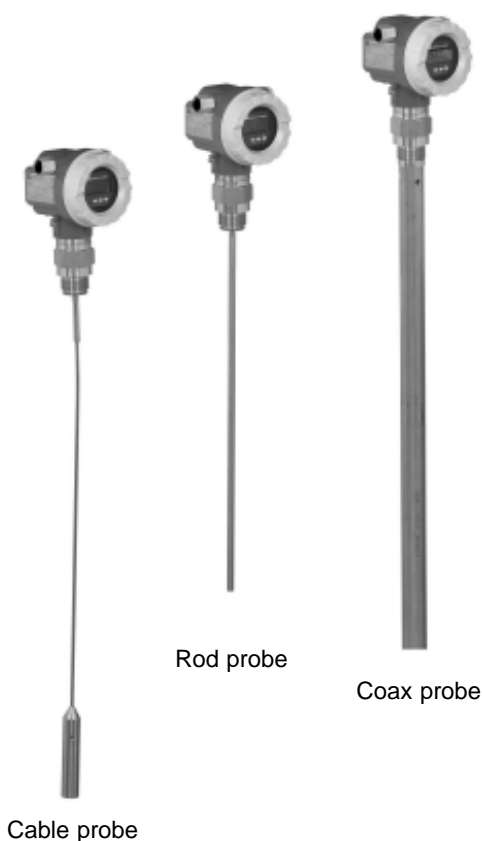


# Guided Level-radar Measurement *levelflex M FMP 40*

**Smart transmitter for continuous level measurement in liquids and bulk solids**  
**Cost-effective 4 to 20 mA 2-wire technology, suitable for hazardous locations**



## Application

The levelflex M is a top-mounted, compact level transmitter for process control or inventory/storage applications that operates with micro-impulse radar on the guided time-of-flight principle. Fluctuations in the density, temperature, or build-up of dust do not influence the measurement. Probes are available with various process connections including 3/4" NPT, 1-1/2" NPT, and flanges up to 8".

- Cable probes for measurement in bulk solids and liquids
- Rod probes for measurement in liquids and solids
- Coax probes for measurement in liquids only

The following interfaces are available for system integration:

- HART® (standard), 4 to 20 mA
- PROFIBUS-PA
- Foundation Fieldbus

## Features and benefits

- Simple, menu-guided on-site operation with four-line plain text display
- Envelope curves on the on-site display for simple diagnosis
- Easy operation, diagnosis and measuring point documentation with the supplied ToF Tool operating program
- Optional remote display and operation
- Coax probe allows measurement completely independent of the tank interior and installation in a nozzle

**Endress + Hauser**

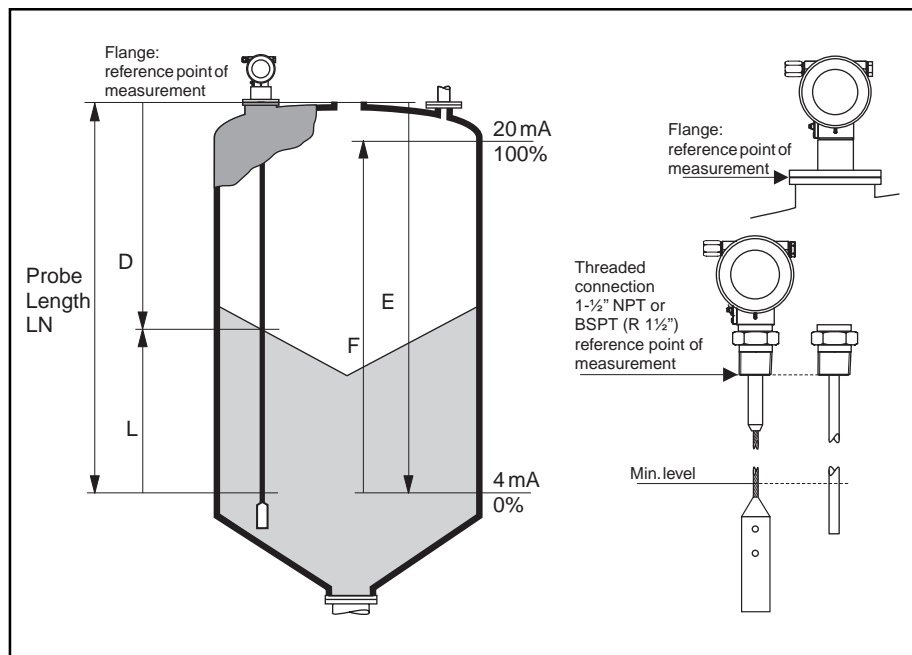
The Power of Know How



# Function and system design

## Measuring principle

The Levelflex is a “downward-looking” Time-of-Flight (ToF) measuring system which measures the distance from the process connection to the material surface. An electrical pulse is launched and guided down the probe, which acts as a surface wave transmission line. The pulses are reflected by the product surface, received by the electronics, evaluated and converted into level information.



## Input

Each point along the probe is sampled for its pulse reflection behavior. The information accumulated over the sampling cycle is captured and passed on to signal processing. The unambiguous signal identification is accomplished by PulseMaster® software algorithms that are based on many years of experience with time-of-flight technology.

The distance  $D$  to the product surface is proportional to the time of flight pulse  $t$ :

$$D = c \times t/2, \text{ with } c \text{ being the speed of light}$$

Based on the known empty distance  $E$ , the level  $L$  is calculated:

$$L = E - D$$

Refer to the figure above for the reference point for  $E$ .

The Levelflex M is equipped with functions to suppress interference echoes (tank mapping). The user can activate these functions which ensure that interference echoes (i.e. tank edges, weld seams, struts) are not interpreted as level echoes.

## Output





The Levelflex is initially adjusted at the factory to the probe length ordered, so that in most cases, only the application parameters, that automatically adapt the device to the measuring conditions, need to be entered. For models with current output, the factory adjustment for zero point and span is 4 mA and 20 mA. For digital outputs and the display module, 0% and 100%.




A linearization function (maximum of 32 points), based on a table entered manually or semiautomatically, can be activated locally or remotely. This function provides a measurement in engineering units and a linear output signal for spherical, horizontal cylindrical tanks, and vessels with conical outlets.

## Equipment selection

### Probe selection

The various types of probe in combination with the process connections are suitable for the following applications:

Probes with 1-1/2" threaded connection or flange				
Version:	FMP 40- *B* ...	FMP 40- *A* ...	FMP 40- *K* ...	FMP 40- *L* ...
Type of probe:	Cable probe 0.23" (6mm)	Cable probe 0.16" (4mm)	Rod probe 0.63" (16mm)	Coax probe
				
Tensile strength:	6744 lbf (30 kN)	2698 lbf (12 kN)	Not relevant	Not relevant
Collapse load:	7868 lbf (35 kN)	3597 lbf (16 kN)	Not relevant	Not relevant
Lateral load	Not relevant	Not relevant	22 lbf ft (30 Nm)	221 lbf ft (300 Nm)
For application:	Bulk solids	Mainly bulk solids, liquids with measuring range > 13 ft (4 m)	Mainly liquids, bulk solids on short measuring ranges and side mounting	Liquids
Max. measuring range:	115 ft (35 m) *	115 ft (35 m) *	13 ft (4 m)	13 ft (4 m)

Probes with 3/4" threaded connection			
Version:	FMP 40- *A* ...	FMP 40- *P* ...	FMP 40- *L* ...
Type of probe:	Cable probe 0.16" (4mm)	Rod probe 0.24" (6mm)	Coax probe
			
Tensile strength (min.):	1124 lbf (5 kN)	Not relevant	Not relevant
Collapse load (max.): **	1798 lbf (8 kN)	Not relevant	Not relevant
Lateral load	Not relevant	3 lbf ft (4 Nm)	44 lbf ft (60 Nm)
For application:	Liquids	Liquids	Liquids
Max. measuring range:	115 ft (35 m) *	6.6ft (2 m)	13 ft (4 m)

\* For versions with remote electronics with 10 ft (3 m) of connecting cable, the maximum measuring range is reduced to 98 ft (30 m). If the extension sleeve is used, the maximum measuring range is reduced to 111 ft (34 m).

\*\* This is the maximum load on the vessel top. In cases of overload, the process seal remains tight.

The diagram illustrates a HART communication system setup. A PLC (Programmable Logic Controller) is connected to a Transmitter power supply unit (RMA 422 or RN 221 N) which includes a communication resistor. This unit is connected to a HART handheld (DXR 275) and a Service adapter (FXA 193). The Service adapter is connected to a laptop (ToF Tool). A Commubox (FXA 191) is connected to the HART handheld and a laptop (COMMWIN II). An Operating and display module (VU 331) is connected to the HART handheld and a HART handheld (DXR 275).

- With display and operating module VU 331
- With personal computer, FXA 193 and ToF Tool operating software.

The ToF Tool is a graphical operating software for all instruments from Endress+Hauser that operate based on the time-of-flight principle (radar, ultrasonic, guided micro-impulse). It assists with commissioning, securing date, signal analysis, and creating documentation for the measuring point.

- With HART® handheld DXR 275
- With PC, Commubox FXA 191 and Commuwin II software or the ToF Tool

If the HART® communication resistor is not installed in the power supply and HART® protocol is to be used, a resistor ( $\geq 250 \Omega$ ) must be installed in the 2-wire line.

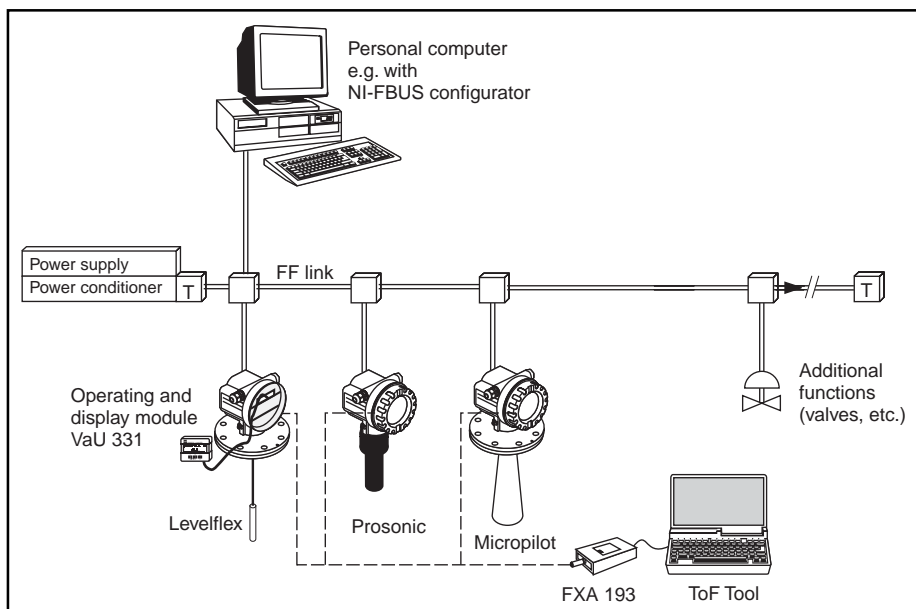
A maximum of 32 transmitters (10 if in an explosion hazardous location EEx ia IIC according to FISCO-model) can be connected to the bus. Bus voltage is supplied by the segment coupler. Both on-site as well as remote operation is possible.



### System integration via Foundation Fieldbus

A maximum of 32 transmitters \* (non-hazardous, IS or XP) can be connected to the bus. The maximum number of transmitters depends on the established rules and standards for intrinsically safe circuits (EN 60070-14). Both on-site and remote operation are possible.

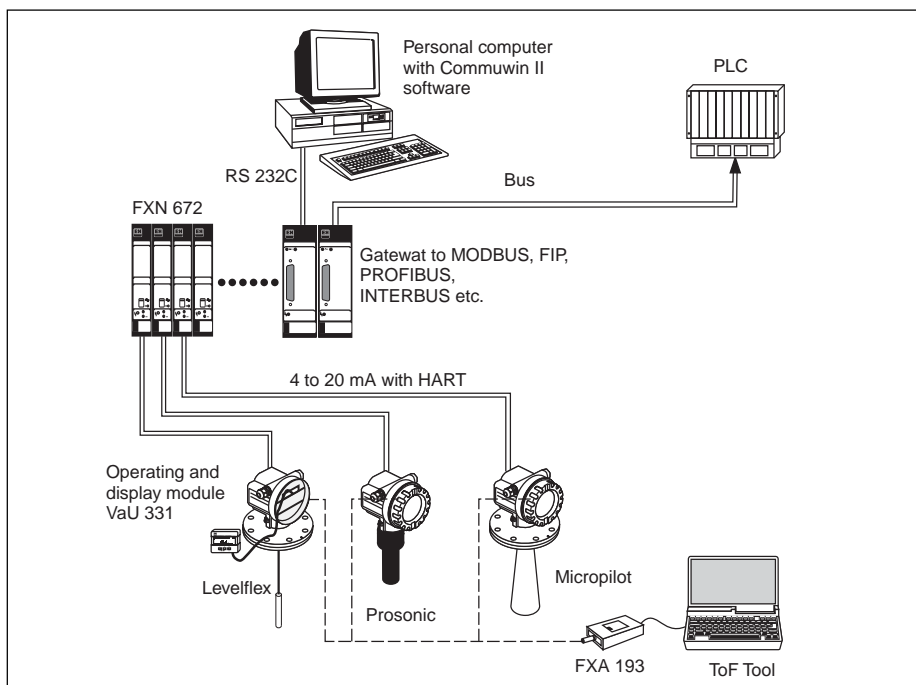
\* actual limit is based on the host system.



### System integration via Rackbus

Multiple transmitters Levellflex M (or other instruments) can be connected to a higher level bus system via a Gateway ZA:

- Every HART® transmitter via one interface module FXN 672 each.
- Gateways are available for MODBUS, FIP, PROFIBUS, INTERBUS, etc.
- Both on-site as well as remote operation are possible
- Ideal for Levellflex M integration into existing systems.



## Input

### Measured variable

The measured variable is the distance between a reference point (refer to page 3) and a reflective surface (i.e. process medium). The level is calculated based on the tank input zero point ("E", refer to page 3) and can be converted into other units (volume, mass) by means of linearization.

### Measuring range

The achievable measuring range depends on the reflectiveness of the medium, the mounting location, and any interference reflections. The following tables describe the groups of media as well as the achievable measuring range as a function of the application.

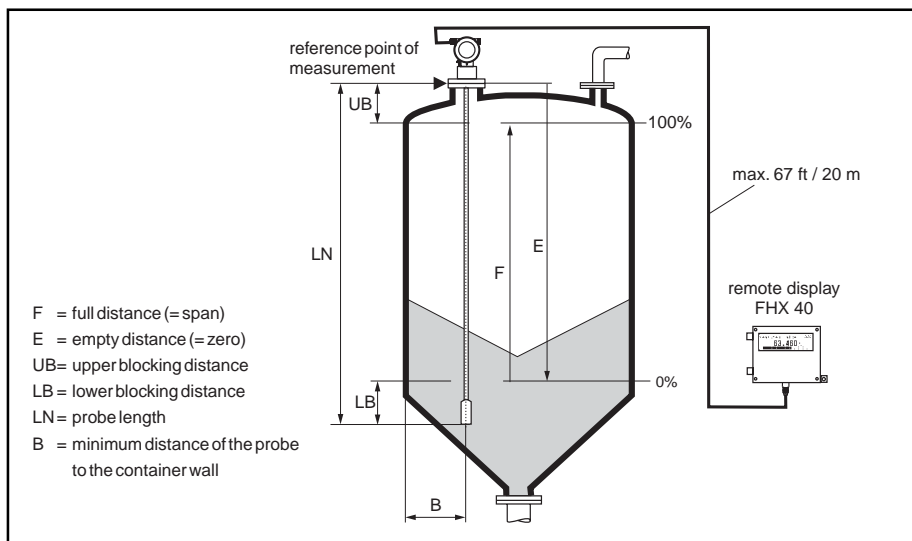
Media group	DK (εr)	Typical bulk solids	Typical fluids	Maximum measuring range
1	1.4 to 1.6		- Condensed gases, e.g. N <sub>2</sub> , CO <sub>2</sub>	13 ft. (4 m), coax probe only
2	1.6 to 1.9	- Plastic granules - White lime, special cement - Dry sawdust - Sugar	- Liquefied gas, e.g. Propane - Solvent - Freon 12 / Freon - Palm oil	82 ft (25 m)
3	1.9 to 2.5	- Portland cement, plaster	- Mineral oils, fuels	98 ft (30 m)
4	2.5 to 4	- Grain, seeds - Ground stones - Sand	- Benzene, styrene, toluene - Furan - Naphthalene	114 ft (35 m)
5	4 to 7	- Naturally moist (ground) stones, ores - Salt	- Chlorobenzene, Chloroform - Cellulose spray - Isocyanate, aniline	114 ft (35 m)
6	> 7	- Metallic powder	- Aqueous fluids - Alcohols - Ammonia	114 ft (35 m)

The respective lower group applies for very loose, or loosened bulk solids. The reduction of the maximum possible measuring range through:

- Extremely loose surfaces, such as bulk solids with low bulk weight for pneumatic filling
- Build-up, especially moist products

## Blocking distance

The upper blocking distance (UB) is the minimum distance from the reference point of the measurement (mounting flange) to the maximum level. The lower blocking distance (LB) is the range of the probe from the lower edge calculated upwards, in which exact measurement is not possible.



The start of the measuring range is situated above the lower blocking distance (LB). The maximum possible measuring range (F) depends on the probe length.

### Blocking distance and measuring range for $D_k \geq 1.6$ (1.4 for coax probes):

	LN feet (m)		UB inch (mm)	LB inch (mm)
	min	max	min	min
Cable probe	3.3 (1)	115 (35)	7.9 (200)	9.84 (250)
0.24" (6 mm) rod	1 (0.3)	6.5 (2)	7.9 (200)	1.97 (50)
0.63" (16 mm) rod	1 (0.3)	13 (4)	7.9 (200)	1.97 (50)
Coax probe	1 (0.3)	13 (4)	0 (0)	1.97 (50)

### Blocking distance and measuring range for $D_k \geq 7$ :

	LN feet (m)		UB inch (mm)	LB inch (mm)
	min	max	min	min
Cable probe	3.3 (1)	115 (35)	3.9 (100)	9.84 (250)
0.24" (6 mm) rod	1 (0.3)	6.5 (2)	3.9 (100)	1.97 (50)
0.63" (16 mm) rod	1 (0.3)	13 (4)	3.9 (100)	1.97 (50)
Coax probe	1 (0.3)	13 (4)	0 (0)	1.97 (50)

### Minimum distance B of the probe to the container wall:

Wall	Minimum distance B
Metal	Probe must not touch wall in the measuring range. For corrugated plates, 2 x size of the wave.
Plastic	Any
Concrete	20 inches, otherwise maximum measuring range is reduced.

NOTE: A reliable measurement cannot be guaranteed if material is present in the upper and lower blocking distances.

## Operating frequency

100 Mhz to 1.5 GHz

## Output

### Output signal

- 4 to 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 (configurable)
- Digital interface

### Linearization

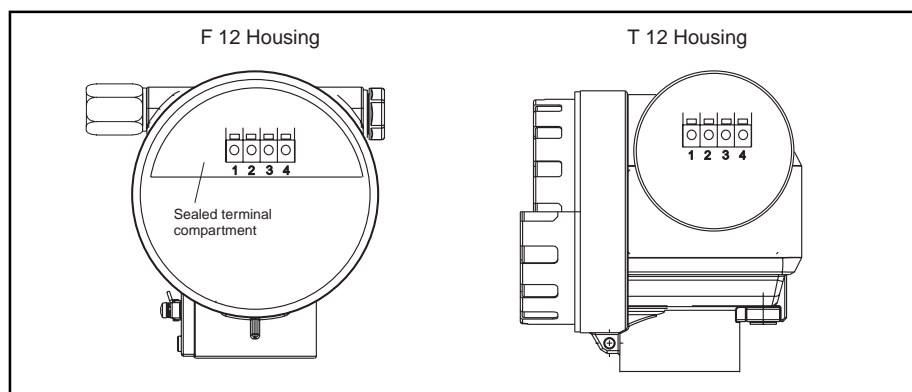
The linearization function of the Levelflex M allows conversion of the measured value into any unit of length, volume, mass or %. Linearization tables for calculating volume in horizontal cylindrical tanks are preprogrammed. You can also enter any number of other tables containing up to 32 value pairs either manually or semi-automatically (by filling the vessel under controlled conditions). You can use the ToF Tool operating program to calculate the table automatically for any tank form and then enter the table into the Levelflex program.

## Power supply

### Terminal compartment

Two housing styles are available:

- F 12 housing with sealed terminal compartment for standard or intrinsically safe areas
- T 12 housing with separate terminal compartment for standard or explosion hazardous areas



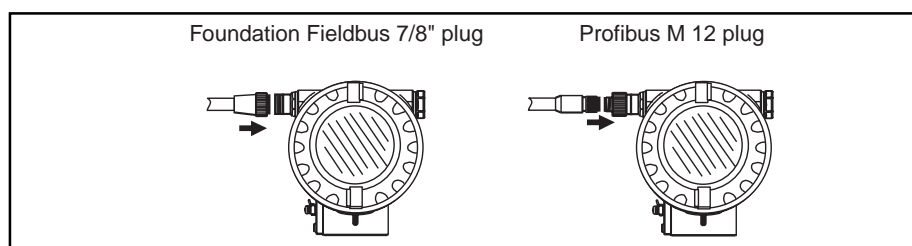
- After mounting, the housing can be rotated 350° in order to simplify access to the display and wiring terminal compartment.

NOTE: It is necessary to make a good ground connection to the ground terminal on the outside of the housing to insure EMC protection.

### Prewired connectors

Endress+Hauser offers plug connectors, prewired:

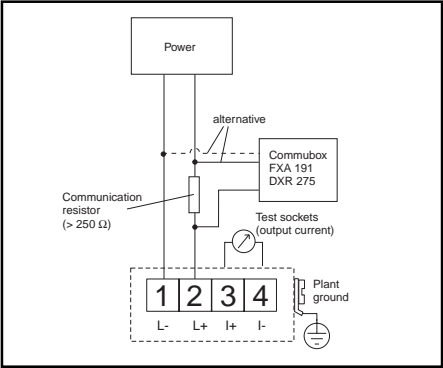
- 7/8" plug connector for Foundation Fieldbus
- M12 plug connector for PROFIBUS-PA



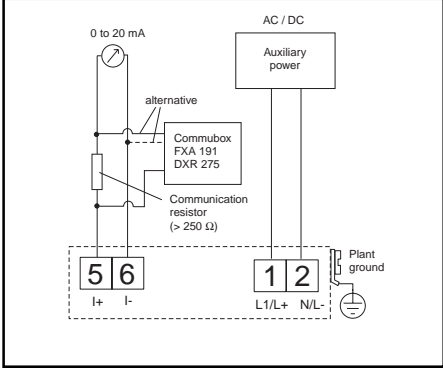


Terminal assignment

4 to 20 mA with HART®, 2-wire

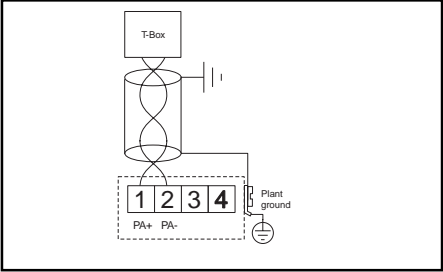


4 to 20 mA with HART®, 4-wire, active

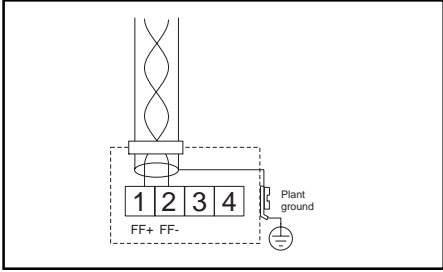


Connect the connecting line to the screw terminals (up to 18 AWG) in the terminal compartment. Use 2-wire twisted pair cable with shield for wiring. Units are internally protected against reverse polarity, RFI and over-voltage peaks (refer to TI 241F/00/en “EMC Test Procedures”).

PROFIBUS-PA



Foundation Fieldbus



The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary power. Please use 2-wire twisted pair cable with shield. Refer to the following operating manuals for information on cable types, and how to set and ground the network

- BA 198F/00/en “PROFIBUS-DP/-PA: Guidelines for planning and commissioning”
- Further cable specifications can be found in the FF specification or IEC 61158-2

Information regarding architecture and network grounding can be found at <http://www.fieldbus.org>

Cable entry

- Cable gland: M20 x 1.5, recommended cable diameter 0.23” to 0.39” (6 to 10 mm)
- Cable entry 1/2” NPT or G 1/2
- PROFIBUS-PA M12 plug
- Foundation Fieldbus 7/8” plug

Supply voltage

The following values are the voltages across the terminals directly at the instrument. Minimum load for HART® is 250Ω.

HART® 2-wire:

Version		Current consumption	Terminal voltage	
			Min.	Max.
HART	Standard	4 mA	16 V	36 V
		20 mA	7.5 V	36 V
	IS	4 mA	16 V	30 V
		20 mA	7.5 V	30 V
	XP, DIP	4 mA	16 V	30 V
		20 mA	11 V	30 V
Fixed current (measured value transmitted by HART)	Standard	11 mA	10 V	36 V
	IS	11 mA	10 V	30 V

HART® residual ripple, 2-wire:  $U_{ss} \leq 200 \text{ mV}$

HART® 4-wire active:

10.5 to 32 VDC, 90 to 250 VAC 50/60 Hz, maximum load is 600 Ω.  
Residual ripple,  $U_{ss} \leq 2V$ , including ripple within the permitted voltage (10.5 to 32 V).

**Power consumption**

Minimum 60 mW, maximum 900 mW

**Current consumption**

Communication	Output current	Current consumption / Power consumption
HART®, 2-wire	3.6 to 22 mA	-
HART®, 4-wire (AC)	2.4 to 22 mA	~ 3 to 6 mA / ~ 3.5 VA
HART®, 4-wire (DC)	2.4 to 22 mA	~ 100 mA / ~ 1 W
PROFIBUS-PA	-	max. 11 mA
Foundation Fieldbus	-	max. 15 mA

**Performance characteristics**
**Reference operating conditions**

- Temperature = 68°F (20°C) ± 9°F (5°C)
- Pressure = 14.7 psia (1013 mbar abs.) ± 0.3 psi (20 mbar)
- Relative humidity (air) = 65% ± 20%
- Reflection factor 0.8 (surface of water for coax probe, metal plate for rod and cable probe min. 3 ft diameter)
- Flange for rod or cable probe ≥ 1" (30 mm)
- Distance to obstructions ≥ 3 feet (1 m)

**Maximum measured error**

Typical statements for reference conditions, including linearity, repeatability and hysteresis (according to IEC 60770-1):

- up to 33 ft (10 m) measuring range: ± 0.13" (3 mm)
- 33 ft to 114 ft (10 m to 35 m) measuring range: ± 0.03%

**Resolution**

- Digital, 0.04" (1 mm)
- Analog, 0.03% of measuring range

**Reaction time**

The reaction time depends on the configuration (minimum 1 s)

- 2-wire electronics, 1 second
- 4-wire electronics, 0.7 seconds

**Influence of ambient temperature**

The measurements are carried out in accordance with EN 61298-3:

- Digital output (HART, PROFIBUS-PA, Foundation Fieldbus):
  - **FMP 40**  
average  $T_K$ : 0.023"/10K, maximum ± 0.14" (3.5 mm) over the entire temperature range, -40° to +176°F (-40° to +80°C)
- **2-wire:**
  - Current output (additional error, in reference to the span of 16 mA)
    - **Zero point (4 mA)**  
average  $T_K$ : 0.032%/10K, maximum 0.35% over the entire temperature range, -40° to +176°F (-40° to +80°C)
    - **Span (20 mA)**  
average  $T_K$ : 0.05%/10K, maximum 0.5% over the entire temperature range, -40° to +176°F (-40° to +80°C)
- **4-wire:**
  - Current output (additional error, in reference to the span of 16 mA):
    - **Zero point (4 mA)**  
average  $T_K$ : 0.02%/10K, maximum 0.29% over the entire temperature range, -40° to +176°F (-40° to +80°C)
    - **Span (20 mA)**  
average  $T_K$ : 0.06%/10K, maximum 0.89% over the entire temperature range, -40° to +176°F (-40° to +80°C)

## Operating conditions / installation

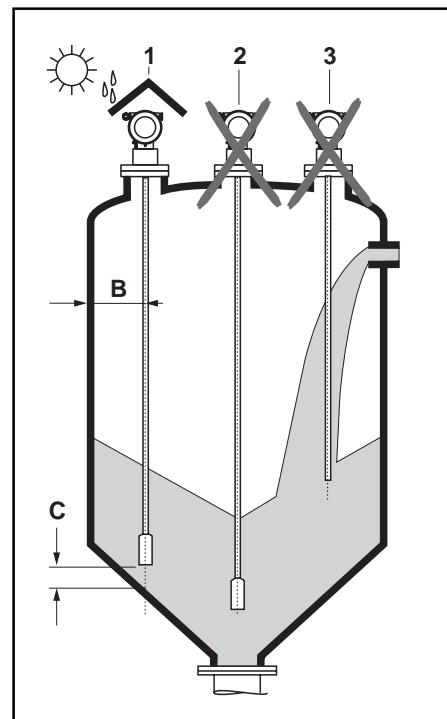
### General installation instructions (for bulk solids and fluids)

Probe selection (see equipment selection, page 3)

- Normally, cable probes should be used for bulk solids, rod probes are only suitable for short measuring ranges up to approximately 6 feet (2 m) in bulk solids. This applies above all to applications in which the probe is installed laterally at an angle and for light and pourable bulk solids.
- Normally, rod or coax probes are used for liquids. Cable probes are used in liquids for measuring ranges > 13 ft (> 4 m) and with restricted ceiling clearance which does not allow the installation of rigid probes.
- Coax probes are suited for liquids with viscosities up to approximately 500 cst. Coax probes can measure most liquefied gases, with a dielectric constant of 1.4 and higher. Moreover, installation conditions such as nozzles, tank internal fittings etc., have no effect on the measurement when a coax probe is used. A coax probe offers maximum EMC protection when used in plastic tanks.

### Mounting location

- Do not mount rod or cable probes in the fill stream (3)
- Mount rod and cable probes away from the wall (B) at a distance that even with material build-up, a minimum distance of 4" (100 mm) between the probe and build-up is maintained.
- Mounting location in the vessel should be ~1/6 to 1/4 of the vessel diameter.
- Mount rod and cable probes as far away as possible from installed fittings. For distances < 12" (300 mm) tank mapping must be carried out during commissioning.
- When installing rod and cable probes in plastic containers, the minimum distance of 12" (300 mm) also applies to metallic parts outside the container.
- Rod and cable probes should not contact metallic walls or floors of the container.
- In metal containers, do not install the rod or cable probe exactly in the center (2).
- Minimum distance of the probe end to the container floor (C):
  - Cable probe: 6" (150 mm)
  - Rod probe: 4" (100 mm)
  - Coax probe: 2" (50 mm)
- When installing outdoors, a protective cover is recommended (1). Refer to accessories, page 30.

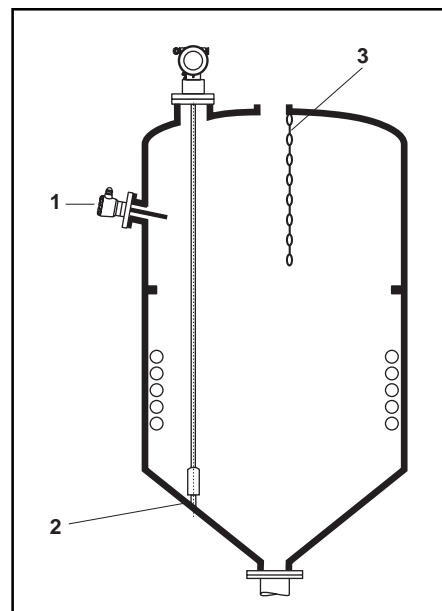


### Other installations

- Ensure that internal switches (1) such as temperature sensors, limit switches tank struts, etc. are not closer than 12" (300 mm) to the probe.
- Cable probe must stay within the measuring range span and not touch any internal objects during operation. A tiedown (2) may be required to ensure minimal movement.
- Products which produce extreme static electricity may require a grounding chain (3) to be installed in the filling stream.

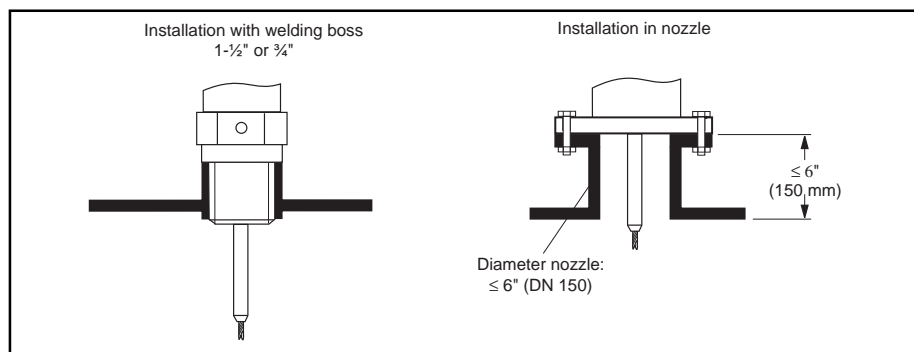
### Optimization options

- Interference echo suppression: Measurement can be optimized by electronically tuning out interference echoes.



### Type of probe installation

- Probes are mounted to the process connection with threaded bosses or flanges and are usually mounted with these. If during installation there is the danger that the probe end will move enough to touch the tank floor or cone, the probe must be shortened and tied down. Probe weight is internally threaded in the bottom portion of the weight.  
0.16" (4 mm cable), M 14 thread  
0.24" (6 mm cable), M 20 thread
  - The ideal installation is mounting in a threaded joint or threaded sleeve which is internally flush with the container ceiling.
  - Nozzle mounting: 2" to 6" (50 to 10 mm) diameter nozzles, 6" (150) maximum height can be used to mount unit. Larger height nozzles can be used as long as the lower end of the probe is fixed, or a centering disk is used to prevent the probe from touching the lower end of the nozzle. Refer to accessories, page 30.
- NOTE: Contact Endress+Hauser for nozzle diameters greater than 10" (DN 250)

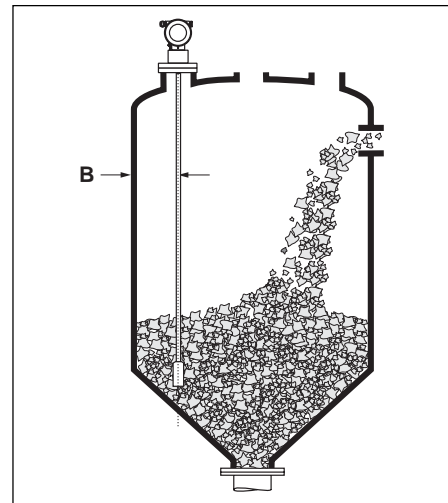


- The measuring range is directly dependent on the probe length. If the probe is not attached at the bottom end, the following distances to the container floor must be observed.
  - Cable probe: 6" (150 mm)
  - Rod probe: 4" (100 mm)
  - Coax probe: 2" (50 mm)

It is better to order the probe too long than too short. Probe can be shortened in the field.

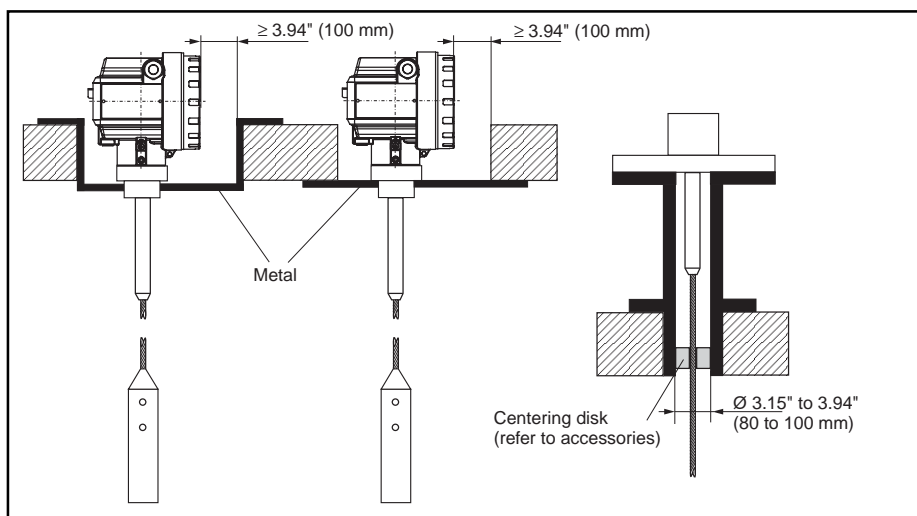
### Special notes for bulk solids

- In the case of bulk solids, as great a distance as possible from the filling stream is especially important to avoid wear to the probe.
- In concrete silos, a large distance (B) should be observed between the probe and the concrete wall, if possible,  $\geq 3 \text{ ft}$  (1 m), or at least 1.5 ft (0.5 m).



### Installation in vessels with a concrete top

Vessels with thick concrete tops require the Levelflex to be mounted on a metal plate so that the unit is flush with the lower surface of the top. Mounting into a metal pipe can also be done as long as the pipe does not extend past the lower edge of the top.



## Installation instructions for level measurement in bulk solids silos

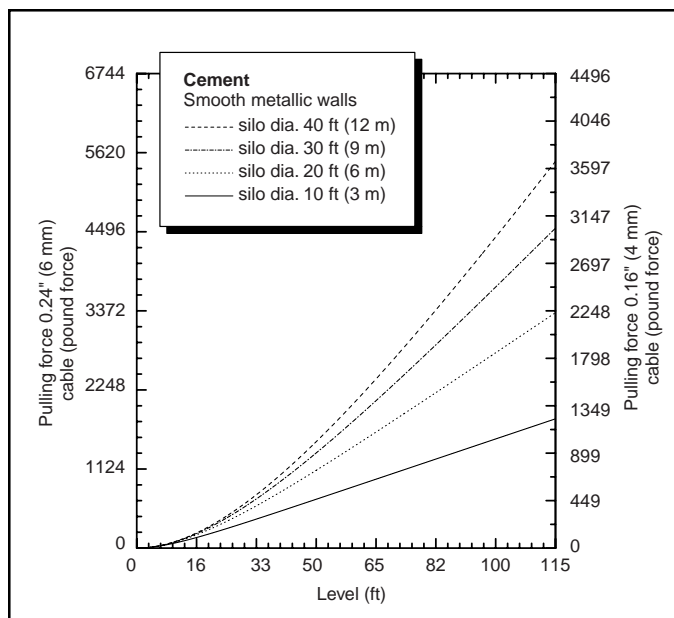
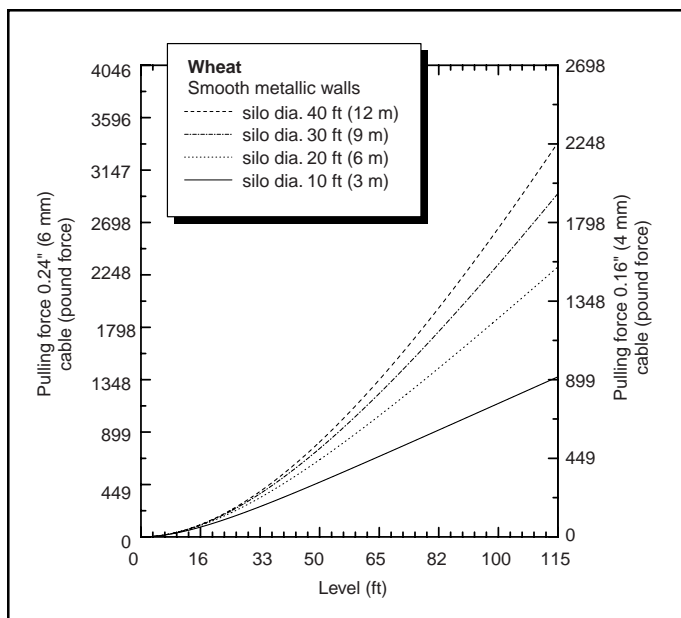
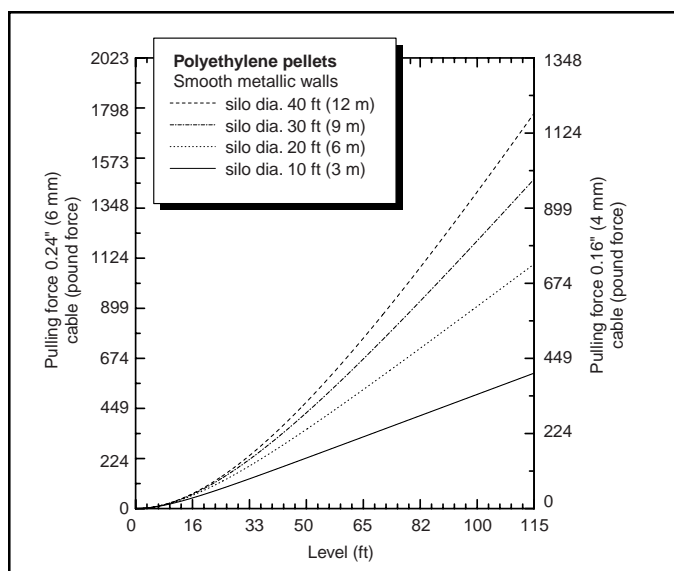
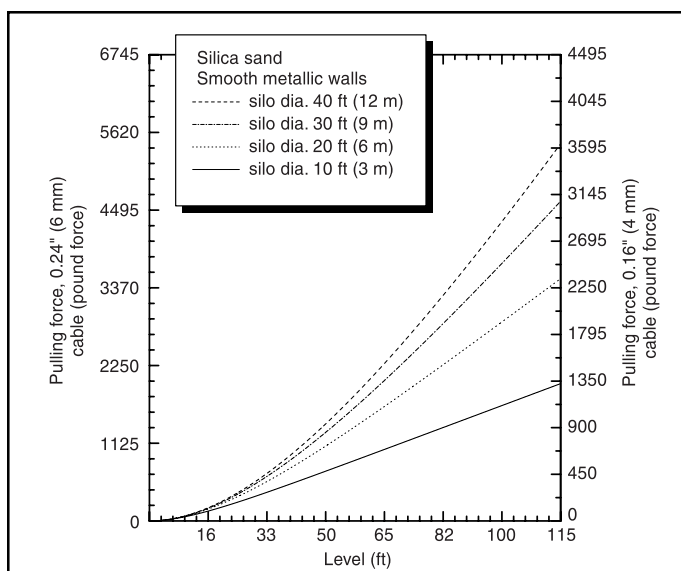
### Cable load

Tensile forces on a secured cable probe are much greater than on a free hanging cable with attached weight. In the diagrams below, the tensile forces are shown for different bulk solids, vessel diameters, and cable diameter as a function of level (refer to page 3 for maximum load values).

The cable probe and vessel top must be able to withstand tensile forces on the cable. Down-pull on the cable is dependent on the bulk solid density and coefficient of friction of the material, the size of the vessel, the position of the cable in the vessel, and the selected cable diameter.

The calculation is performed for the following conditions:

- Suspended cable (cable is not attached at the bottom)
- Free-flowing bulk solids, i.e. mass flow. A calculation for core flow is not possible. In the event of collapsing materials, considerably higher loads can occur.
- The specification for tensile forces contains a safety factor of 2, which compensates for the normal fluctuation range in pourable bulk solids.



Since the tensile forces are also heavily dependent on the viscosity of the product, a higher safety factor is necessary for highly viscous products and if there is a risk of mounding build-up. In critical cases, it is better to use a 0.24" (6 mm) cable than the 0.16" (4 mm) cable.

The same forces also act on the vessel cover. On a fixed cable, the tensile forces are definitely greater, but this force cannot be calculated. Observe the tensile strength of the individual probes (see page 3) to ensure the tensile strength is not exceeded.

Options for reducing tensile forces:

- Shorten the probe
- If the maximum load is exceeded, another method of measurement (such as an ultrasonic non-contact instrument) should be used.

### Special notes for liquids

- When installing in agitation units, check whether a non-contact (ultrasonic or radar) would be better suited, especially if the agitator generates large mechanical loads on the probe.
- If the Levelflex M is installed into tanks with agitators, it is better to use a coax probe, which has a greater lateral load capacity (see page 3).

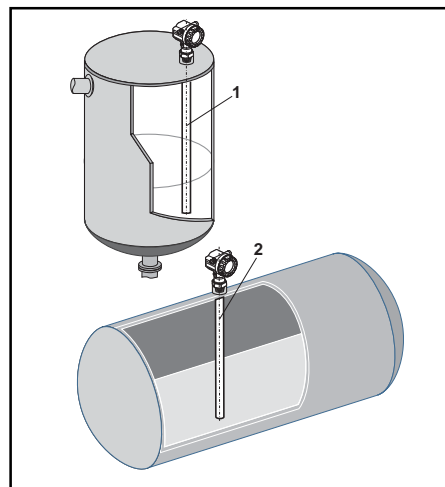
### Standard installation

Using a coax probe offers great advantages when the viscosity of the product is  $\leq 500$  cst and it is certain that the product does not accumulate build-up.

- Greater reliability: as of dielectric constant = 1.4, measurement functions independently of all electrical properties in all liquids.
- Internal structures do not effect measurement.
- Higher lateral loads are allowed over rod probes.
- If Levelflex cannot be mounted directly onto vessel, a mounting nozzle must be used. The nozzle dimensions do not effect the coax probe.
- Higher viscosity fluids require use of a rod probe.

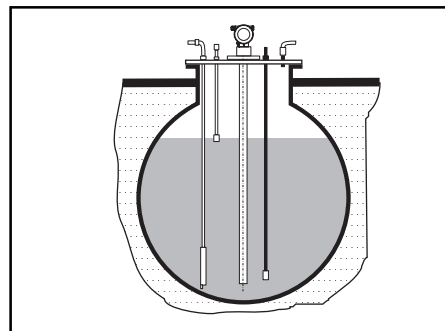
### Horizontal cylindrical and standing tank installations

- For measuring ranges up to 13 ft. (4 m) use a coax or rod probe. For larger measuring ranges or too much free cover space, use a 0.16" (4 mm) cable probe.
- Installation and securing probe is the same as for bulk solids vessels.
- Any distance from the vessel wall is acceptable as long as probe doesn't contact wall.
- Do not mount a rod or cable probe (1) exactly center on the vessel. Coax probe mounted in the center (2) does not effect performance.
- When installing in tanks with large quantities of internal structures or structures close to probe location, use coax probe.



### Installation in underground tanks

- Use coax probe for long nozzles with large diameters.

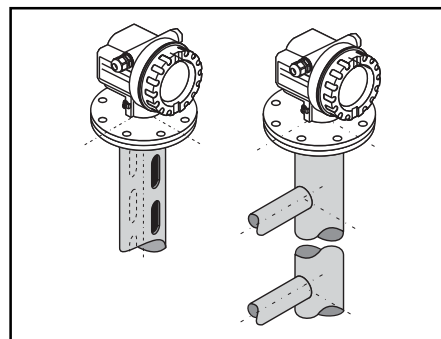


### Measurement in corrosive fluids

For measurement in corrosive fluids, it is possible to install a rod probe in a closed plastic pipe with a diameter of up to approximately 2" (50 mm). When using plastic tanks, it is also possible to mount the probe on the outside of the tank (maximum wall thickness 0.6"). The Levellflex then measures the level through the plastic pipe. Refer to "Installation in Plastic Vessels".

### Installation in stilling wells or bypass pipes

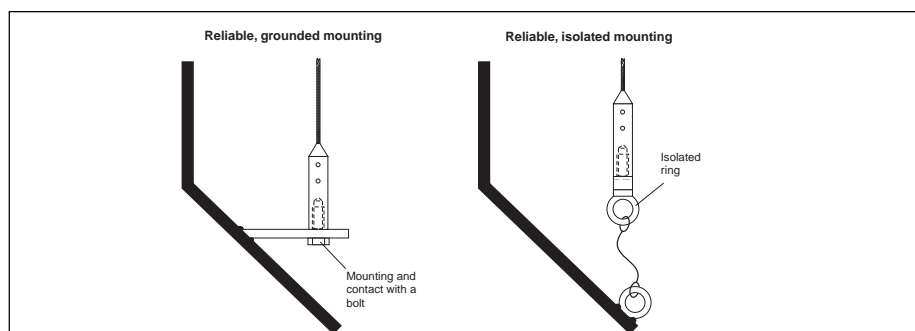
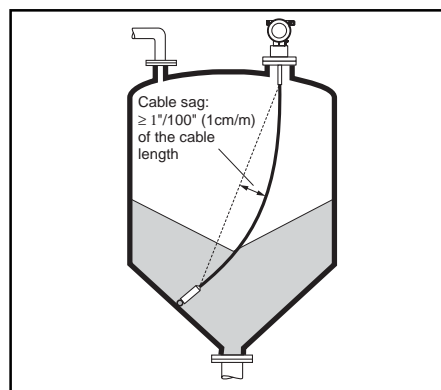
- A rod probe can be used for pipe diameters up to 4" (100 mm), for diameters larger, the FAU 20 adapter flange is recommended.
- Installation is possible in both metallic and plastic pipes. To prevent corrosion to the probe by the liquid, the pipe can be closed; pipe diameter cannot exceed 2" (50 mm).
- When installing a rod probe in a metallic pipe with an internal diameter of up to 4" (100 mm), you have all the advantages of a coax probe.
- Welded joints that protrude up to 0.2" (5 mm) into the pipe do not affect the measurement.



### Notes on special installation situations

#### Attaching cable probe

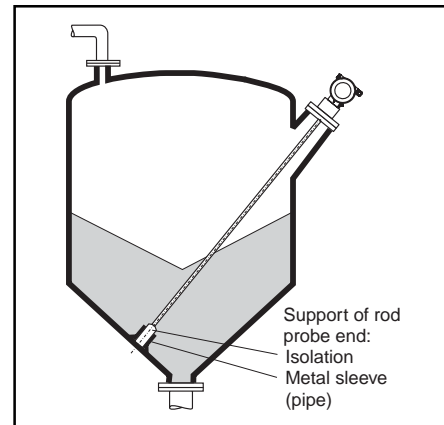
- The end of the probe needs to be secured if the probe would otherwise touch the silo wall, the cone or another part, or if the probe comes closer than 1.6 ft (0.5 m) to a concrete wall. The internal thread of the cable weight is intended for attaching the probe.
  - for 0.16" (4 mm) cable, M14 thread
  - for 0.24" (6 mm) cable, M20 thread
- Preferably use the 0.24" (6 mm) cable due to its higher tensile strength when securing a cable probe.
- The securing method must provide a reliable ground or be insulated. If the probe cannot be grounded, it can be secured using an isolated eyelet (see graphic below).
- To prevent high tensile loads breaking the cable, the cable must have slack. Ensure the cable is longer than the required measuring range to allow slack in the center of the cable length, 1" / 100" (1 cm / m).





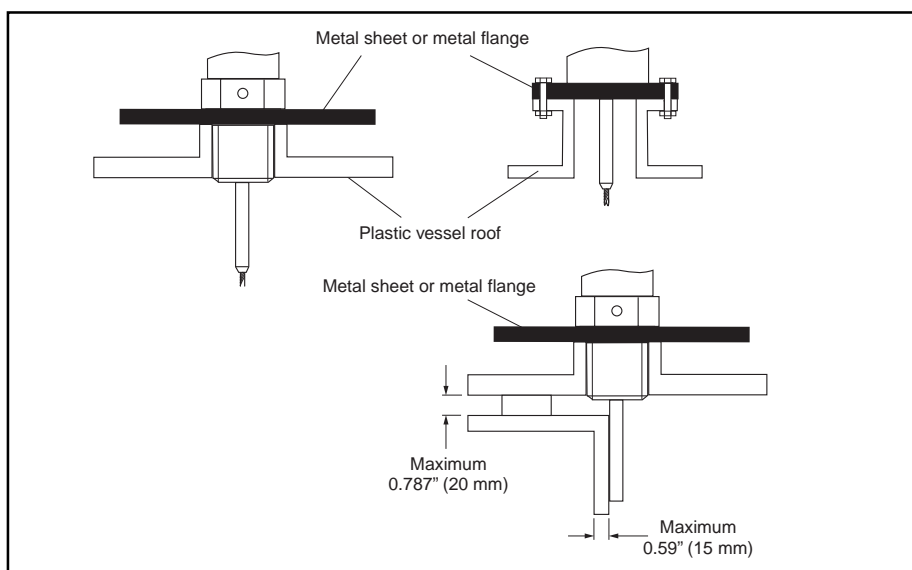
#### Installation from the side

- If installation from above is not possible, the Levellflex can also be mounted from the side.
- For cable probes, always attach the weighted end.
- For rod probes, connect using metal sleeve to container wall
- For coax probes, insure the lateral load capacity is not exceeded (see page 3). Do not attach bottom of coax probe.



#### Installation in plastic vessels

Installation into vessels with tops made of plastic requires mounting of the rod or cable probe into a metal flange  $\geq 2"$  (DN 50) or a metal sheet  $\geq 8"$  (200 mm). Optimal performance can be guaranteed only with a metallic surface at the process connection.

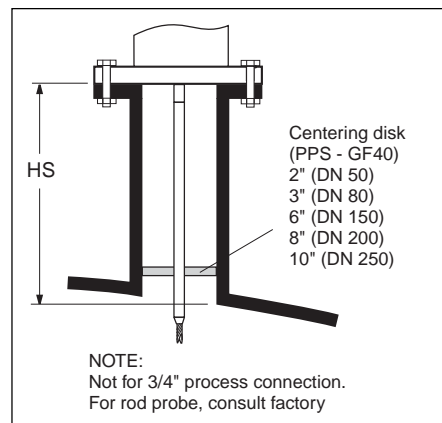


- The probe can be mounted externally on the tank wall for measuring in liquid solutions. Measurement then takes place through the tank wall without contacting the process. If mounted externally, a half plastic shield with a diameter of 8" (200 mm), or some other protective shield must be affixed to prevent any external influences on the measurement. This is especially necessary if people are in the vicinity.
- There must not be any metallic reinforcement rings secured to the tank.
- The wall thickness should be a Fibre-Glass Reinforced Plastic/PP  $< 0.6"$  (15 mm).
- There must be no open space between the tank wall and the probe.

### Installation in nozzles > 6" (150 mm) high

When installing a cable probe in a nozzle (1-1/2" to 10" in diameter) with nozzle heights (HS) greater than 6" (150 mm), any material movement in the vessel may cause the cable to touch the lower edge of the nozzle. This could damage the cable as well as impair accurate measurement. We recommend using an extension rod with or without a centering disk. When installing a Levelflex in nozzles up to 24" (600 mm) in height, a center disk is recommended to keep the cable probe from touching the nozzle sides. A threaded rod is provided with each disk and is connected between the cable and process connection. When specifying the cable length, include the rod length so that the cable does not have to be shortened.

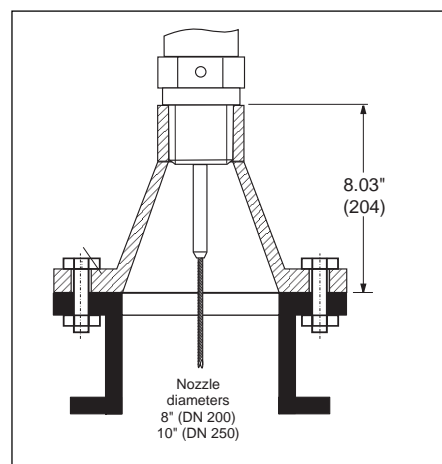
Refer to Accessories for ordering information (page 30). Only use centering disks with small diameter nozzles, 1-1/2" and 2" (DN 40 and 50) if there is no significant build-up in the nozzle above the disk.



### Flange adapter

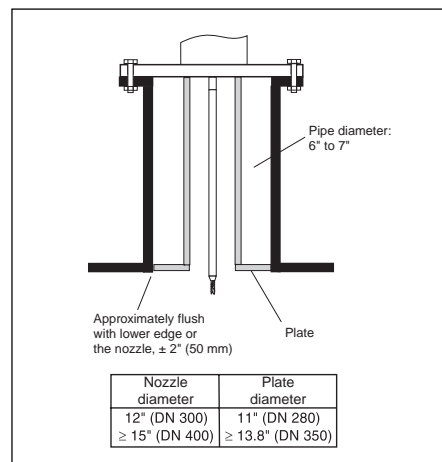
Installation into nozzles greater than 8" (DN 200) can create reflections from the nozzle wall which result in false measurements, especially in low dielectric constant materials. An adapter horn is available for 8" (DN 200) and 10" (DN 250) diameter nozzles.

NOTE: nozzles greater than 10" (DN 250) should be avoided. Contact Endress+Hauser for further information.



### Installation in nozzles greater than 12" diameter

If installation in nozzles greater than 12" (300 mm) is unavoidable, a user-supplied pipe and plate must be installed to insure accurate measurement.



### Installation for difficult to access process connections

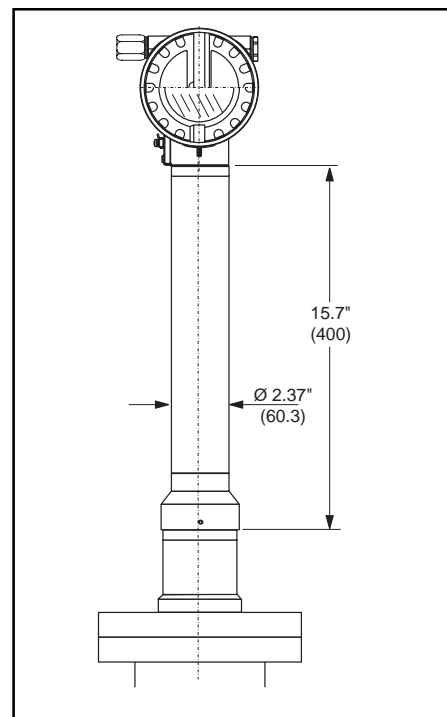
### Extension pipe

An extension pipe option allows the electronics to be mounted above the process mounting location. This option is used when process temperatures at the process connection may cause the electronics to exceed normal operating temperatures. Refer to chart under Operating Conditions section, page 20. Another option for high temperatures is the remote electronics option.

The extension pipe can be used to extend the electronics above other objects on top of the tank (such as catwalks, manhole covers, etc.) to allow the operator easier view of the display and easier access to the wiring compartment. After mounting, the housing can be rotated 350° for ease of access.

## NOTE

The maximum measuring range for the system is reduced to 111 feet (34 m).

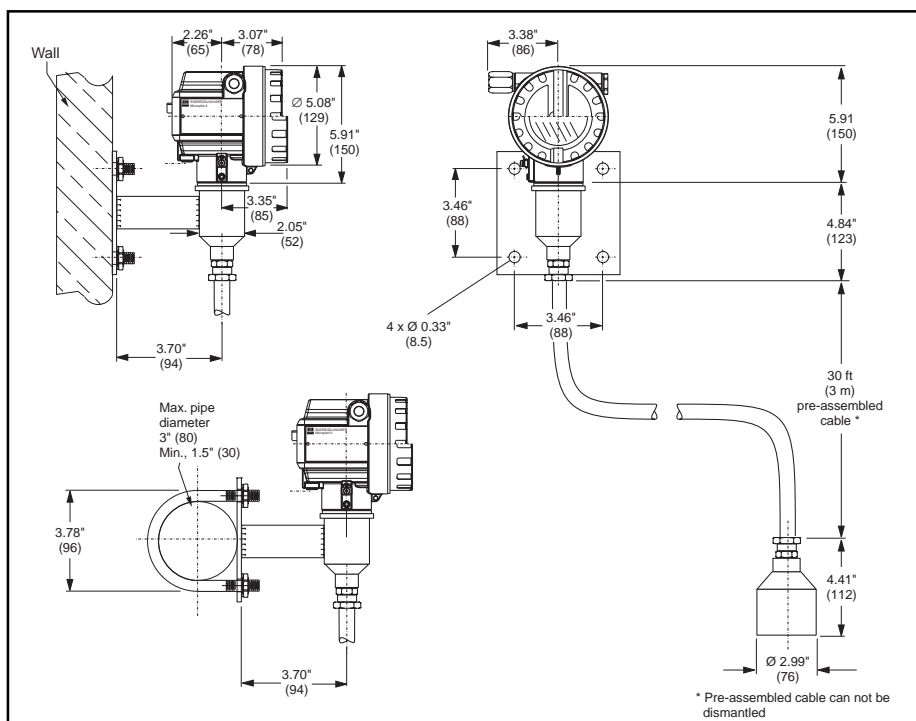


## Remote mounted electronics

A remote electronics housing is available and designed for use where high ambient temperatures exist at the mounting location of the sensor. The housing can be wall or pipe mounted and is supplied with 9 ft. (3 m) prewired connection cable. When ordered, the system consists of the remote housing, probe and connecting cable. Unit is assembled at the factory, and the connecting cable cannot be dismantled.

### NOTE

The maximum measuring distance of the system is reduced to 98 feet (30 m).



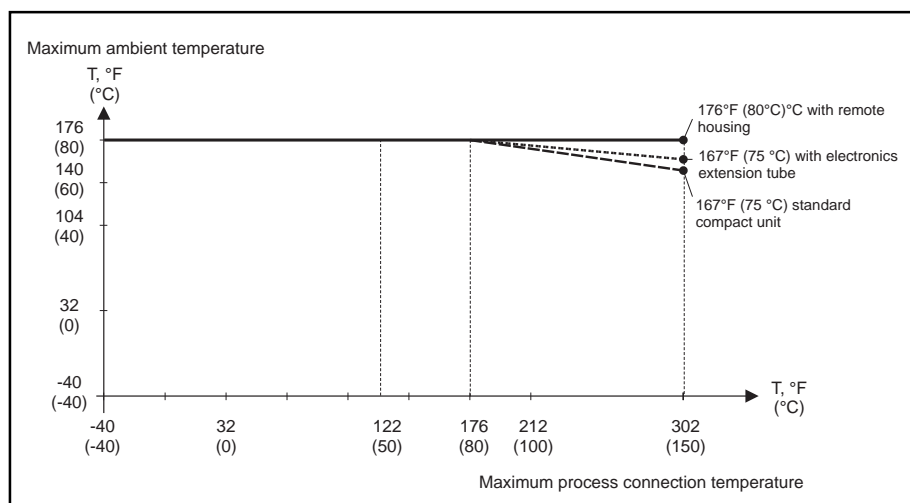
## Operating conditions (environment)

### Ambient temperature range

Transmitter: -40° to +176°F (-40° to +80°C). The LCD function may be limited at temperatures  $T_a < -4^\circ$  (-20°C) and  $T_a > +140^\circ$  F (60°C). A weather protection cover is recommended for outdoor usage if the instrument is exposed to direct sunlight.

### Ambient temperature limits

For process connection temperatures above 176°F (80°C), the allowed ambient temperature at the electronics housing is reduced according to the following graph.



### Storage temperature

-40° to +176°F (-40° to +80°C)

### Climate class

DIN EN 60068-2-38 (test Z/AD)

### Protection rating

Housing: NEMA 4X (IP 66), open housing, NEMA 1 (IP 20)

Probe: NEMA 6P (IP 68)

Caution!

Degree of protection NEMA 6P applies for M12 PROFIBUS-PA plug connectors only when plugged in.

### Vibration resistance

DIN EN 60068-2-64 / IEC 68-2-64: 20 to 2000 Hz, 1 (m/s<sup>2</sup>)/Hz

### Electromagnetic compatibility

When installed in metal or concrete vessels (rod and cable), or coax probes, the following applies:

- Interference emission to EN 61326, Electrical Equipment Class B
- Interference immunity to EN 61326, Annex A (Industrial)

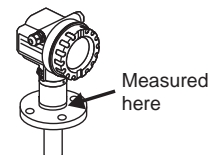
When installed in plastic or wood vessels, cable and rod probes can be influenced by large electromagnetic fields. Interference Emission to EN 61326 is in this case, Class A.

## Operating conditions (process)

### Process temperature range

The temperature at the process connection is measured as shown in the graphic below right. The product temperature inside the vessel can be considerably higher. Maximum permitted temperature at the process connection is dependent on the o-ring specified as shown in the chart below.

O-ring material	Min. Temperature	Max. Temperature
Viton (FKM)	-22°F (-30°C)	+302°F (150°C)
EPDM	-40°F (-40°C)	+248°F (120°C)
Kalrez (FFKM)	23°F (-5°C)	+302°F (150°C)



NOTE: The medium temperature can be higher; however, when using cable probes, the stability of the probe cable is reduced by structural changes at temperatures over 660°F (350°C).

### Process pressure

Vacuum up to maximum 580 psi (40 bar)

NOTE

All levelflex probes have two levels of sealing. An o-ring seal and a molded seal behind the o-ring.

### Process connection material / Seal

316L stainless steel / Refer to chart above for o-ring seal and temperature range.

### Plastic wetted materials

Probes with 1-1/2" threaded or flange connection

- Teflon on lower edge of process connection
- Coax probe centering stars, Teflon

Probes with 3/4" threaded connection

- PPS on lower end of rod or cable probe process connection
- Teflon on all parts of coax probe

### Probe cleaning

Depending on the application, dirt or sediments can accumulate on the probe. A thin, even layer only influences measurement slightly. Thick layers can dampen the signal and then reduce the measuring range. Heavy, uneven build-up, especially adhesion (e.g. through crystallization) can lead to incorrect measurement. In this case, it is recommended to use a non-contact measuring system or check probe regularly for build-up.

### Dielectric constant

Coax probe,  $\epsilon_r \geq 1.4$

Rod and cable probes,  $\epsilon_r \geq 1.6$

### Cable extension due to tension and temperature

0.24" (6 mm) cable:

- Elongation due to tension at maximum load 6744 lbf (30 kN), 0.51" / 3 ft cable length (13 mm / m)
- Elongation due to temperature increase from 86° to 300°F (30° to 150°C) is 0.08" / 3 ft cable length (2 mm / m)

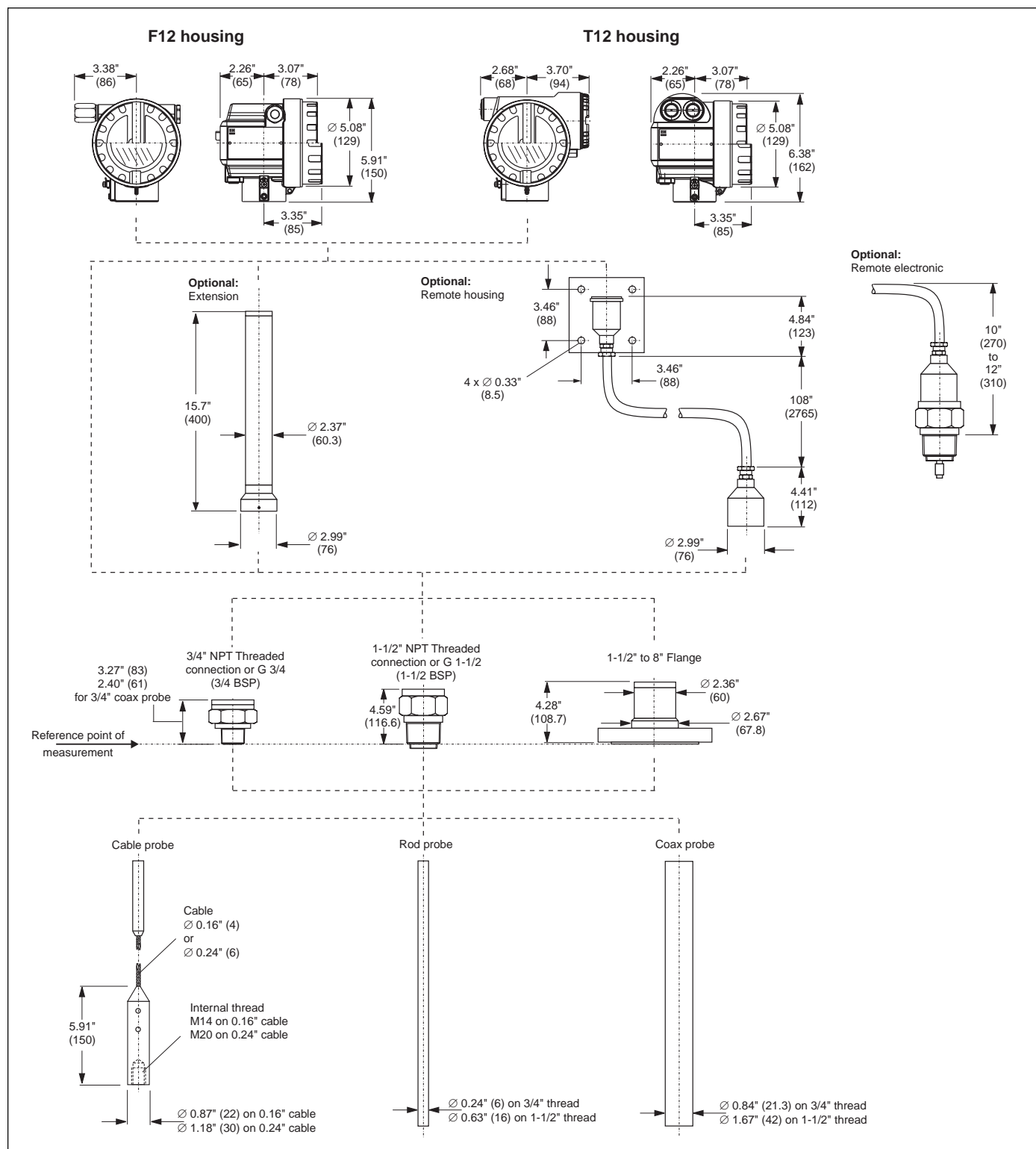
0.16" (4 mm) cable:

- Elongation due to tension at maximum load 6744 lbf (30 kN), 0.43" / 3 ft cable length (11 mm / m)
- Elongation due to temperature increase from 86° to 300°F (30° to 150°C) is 0.08" / 3 ft cable length (2 mm / m)

# Mechanical construction

## Dimensions and mounting details

All dimensions are in inches (mm)

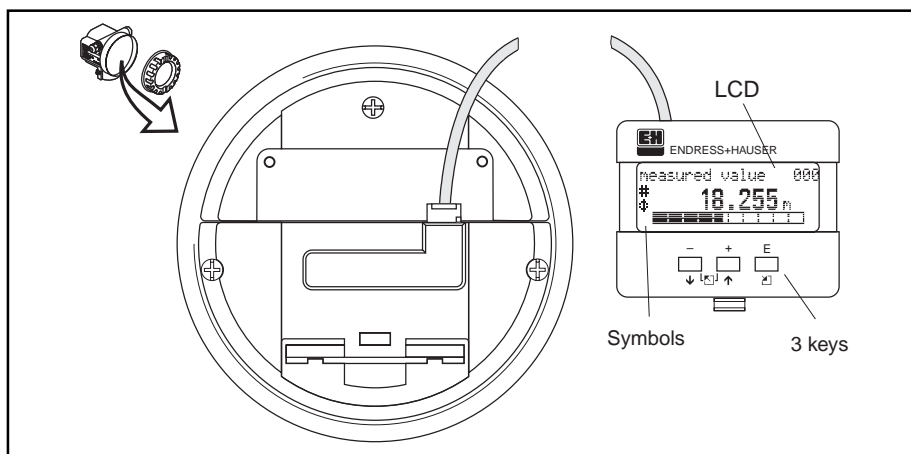


<b>Weight</b>	<p>FMP 40 housing, approximately 8 lb (4 kg) plus the probe weight (below) and flange.</p> <ul style="list-style-type: none"> <li>• 0.16" (4 mm) cable probe unit, 0.4 lb/3 ft cable (0.2 kg/m)</li> <li>• 0.24" (6 mm) cable probe unit, 0.7 lb/3 ft cable (0.3 kg/m)</li> <li>• 0.63" (16 mm) rod probe unit, 0.7 lb/3 ft rod (0.3 kg/m)</li> <li>• Coax probe, 2.6 lb/3 ft probe (1.6 kg/m)</li> </ul>
<b>Housings</b>	<p>F12, sealed terminal compartment for standard or instrinscillay safe areas T12, separate terminal compartment for increased safety and explosion proof areas</p> <ul style="list-style-type: none"> <li>• Aluminum, chromated, powder-coated, seawater repellent</li> <li>• Safety glass sight window</li> <li>• 1/2" NPT cable entry, PROFIBUS-PA M 12 plug, 3/4" Foundation Fieldbus plug, G 1/2, or M20 x 1.5</li> </ul>
<b>Process connections</b>	<ul style="list-style-type: none"> <li>• 3/4" NPT, 1-1/2" NPT, G 3/4 or G 1-1/2 all 316L SS</li> <li>• 1-1/2" to 4" flanges, Class 150 or 300, ANSI B16.5, 316L SS</li> <li>• 6" and 8" flanges, Class 150, ANSI B16.5, 316L SS</li> <li>• JIS and DIN flanges available, 316L SS</li> </ul>
<b>O-ring seal</b>	<ul style="list-style-type: none"> <li>• Viton, EPDM, or Kalrez</li> </ul>
<b>Probe</b>	<ul style="list-style-type: none"> <li>• 0.16" (4 mm) cable, 304 SS, 40 inches to 115 feet (1000 mm to 35 m)</li> <li>• 0.24" (6 mm) cable, 304 SS, 40 inches to 115 feet (1000 mm to 35 m)</li> <li>• 0.63" (16 mm) rod, 316L SS, 12 inches to 13 feet (300 mm to 4 m)</li> <li>• Coax probe, 316L SS, 12 inches to 6.5 feet (300 mm to 2 m)</li> </ul>

## Human interface

<b>Operating concept</b>	<p>The display of the process value and the configuration of the Levellflex M take place locally by means of a large 4-digit alphanumeric display with plain text information. The guided menu system with integrated help text ensures a quick and safe commissioning.</p> <p>Remote commissioning, including documentation of the measuring point and indepth analysis functions, is supported via the ToF Tool, the graphical operating software for Endress+Hauser time-of-flight systems.</p>
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<b>Display elements</b>	<p><b>Liquid crystal display (LCD)</b></p> <p>The LCD module VU 331 for display and operation is located beneath the housing cover, and includes four lines with 20 characters per line. The measured value is legible through the glass in the cover. The cover must be removed to operate the device. A 10-segmented bar graph indicates % value. Display contrast is adjustable through key combinations (see page 24).</p> <p>Key functions are describe on page 24.</p>
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Displayed Symbol	Meaning
	<b>ALARM symbol</b> Symbol appears when the instrument is in an alarm state. Flashing indicates warning, steady ON indicates alarm.
	<b>LOCK symbol</b> The lock symbol appears when the instrument is locked; input is not possible during the locked state
	<b>COMMUNICATION symbol</b> Communication symbol appears when data transmission via HART, PROFIBUS, or Foundation Fieldbus is in progress.
	<b>SIMULATION_SWITCH_ENABLE symbol</b> This communication symbol appears when simulation in Foundation Fieldbus is enabled via the DIP switch.

## Operating elements

The operating elements are located inside the housing and are accessible for operation by opening the lid of the housing.

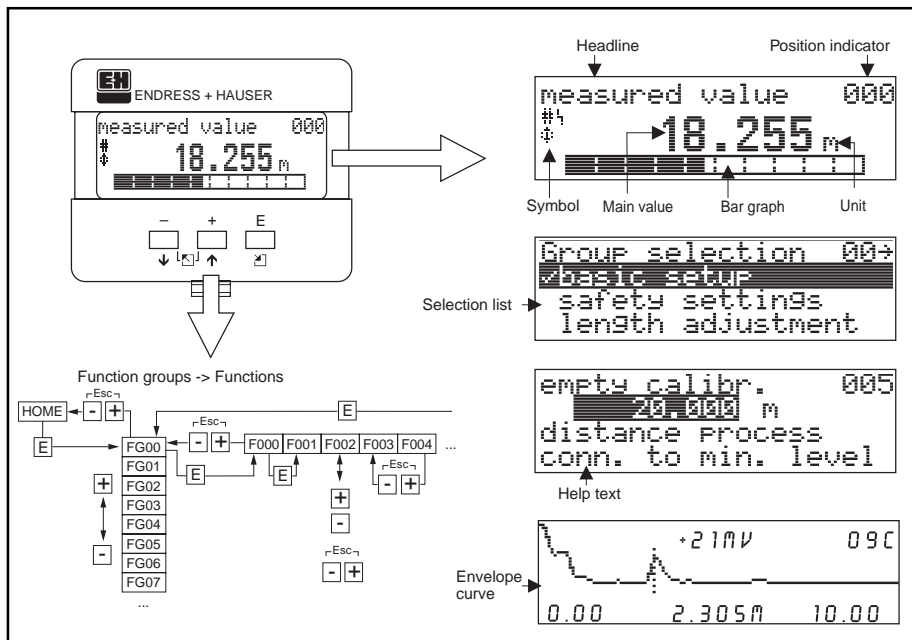
Key (s)	Meaning
Or	Navigate upwards in the selection list Edit numeric value within a function
Or	Navigate downwards in the selection list Edit numeric value within a function
<sup>Esc</sup> Or	Navigate to the left within a function group
Or	Navigate to the right within a function group, confirmation
and or and	Contrast settings of the LCD
and  and	Hardware lock / unlock After a hardware lock, an operation via the 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

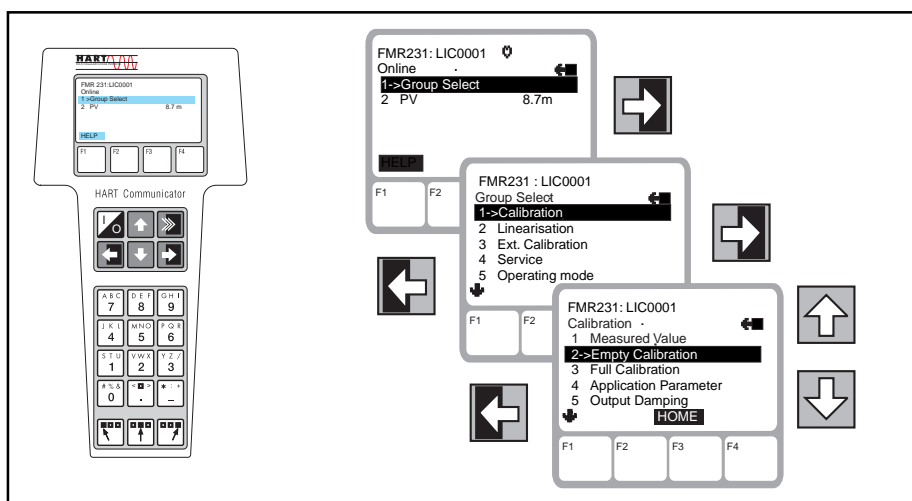
### Operation with VU 331 display

The LC-display VU 331 allows configuration via 3 keys. 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.



### Operation with handheld unit DXR 275

All device functions can be adjusted via a menu with the DXR 275 handheld HART® unit.



## Remote operation

The Levelflex M can be remotely operated via HART®, PROFIBUS-PA and Foundation Fieldbus. On-site operation adjustments are also possible.

### Operation with ToF Tool

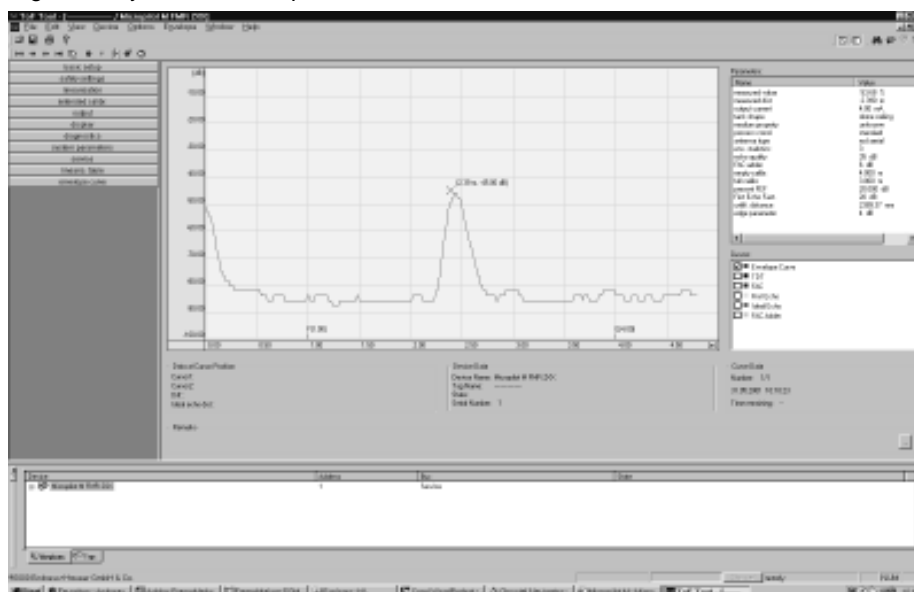
The ToF Tool is a graphical operating software package for instruments from Endress+Hauser that operate based on the time-of-flight principle. It is used to support commissioning, securing of data, signal analysis, and documentation of the instruments. It is compatible with the following operating systems: Win 95, Win 98, WinNT 4.0, Win 2000 and Win XP. The ToF Tool supports the following functions:

- Online configuration of transmitters
- Signal analysis via envelope curve
- Loading and saving of instrument data (Upload/Download)
- Documentation of measuring point data

Menu-guided commissioning:



Signal analysis via envelope curve:



Connection options:

- HART® with Commubox FXA 191
- Profibus-PA
- Service-interface with FXA 193 adapter

### Operation with Commuwin II (for communication versions 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:

- On-line configuration of transmitters
- Loading and saving of instrument data (Upload/Download)
- Orderly visualization of measured values and limit values
- Display and recording of measured values with a line recorder

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

Connections (page 9):

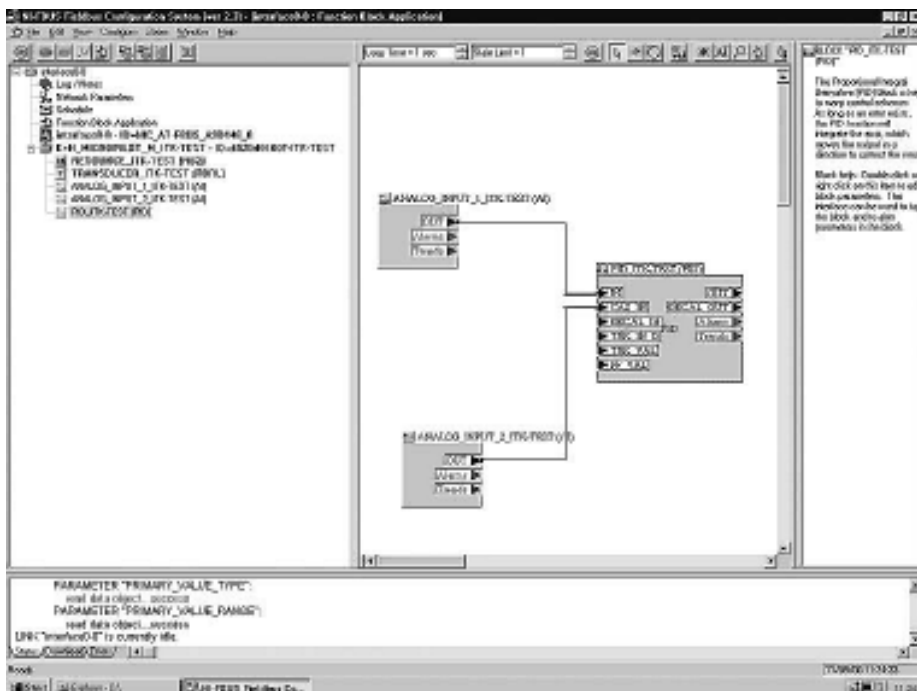
- HART® with Commubox FXA 191 (available as accessory)
- PROFIBUS-PA

### Operation with NI-FBUS Configurator (only with 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.

The NI-FBUS Configurator is used 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
- Log project download changes
- Save and print a configuration



## Certificates and approvals

### CE mark

By attaching the CE mark, Endress+Hauser confirms that the instrument fulfills all the requirements of the relevant EC directives.

### Hazardous areas

- FM approved Intrinsically safe Class I, II, III; Division 1, Groups A-G, Non-incendive
- FM approved Explosion proof Class I, II, III; Division 1, Groups A-G
- FM approved Dust ignition proof Class II, Division 1, Groups E-G Non-incendive
- CSA approved Intrinsically safe Class I, II, III; Division 1, Groups A-D, G + coal dust, Non-incendive
- CSA approved Dust ignition proof Class II, Division 1, Group G + coal dust, Non-incendive
- CSA approved Explosion proof Class I, II, III; Division 1, Groups A-D, G + coal dust, Non-incendive

### Other standards and guidelines

EN 60529: Protection class of housing, IP-code

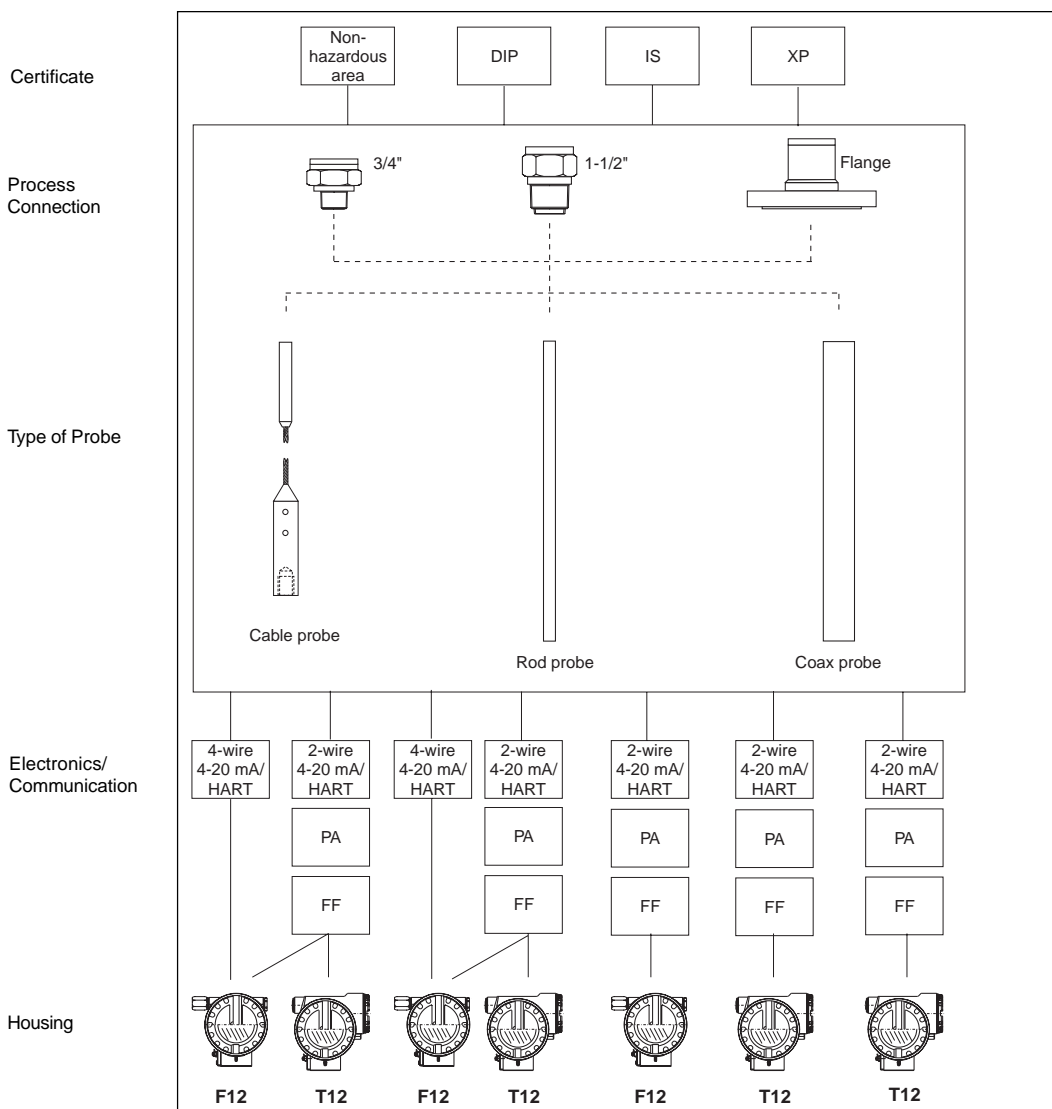
EN 61010: Safety regulations for electrical devices for measurement, control, regulation, and laboratory use

EN 61326: Emissions (equipment class B), compatibility (appendix A-industrial area)

NAMUR: Standards committee for measurement and control in the chemical industry

## Ordering information

### Levellflex M FMP 40 instrument selection guide



## Wetted parts

Cable probes: Process connection and weight, 316L SS. Cable, 316 SS  
Rod probes: Process connection, 316L SS. Rod and coax pipe, 316L SS

For orders with a display, the housing cover is supplied with an inspection glass. For orders without a display, a dummy cover is supplied.

Since the probes are metallic and only insulated in the feedthrough area, there is no danger of static charging and therefore no application restrictions.

## Levellflex M FMP 40

FMP 40 - 1 2 3 4 5 6 7 8 9 10

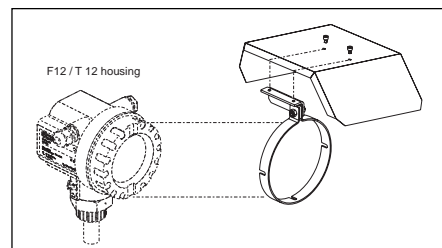
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| <p>1 Certificates</p> <p>A For non-hazardous areas</p> <p>M FM DIP, Class II, Div. 1, Grps. E-G, NI</p> <p>N CSA general purpose</p> <p>P CSA DIP, Class II, Div. 1, Grp. G + coal dust, NI</p> <p>S FM IS, Class I, II, III; Div. 1, Grps. A-G, NI</p> <p>T FM XP, Class I, II, III; Div. 1, Grps. A-G</p> <p>U CSA IS, Class I, II, III; Div. 1, Grps. A-D, G + coal dust, NI</p> <p>V CSA XP, Class I, II, III; Div. 1, Grps. A-D, G + coal dust, NI</p> <p>2 Probe version / material *</p> <p>A 0.16" (4 mm) cable, mainly bulk solids / 316 SS</p> <p>B 0.24" (6 mm) cable, solids / 316 SS</p> <p>K 0.63" (16 mm) rod, mainly liquids / 316L SS</p> <p>L Coax probe, liquids / 316L SS</p> <p>P 0.24" (6 mm) rod probe, liquids / 316L SS</p> <p>3 Probe length</p> <p><i>Cable probes, 40" to 1378" (1000 to 35,000 mm)</i></p> <p>A mm, 4 mm cable, 316 SS</p> <p>B mm, 6 mm cable, 316 SS</p> <p>C inches, 0.16" cable, 316 SS</p> <p>D inches, 0.24" cable, 316 SS</p> <p><i>Rod probes, 12" to 157" (300 to 4000 mm)</i></p> <p>K mm, 16 mm rod, 316L SS</p> <p>L mm, coax probe, 316L SS</p> <p>M inches (0.1"), 16 mm rod, 316L SS</p> <p>N inches, (0.1"), coax probe, 316L SS</p> <p><i>Rod probes, 12" to 80" (300 to 2000 mm)</i></p> <p>P mm, 6 mm rod, 316L SS</p> <p>R inches, (0.1"), 6 mm rod, 316L SS</p> <p>4 O-ring seal</p> <p>2 Viton, -22° to +302°F (-30° to +150°C)</p> <p>3 EPDM, -40° to +248°F (-40° to + 120°C)</p> <p>4 Kalrez, 23° to 302°F (-5° to +150°C)</p> <p>* Rod and cable probes are available in Alloy C22.<br/>In this case, the probe is fixed to the instrument and cannot be dismantled</p> | <p>5 Process connection / Material</p> <p>CNJ 3/4" NPT / 316L SS</p> <p>GNJ 1-1/2" NPT / 316L SS</p> <p>ACJ 1-1/2" Class 150 ANSI B16.5 / 316L SS</p> <p>ADJ 1-1/2" Class 300 ANSI B16.5 / 316L SS</p> <p>AEJ 2" Class 150 ANSI B16.5 / 316L SS</p> <p>AFJ 2" Class 300 ANSI B16.5 / 316L SS</p> <p>ALJ 3" Class 150 ANSI B16.5 / 316L SS</p> <p>AMJ 3" Class 300 ANSI B16.5 / 316L SS</p> <p>APH 4" Class 150 ANSI B16.5 / 316L SS</p> <p>AQJ 4" Class 300 ANSI B16.5 / 316L SS</p> <p>AWJ 6" Class 150 ANSI B16.5 / 316L SS</p> <p>A3J 8" Class 150 ANSI B16.5 / 316L SS</p> <p>DIN and JIS flanges available, consult factory</p> <p>6 Electronics / communication</p> <p>B 2-wire / 4 to 20 mA HART®</p> <p>D 2-wire / PROFIBUS-PA</p> <p>F 2-wire / Foundation Fieldbus</p> <p>G 4-wire, 90 to 250 VAC, 50/60 Hz / 4 to 20 mA HART®</p> <p>H 4-wire, 10.5 to 32 VDC / 4 to 20 mA HART®</p> <p>7 Display</p> <p>1 Without display</p> <p>2 With VU 331 display including on-site operation</p> <p>3 Prepared for FHX 40 remote display, please consult factory for area approvals.</p> <p>8 Remote electronics</p> <p>1 Standard compact unit</p> <p>2 Extension pipe version, 15.7" (400 mm)</p> <p>3 Remote electronics, 9 ft (3 m) cable</p> <p>9 Aluminum housing / cable entry</p> <p>A F 12 / M20 x 1.5</p> <p>B F 12 / G 1/2</p> <p>C F 12 / 1/2" NPT</p> <p>D F 12 / M 12 PROFIBUS-PA plug</p> <p>E F 12 / 7/8" Foundation Fieldbus plug</p> <p>G T 12 / M20 x 1.5</p> <p>H T 12 / G 1/2</p> <p>J T 12 / 1/2" NPT</p> <p>K T 12 / M 12 PROFIBUS-PA plug</p> <p>L T 12 / 7/8" Foundation Fieldbus plug</p> <p>10 Additional options</p> <p>A Additional options not selected</p> <p>B 3.1.B material, wetted parts 316TI SS, inspection certificate EN 10204, according to specification 52005759</p> |
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## Accessories

### Protective cover

A protective cover made of stainless steel is available for outdoor installations. Cover, mounting ring and hardware included.

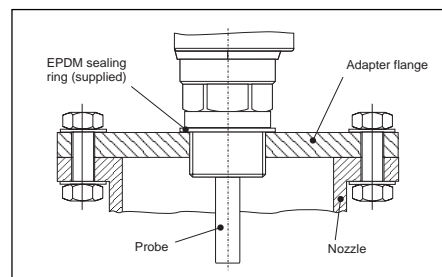
Part Number: 543199-0001



### FAU 70 adapter flange

Adapter flange for the FMP 40 threaded units for mounting on existing nozzles or applications requiring a nozzle mount.

	1	2	3
FAU 70 A -	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 Version			
22	2" ANSI, Class 150		
24	3" ANSI, Class 150		
25	4" ANSI, Class 150		
2 Thread			
5	1-1/2" NPT		
3 Material			
2	317L SS		



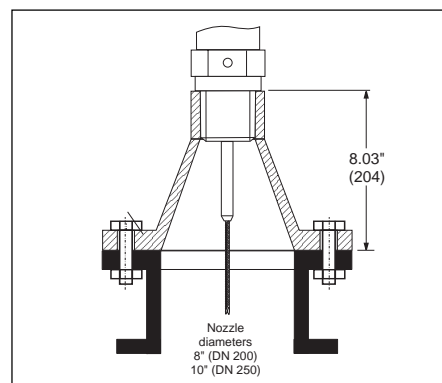
### Horn adapter flange

Horn adapter flange for nozzles  
1-1/2" NPT, 8" nozzle, 150 psi  
Part Number: 52014253

1-1/2" NPT, 10" nozzle, 150 psi  
Part Number: 52014254

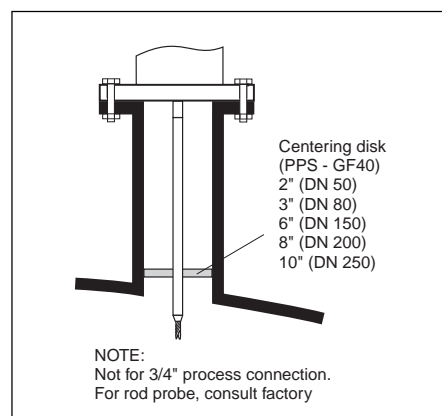
G 1-1/2, DN 200, PN 16  
Part Number: 52014251

G 1-1/2, DN 250, PN 16  
Part Number: 52014252



### HMP 40 centering disk

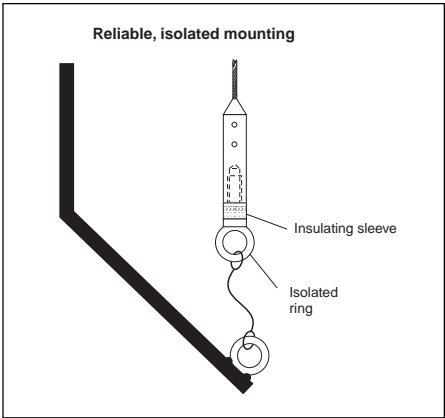
	1	2	3
HMP 40 -	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 Certificate			
A	For non-hazardous areas		
2 Extension rod			
1	4.5" (115 mm) rod for 6" to 10" nozzle		
2	8.5" (215 mm) rod for 10" to 14" nozzle		
3	12.4" (315 mm) rod for 14" to 18" nozzle		
4	16.3" (415 mm) rod for 14" to 22" nozzle		
3 Centering disk			
A	Without disk		
B	1-12", inside dia. 1.5" to 1.7"		
C	2", inside dia. 2" to 2.2"		
D	DN 80, inside diameter 80 to 85 mm		
E	3", inside diameter 2.9" to 3.1", PPS GF40		
G	4", inside diameter 3.9" to 4.3"		
H	6", inside diameter 5.9" to 6.5", PPS GF40		
J	9", inside diameter 7.9" to 8.5"		
K	10", inside diameter 9.9" to 10.6"		



Isolated tie down

For 0.16" (4 mm) cable  
Part Number: 52014249  
For 0.24" (6 mm) cable  
Part Number: 52014250  
If a cable probe has to be fixed and a secure grounded mounting is not possible, we recommend using the insulating sleeve (PEEK-GF30) with SS eye-bolt. Maximum process temperature with insulating sleeve, 300°F (150°C).

**NOTE:** Due to the risk of electrostatic discharge, the insulating sleeve is not suitable for use in hazardous areas.



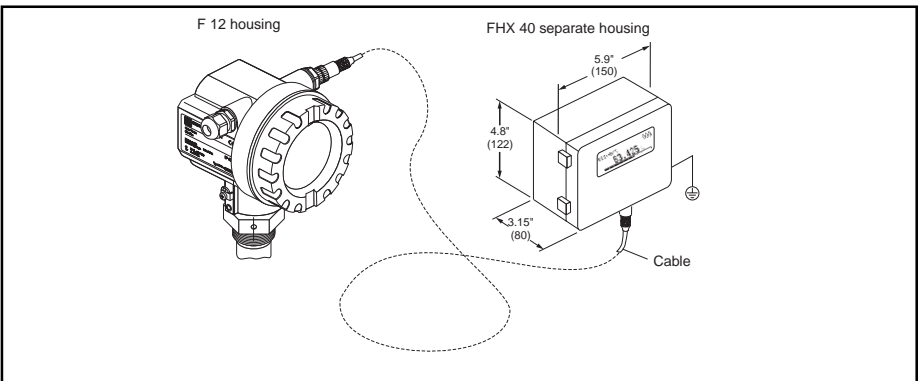
FXA 191 commubox

For intrinsically safe communication between HART® protocol and Personal Computer (refer to page 4). The Levelflex M can be operated either with the ToF Tool or the Commuwin II program. The commubox converts HART® protocol signals into RS 232C signals.  
Additional information is available in Technical Information TI 237F/00/en.

FXA 193 service adapter

For communication with ToF Tool via the display connector (refer to page 5).  
Order No.: 50095566

FHX 40 remote display and operating unit



The FHX 40 provides remote display and operation for the FMP 40 unit. The display unit must be specified when ordering the Levelflex M, it cannot be retrofited due to the preinstallation of the plug connectors. Maximum cable length is 65 feet (20 m).

- Temperature range: -22° to +158°F (-30° to +70°C)
- Protection: NEMA 4 (IP 65)
- Material: Aluminum alloy AL Si 12
- Maximum cable length: 65 ft. (20 m)

**NOTE:** The FMP 40 remote housing is not FM/CSA approved as of this printing. Please consult Endress+Hauser for information.

FHX 40 - 

1	2	3
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- 1 Certificates
  - A For nonhazardous area
  - S FM IS Class I, Div. 1, Grps. A-D (consult factory)
  - U CSA IS Class I, Div. 1, Grps. A-D (consult factory)
  - N CSA General Purpose (consult factory)
- 2 Cable length
  - 1 65 ft (20 m)
- 3 Additional option
  - A Additional option not selected
  - B Mounting bracket, 1" or 2" pipe

## Supplemental documentation

- ☐ 4 to 20 mA HART®, BA 242F/00/en
- ☐ PROFIBUS-PA, BA 243F/00/en
- ☐ Foundation Fieldbus, BA 244F/00/en
- ☐ Instrument Functions Description, BA 245F/00/en

This product may be protected by at least one of the following listed patents.  
Further patents are pending.

- US 5,345,471  $\triangleq$  EP 0 694 235 (under license)
- US 5,517,198 (under license)
- US 5,661,251  $\triangleq$  EP 0 780 664
- US 5,827,985  $\triangleq$  EP 0 780 664
- US 5,884,231  $\triangleq$  EP 0 780 665
- US 5,973,637  $\triangleq$  EP 0 928 974

For application and selection assistance,  
call 888-ENDRESS

For total support of your installed base,  
24 hours a day, call 800-642-8737

Visit us on our web site, [www.us.endress.com](http://www.us.endress.com)

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