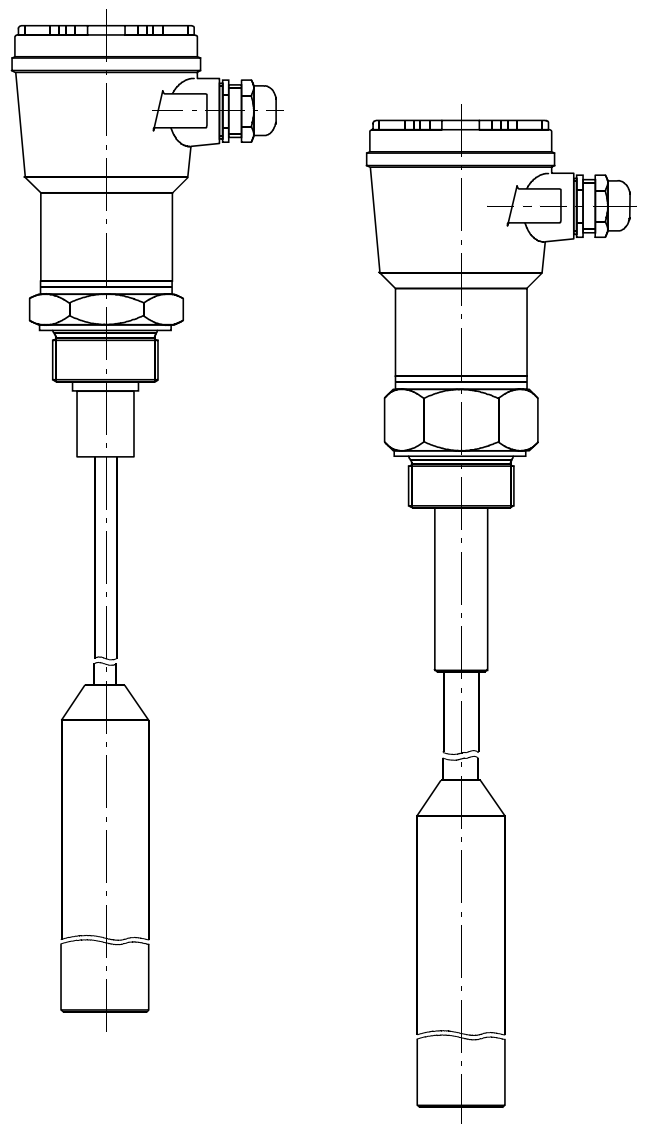
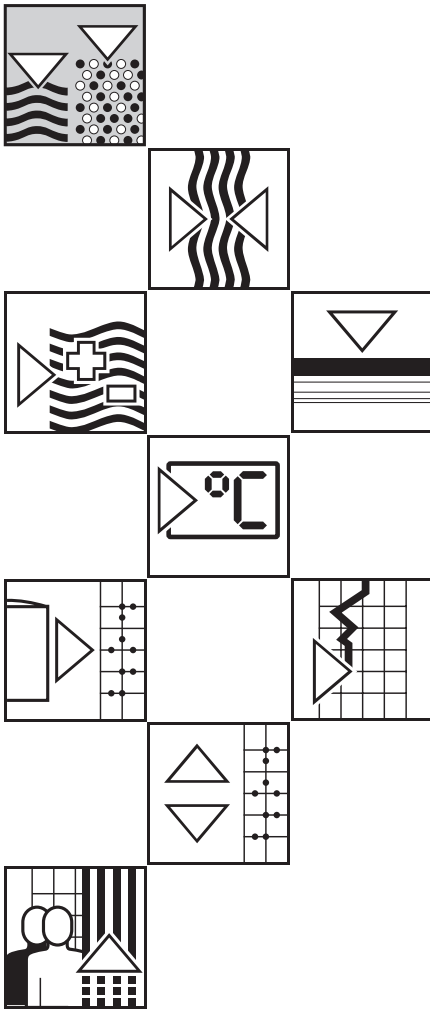


nivocompact FTC 231/331 Level Limit Switch

Installation and Operating Manual



Endress + Hauser

The Power of Know How



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Application

The Nivocompact FTC 231/331 is used for limit detection in silos containing bulk solids (for minimum or maximum level indication).

- FTC 231 with rope probe \varnothing 10 mm, for mounting from above.
Mainly for maximum detection.
For minimum detection with light bulk solids.
- FTC 331 with rope probe \varnothing 16 mm, for mounting from above.
For maximum and minimum detection with heavy bulk solids.

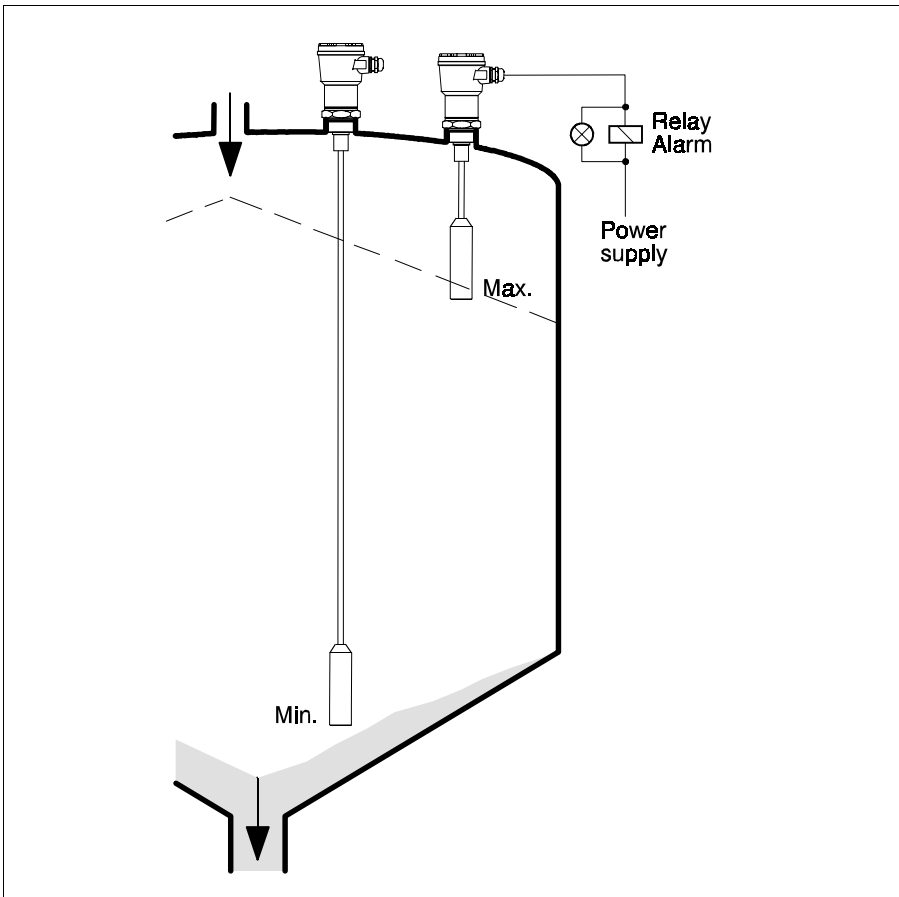


Fig. 1
Level limit detection in bulk solid silos with the capacitive level limit switch Nivocompact FTC 231 or FTC 331.

Application Examples

Sand	Glass aggregate	Gravel	Moulding sand
Lime	Ore, crushed	Plaster	Aluminium shavings
Cement	Grain	Pumice	Flour
Dolomite	Kaolin	Fodder	Sugar beet chips

and similar bulk solids

Note:
Bulk solids should have dielectric constants $\epsilon_r \geq 2.5$

Please contact us for advice if the dielectric constant of the bulk solid is not known.

Technical Data

Operating Data

Nivocompact	FTC 231	FTC 331
Operating temperature in silo	-20 °C...+80 °C	-20 °C...+60 °C
Operating pressure p_e	atmospheric	atmospheric
Max. permissible load on probe	30 kN vertical	80 kN vertical
Minimum dielectric constant ϵ_r of material	2.5	2.5
Ambient temperature for housing	-20 °C...+60 °C	-20 °C...+60 °C
Storage temperature	-40 °C...+85 °C	-40 °C...+85 °C

Probes

Nivocompact	FTC 231	FTC 331
Material	Steel rope	Steel rope
Probe diameter	10 mm	16 mm
Insulation	PA	PVC
Thickness of insulation	1 mm	2 mm
Electrical connection to bulk solid	Steel rope connected to cast iron weight	

Process Connections

- Parallel thread: G 1¹/₂ A acc. to DIN ISO 228/1
- Tapered thread: NPT 1¹/₂" acc. to ANSI B 1.20.1
- Material: steel or stainless steel 1.4571

Probe Length Tolerances

Probe length	Tolerance
to 1 m	+0 mm, - 5 mm
to 3 m	+0 mm, -10 mm
to 6 m	+0 mm, -20 mm
to 22 m	+0 mm, -30 mm

Housing Versions

- Aluminium housing, IP 55
- Aluminium housing, IP 66
- Aluminium housing with synthetic coating, IP 66
- Synthetic housing in PBTP, IP 66
(Protection IP... acc. to DIN 40050)

Cable Gland

- Housing IP 55: standard PG in nickel-plated brass with NBR gasket for cable diameter 7...10 mm
- Housing IP 66: water-tight PG in polyamide with Neoprene-CR gasket for cable diameter 5...12 mm

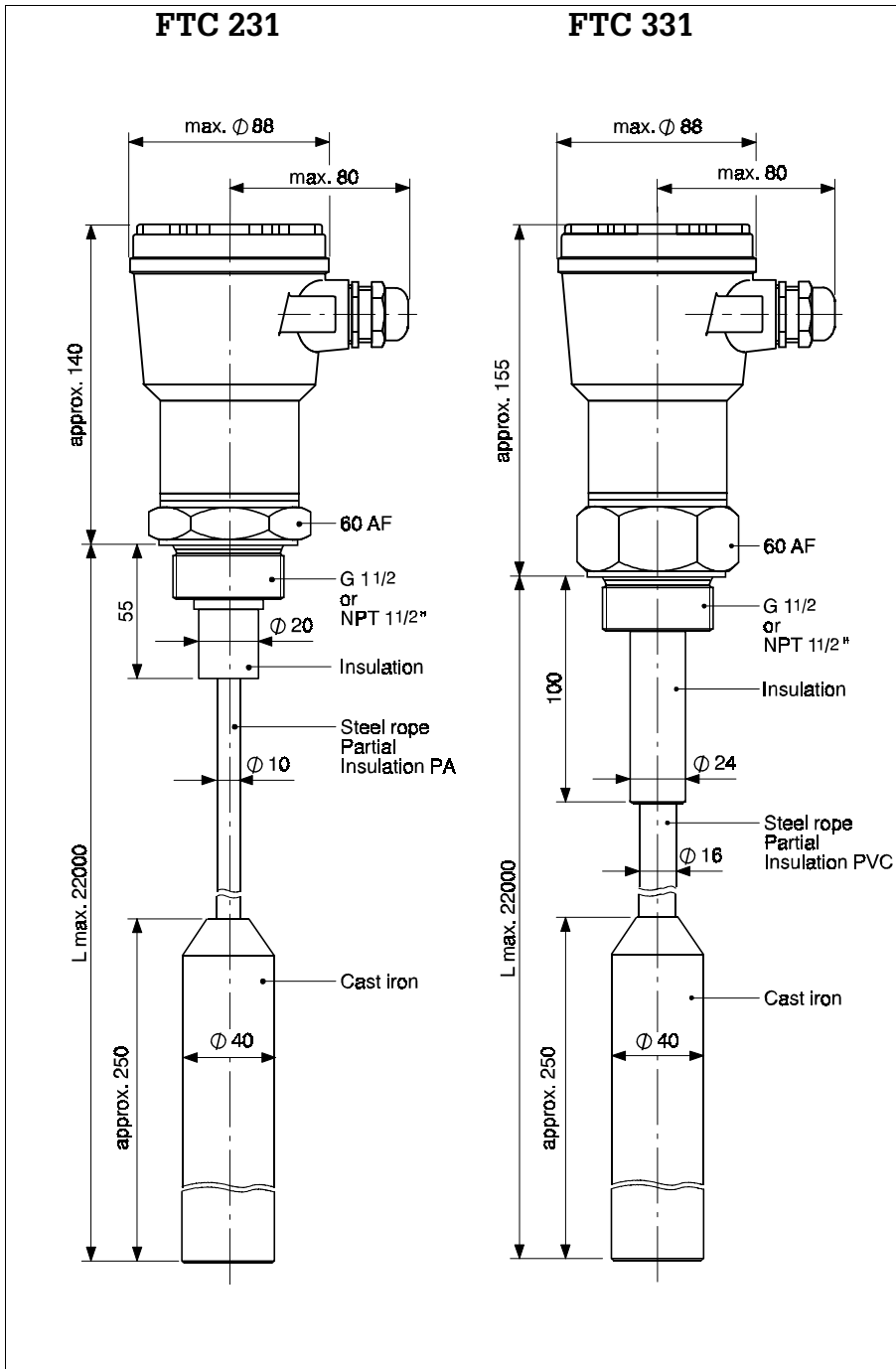


Fig. 2
Dimensions Nivocompact
FTC 231, FTC 331.

Electronic Inserts

- Terminal Connections: for max. 2.5 mm²
- Measuring frequency: approx. 750 kHz for short probes up to 4 m, switchable to approx. 450 kHz for long probes
- Initial capacitance, adjustable: to approx. 400 pF
- Switching delay: approx. 0.5 s
- Minimum/maximum fail-safe switching: selectable with rotary switch
- Switching indication: red LED

**Electronic Insert EC 20
for AC Voltage
(Two-Wire Connection)**

- Power supply U_~: 21 V...250 V, 50/60 Hz
- Connected loads, short-term (max. 40 ms): max. 1.5 A;
max. 375 VA at 250 V;
max. 36 VA at 24 V
- Maximum voltage drop: 11 V
- Connected loads, continuous: max. 350 mA;
max. 87 VA at 250 V;
max. 8.4 VA at 24 V
- Minimum load current at 250 V: 10 mA (2.5 VA)
- Minimum load current at 24 V: 20 mA (0.5 VA)
- No-load current (eff.): < 5 mA

**Electronic Inserts
EC 22 and EC 23
for DC Voltage
(Three-Wire Connection)**

- Power supply U =: 10 V...55 V
- Superimposed AC voltage U_{pp}: max. 5 V
- Current consumption: max. 15 mA
- Load connection: Open Collector; PNP (EC 22) or NPN (EC 23)
- Switching voltage: max. 55 V
- Connected load, short-term (max. 1 s): max. 1 A
- Connected load, continuous: max. 350 mA
- Residual current with transistor blocked: < 100 µA
- Protected against reverse polarity

**Electronic Insert EC 24
for DC and AC Voltages
(Relay Output)**

- Power supply U =: 20 V...200 V
or
Power supply U_~: 21 V...250 V, 50/60 Hz
- Current consumption (eff.): max. 5 mA
- Peak inrush current: max. 200 mA, max. 5ms
- Pulse current: max. 50 mA, max. 5 ms
- Pulse frequency: approx. 1.5 s
- Output: potential-free change-over contact
- Contact load capacity:
U_~ max. 250 V, I_~ max. 6 A,
P_~ max. 1500 VA (cosφ = 1) or P_~ max. 750 VA, cosφ ≥ 0.7
U = max. 250 V, I = max. 6 A, P = max. 200 W
- Operating life: min. 10⁵ switchings at max. contact load
- Additional switching delay: max. 1.5 s

EMC

- Electromagnetic Compatibility:
Interference Emission to EN 61326, Electrical Equipment Class A
Interference Immunity to EN 61326

Type Key

See Page 13 for order specification key and order code.

Subject to modification.

- Gasket for thread G 1 1/2 A:
elastomer/fibre (asbestos-free), supplied
- Protective sun cover for aluminium housing
Material: polyamide

Accessories

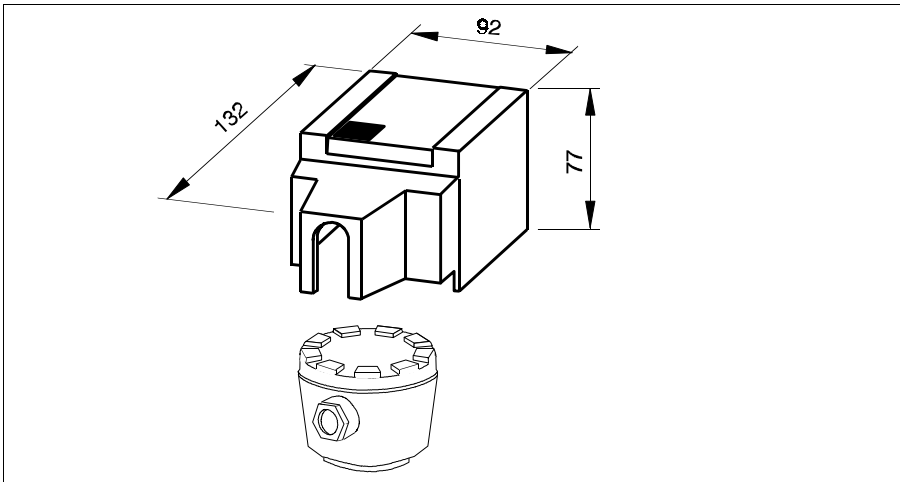


Fig. 3
Dimensions of protective sun cover
(accessory)
This cover prevents condensation in the
housing.

- Butterfly weight for FTC 231 or FTC 331
Material: steel, weight: approx. 3.2 kg

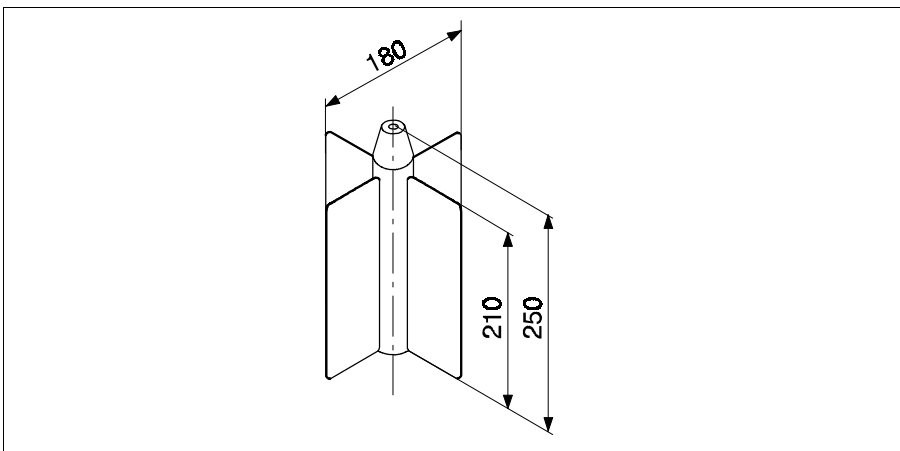


Fig. 4
Dimensions of butterfly weight (accessory).
This weight increases the capacitance
difference for rope probes.

The Measuring System

The Nivocompact is an electronic switch.
The entire measuring system consists of:

- Nivocompact FTC...
- power supply and
- connected control systems, switches, signal transmitters (e.g. process control systems, PLC, relays, microcontactors, lamps, sirens etc.)

Function

The rope probe with weight and silo wall form the two electrodes of a capacitor, with a high frequency voltage between them.

The limit value is based on the principle of a discharge circuit:

As long as the probe is in air with a dielectric constant of $\epsilon_r=1$, then the discharge time constant is $\tau = R \times C_A$ where R is the resistance of the circuit and C_A the capacitance of the capacitor formed by the probe and silo wall. If bulk material with a higher dielectric constant moves into the electrical field between the probe and silo wall, then the capacitance C_A increases and with it the time constant τ .

The change in the time constant is evaluated and the Nivocompact is activated according to its switching mode.

The Nivocompact is extremely insensitive to build-up on the probe and silo wall as long as the material does not form a bridge between the probe and silo roof (e.g. on the threaded boss).

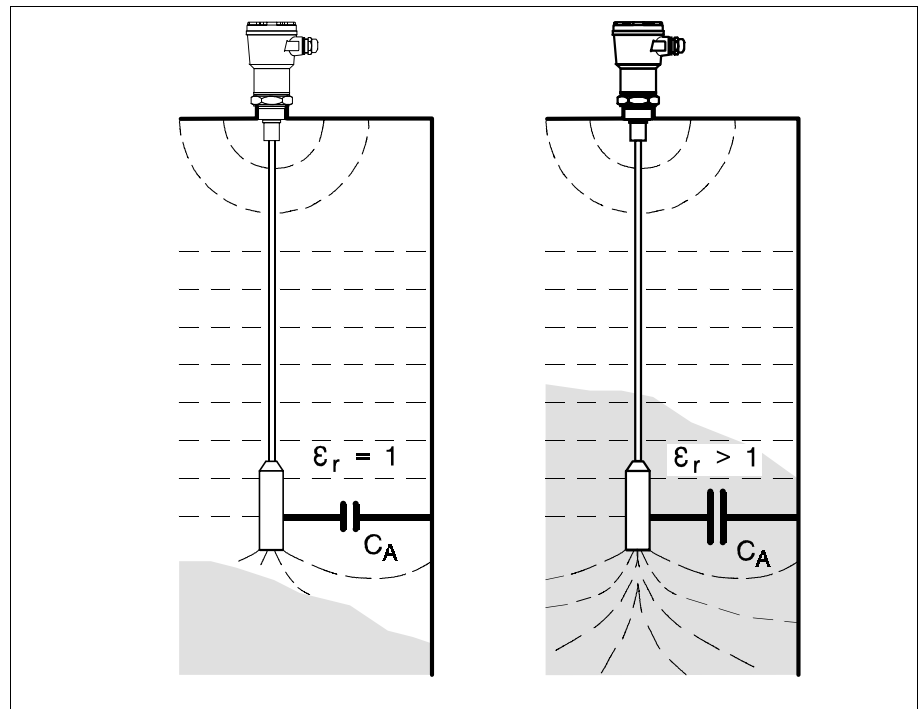


Fig. 5
The capacitor consisting of the silo wall and probe.

The built-in feature for minimum/maximum fail-safe switching allows the Nivocompact to be used in all applications requiring high operational safety:

Maximum Fail-Safe: The current circuit is blocked if the probe is covered or the power supply fails.

Minimum Fail-Safe: The current circuit is blocked if the probe is uncovered or the power supply fails.

A red LED on the electronic insert indicates switching status.

See also Fig. 24 in Section »Fail-Safe Switching«, Page 24.

Installation

Project Planning

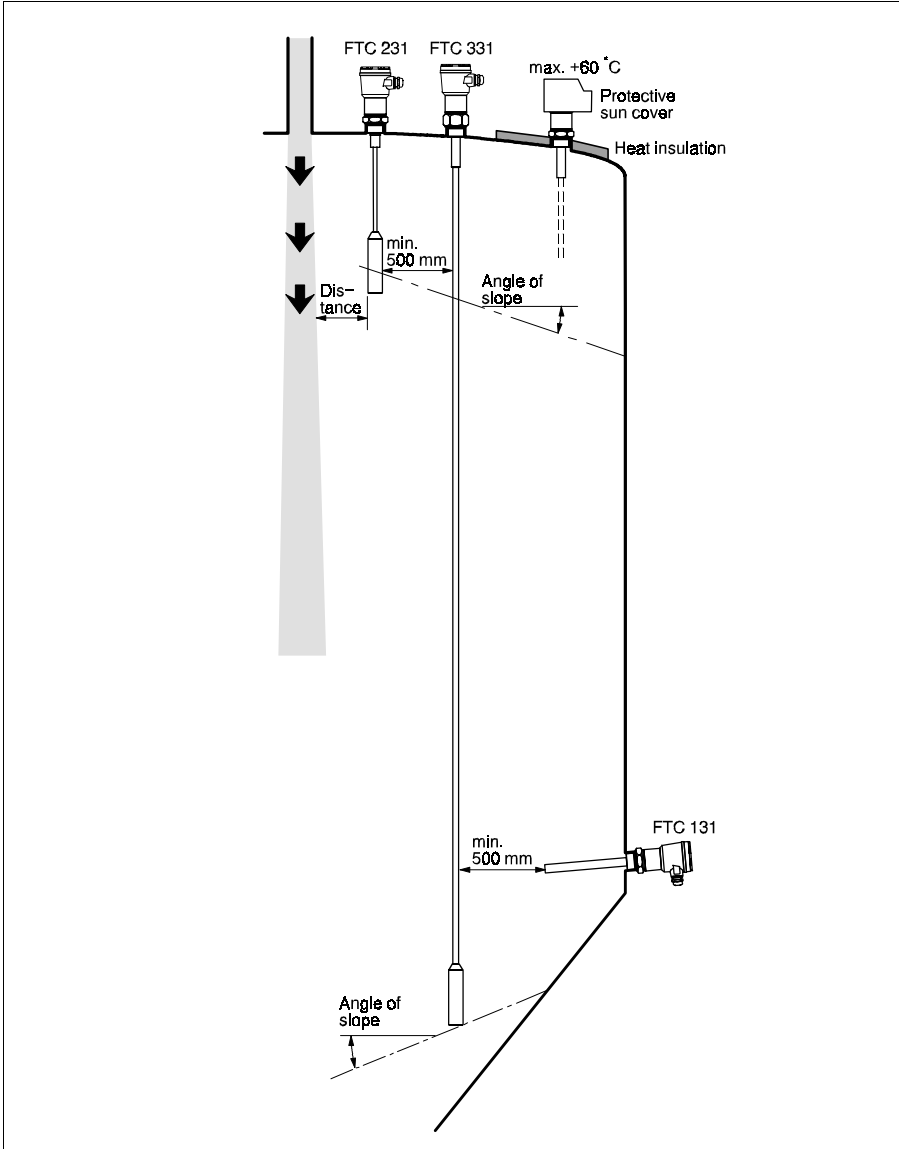


Fig. 6
General information for installing the Nivocompact FTC...

The filling stream should not be directed onto the probe.

To avoid mutual interference of the probes, a minimum distance of 0.5 m must be allowed for. This also applies if there are a number of Nivocompact FTC... units mounted in silos next to each other which have non-conducting walls.

If the silo is filled pneumatically, then probes should be as far apart as possible so that, even with the probes swaying, the minimum distance is maintained.

The Nivocompact FTC 231 or FTC 331 should only be used for maximum detection in silos with very coarse or abrasive material.

Filling the Silo

Distance Between Probes

Coarse Grained Materials

Heat Insulation

With high silo temperatures:

Insulate the outside silo wall to avoid exceeding the max. permissible temperature of the Nivocompact housing.

This insulation also prevents condensation near the threaded boss and so reduces build-up and the danger of error switching.

Insulation in the Open

A protective sun cover as an accessory protects the Nivocompact with the aluminium housing from excessive temperatures and from condensation which may form in the housing due to large temperature variations.

Angle of Material Flow

Note the angle of material flow or the outlet funnel when determining the measuring point or probe length.

Probe Length

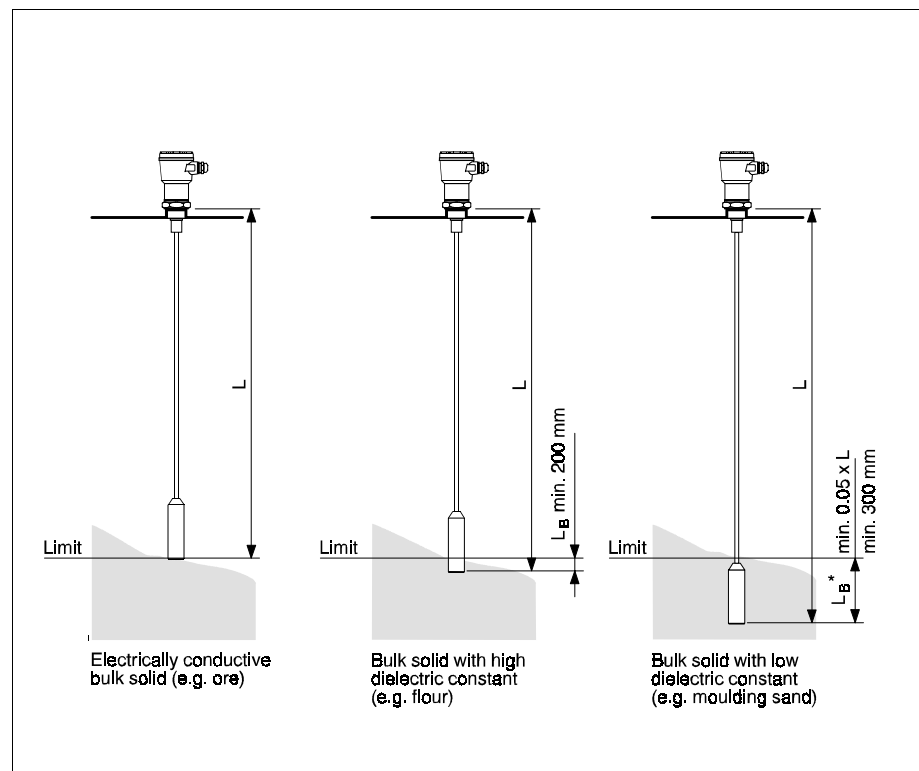


Fig. 7
Selecting the correct probe length.

* L_B (covered length):

With non-conductive materials having low dielectric constants, the rope probe must be approx. 5 % (or minimum 300 mm) longer than the distance from the roof of the vessel to the switch point.

If it is not possible to select the correct L_B for minimum detection with very long probes, then a special version with a »butterfly weight« can be supplied as an accessory. The increased surface area of this weight ensures that there is a large enough change in capacitance when the probe is covered by material. An L_B of 300 mm is normally sufficient.

Ensure that the silo roof is strong enough!
Very high tensile forces, up to 100 000 N (10 t), may occur at the material outlet especially with heavy, powdery bulk materials which tend to form build-up.

Use the shortest possible threaded socket when mounting the Nivocompact FTC 231, 331.

Condensation can form or dust can settle in long threaded sockets and interfere with correct operation of the probe.

Silo Roof

Threaded Socket for Mounting

Examples for Mounting

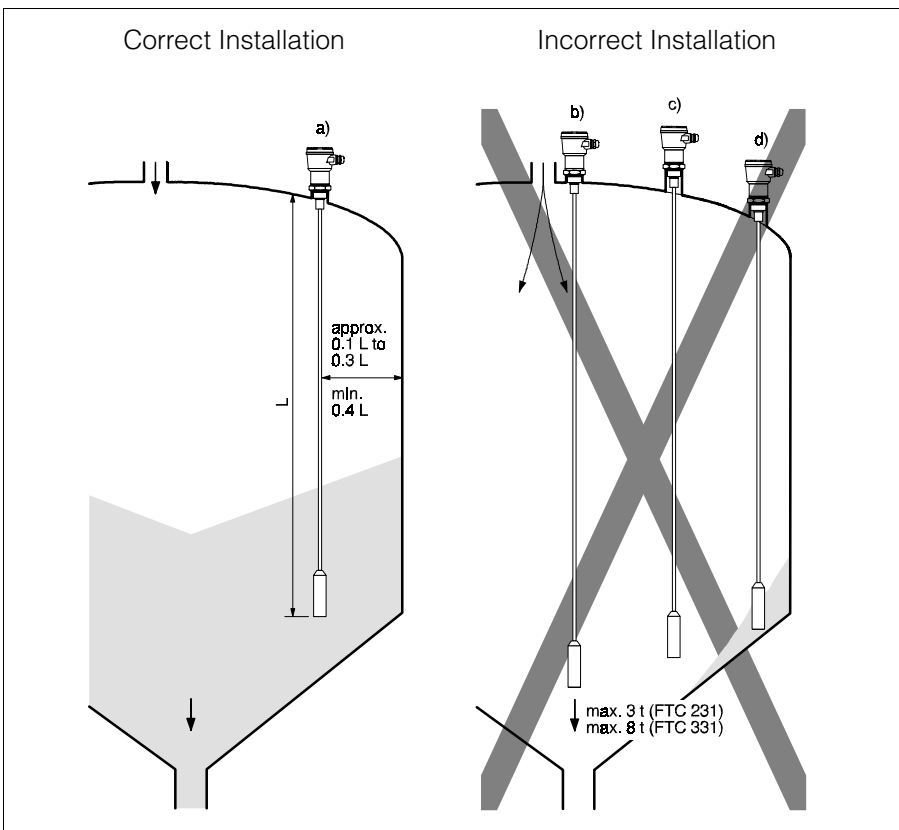


Fig. 8
Silo with metal walls.

a) The correct distance from the silo wall, the material filling curtain and the material outlet.
For pneumatic filling systems, the distance of the probe from the wall should not be too small as the probe may swing against it.

Correct Installation

b) The probe can be damaged by the inflowing material if mounted too near the inlet.
When mounted near the centre of the outlet, the high tensile forces present at this point may damage the probe or subject the silo roof to excessive strain.

Incorrect Installation

c) Threaded socket too long.
Condensation and dust may penetrate and cause error switching.

d) 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.

Installation in a Steel Concrete Roof

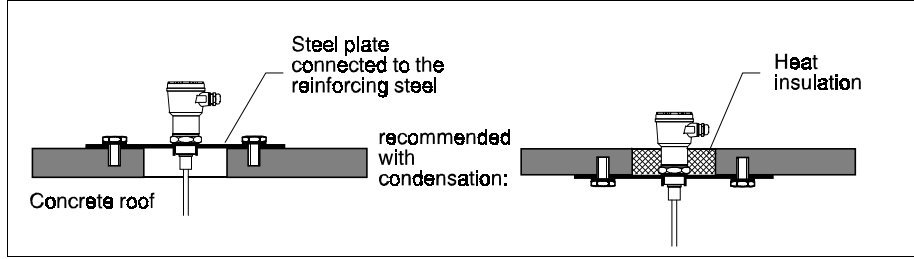


Fig. 9
Silo with concrete walls.

The 25 mm long threaded socket should project into the silo so as to minimise effects due to condensation and material build-up.

Protection Against Condensation

Heat insulation prevents condensation and build-up on the steel plate.

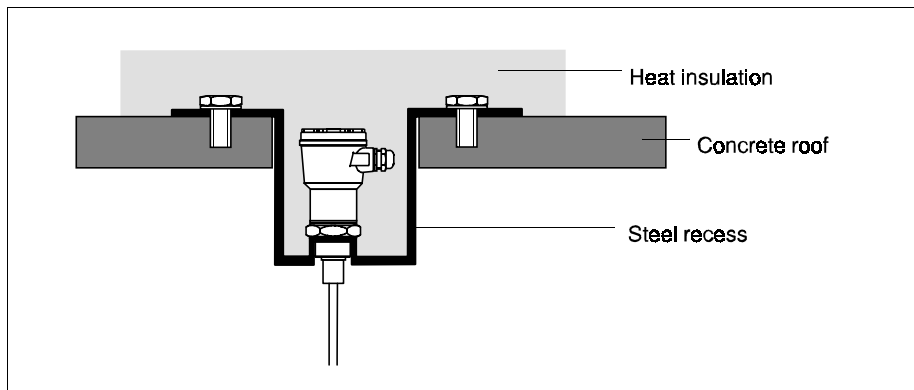


Fig. 10
The ideal solution with high condensation:
The base of the steel recess is the same temperature as in the silo itself with therefore no liquid condensing onto it.

Silos with Non-Conductive Walls

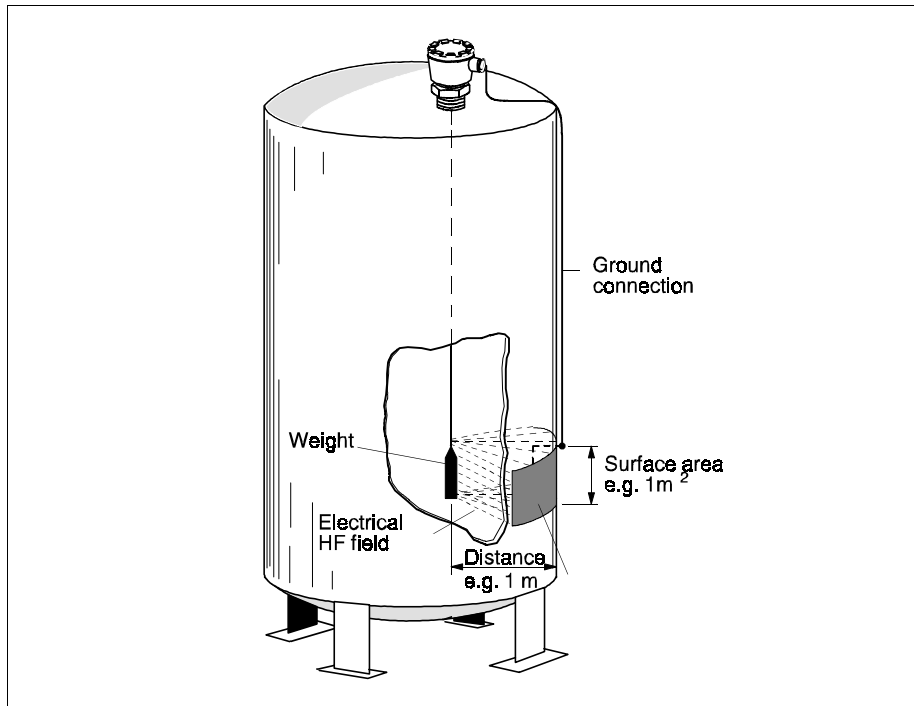


Fig. 11
Silo with plastic walls.

When mounting in a silo made of plastic, a counter electrode must be mounted on the outside and at the same height as the weight. The length of the edge of the counter electrode should be roughly the same length as the distance of the weight to the silo wall.

Mounting

- Open-end spanner 60 AF
- Screwdriver, blade width 5 to 6 mm
or Phillips screwdriver PZD 2

Tools Required for Installation

Compare the order code on the nameplate of your instrument with the order specification key to ensure that the correct instrument is being installed.

Initial Check

FTC 231 capacitive level limit switch with rope probe, ø10 mm
FTC 331 capacitive level limit switch with rope probe, ø16 mm

Process Connection
 G Thread G 1 1/2" in steel
 H Thread NPT 1 1/2" in steel
 Y Special version - please check!

Weight
 1 Weight in cast iron
 9 Special version - please check!

Probe
 1 ...mm length
 Length from 500 to 22000 mm, selectable
 2 2500 mm (basic length for FTC 231, can be shortened)
 6 6000 mm (basic length for FTC 231, can be shortened)
 8 8000 mm (basic length for FTC 331, can be shortened)
 9 Special version - please check!

Housing
 B Aluminium housing, IP 66
 K PBTP synthetic housing, IP 66
 Y Special version - please check!

Electronic Insert (mounted in housing)
 1 21 V...250 V, 50/60 Hz (EC 20)
 Two-wire AC connection
 2 PNP 10 V...55 V= (EC 22)
 Three-wire DC connection
 3 NPN 10 V...55 V= (EC 23)
 Three-wire DC connection
 4 Relay, 21...250 V AC/200 V= (EC 24)
 AC or DC connection
 with relay output (change-over contact)
 9 Special version - please check!

Order code on nameplate

FTC...									
--------	--	--	--	--	--	--	--	--	--

Check the length of the probe!
 The length of the probe of the Nivocompact at delivery is stated on the nameplate.

Shortening the Probe

The probe can be shortened if it is too long:

- ① Loosen the three screws in the weight (Allen screws 5 AF).
- ② Pull off the weight.
- ③ Remove a length of the steel rope (e.g. with a cutting wheel).
- ④ Put the weight back on the steel rope.
- ⑤ Screw up the 3 screws in the weight tightly enough to penetrate the rope insulation.

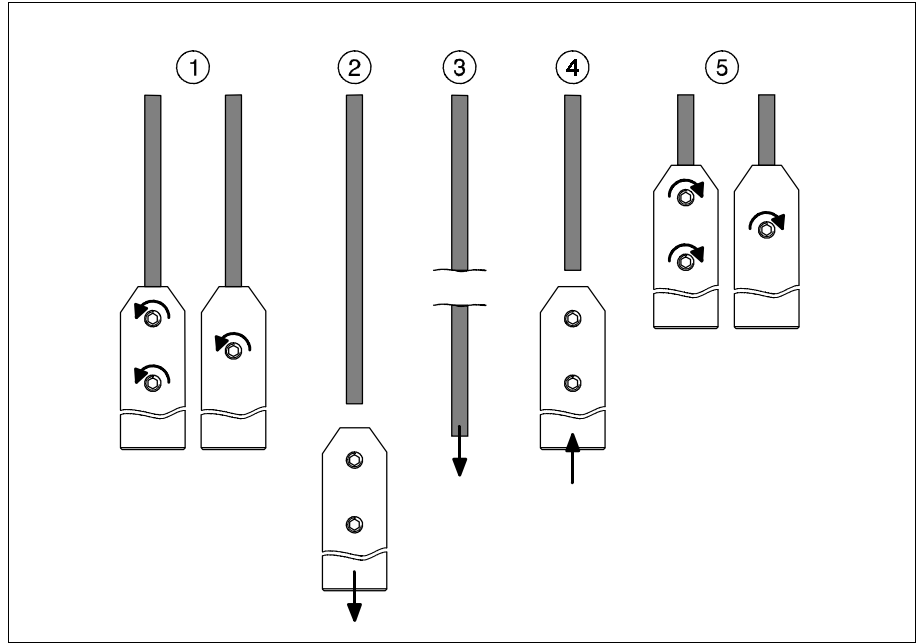


Fig. 12
The rope probe can be easily shortened as shown here.

Lengthening the Probe

The probe can be lengthened if it is too short:

Weld a length of tubing with an external diameter of max. 40 mm directly on the lower end of the weight.

Screwing In

- Straighten the lowest 2 m of the probe rope.
- FTC with parallel thread G 1¹/₂:
Place the gasket supplied against the sealing surface
- FTC with tapered thread NPT 1¹/₂":
Before screwing in, apply a suitable sealant around the tapered thread
- Thread the rope through the threaded socket taking care not to damage the insulation.
- When screwing in, turn the instrument by the 60 AF hex nut only!
Do not tighten too tightly! A torque of more than 300 Nm will destroy the seal for the parallel thread G 1¹/₂.

The housing can be rotated if the cable gland is facing in the wrong direction after the Nivocompact has been screwed in:

Rotating the Housing

Removing

- Unscrew and remove the housing cover
- Loosen the central screw in the electronic insert
- Remove the plug-in electronic insert from the housing using the handle
- Slightly loosen the 3 screws in the housing, see Fig. 13

Rotating

- The housing can now be rotated through 360°.

Tightening

- Tighten up the 3 screws in the housing so that the housing is well sealed at the hex nut
- Insert the electronic insert in the plug
- Securely tighten the central mounting screw while making sure that the cable gland remains free.

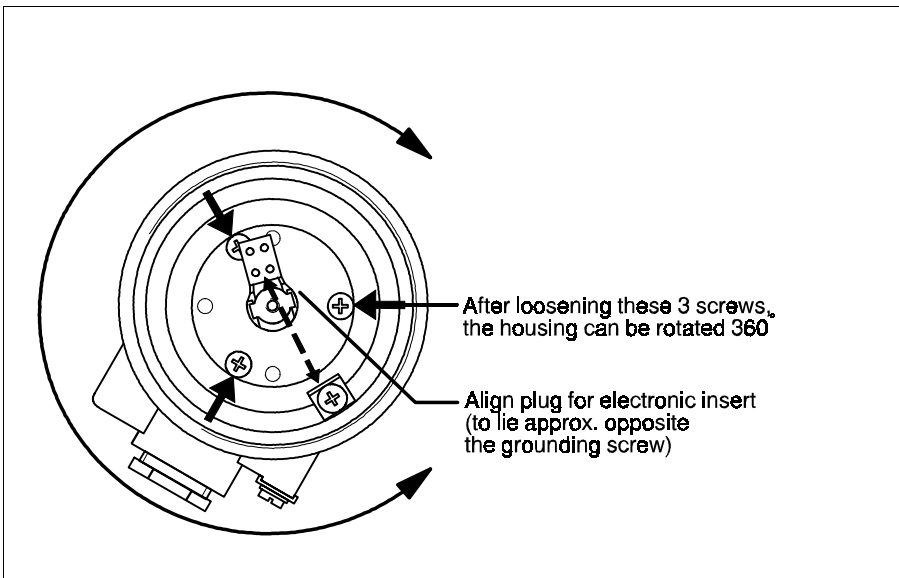


Fig. 13
Loosening and rotating the housing.

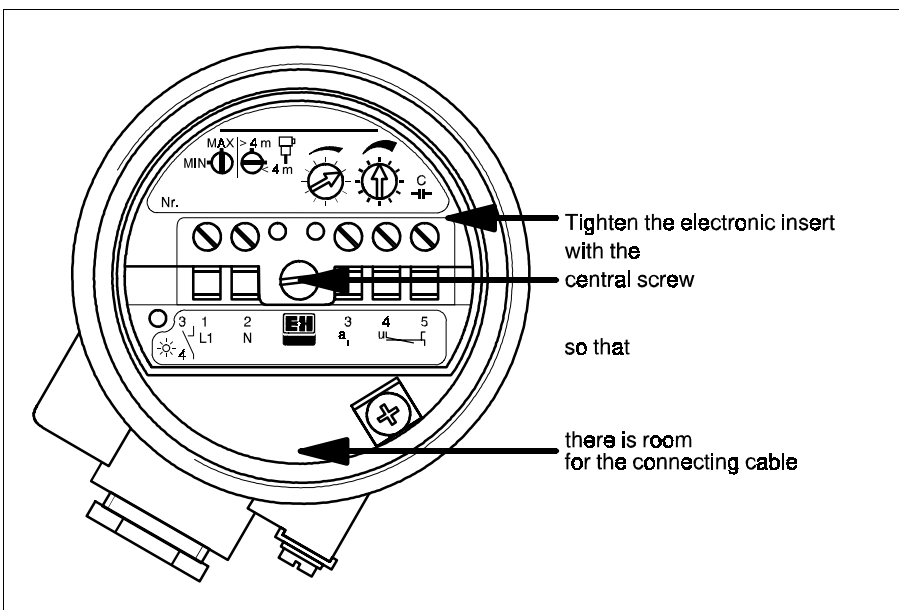


Fig. 14
Tightening the electronic insert.

Connection

Wiring Connection

Main Features of the Different Electronic Inserts

The last number of the order code on the nameplate identifies the electronic insert mounted in the Nivocompact FTC...:

- 1=Electronic Insert EC 20
Two-wire AC; voltage: 21 V...250 V
Electronic switch, max. 350 mA
- 2=Electronic Insert EC 22
Three-wire DC; voltage: 10 V...55 V
Transistor circuit, load connection PNP, max. 350 mA
- 3=Electronic Insert EC 23
Three-wire DC; voltage: 10 V...55 V
Transistor circuit, load connection NPN, max. 350 mA
- 4=Electronic Insert EC 24
with potential-free relay output
AC power supply 21 V...250 V or
DC power supply 20 V...200 V

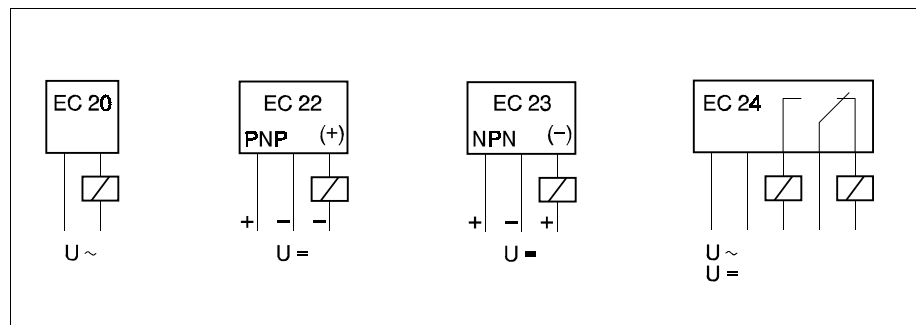


Fig. 15
Electrical connections available with the different electronic inserts.

Load Limit Values

Note the limit values of the loads to which you want to connect the Nivocompact. Exceeding the load can destroy the electronic insert (or the relay contact in the EC 24).

Fuse

Ensure that the rating of the fine-wire fuse corresponds to the maximum load to be connected.
The fine-wire fuse does not protect the electronic insert of the Nivocompact FTC.

Diameter of Wiring

Because of the small current used, only small diameter cabling is required. Low-cost cabling with diameters of 0.5 mm² to max. 1.5 mm² is recommended.

Grounding

The Nivocompact must be grounded to give reliable operation free from interference. This is done by either connecting it to a grounded silo with metal or reinforced concrete walls or else to the earth conductor PE.
If a counter electrode is connected to a silo made of plastic material, then there must be a short ground connection from the Nivocompact to the counter electrode.

Connecting the Nivocompact with Electronic Insert EC 20 for AC (Two-Wire Connection)

The level limit switch Nivocompact with electronic insert EC 20 must - like all switches - be connected in series with the load (e.g. relays, microcontactors, lamps) to the power supply.

Direct connection to the power supply without any intermediate load connected (short circuit!) will result in immediate and permanent damage to the electronic insert.

The load can be connected to Terminal 1 or 2 of the electronic insert. It is unimportant whether L 1 is connected to Terminal 1 or 2.

The voltage across Terminal 1 or 2 of the electronic insert must be at least 21 V.

The power voltage must be correspondingly higher to compensate for the voltage drop across the connected load.

Note that loads connected in series are not completely disconnected from the power supply if the electronic switch in the electronic insert of the Nivocompact »disconnects« (blocks) with level alarm.

Because of the current requirements of the electronics, a small »no-load current« still flows through the connected load.

When the load is a relay with a very small retaining current, then the relay may not de-energise. In this case, connect an additional load in parallel to the relay, e.g. a resistor or signal lamp.

Connecting in Series to a Load



Power Voltage

Load Cutoff

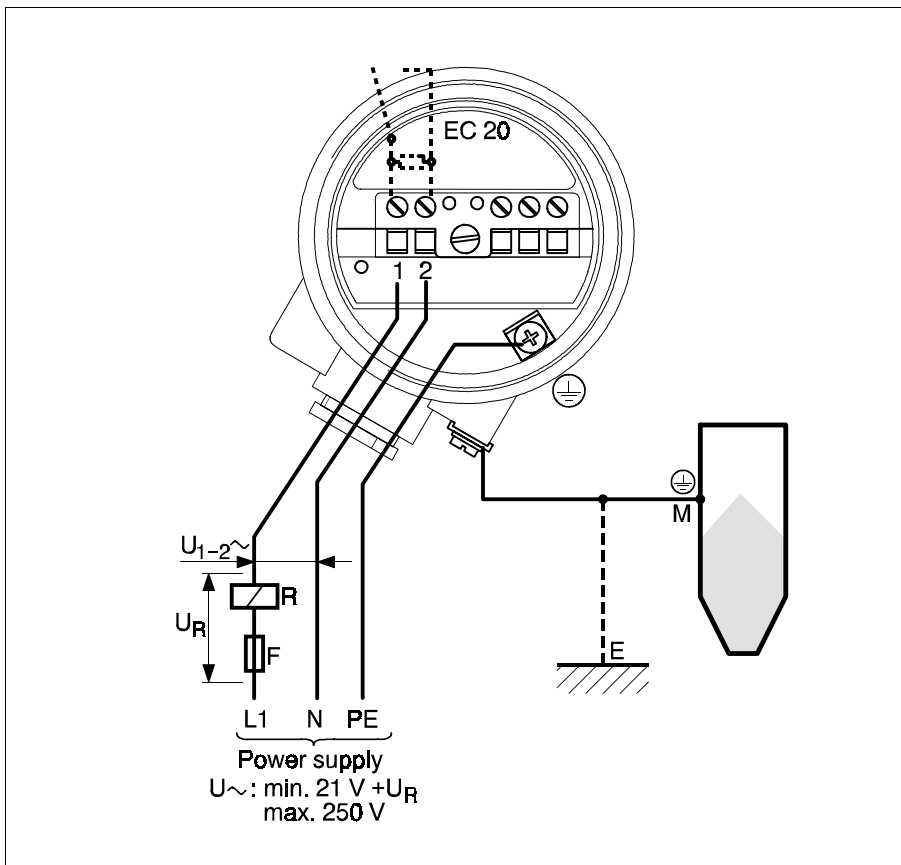


Fig. 16
Connecting the Nivocompact with electronic insert EC 20

U_{1-2} : 21 V...250 V across Terminals 1 and 2 of the EC 20

R: Connected (external) load, e.g. relay

F: Fine-wire fuse, load-dependent

U_R : Voltage drop across the load and the fine-wire fuse

M: Ground connection to silo or to counter electrode

E: Grounding

Connecting the Nivocompact with Electronic Insert EC 22 (Three-Wire PNP) for DC

Transistor Circuit for Load

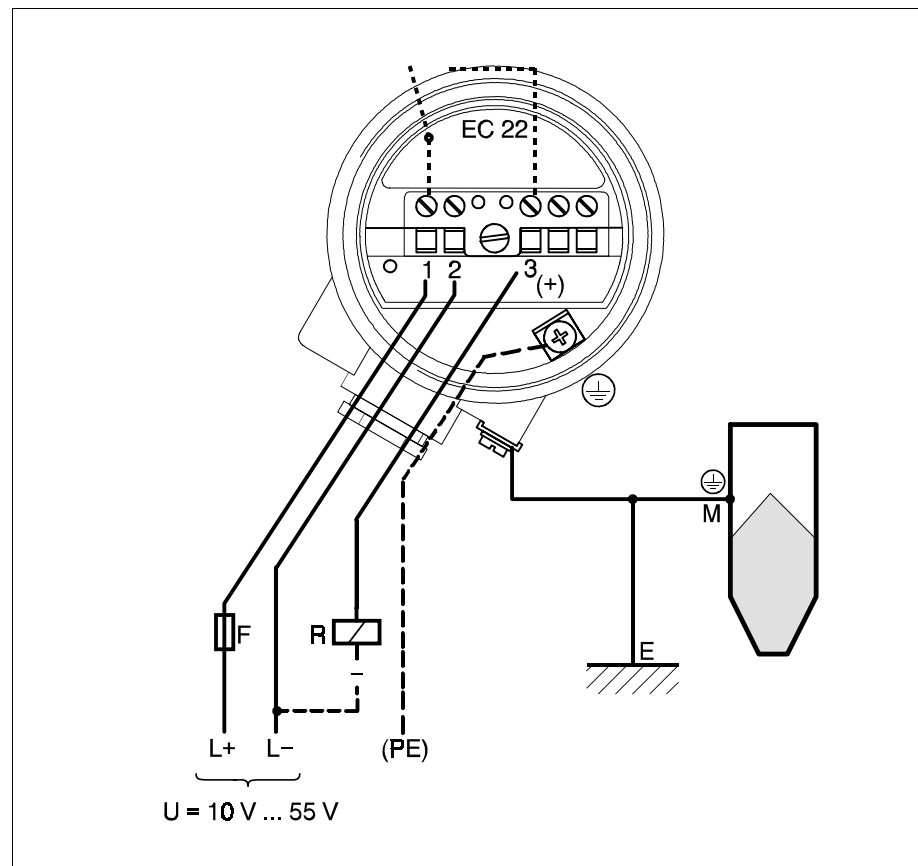
The load connected to Terminal 3 is switched by a transistor, contactless and therefore without bouncing.

Terminal 3 has a **positive** signal in normal switching mode.

The transistor is blocked on level alarm or with a power failure.

Protection Against Voltage Peaks

Connecting to an instrument with a high inductance: a voltage limiter should be connected.



Connecting the Nivocompact with Electronic Insert EC 23 (Three-Wire NPN) for DC

The load connected to Terminal 3 is switched by a transistor, contactless and therefore without bouncing.

Terminal 3 has a **negative** signal in normal switching mode.

The transistor is blocked on level alarm or with a power failure.

Connecting to an instrument with a high inductance: a voltage limiter should be connected.

Transistor Circuit for Load

Protection Against Voltage Peaks

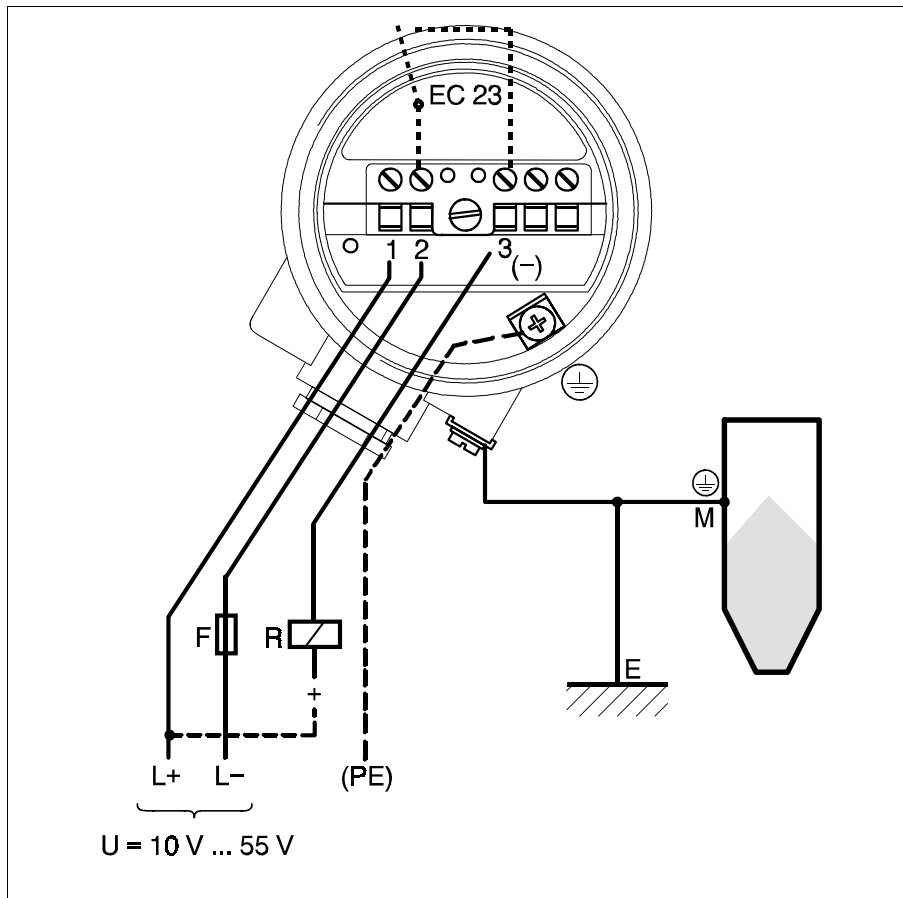


Fig. 18
Connecting the Nivocompact with electronic insert EC 23 (NPN connection)

- F: Fine-wire fuse, load-dependent
- R: Connected load, e.g. PLC, PCS, relay
- M: Ground connection to silo or to counter electrode
- E: Grounding

Connecting the Nivocompact with Electronic Insert EC 24 (Relay Output) for DC and AC

Power Supply

With AC, it is unimportant whether L1 or N is connected to Terminal 1.
 With DC, it is unimportant whether L+ or L- is connected to Terminal 1.

Relay Contact for Load

The load is connected over a potential-free relay contact (change-over contact).
 The relay contact breaks the connection between Terminal 3 and Terminal 4 on level alarm or with a power failure.

Protection Against Voltage Peaks and Short-Circuiting

Protect the relay contact by connecting a spark barrier to instruments with high inductance.
 A fine-wire fuse (load-dependent) can protect the relay contact if a short-circuit occurs.

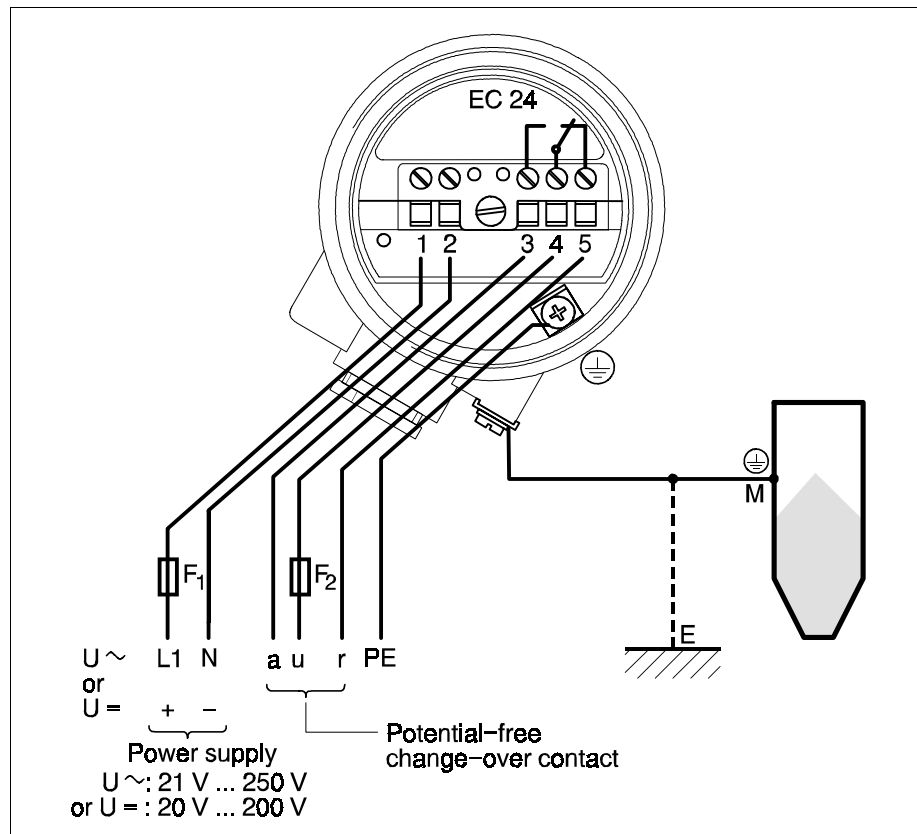


Fig. 19
 Connecting the Nivocompact with electronic insert EC 24; (relay output)

F1: Fine-wire fuse 200 mA, semi-time lag, recommended

F2: Fine-wire fuse to protect the relay contact, load-dependent

M: Ground connection to silo or to counter electrode

E: Grounding

Wiring On-Site

- Open-end spanner 22 AF
- Screwdrivers, blade widths approx. 4 mm and 7 mm or Phillips screwdriver PZD 1 and PZD 2
- Usual electrical tools

Before connecting, make sure that the power supply used is the same as that stated on the nameplate of the electronic insert.

Tools Required for Connection

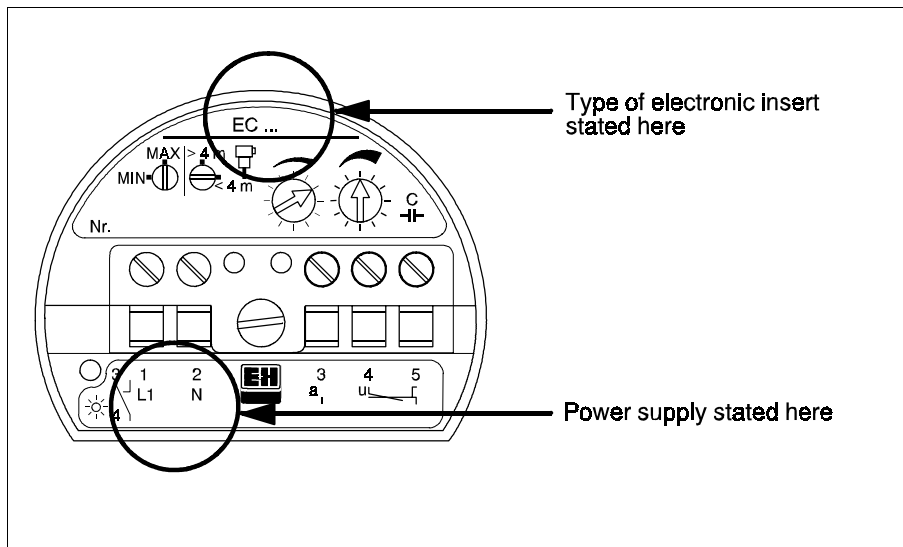


Fig. 20
Note the power voltage stated on the nameplate!

Connect the Nivocompact according to the appropriate diagram Fig. 16 to Fig. 19.

Ensure that no water gets into the housing while connecting up.

The gasket in the standard cable gland is designed for cable diameters from 7 mm to 10 mm.

A suitable gasket must also be used for other cable diameters.

You can seal with the »water-tight« cable gland with cables having diameters from 5 mm to 12 mm.

Ensure that there is a good **short ground connection** from the housing of the Nivocompact to the silo, to the counter electrode or to e.g. the metal reinforcement of a steel reinforced silo.

No special ground connection is required if an FTC..., without sealing material on the thread, is screwed into a metal silo.

Screw the thread of the cable gland tightly to comply with the standards of Protection IP 55 or 66.

For applications in the open or in moist surroundings, sealing the standard cable gland with sealing compound is also recommended.
(This is not required with the »water-tight« cable gland).

Electrical Connections

After Connecting

Calibration

Tools Required for Calibration

- Screwdriver with blade width approx. 3 mm
- Screwdriver with blade width approx. 5 mm

The rotary switches and adjusting elements for calibration are on the electronic insert in the housing.



Directly beside these calibration elements are the power connections with voltages up to 250 V.

Only use a screwdriver which has insulation as far as the blade or else tape over the terminals with insulating tape before calibration.

Capacitance Calibration

For capacitance calibration, the silo must be empty or the level of material must be at least 200 mm below the probe.

- Turn on the power supply
- Carry out the calibration according to the sequence of diagrams Fig. 21 to Fig. 23.
- Ensure that no water gets into the housing while calibrating.

Capacitance Calibration, Initial Settings

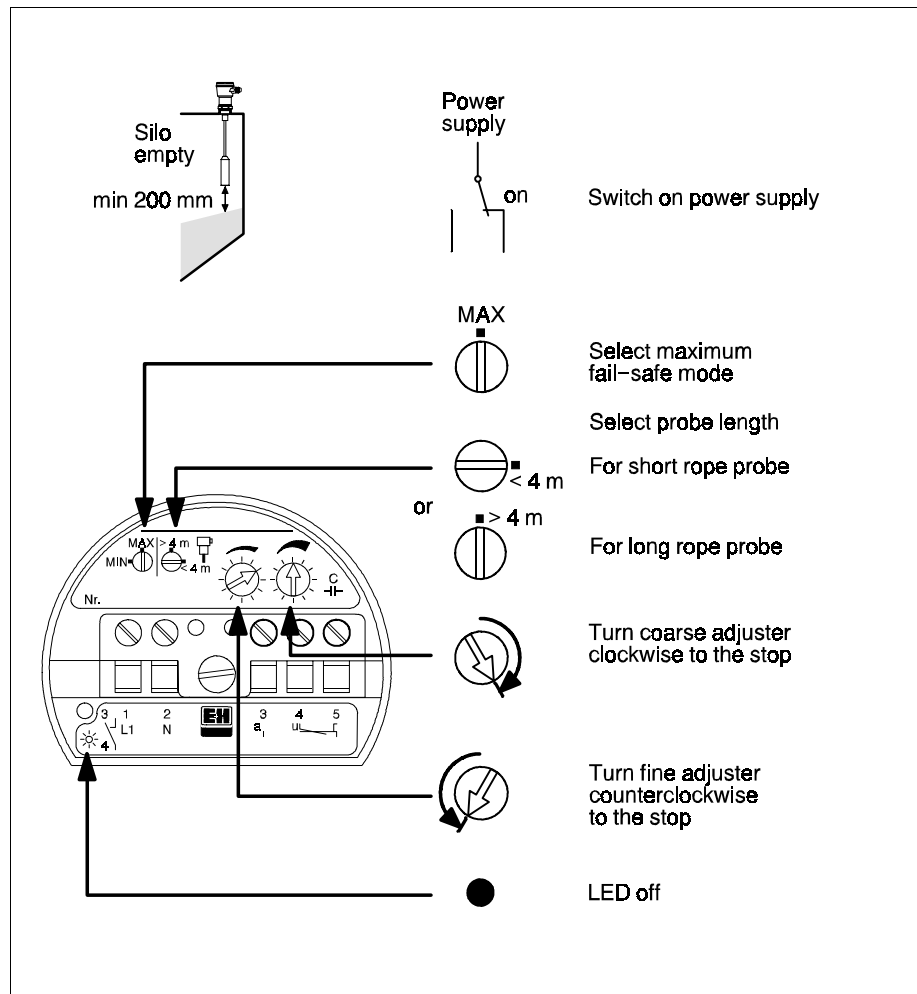
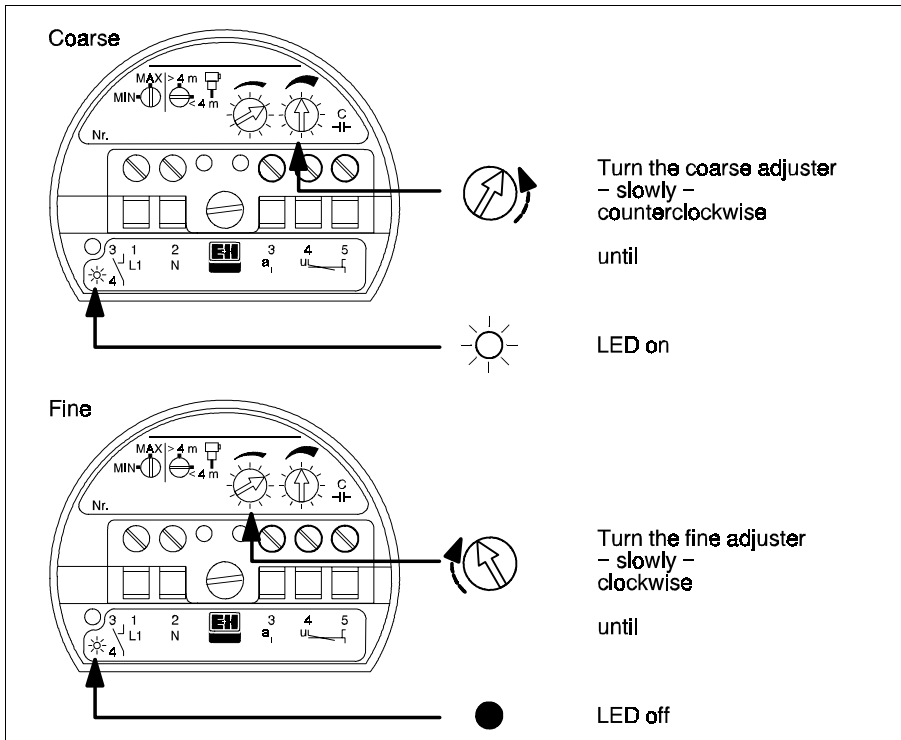
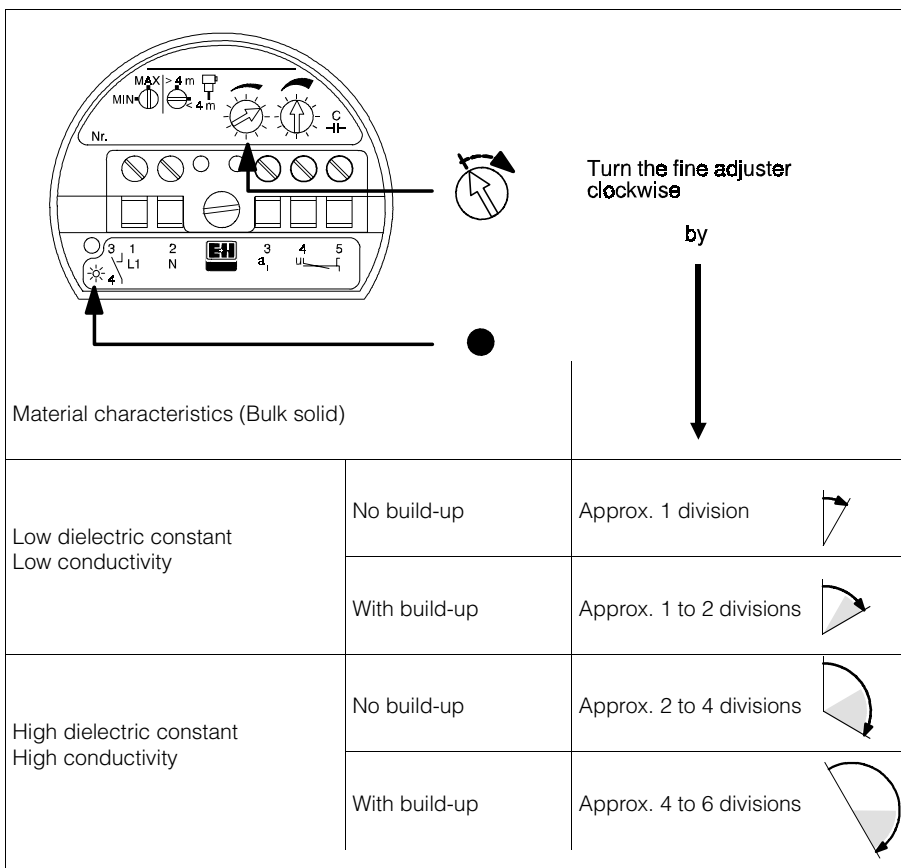


Fig. 21
These are the initial switch positions for carrying out capacitance calibration.



Capacitance Calibration

Fig. 22
Capacitance calibration must be carried out both slowly and carefully.



Adjusting for Material Characteristics

Fig. 23
Accurate adjustment ensures high switching reliability.

When the probe is covered with non-conductive bulk solid having a low dielectric constant, then the Nivosonic only switches when a section of the rope probe is well covered with the material. The degree of covering depends on the calibration. Turning the fine calibrating element clockwise causes the Nivocompact to become less sensitive.

Safety Switching

By using the rotary switch, select the fail-safe mode for your particular application:

- Maximum fail-safe: The current circuit is blocked if the probe is covered or the power supply fails.
- Minimum fail-safe: The current circuit is blocked if the probe is uncovered or the power supply fails.

Changing the fail-safe mode also changes the LED status indication.

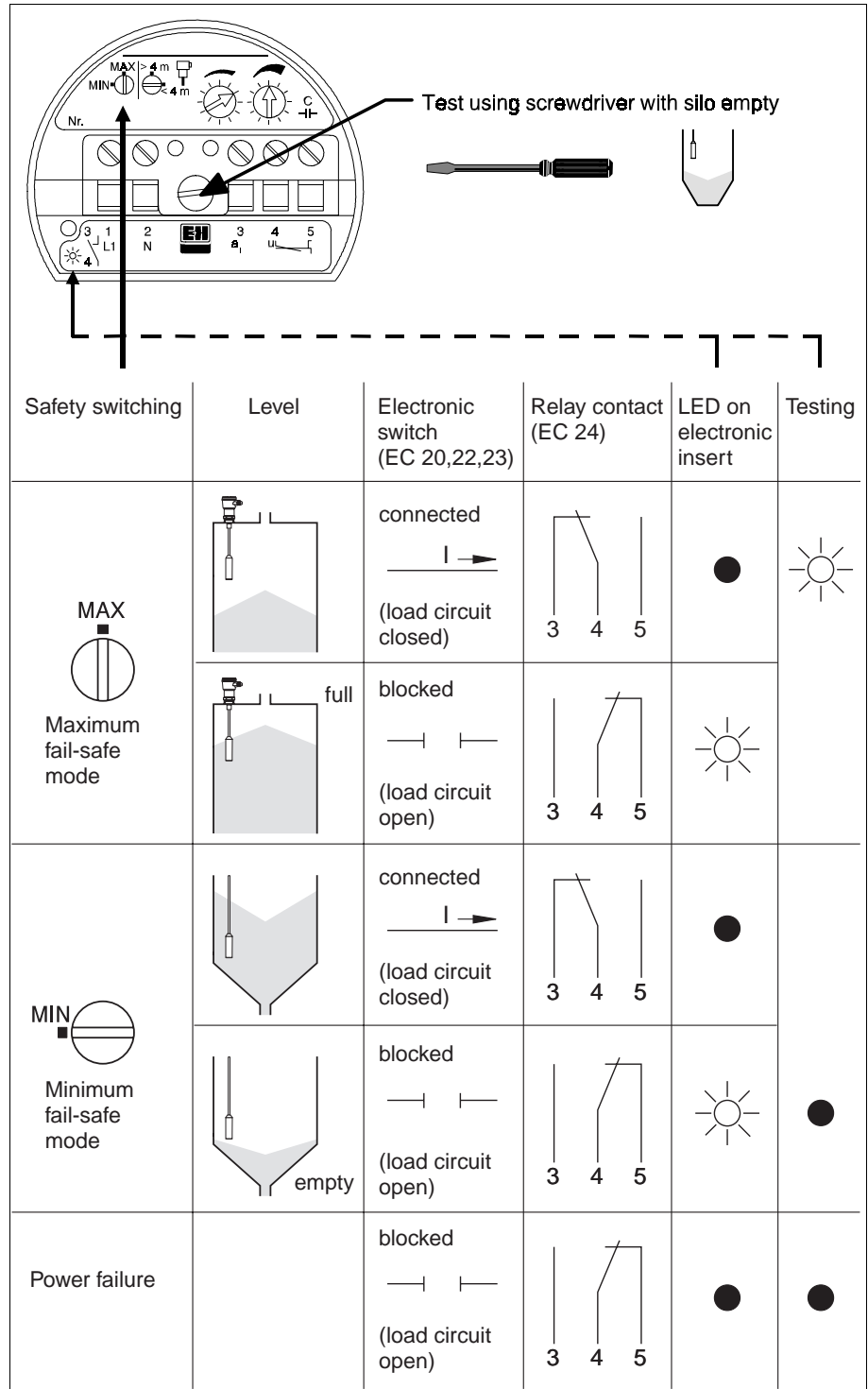


Fig. 24
Selecting the fail-safe mode and function.

Function Control

With the probe uncovered, touch the central retaining screw of the electronic insert with a screwdriver, holding it by the insulated handle. This simulates the bulk solid covering the probe. The LED indicates a change of status.

This is only a function control test of the instrument. Please also check for the correct operation for limit detection by filling and emptying the silo such that the weight is covered and uncovered.



Final Points

Screw the housing cover securely down after connection and calibration to comply to the standards of Protection IP 55 or IP 65.

For applications in the open, a protective sun cover (accessory) is to be used to cover the aluminium housing of the Nivocompact.

Maintenance

The capacitive level limit switch Nivocompact FTC... requires no maintenance when correctly installed and used properly under the normal conditions specified by the system.

When cleaning and checking the silo:

- Examine the probe to check for damage to the insulation
- Remove material build-up, especially around the threaded boss.

With initial but permanently low material build-up:

Recalibrate the Nivocompact after the material build-up has occurred.

Ensure that the cable gland and housing cover are tight fitting so that no moisture can enter.

Troubleshooting

When an error is indicated, first check to make sure that

- The Nivocompact is properly connected
- There is a good ground connection to the silo or to the counter electrode
- There is a power supply at the terminals
- All instruments connected are operating correctly
- In the case of the electronic insert EC 20, the minimum required load of the connected instruments is at least present
- The correct fail-safe mode has been chosen
- Calibration has been carried out correctly (see Calibration)

Carry out a function control (see above)

Refer to the Error Tables, Fig. 25 and Fig. 26.


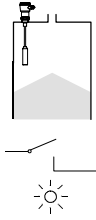

Error with maximum fail-safe mode	 Possible causes
Probe free (level below maximum) but with electronic switch blocked LED on	 <ul style="list-style-type: none"> - Water condensing around the threaded boss - High material build-up on the threaded boss - Probe insulation damaged - Rope probe touching silo wall - Water in housing
Probe covered (level above maximum) but with electronic switch connected LED off	 <ul style="list-style-type: none"> - Rope probe or weight torn off - Dielectric constant of the material too small - Drier (or different) material now in silo than expected on calibration

Fig. 25
Troubleshooting with maximum fail-safe mode.


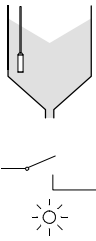

Error with minimum fail-safe mode	 Possible causes
Probe covered (level above minimum) but with electronic switch blocked LED on	 <ul style="list-style-type: none"> - Rope probe or weight torn off - Dielectric constant of the material too small - Drier (or different) material now in silo than expected on calibration - Material has formed cavities
Probe free (level below minimum) but with electronic switch connected LED off	 <ul style="list-style-type: none"> - Water condensing around the threaded boss - High material build-up on the threaded boss - Probe insulation damaged - Rope probe touching silo wall - Water in housing

Fig. 26
Troubleshooting with minimum fail-safe mode.

Guarantee

Our guarantee terms are included with the documents which accompany delivery. Copies may also be obtained from the agent responsible. Any modification carried out within the instrument during the guarantee period invalidates the terms of the guarantee.

Replacement of Parts

Replacing the Electronic Insert

Switch off all sources of power to the Nivocompact

- Remove the electrical connections to the electronic insert
- Loosen the central screw in the electronic insert
- Lift out the electronic insert from the housing using the handle

- Push the new electronic insert carefully into the plug in the housing
- Tighten the central screw
- Connect up the electrical wires

- Switch on the power supply
- Turn the switch for probe length to the same position as it was on the old electronic insert
- Carry out a new capacitance calibration with an empty silo
- Select the same fail-safe mode as for the old electronic insert

Removal



Insertion

Calibration

Replacing Probes

- If a probe is to be replaced with one of a different length, then a new capacitance calibration must be carried out.

Returning Parts for Repair

If a Nivocompact FTC 231 or FTC 331 cannot be repaired and needs to be sent back to Endress+Hauser, then please note the following:

Remove all material residue attached to the probe.

This is especially important as the material may be of a dangerous nature, e.g. corrosive, poisonous, carcinogenic, radioactive etc.

Please return parts only after they have been thoroughly cleaned of dangerous materials. Check in particular scratches and the possibility of diffusion through plastic material.

When returning the probe, please state exactly the material in which it was used and its characteristics.

A brief description of the error will also help us to diagnose the reason for it and at the same time keep your costs down.

Thank you for your cooperation.

Cleaning the Probe



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