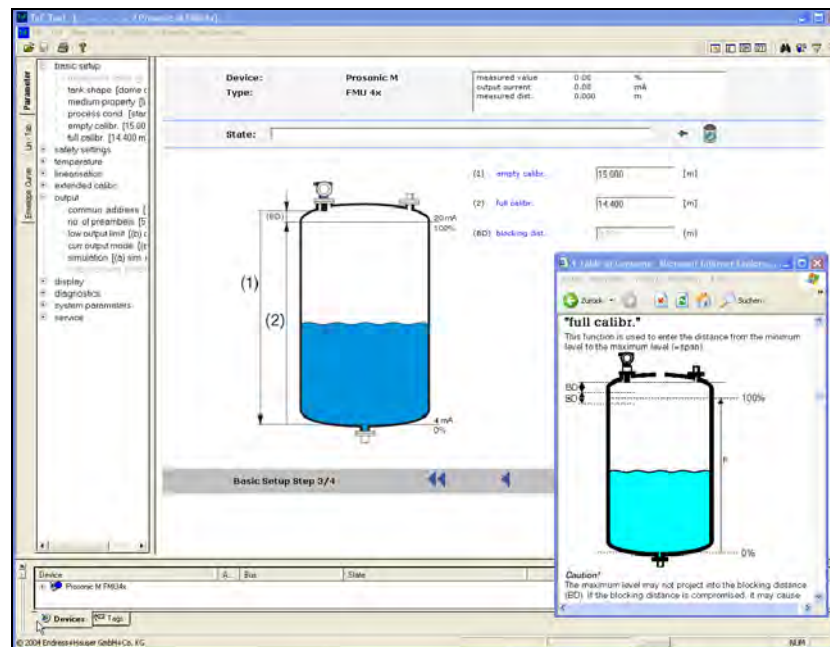
L00-FMU4xxxx-19-00-00-en-003

Signal analysis via envelope curve:

L00-FMU4xxxx-19-00-00-en-004

Operation with FieldCare

FieldCare is **ACS** FDT based Plant Asset Management Tool. It can configure all intelligent field devices in your plant and supports you in managing them. By using status information, it also provides a simple but effective means of checking their health.

- Supports Ethernet, HART, PROFIBUS, FOUNDATION Fieldbus etc.
- Operates all **ACS** devices
- Operates all third-party actuators, I/O systems and sensors supporting the FDT standard
- Ensures full functionality for all devices with DTMs
- Offers generic profile operation for any third-party fieldbus device that does not have a vendor DTM

Operation with Commuwin II (for communication variants HART or PROFIBUS-PA)

Commuwin II is an operating software with graphical support (MS Windows) for intelligent transmitters with the communication protocols Rackbus, Rackbus RS-485, HART and PROFIBUS-PA.

Commuwin II supports the following functions:
- Online configuration of transmitters
- Loading and saving of instrument data (Upload/Download)
- Orderly visualisation of measured values and limit values
- Display and recording of measured values with a line recorder

It is not possible to display envelope curves with Commuwin II. To display them, please use the ToF Tool program supplied.

Connections:
- HART with Commubox FXA 191 (available as accessory)
- PROFIBUS PA

Operation with NI-FBUS Configurator (only Foundation Fieldbus)

The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts.

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:
- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke Device Description (DD) methods
- Display DD menus
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace devices
- Save and print a configuration

Certificates and Approvals

|	
CE mark	The measuring system meets the legal requirements of the EC-guidelines. ACS-CONTROL-SYSTEM confirms the instrument passing the required tests by attaching the CE-mark.
Ex-Zulassung	Die erhältlichen Zertifikate sind in den Bestellinformationen aufgeführt. Beachten Sie jeweils die zugehörigen Sicherheitshinweise (XA) bzw. Control oder Installation Drawings (ZD).
External standards and guidelines	**EN 60529** Protection class of housing (IP-code) **EN 61326** Electromagnetic compatibility (EMC requirements) **NAMUR** Standards committee for measurement and control in the chemical industry

Accessories

Weather protection cover

A Weather protection cover made of stainless steel is recommended for outdoor mounting (order code: 543199-0001). The shipment includes the protective cover and tension clamp.
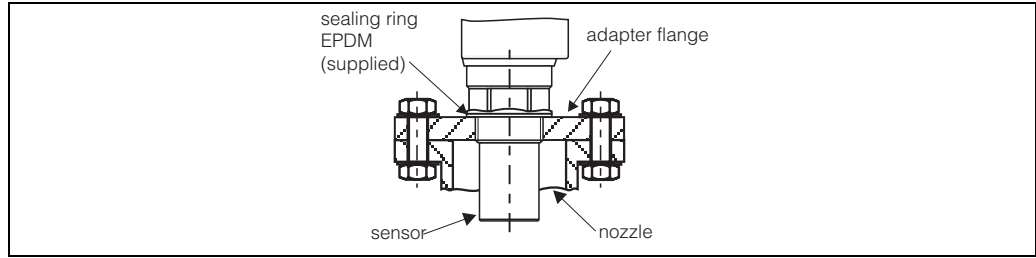

F12 / F23 / T12 housing

L00-FMR2xxxx-00-00-06-en-001
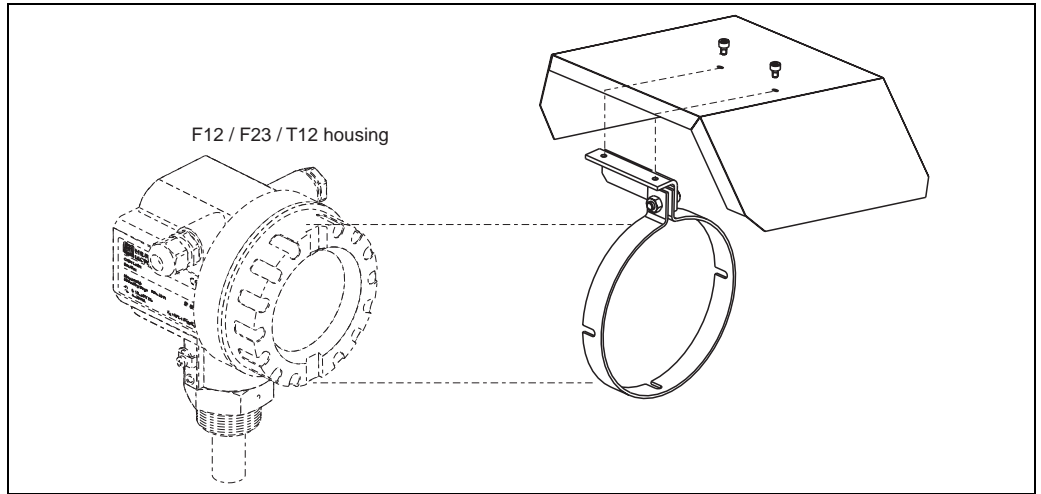
Installation bracket for USD 050/080

L00-FMU4x-00-00-00-de-001
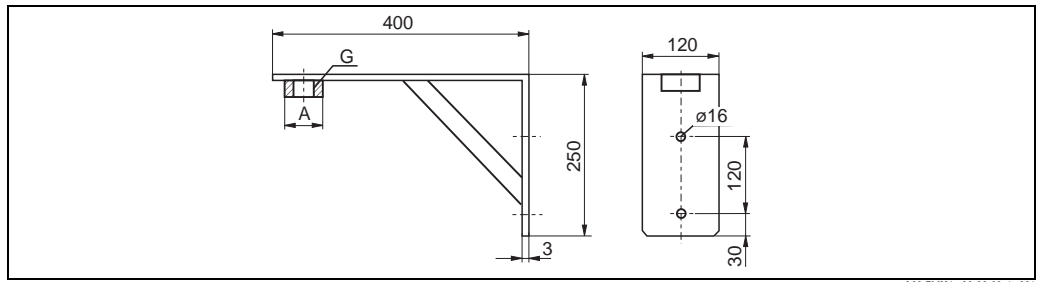
- for **USD 050**, G1½: Order No. 942669-0000
- for **USD 080**, G2: Order No. 942669-0001

suited for NPT 1½" and 2" as well

Adapter flange for USD 050 / USD 080

sealing ring EPDM (supplied) — adapter flange — sensor — nozzle

L00-FMUX3XXX-00-00-00-en-001

Version with metrical thread (FAU 70 E)

	Version			
	12	DN 50 PN 16		
	14	DN 80 PN 16		
	15	DN 100 PN 16		
		Thread		
		3	G 1½, ISO 228	
		4	G 2, ISO 228	
			Material	
			2	1.4435 (316L)
			7	PPs (Polypropylene)
FAU 70 E				Product designation

Version with conical thread(FAU 70 A)

	Version			
	22	ANSI 2" 150 psi		
	24	ANSI 3" 150 psi		
	25	ANSI 4" 150 psi		
		Thread		
		5	NPT 1½ – 11,5	
		6	NPT 2 – 11,5	
			Material	
			2	1.4435 (316L)
			7	PPs (Polypropylene)
FAU 70 A				Product designation

Cantilever
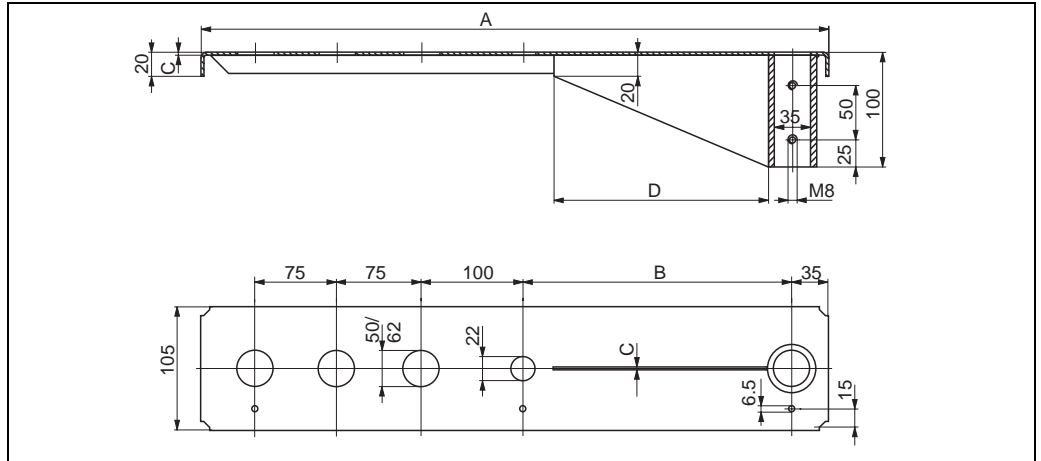
L00-FMU4xxxx-06-00-00-yy-005

A	B	C	D	for Sensor	Material	Order Code
585 mm	250 mm	2 mm	200 mm	**USD 050**	1.4301 (AISI 304)	52014132
					galv. steel	52014131
				USD 080	1.4301 (AISI 304)	52014136
					galv. steel	52014135
1085 mm	750 mm	3 mm	300 mm	**USD 050**	1.4301 (AISI 304)	52014134
					galv. steel	52014133
				USD 080	1.4301 (AISI 304)	52014138
					galv. steel	52014137

- The 50 mm or 62 mm orifices serve for the mounting of the **USD 050 or USD 080, sensor** respecitvely.
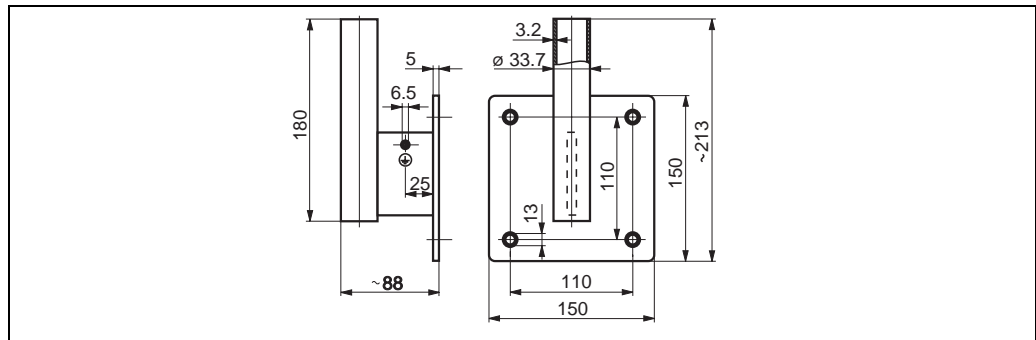- The 22 mm orifice may be used for an additional sensor.

Mounting Frame
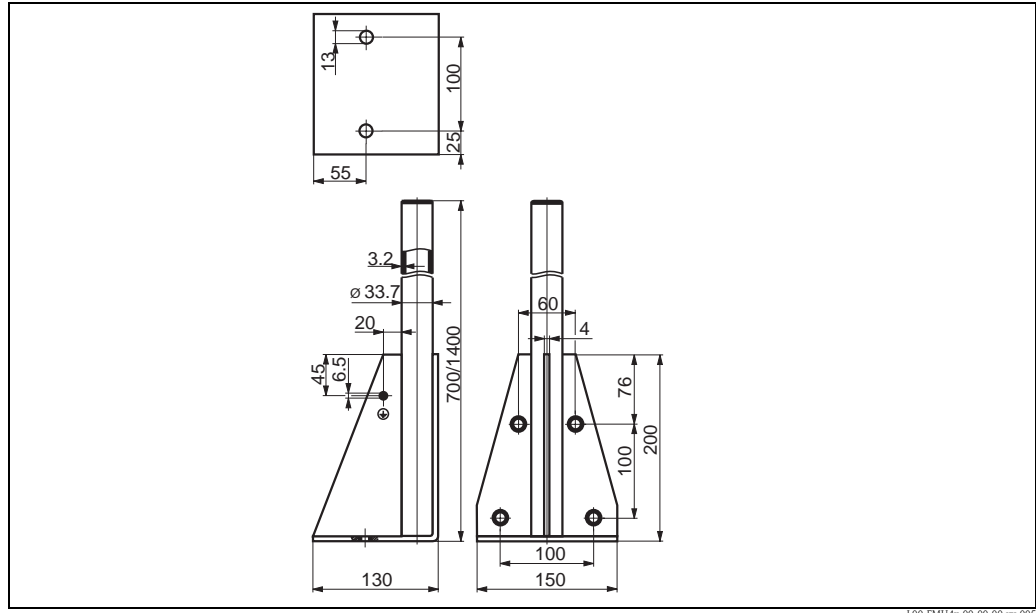
L00-FMU4x-00-00-00-yy-005

Height	Material	Order Code
700 mm	galv. steel	919791-0000
700 mm	1.4301 (AISI 304)	919791-0001
1400 mm	galv. steel	919791-0002
1400 mm	1.4301 (AISI 304)	919791-0003

Wall Bracket

L00-FMU4x-00-00-00-yy-006

Material	Order Code
galv. steel	919792-0000
316Ti/1.4571	919792-0001

Commubox FXA191

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

Service Interface FXA193   The Service-Interface connects the Service plug of Proline and ToF instruments with the 9 pin RS 232C interface of a PC. (USB connectors must be equipped with a usual commercial USB/Serial adapter.)

Product structure

		Approvals
	A	For use in non-hazardous areas
	B	ATEX II (1) GD
	C	CSA/FM Class I Div. 1
	D	ATEX, CSA, FM
	9	other

		Connection cable
	B	Connection cable for ToF devices
	E	Connection cable for Proline and ToF devices
	H	Connection cable for Proline and ToF devices and Connection cable for Ex two-wire devices
	X	without connection cable
	9	others

FXA193-			Complete product designation

Associated documentation

- Technical Information: TI063D
- Safety Instructions for ATEX II (1) GD: XA077D
- Supplementary information for the cable adapters: SD092D

Remote display FHX40   **Dimensions**

Wall-mounting (without mounting bracket)

Pipe-mounting (mounting bracket and plate supplied optionally, s. product structure)

Micropilot M
Radarcont
Sonicont

Separate housing FHX 40 (IP 65)

Cable

pipe
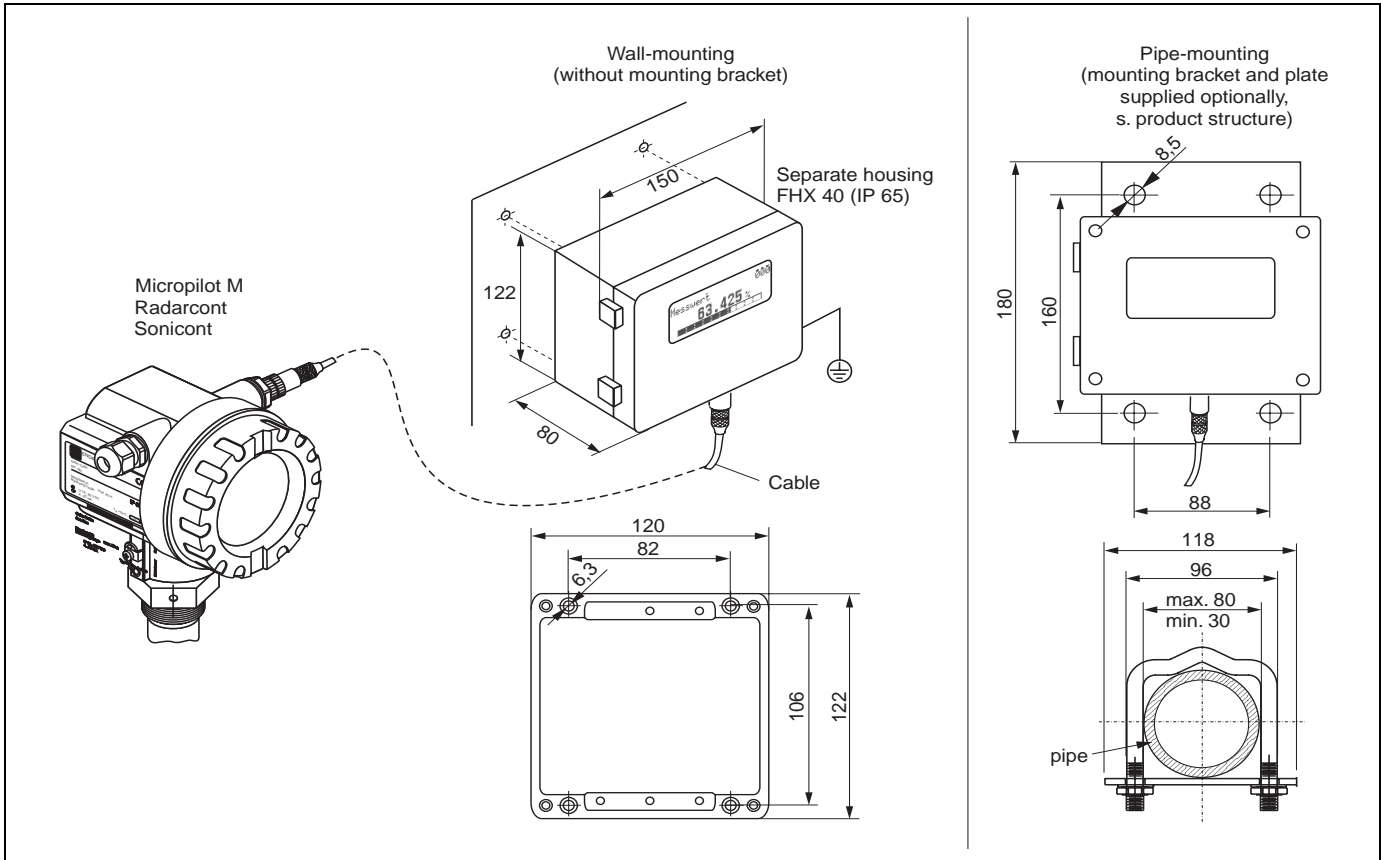
L00-FMxxxxxx-00-00-06-en-003

Technical data (cable and housing) and product structure:

Max. cable length	20 m (65 ft)
Temperature range	–30 °C...+70 °C (-22 °F...158 °F)
Degree of protection	IP65 acc. to EN 60529 (NEMA 4)
Materials	Housing: AL Si 12; cable glands: nickle plated brass
Dimensions [mm] / [inch]	122x150x80 (HxWxD) / 4.8x5.9x3.2

				Approval:
	A			Nn-hazardous area
	1			ATEX II 2 G EEx ia IIC T6, ATEX II 3D
	S			FM IS Cl.I Div.1 Gr.A-D
	U			CSA IS Cl.I Div.1 Gr.A-D
	N			CSA General Purpose
				Cable length:
		1		20m/65ft
				Additional option:
			A	Basic version
			B	Mounting bracket, pipe 1"/ 2"
FHX40 –				Complete product designation

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Supplementary documentation

System Information   **SI 005F**

Ultrasonic level measurement

Operating manual   Depending on the communication variant ordered, the following operating manuals are supplied with the device:

Communication	Operating manual
4 ... 20mA, HART	BA 237F
Profibus PA	BA 238F
Foundation Fieldbus	BA 239F

These instructions describe the installation and first commissioning of the Prosonic M. From the operating menu, all functions are included, which are required for standard measurement tasks. Additional functions are **not** contained in the manual.

Description of device functions   **BA 240F**

This contains a detailed description of **all** the functions of the **Sonicont** and is valid for all communication variants.
A pdf file of this document can be found
- in the supplied "ToF Tool – FieldTool Package" at "Help/ToF Tool Help/ Online Manual/ Operating Manual/Ultrasonic/USD Functions"[1].

Short instructions   **KA 183F**

can be found under the device housing cover.
The most important menu functions are summarised on this sheet. It is intended primarily as a memory jogger for users who are familiar with the operating concept of Endress+Hauser time-of-flight instruments.

Safety Instructions   The following safety instructions are supplied with ATEX–certified device versions. If the devices are used in explosive areas, comply with all the specifications in these safety instructions.

Instrument version	Certificate	Communication	Housing	Safety Instructions
▪ USD 050-E1*A*S* ▪ USD 080 -E1 1*B*A* ▪ USD 100 - E1*A*0***	ATEX II 1/2 G or II 2 G EEx ia II C T6	HART (2-wire)	F12	XA 174F
	ATEX II 1/2 G or II 2 G EEx ia II C T6	HART (2-wire)	T12 with overvoltage protection	XA 224F

▪ USD 050 -E1*B*0*
         - E1*C*0*
▪ USD 080 - E1*B*0*
         - E1*C*0*
▪ USD 100 - E1*B*0***
         - E1*C*0***
	ATEX II 1/2 G or II 2 G
	EEx ia II C T6
		▪ Profibus-PA
		▪ Foundation Fieldbus
			F12	XA 175F

	ATEX II 1/2 G or II 2 G EEx ia II C T6	▪ Profibus-PA ▪ Foundation Fieldbus	T12 with overvoltage protection	XA 225F

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1)   If the Operating Instructions have not been installed together with the "ToF Tool – FieldTool Package", they can be added to the installation subsequently.

Instrument version	Certificate	Communication	Housing	Safety Instructions
	ATEX II 1/2 G or II 2 G EEx d [ia] II C T6	■ HART (2-wire) ■ Profibus-PA ■ Foundation Fieldbus	T12	XA 176F
	ATEX II 3G EEx nA II T6	■ HART (2-wire) ■ HART (4-wire, DC) ■ HART (4-wire, AC) ■ Profibus-PA ■ Foundation Fieldbus	■ F12 ■ T12 ■ T12 with overvoltage protection	XA 179F

■ USD 050 - E2*A*0*
    - E2*B*0*
    - E2*C*0*
    - E5*A*0*
    - E5*B*0*
    - E5*C*0*
■ USD 080- E2*A*0*
    - E2*B*0*
    - E2*C*0*
    - E5*A*0*
    - E5*B*0*
    - E5*C*0*
■ USD 100 -E2*A*0***
    - E2*B*0***
    - E2*C*0***
    - E5*A*0***
    - E5*B*0***
    - E5*C*0***
	■ ATEX II 1/2D
	■ ATEX II 1/3D
		■ HART (2-wire)
		■ Profibus-PA
		■ Foundation Fieldbus
			F12	XA 180F

■ USD 050 -E2*D*0*
    - E2*E*0*
    - E5*D*0*
    - E5*E*0*
■ USD 080 -E2*D*0*
    - E2*E*0*
    - E5*D*0*
    - E5*E*0*
■ USD 100 -E2*D*0***
    - E2*E*0***
    - E5*D*0***
    - E5*E*0***
	■ ATEX II 1/2D
	■ ATEX II 1/3 D
		■ HART (4-wire, DC)
		■ HART (4-wire, AC)
			F12	XA 259

■ USD 150 -E2*D*0*
    - E2*E*0*
    - E5*D*0*
    - E5*E*0*
	■ ATEX II 1/2 D or II 2 D
	■ ATEX II 1/3 D or II 3 D
		■ HART (4-wire, DC)
		■ HART (4-wire, AC)
			F12	XA 177F

■ USD 150 -E2*B*0*
    - E2*C*0*
    - E5*B*0*
    - E5*C*0*
	■ ATEX II 1/2 D or II 2 D
	■ ATEX II 1/3 D or II 3 D
		■ Profibus-PA
		■ Foundation Fieldbus
			F12	XA 178F