

Technical Information

Prosonic M

FMU40, FMU41, FMU42, FMU43, FMU44

Ultrasonic Level Measurement

Compact transmitters for non-contact level measurement



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 to 20mA
 - PROFIBUS PA
 - FOUNDATION Fieldbus
- Maximum measuring range:
 - FMU40: 5 m (16 ft) in fluids, 2 m (6.6 ft) in bulk materials
 - FMU41: 8 m (26 ft) in fluids, 3,5 m (11 ft) in bulk materials
 - FMU42: 10 m (33 ft) in fluids, 5 m (16 ft) in bulk materials
 - FMU43: 15 m (49 ft) in fluids, 7 m (23 ft) in bulk materials
 - FMU44: 20 m (66 ft) in fluids, 10 m (33 ft) in bulk materials

Features and benefits

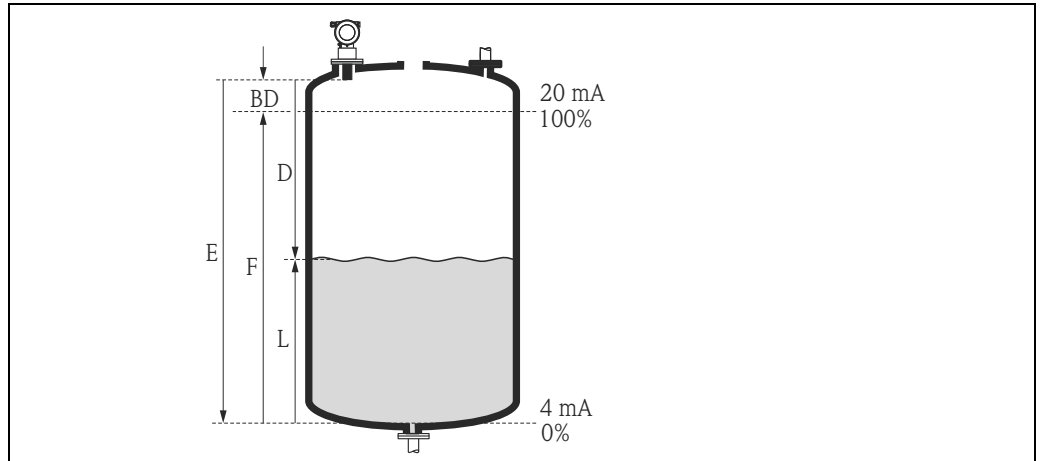
- Quick and simple commissioning via menu-guided on-site operation with four-line, multilingual plain text display
- Envelope curves on the on-site display for simple diagnosis
- Easy remote operation, diagnosis and measuring point documentation with the free operating program FieldCare supplied.
- Suitable for explosion hazardous areas (Gas-Ex, Dust-Ex)
- Linearization 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 (66 ft) from transmitter)
- Installation possible from thread G 1½" or 1½" NPT upwards
- Integrated temperature sensor for automatic correction of the temperature dependent sound velocity

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Function and system design

Measuring principle



BD Blocking distance
 E Empty distance
 L Level
 D Distance from sensor membrane - product surface
 F Span (full distance)

Sensor	BD	Max. range fluids	Max. range bulk materials
FMU40	0.25 (0.8)	5 (16)	2 (6.6)
FMU41	0.35 (1.1)	8 (26)	3.5 (11)
FMU42	0.4 (1.3)	10 (33)	5 (16)
FMU43	0.6 (2.0)	15 (49)	7 (23)
FMU44	0.5 (1.6)	20 (66)	10 (33)

Dimensions m (ft)

Time-of-flight method

The sensor of the Prosonic M transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The Prosonic M 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 (NTC) compensates for changes in the velocity of sound caused by temperature changes.

Interference echo suppression

The interference echo suppression feature on the Prosonic M 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.

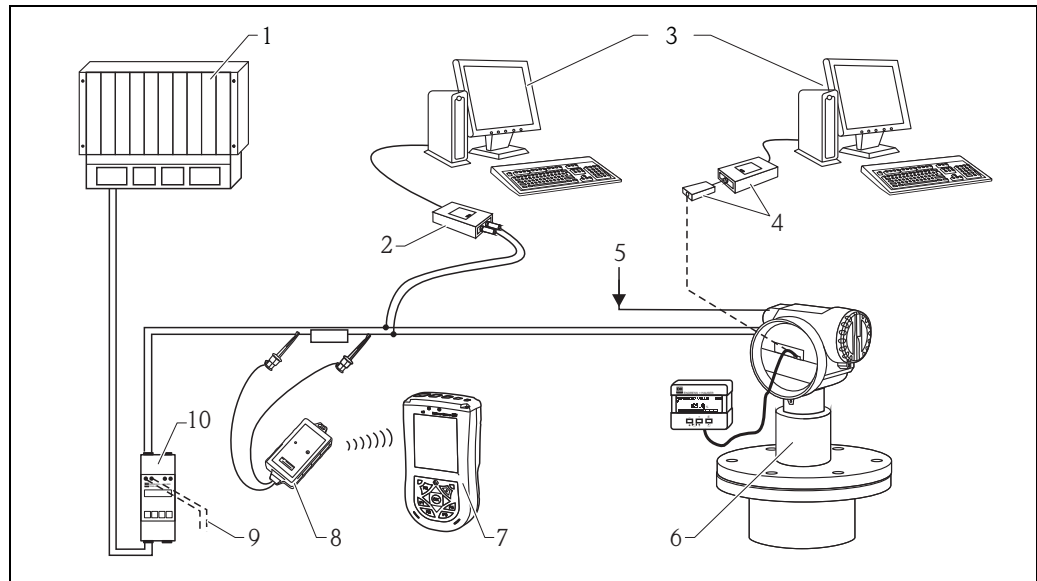
Blocking distance

Span F may not extend into the blocking distance BD . Level echos within 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:



- 1 PLC (programmable logic controller)
 2 Commubox FXA191 (RS232) or FXA195 (USB)
 3 Computer with operating tool (e.g. FieldCare)
 4 Commubox FXA291 with ToF Adapter FXA291
 5 Power supply (for 4-wire)
 6 Prosonic with display and operating modul
 7 Field Xpert
 8 VIATOR Bluetooth modem with connection cable
 9 Connection for Commubox FXA191, FXA195 or Field Xpert
 10 Transmitter supply unit RMA422 or RN221N (communication resistor included)

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

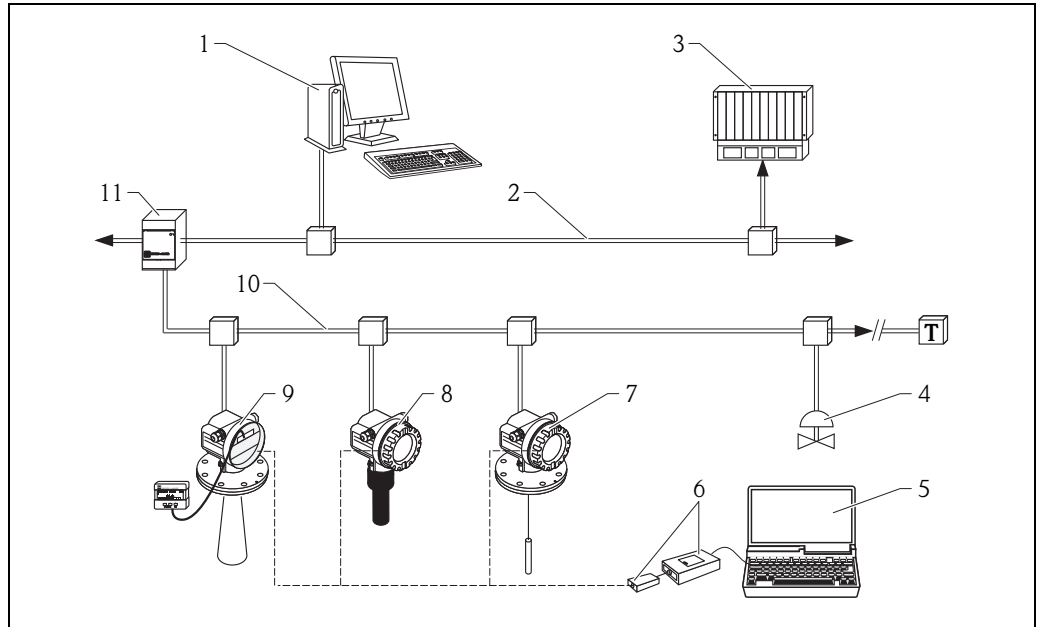
- With display and operating module,
- With a Personal Computer, FXA291 with ToF Adapter FXA291 (USB) and the operating software "FieldCare". FieldCare is a graphical operating software for instruments (radar, ultrasonic, guided microimpulse). It assists with commissioning, securing data, signal analysis and documentation of the measuring point.

Remote operation

- With Field Xpert
- With a Personal Computer, Commubox FXA195 and the operating software "FieldCare"

System integration using PROFIBUS PA

A maximum of 32 transmitters (8 if mounted in an explosion hazardous location Ex 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. For further information on the cable specifications, see Operating Instructions BA00034S/04/ENGuidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC61158-2 (MBP).

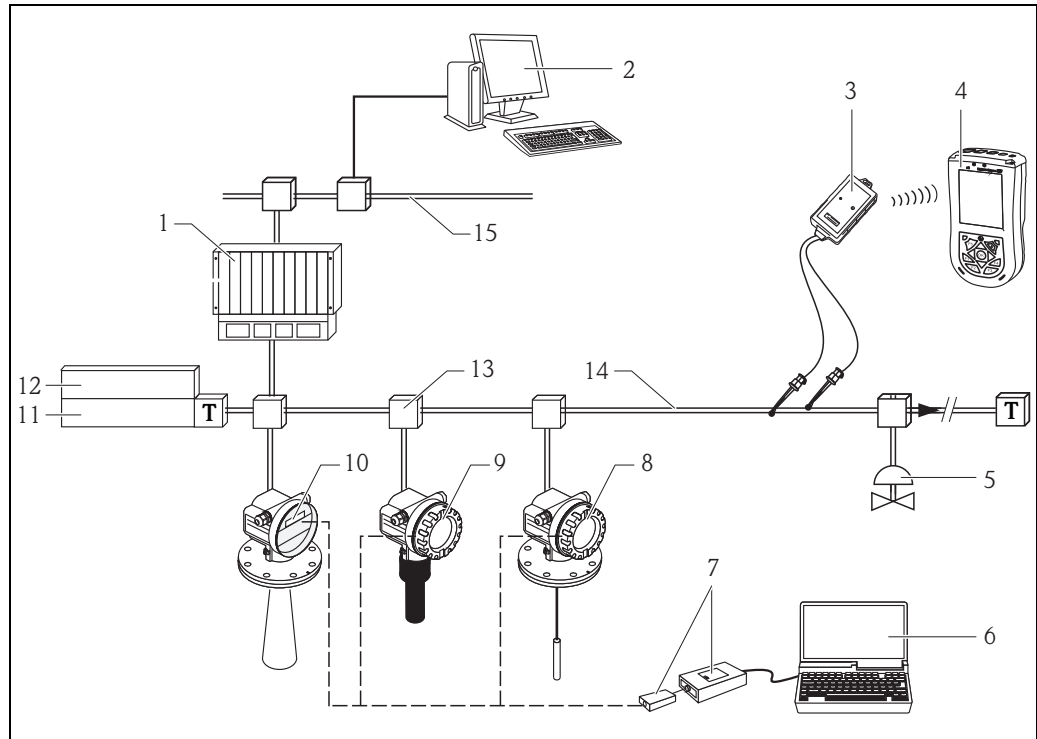


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- 1 Computer with Profiboard/Proficard and operating tool (FieldCare)
- 2 PROFIBUS DP
- 3 PLC (programmable logic controller)
- 4 More functions (valves etc.)
- 5 Computer with operating tool (FieldCare)
- 6 Commubox FXA291 with ToF Adapter FXA291
- 7 Levelflex M
- 8 Prosonic M
- 9 Micropilot M with display and operating modul
- 10 PROFIBUS PA
- 11 Segment coupler

System integration using FOUNDATION Fieldbus

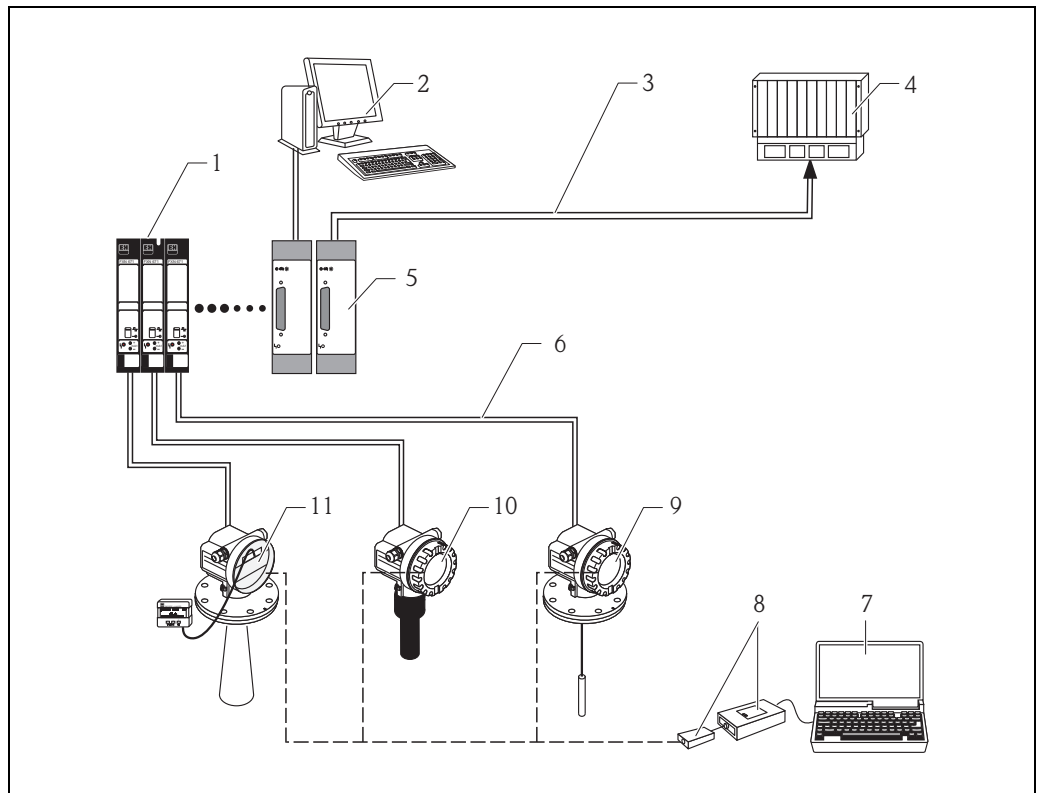
A maximum of 32 transmitters (standard or Ex d) can be connected to the bus. For protection class Ex ia: the maximum number of transmitters depends on the established rules and standards for intrinsically safe circuits (EN 60070-14) and proof of intrinsic safety. Both on-site and remote operation are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



- 1 SPS, PLC, API
- 2 Personal computer, e.g. with NI-FBUS configurator
- 3 VIATOR Bluetooth modem with connection cable
- 4 Field Xpert
- 5 More functions (valves etc.)
- 6 FieldCare
- 7 Commubox FXA291 with ToF Adapter FXA291
- 8 Levelflex M
- 9 Prosonic M
- 10 Micropilot M
- 11 Power conditioner
- 12 Power supply
- 13 FF link
- 14 FOUNDATION Fieldbus
- 15 Ethernet

System integration using Endress+Hauser Rackbus

You can interconnect a maximum of 64 2-wire devices with HART protocol to a Rackbus. Use an FXN672 interface module for each device. You can integrate this bus into a higher-level bus by using gateway.



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- 1 Interface FXN672
- 2 Personal computer with communication software
- 3 Bus
- 4 PLC
- 5 Gateway to MODBUS, FIP, PROFIBUS, INTERBUS etc.
- 6 4-20 mA HART
- 7 FieldCare
- 8 Commubox FXA291 with ToF Adapter FXA291
- 9 Levelflex M
- 10 Prosonic M
- 11 Micropilot M with display and operating modul

Note!

The FXN672 can be used with all 2-wire devices of the Prosonic M family.

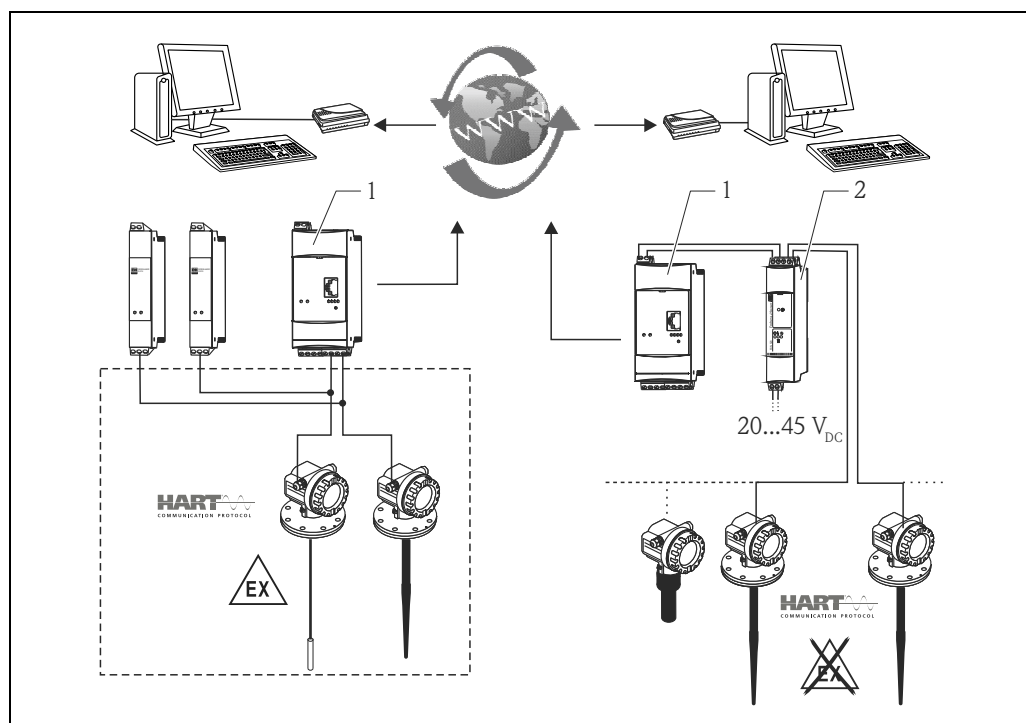
System integration via Fieldgate

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. 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.



The complete measuring system consists of devices and:

- 1 Fieldgate FXA520
- 2 Multidrop Connector FXN520

Note!

The number of instruments which can be connected in mutidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information TI00400F/00/EN (Multidrop Connector FXN520).

The program is available form your Endress+Hauser sales organisation or in the internet at: "www.endress.com → select your country → download → search: Fieldnetcalc

Input

Measured variable

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

Using the linearization 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 to 10 dB
Strong turbulence (e.g. stirrers)	10 to 20 dB
Foaming	Please contact your Endress+Hauser sales representative.

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

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

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

Temperature difference between sensor and product surface	Attenuation
to 20 °C (68 °F)	0 dB
to 40 °C (104 °F)	5 to 10 dB
to 80 °C (176 °F)	10 to 20 dB

