



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

Minicap FTC260, FTC262

Capacitive

Compact point level switch with active build-up compensation; No calibration necessary



Applications

The Minicap is designed for point level detection in light bulk solids with a grain size up to max. 30 mm (1.18 in) and a dielectric constant $\epsilon_r \geq 1.6$ e.g. grain products, flour, milk powder, animal feed, cement, chalk or gypsum.

Versions:

- Minicap FTC260:
 - with rod probe for bulk solids and liquids
- Minicap FTC262:
 - with rope probe up to 6 m (20 ft); for bulk solids
- Relay output (potential-free change-over contact / SPDT) with AC or DC power
- PNP output with three-wire DC power

Your Benefits

- Complete unit consisting of the probe and electronic insert:
 - simple mounting
 - no calibration on start-up
- Active build-up compensation
 - accurate switch point
 - high operational safety
- Mechanically rugged
 - no wearing parts
 - long operating life
 - no maintenance
- The rope probe of the Minicap FTC262 can be shortened
 - optimum matching to the measuring point in the silo
 - less stocks required

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Function and system design

Measuring principle

Point Level Detection

A metal plate at the end of the probe, within the insulation, and the integrated counter-electrode together with the surroundings combine to form the two electrodes of a capacitor. If the probe is covered or free of process medium, the capacitance changes and the Minicap switches.

Active Build-up Compensation

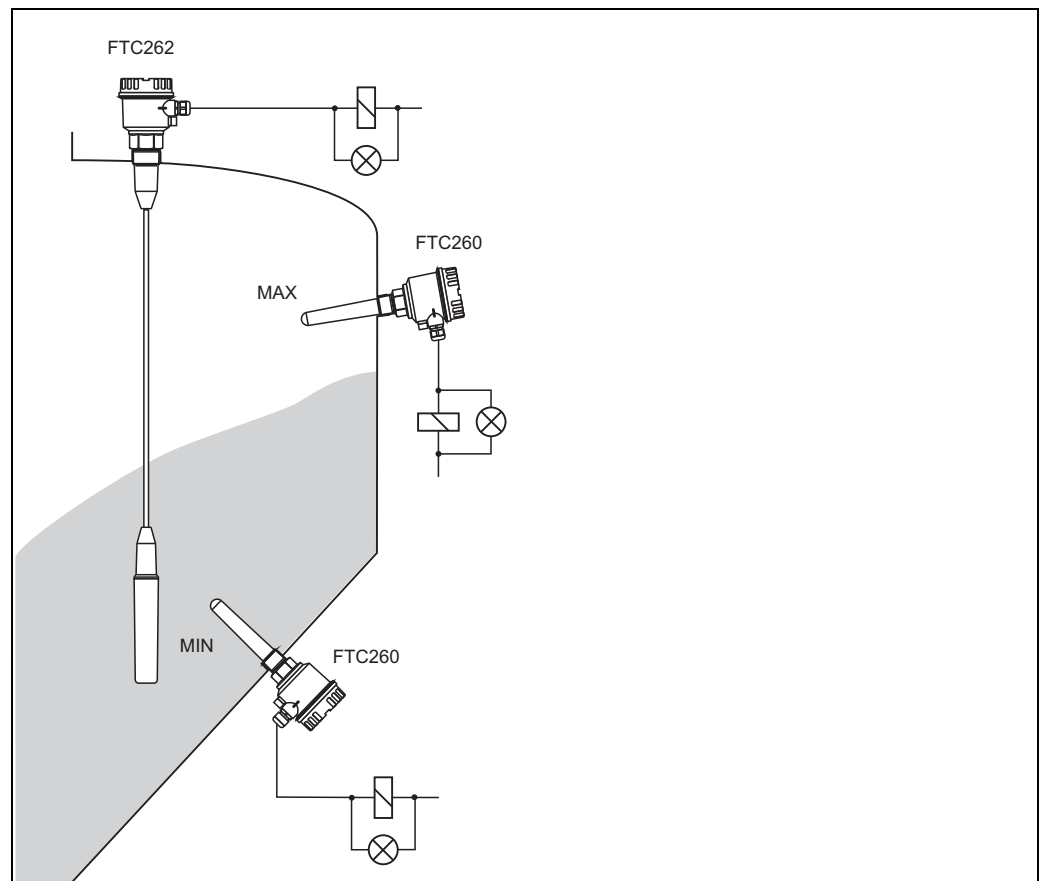
The Minicap detects build-up on the probe and compensates for its effects so that the switch point is always accurate. The effects of build-up compensation depend on:

- the thickness of the build-up on the probe,
- conductivity of the material,
- the sensitivity setting on the electronic insert.

Measuring System

Minicap is an electronic switch. The complete measuring system consists of:

- the Minicap FTC260 or FTC262
- a power supply and
- controllers, switching devices, signal transmitters (e.g. lamps, horns, PCS, PLC, etc.)



Point level detection in silos containing solids

100-FTC26xxx-14-06-xx-xx-001

Function Range

There is a loose relationship between the dielectric constant ϵ_r and the density of the material. The table on the left indicates whether the Minicap can be used or if application limits are exceeded.

Grain, seed, legumes and their products			Minerals, inorganic materials			Plastics		
Examples	ρ in g/l (approx.)	ϵ_r (approx.)	Examples	ρ in g/l (approx.)	ϵ_r (approx.)	Examples	ρ in g/l (approx.)	ϵ_r (approx.)
Rice	770	3.0	Cement	1050	2.2	ABS granulate	630	1.7
Cornstarch (packed)	680	2.6	Plaster	730	1.8	PA granulate	620	1.7
Flour (wheat)	580	2.4	Chalk (packed)*	540	1.6	PE granulate*	560	1.5
Corn grit	500	2.1	Chalk (loose)*	360	1.4	PVC powder*	550	1.4
Sunflower seeds	380	1.9				PU dust*	80	1.1
Noodles	370	1.9						
Bran (wheat)	250	1.7						
Popcorn*	30	1.1						

* Gray background: Application limits not reached => Use Soliphant FTM as point level switch

In general:

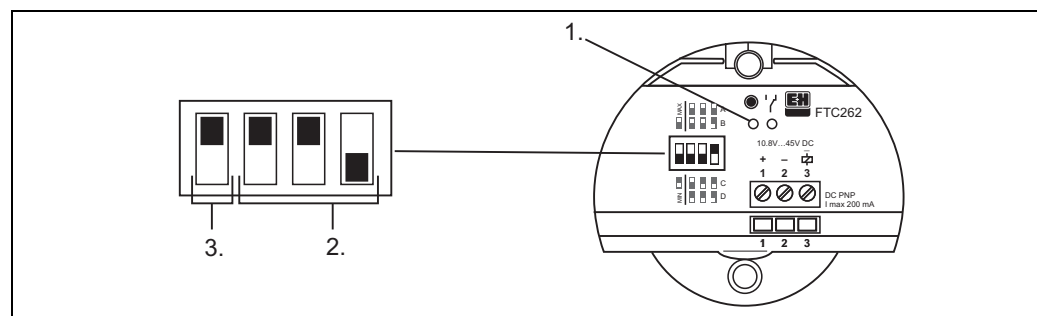
If the dielectric constant is not recognized by the process medium, then the density (apparent weight) of the solid is a deciding factor.

Under normal conditions the Minicap functions in foodstuffs with a density of 250 g/l and above or in plastic or mineral materials with a density of 600 g/l and above.

Setting the Sensitivity

The Minicap is so calibrated at the factory that it correctly switches in most cases.

Greater sensitivity can be set using a multi-pole switch on the electronic insert. This is only necessary, however, if there is very strong build-up on the probe, or if the dielectric constant of the material ϵ_r is very small.



The switch positions show the factory settings:

- 1 LEDs
- 2 Switch for setting sensitivity
- 3 Switch for selecting safety position

Minimum/Maximum Fail-Safe Mode


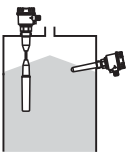
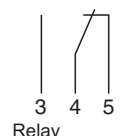
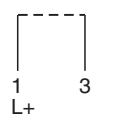


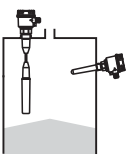
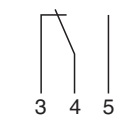
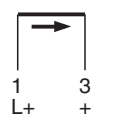



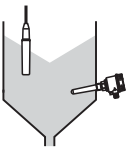
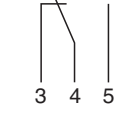
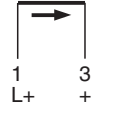


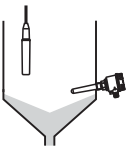
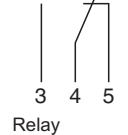
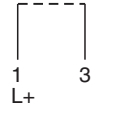


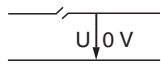
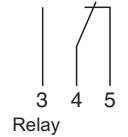
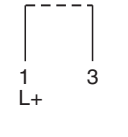


The Minicap FTC260 can be set to minimum or maximum fail-safe mode (see following table).

*AC or DC version with relay output
(potential-free change-over contact):*

- Maximum fail-safe mode:
The relay is de-energised when the probe is covered or the power supply fails.
- Minimum fail-safe mode:
The relay is de-energised when the probe is free or the power supply fails.

DC version with PNP output:

- Maximum fail-safe mode:
The switch output is blocked when the probe is covered or the power supply fails.
- Minimum fail-safe mode:
The switch output is blocked when the probe is free or the power supply fails.

Switch position	Level	Relay output SPDT	Transistor output PNP	Red LED for switching status	Green LED for stand-by
 Maximum fail-safe mode	 Probe covered	 Relay de-energised	 blocked		
	 Probe free	 Relay energised	 connected		
 Minimum fail-safe mode	 Probe covered	 Relay energised	 connected		
	 Probe free	 Relay de-energised	 blocked		
 Power failure		 Relay de-energised	 blocked		

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Selecting the switch position and function

Input

Measured variable Point level

Measuring range

- FTC260: $\varepsilon_T \geq 1.6$
- FTC262: $\varepsilon_T \geq 1.5$

Output

Output signal

- DC, PNP transistor output:
Switching: PNP
 I_{\max} 200 mA
– overload and short circuit protection
– residual voltage at transistor
at $I_{\max} < 2.9$ V
- AC / DC, Relay output:
Contact: change-over,
potential-free
 $U_{\sim \max}$ 253 V, $I_{\sim \max}$ 4 A (AC)
 $P_{\sim \max}$ 1000 VA, $\cos \varphi = 1$
 $P_{\sim \max}$ 500 VA, $\cos \varphi > 0.7$
 $I_{\rightleftharpoons \max}$ 4 A up to U_{\rightleftharpoons} 30 V (DC)
 $I_{\rightleftharpoons \max}$ 0.2 A up to U_{\rightleftharpoons} 253 V (DC)

Signal on alarm

- DC, PNP transistor output: $< 100 \mu\text{A}$
- AC / DC, Relay output: relay de-energised

Switching delay when free or covered

- FTC260: 0.5 s
- FTC262: 0.8 s

Overvoltage category Category III (EN 61010)

Protection class Protection class to EN 61010-1

- FTC260: Class II
- FTC262: Class I

Power supply

Electrical connection

To ensure that the Minicap operates safely and without electrical interference, it must be connected to an earthed silo with metal or reinforced concrete walls.

For silos made of non-conductive materials, the external earth wire of the Minicap must be connected to a conductive and earthed component which is earthed near to the silo. The protective earth can be connected to the internal earth terminal of the Minicap.

Connections can be made with standard instrument cabling.

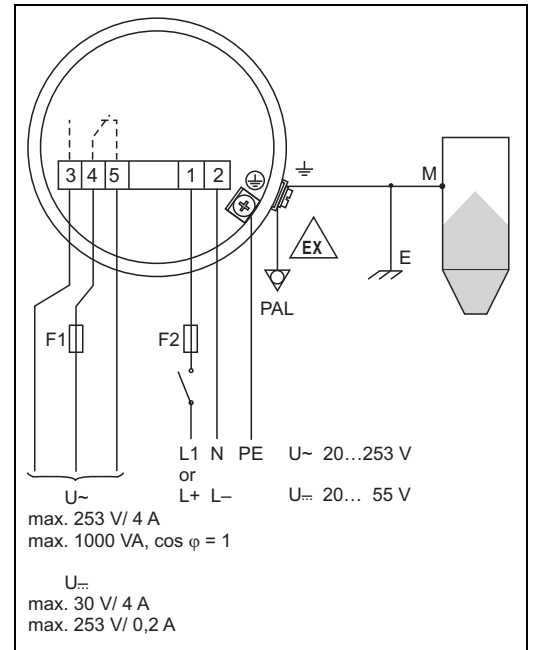
See TI241F/00/EN for information on EMC (testing procedures, installation).

Connect the potential matching lead (PAL) when using in dust explosion hazardous areas.

Note national regulations!

Minicap AC or DC connection and relay output

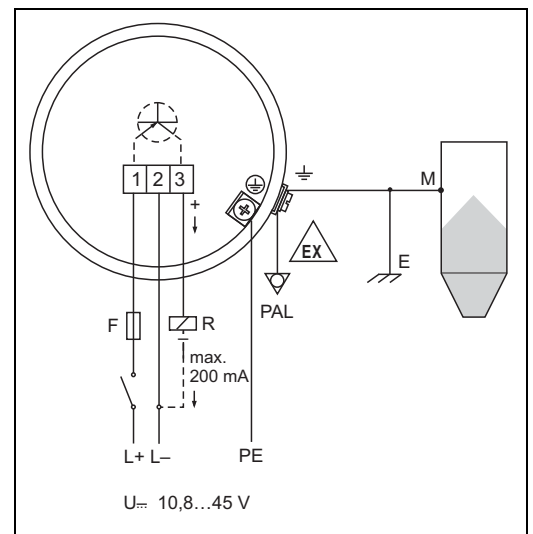
- F1: Fine-wire fuse to protect the relay contact, dependent on the connected load
- F2: Fine-wire fuse, 500 mA
- M: Earth connection to silo or metal components on silo
- E: Earth



No ground lines (PE) or potential matching lines (PAL) are required with Minicap FTC260.

Minicap with three-cable DC connection; Transistor output PNP

- F: Fine-wire fuse, 500 mA
- R: Connected load, e.g. PLC, PCS, relay
- M: Earth connection to silo or metal components on silo
- E: Earth



Minicap is protected against reverse polarity. The green LED for standby goes out if the connections are reversed.

No ground lines (PE) or potential matching lines (PAL) are required with Minicap FTC260.

Supply voltage

- DC, PNP transistor output:
 - U= 10.8...45 V
 - transient pulses to 55 V
 - current consumption max. 30 mA
 - reverse polarity protected
- AC / DC, Relay output:
 - U~ 20...253 V
 - or U= 20...55 V
 - current consumption max. 130 mA


Terminal compartment

- Stranded wires max. 1.5 mm² (16 AWG) in end sleeves
- Electric wire max. 2.5 mm² (14 AWG)

Performance characteristics

Reference operating conditions	<p>In plastic container:</p> <ul style="list-style-type: none"> ■ Ambient temperature: 23 °C (73 °F) ■ Medium temperature: 23 °C (73 °F) ■ Medium pressure p_g: 0 bar (0 psi) ■ Medium: dielectric constant $\epsilon_r = 2.6$ ■ Conductivity: $<1 \mu\text{S}$ ■ Sensitivity setting: C
Hysteresis	<ul style="list-style-type: none"> ■ FTC260: 4 mm (0.16 in) horizontal, 7 mm (0.28 in) vertical ■ FTC262: 5 mm (0.2 in) vertical
Switch point	<ul style="list-style-type: none"> ■ FTC260: Probe center -5 mm (-0.2 in) horizontal, above probe tip 40 mm (1.57 in) vertical ■ FTC262: Above probe tip: 35 mm (1.38 in) vertical
Power up response	<ul style="list-style-type: none"> ■ FTC260: Correct switching after max. 1.5 s ■ FTC262: Correct switching after max. 2 s
Long-term drift	<ul style="list-style-type: none"> ■ FTC260: 3 mm (0.12 in) horizontal, 6 mm (0.24 in) vertical ■ FTC262: Vertical 6 mm (0.24 in)
Influence of medium temperature	Depending on material to be measured

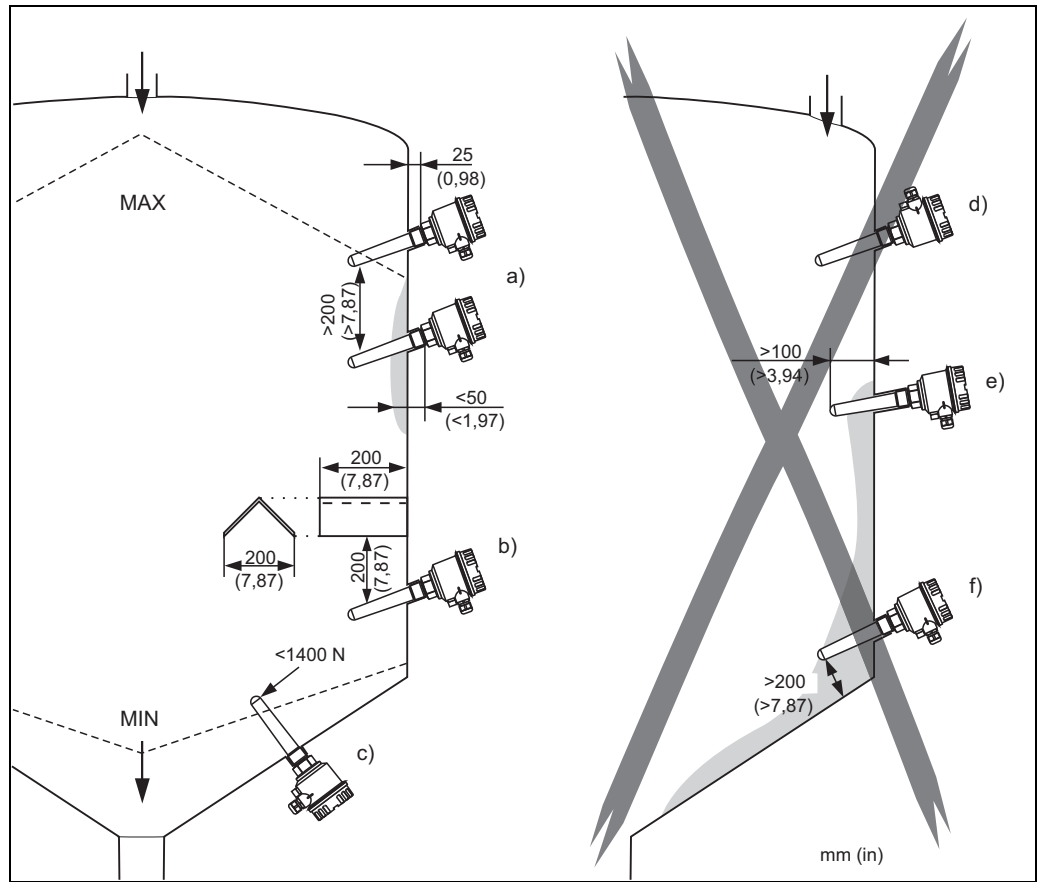
Operating conditions

Installation	<p>Silo Material</p> <p>The Minicap can be used in a range of silos made of different materials.</p> <p>Mounting Point</p> <p>Note the angle of the material mounds and the outlet funnel when determining the mounting point or probe length of the FTC262.</p> <p> Note! The material flow must not be directed at the probe!</p>
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**Installation instructions
FTC260**

Correct Installation

Incorrect Installation



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General information and recommendations for installing a Minicap FTC260 point level switch

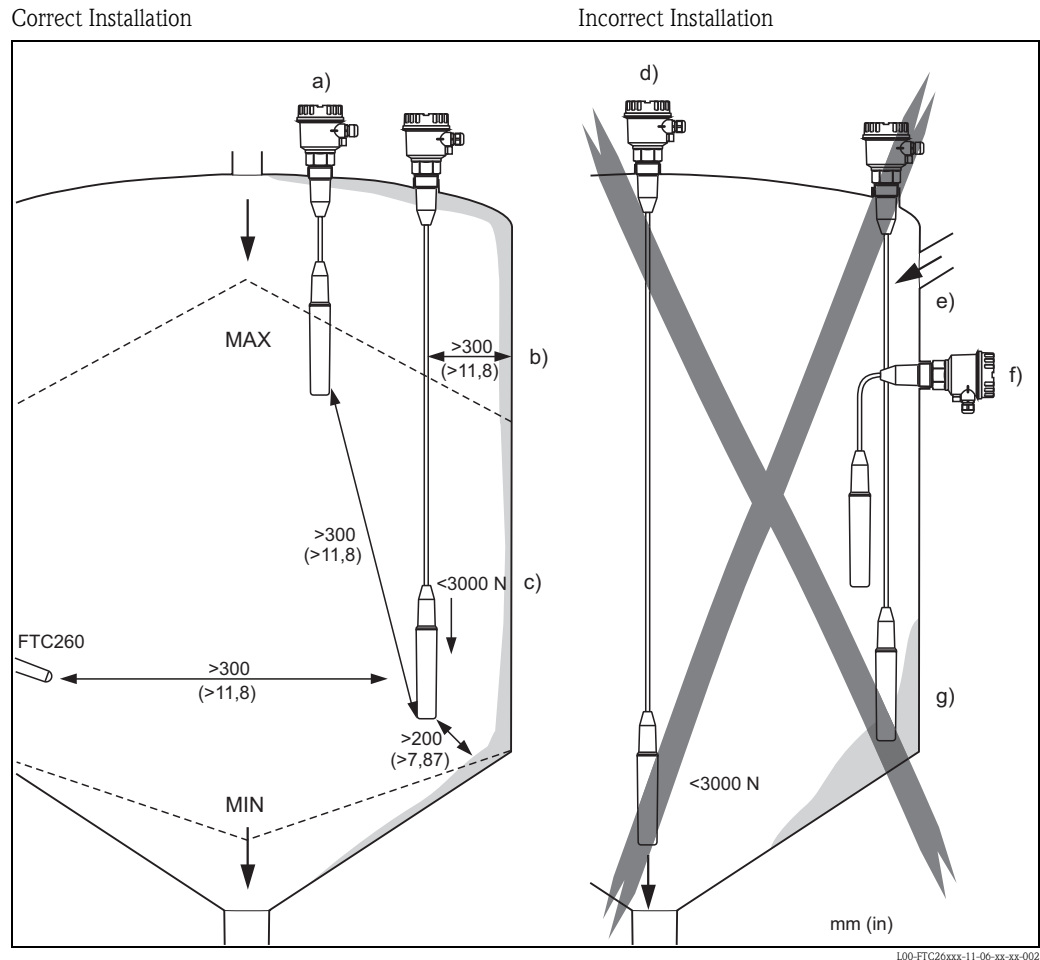
Correct Installation

- a. Minimum distances:
To prevent mutual interference with the FTC260, there must be a minimum distance of 200 mm (7.87 in) between two probe tips.
- b. Mounting point:
Tip of probe points slightly downwards so that process medium can slide off more easily.
The protective cover protects the probe rod from collapsing mounds or mechanical strain at the outflow when the Minicap FTC260 is set to minimum detection.
- c. Mechanical load:
The maximum lateral load on the probe rode must be taken into account when used for minimum detection. It should therefore only be used for minimum detection with loose materials that have good flow characteristics.

Incorrect Installation

- d. The probe may be damaged by inflowing material and cause faulty switching. Cable gland pointed upwards can allow moisture to enter.
- e. Threaded socket too long with material build-up on the silo wall. (Minimum mounting depth 100 mm (3.94 in) not reached).
- f. Mounted near build-up in the silo.
The probe tip is too near to a silo wall (less than a minimum distance of 200 mm (7.87 in)).

Installation instructions FTC262



General notes and recommendations for installing a Minicap FTC262 point level switch

Correct Installation

- Minimum distances:
Sufficient distance from the material filling curtain and the other probe.
- Mounting point:
Do not install in the centre of the outlet cone. Ensure there is sufficient distance from the silo wall and from material build-up on the wall.
- Mechanical load:
Note the tensile strain on the probe rope and the strength of the silo roof when used for minimum detection.
Very high tensile forces may occur at the material outlet especially with heavy, powdery bulk materials which tend to form build-up. These forces are significantly greater over the outlet than at the silo wall.
For minimum detection Minicap FTC262 should only be used for light, easily flowing solids, and that do not tend to form build-up.

Incorrect Installation

- In the centre of the material outflow; the high tensile forces at this point may tear off the probe or damage the silo roof.
- The probe may be damaged by inflowing material
- Mounted laterally
- Too near silo wall; when swinging gently the probe can hit the wall or touch any build-up which may have formed. This can result in error switching

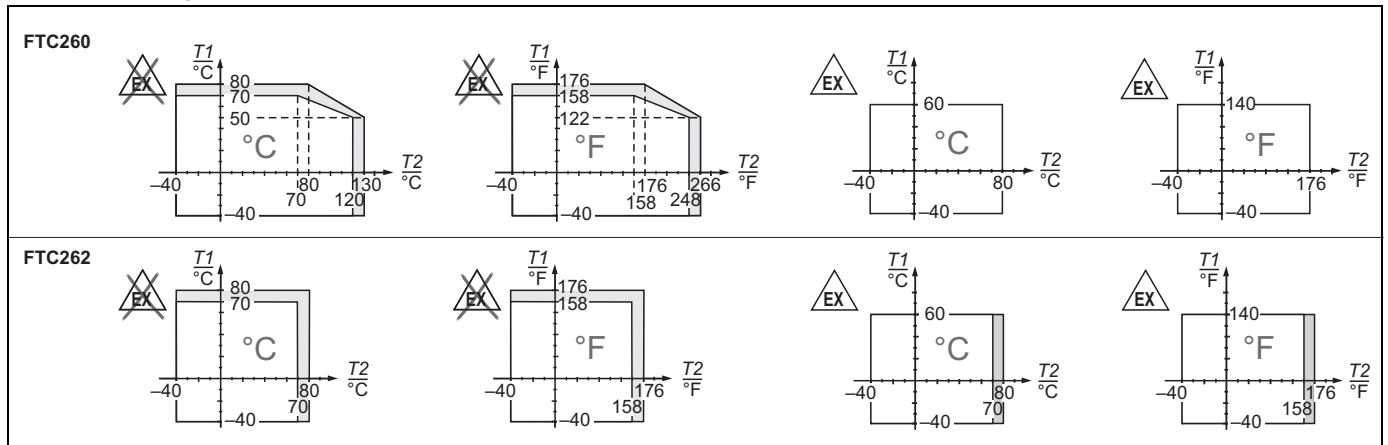
Environment

Ambient temperature range <i>T1</i>	-40 to +70 °C (-40 to +158 °F) For Dust-Ex version: -40 to +60 °C (-40 to +140 °F)
Ambient temperature limits	-40 to +80 °C (-40 to +176 °F) For Dust-Ex version: -40 to +60 °C (-40 to +140 °F)
Storage temperature	-40 to +80 °C (-40 to +176 °F)
Climate class	IEC 68 part 2-38
Degree of protection	IP66; NEMA 4X
Shock resistance	Probe: 7 J
Vibrational resistance	EN 60068-2-64 (IEC 68-2-64), 20...2000 Hz, spectral rate of velocity 0.5, 100 min per axis
Electromagnetic compatibility	Interference Emission to EN 61326, Electrical Equipment Class B Interference Immunity to EN 61326, Annex A (Industrial) and NAMUR Recommendation NE 21 (EMC) See TI241F/00/EN for general instructions regarding the EMC test conditions for E+H instruments.
Operating height	Up to 2000 m (6600 ft) above mean sea level. Extendable up to 3000 m (9800 ft) above mean sea level if overvoltage protection is used, for example HAW562 or HAW569 from Endress+Hauser.

Process

Process temperature range <i>T2</i>	<ul style="list-style-type: none"> ■ FTC260: -40 to +120 °C (-40 to +248 °F) For Dust-Ex version: -40 to +80 °C (-40 to +176 °F) ■ FTC262: -40...+70 °C (-40...+160 °F)
Process temperature limits	<ul style="list-style-type: none"> ■ FTC260: -40 to +130 °C (-40 to +266 °F) For Dust-Ex version: -40 to +80 °C (-40 to +176 °F) ■ FTC262: -40 to +80 °C (-40 to +176 °F)
Process pressure range <i>p_e</i>	<ul style="list-style-type: none"> ■ FTC260: -1 to +25 bar (-14.5 to +362.5 psi) ■ FTC262: -1 to +6 bar (-14.5 to +362.5 psi)

Temperature diagrams

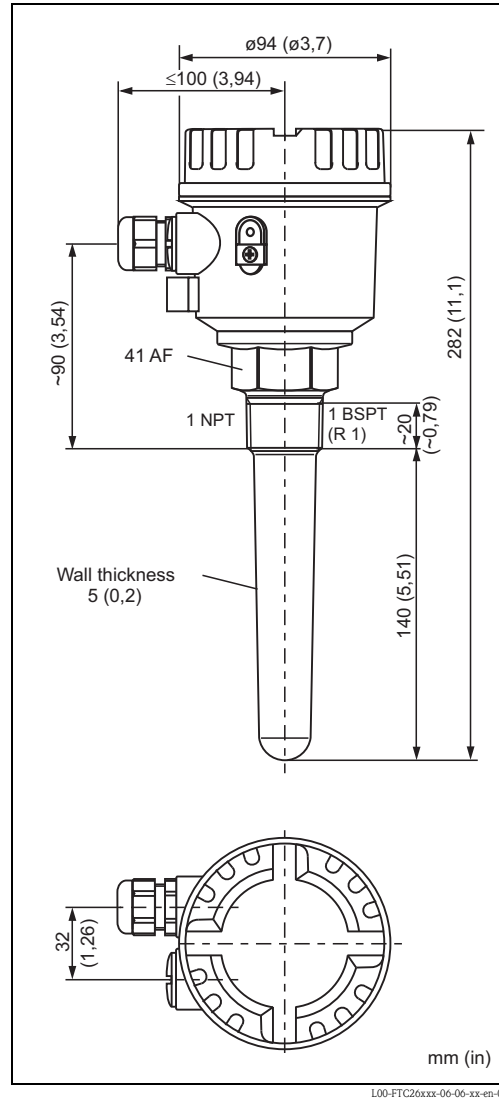


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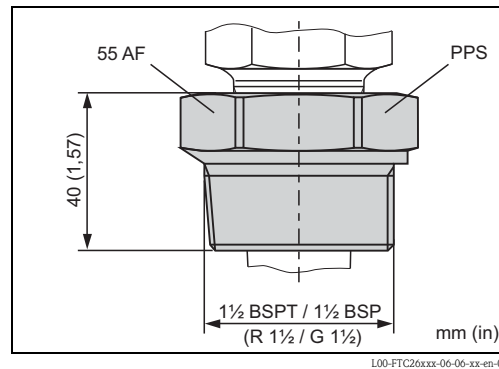
Mechanical construction

Design and dimensions

Minicap FTC260



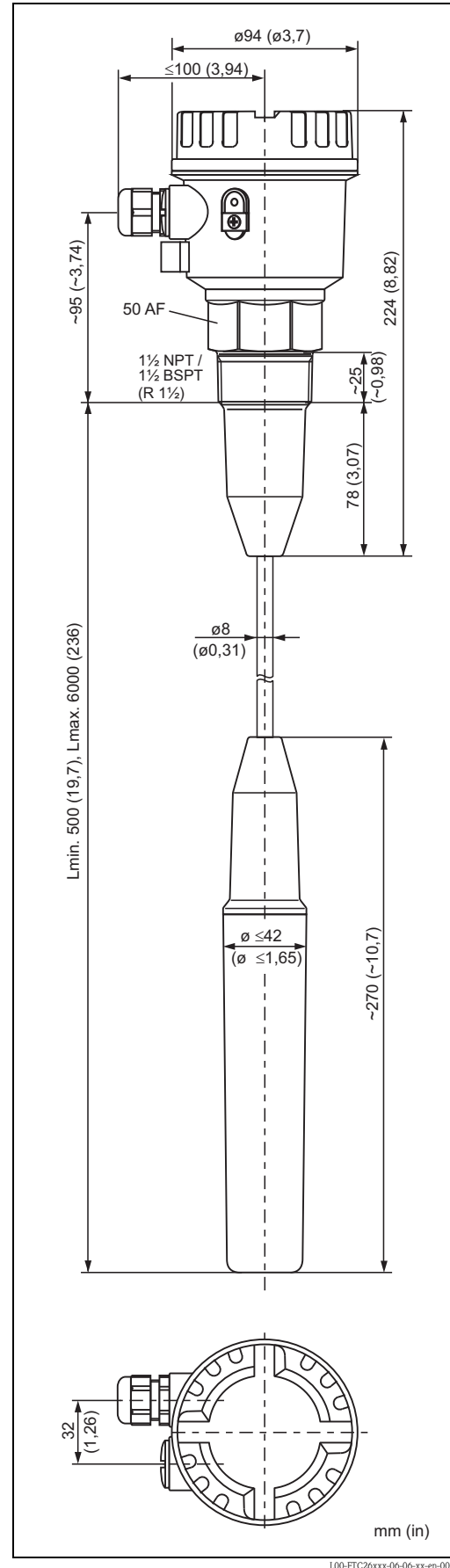
Adapter for FTC260



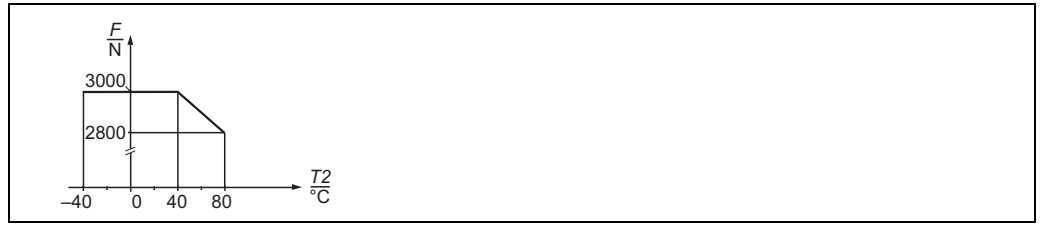
Probe length tolerances:

Probe length L	Tolerances
up to 1000 (39.4)	+0/-10 (+0/-0.39)
up to 3000 (118)	+0/-20 (+0/-0.79)
up to 6000 (236)	+0/-30 (+0/-1.18)

Minicap FTC262



- Material for wetted parts**
- Probe rod FTC260: PPS = Polyphenylene sulphide (glass fibre content approx. 40%), FDA listed
 - Probe length:
 FTC260: 140 mm (5.51 in),
 FTC262: min. 500 mm (19.7 in), max. 6000 mm (236 in)
 - Probe rope FTC262: Surface in High Density PE over steel coating
 - Other probe parts FTC262: PPS = Polyphenylene sulphide (glass fibre content approx. 40 %)



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- Process connections**
- Threaded boss:
- FTC260: – R 1, ISO 7/1 (DIN 2999), BSPT; Adapter for R 1½ and G 1½ → "Accessories" → 14
 – 1 NPT, ANSI B 1.20.1; Adapter for 1¼ NPT → "Accessories" → 14
 - FTC262: – 1½ BSPT (R 1½, ISO 7/1)
 – 1½ NPT, ANSI B 1.20.1

Housing Housing F14: Polyester PBT-FR, IP66

Human interface


- Display elements**
- Green LED: stand-by
 - Red LED: switch status

- Operating elements**
- Switch on electronic insert
- switching between minimum and maximum fail-safe mode
 - Sensitivity setting (depending on dielectric constant ϵ_r and buildup).
 It is usually not necessary to adjust the sensitivity (see "Measuring principle" section → 3)

Certificates and approvals

CE approval The device complies with the legal requirements of the EU directives.
 In attaching the CE Mark, Endress+Hauser confirms that the device conforms to all relevant EU directives.

Ex approval ATEX, FM, CSA

 Note!
 For applications in dust-explosion atmospheres: Protect housing from impact!

Overspill protection FTC260 DIBt, General design approval

Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select instrument → Product page function: Configure this product
- From your Endress+Hauser Sales Center: www.endress.com/worldwide



Note! Product Configurator - the tool for individual product configuration

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

Accessories

Adapter	<ul style="list-style-type: none"> ■ FTC260, 1 BSPT female (R_c1), ISO 7/1 (see dimensional sketch): Part No.: 943215-1001, for 1½ BSPT (R 1½ ISO 7/1), PPS Part No.: 943215-1021, for 1½ BSP (G 1½ DIN ISO228), PPS ■ FTC260, 1 NPT female: Part No.: 943215-0042, for 1¼ NPT, steel Part No.: 943215-0043, for 1¼ NPT, AISI 316Ti (1.4571)
Transparent cover	Part No.: 943201-1001
Rope shortening set for FTC262	Part No.: 52005918

Supplementary documentation

Operating manual (BA)	<ul style="list-style-type: none"> ■ Minicap FTC260 KA093F/00/A6 017476-0000 ■ Minicap FTC262 KA155F/00/A6 52005985 ■ Rope shortening set for FTC262 KA157F/00/A6 52005986
Safety instructions (XA)	<ul style="list-style-type: none"> ■ Safety instructions (ATEX) for FTC260 XA011F/00/a3 CE II 1/3 D 52000928 ■ Safety instructions (ATEX) for FTC262 XA092F/00/A3 CE II 1/3 D 52005988

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