Technical
Information
TI 042F/00/e

Level Limit Switch
soliphant FTM 930/931/932/ Z

For Universal Application with Bulk Materials and Dust Ex Area

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① FTM 930/FTM 930 Z for side mounting: Compact version.

② FTM 931/FTM 931 Z for top or side mounting in silos of average height: Version with extension tube

③ FTM 932 /FTM 932 Z for top mounting. Recommended for use in very high silos: Version with extension cable

Application

The Soliphant has a wide range of safe applications for limit detection in silos with dusts and fine-grained bulk solids. It can also be used in Zone 10 dust explosion area.

The Soliphant is constructed from stainless steel making it especially suitable for use with foodstuffs.
Typical applications:

grain	washing powders
flour	dyes
milk powder	chalk
cocoa	plaster
sugar	cement
animal feed	styropore

Operating Principle

The stainless steel symmetrical fork is brought to its natural resonant frequency piezoelectrically. Vibration characteristics change when the fork is covered with the bulk solid, electronically activating a contact-free and hence jolt-proof switch. Switching status is indicated on-site by an LED.

With the built-in capability for min./max. protection, the Soliphant can be used for any application on a fail-safe basis.

Minimum fail-safe: the circuit is blocked if the oscillating fork is free or if the power fails.

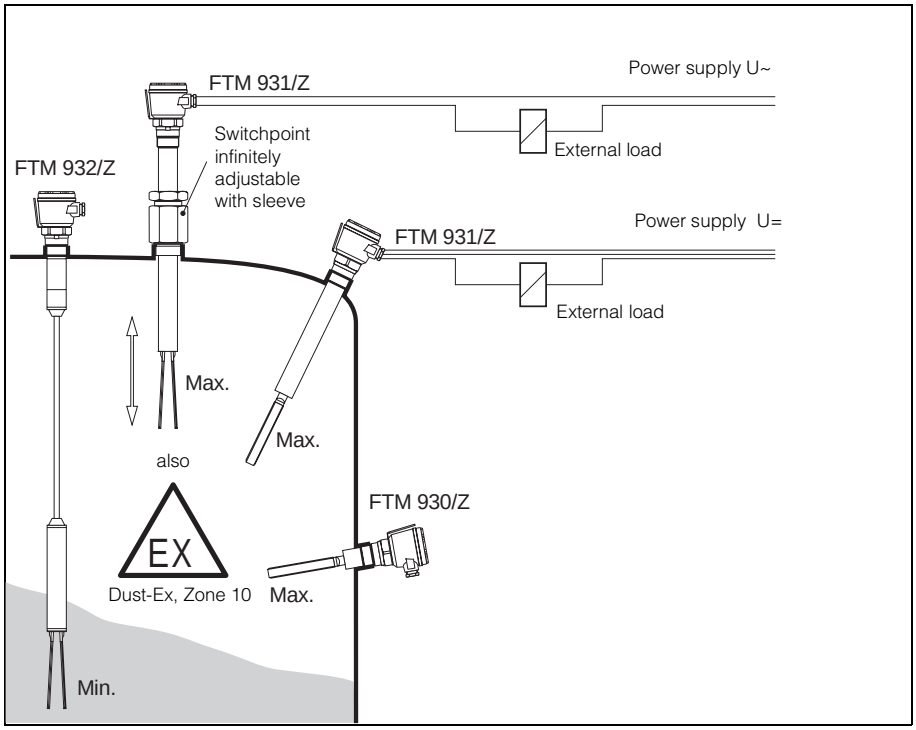
Maximum fail-safe: the circuit is blocked if the oscillating fork is covered or if the power fails.

Endress+Hauser

Nothing beats know-how

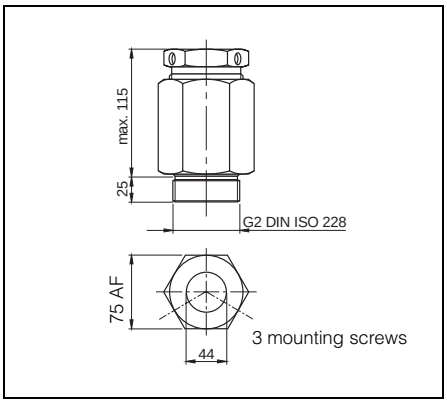
The Complete Measuring System

The Soliphant level limit switch functions just like a switch so that, apart from the Soliphant, only a power source and the instruments to be switched on or off, such as miniature contactors, signalling systems, freely programmable controllers etc. are required.



Example: limit detection with bulk materials

Accessories



Dimensions of the high-pressure sleeve

High pressure sleeve
For infinite height adjustment of the FTM 931/931 Z with extension tube, min. probe length 400 mm.

Material: steel or stainless steel 1.4571

Threaded gland packing:
PTFE / fibre glass

Max. permissible operating pressure:
10 bar

Operating temperature: max. 80°C

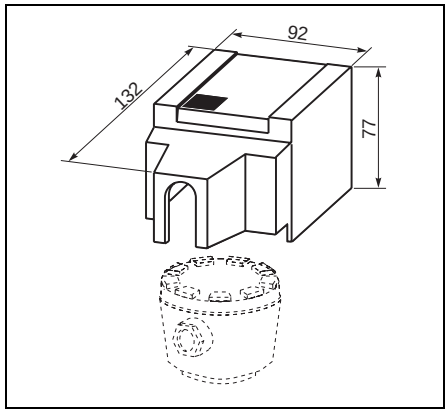
Relay module
For connection to electronic insert EM 11 in FTM 930/ Z or FTM 931/ Z

Output:
potential-free change-over contact

Contact load: max. 250 V,
max. 2.5 A, max. 600 VA

For further data:
see Technical Information TI 083

The use of a sun cover is recommended to prevent condensation build-up in the housing

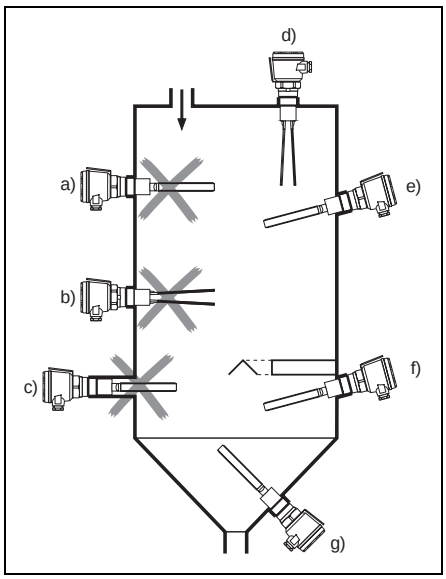


Sun cover
Material: polyamide

Shortening the FTM 932
The modification set for the Soliphant FTM 932 (with cable) consists of cable clips and electrical connectors.
Type »Z« are only available in fixed lengths, Regulations forbid shortening the cable at a later date.

Dimensions in mm
100 mm = 3.94 in
1 in = 25.4 mm

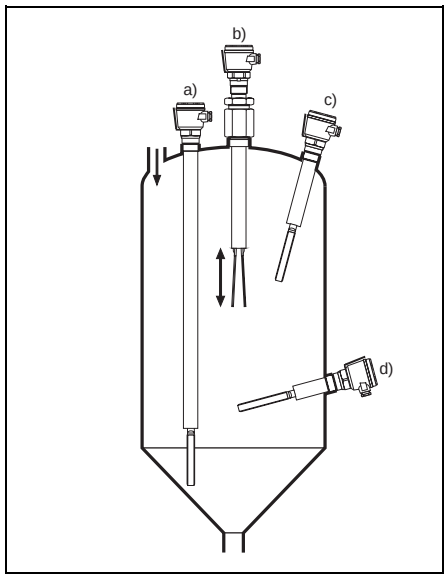
Installation



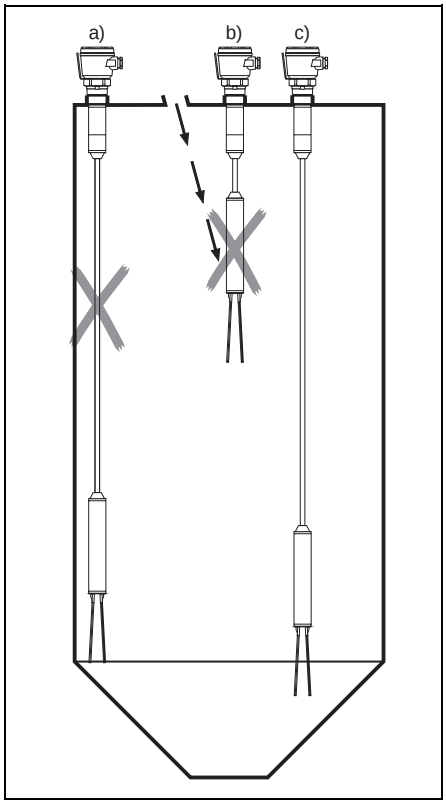
Installation of the Soliphant compact version FTM 930/FTM 930 Z

left: incorrect
a) in filling curtain
b) false orientation of the fork (wide surface of the fork is subjected to high load caused by discharging material)
c) mounting nozzle too long - use FTM 931 Z

right: correct
d) vertically mounted from above; any fork orientation
e) laterally mounted with fork angled slightly downwards, max. nozzle length 60 mm
f) with roof to protect against collapsing mounds
g) in discharging hopper



Mounting the Soliphant with extension tube FTM 931/FTM 931 Z
a) for minimum limit detection, if installation is possible only from above
b) with adjustable sleeve (threaded gland connection) for any adjustment of the limit detection level
c) mounting in any orientation
d) with heavy wall build-up



Installation of the Soliphant with extension cable FTM 932/FTM 932 Z

Incorrect:
a) too near to the vessel wall
b) within filling curtain

Correct:
c) far enough away from the wall and filling curtain

- A short threaded nozzle should be used when installing a Soliphant FTM 930, FTM 930 Z.
- The bulk solid flows off the oscillating fork more easily when it is mounted pointing slightly downward.
- All Soliphant instruments have a tapered thread, i.e. the oscillating fork can be turned to the correct orientation. The cable gland can also be rotated to any position required.
- A guard is recommended to protect the Soliphant from material falling directly onto the fork.
- The oscillating fork must not be installed within the filling curtain of the material.
- Installation of the Soliphant FTM 931/ FTM 931 Z with adjustable sleeve is recommended if the switch height changes during operation.
- When planning, take into account the maximum lateral load allowed for the Soliphant FTM 930/FTM 930 Z or the FTM 931/FTM 931 Z and the maximum stress allowed for the Soliphant FTM 932/FTM 932 Z cable.
- With high bulk solids temperatures, there should be insulation between the vessel and the housing of the Soliphant.
- When operating outside (with large temperature variations), the use of a sun cover is recommended to avoid condensation build-up.

Electrical Connection

The Soliphant can be used with any one of six different electronic inserts. The electronic inserts EM 21, EM 22, and EM 23 with galvanic isolation between power supply and the electronics of the oscillating fork are designed for use with the Soliphant FTM 932/ Z with cable.

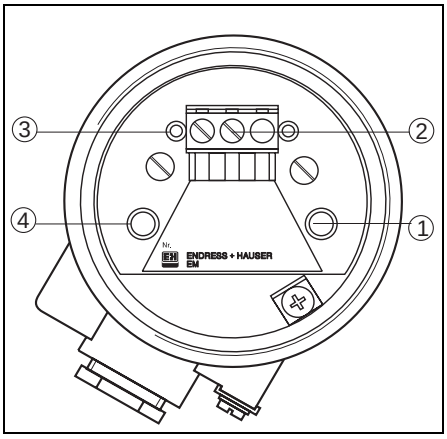
With low voltages, the voltage drop across the external load and the Soliphant must be taken into account. Note also that connected instruments are not separated from the power supply when the electronic switch opens.
A small no-load current still flows (quiescent current).
The relay module can be installed for galvanic isolation as accessory for the FTM 930/931/Z.

① Switch for min./max. fail-safe mode

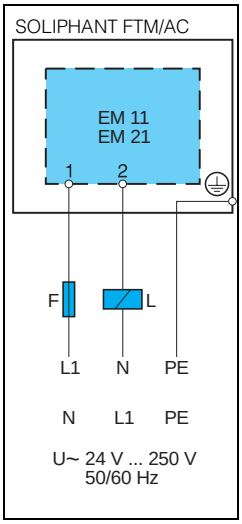
② Terminals

③ LED showing switching status

④ Potentiometer for works adjustment

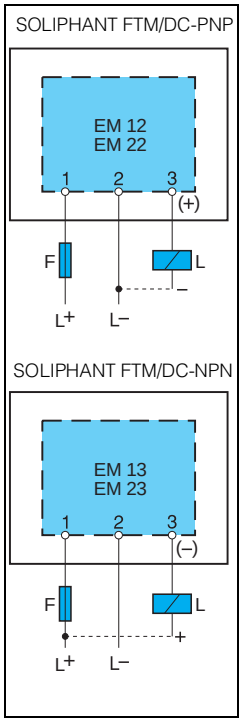


Note
Like a contact switch for 2-wire alternate current connection, the Soliphant must not be connected directly to the mains without a load (signalling or control systems).
Operation without a load will harm the instrument.



Two-wire for AC Connection.
The external load L (e.g. relays, miniature contactors, solenoid valves and signalling systems etc.) is directly connected in series with the Soliphant between Terminal 2 and the power supply.
Recommended fine-blow fuse F:
1 A, semi-time lag

AC Version
Two-wire connection
- Electronic inserts:
  EM 11 for FTM 930/ Z
  and FTM 931/ Z,
  EM 21 for FTM 932/FTM 932 Z
- Supply voltage:
  21V...250 V, 50/60 Hz
- Load for short periods
  (max. 40 ms):
  max. 1.5 A; max. 375 VA at 250 V;
  max. 36 VA at 24 V
- Permanent load:
  max. 350 mA; max. 87 VA at 250 V;
  max. 8.4 VA at 24 V
- Voltage drop:
  max. 10 V at EM 11,
  max. 15 V at EM 21
- 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: 5 mA



Three-wire for DC Connection.
Relays, signalling systems, miniature contactors, freely programmable control systems etc. are externally connected to Terminal 3.
Recommended fine-blow fuse F:
1 A, semi-time lag

DC Version
Three-wire connection
- Electronic inserts:
  EM 12 and EM 13 for FTM 930/ Z and FTM 931/ Z,
  EM 22 and EM 23 for FTM 932/ Z
- Supply voltage:
  10 V...55 V
- Load connection:
  open collector; PNP (EM 12, EM 22) or NPN (EM 13, EM 23)
- Load for short periods
  (max. 1 s): max. 1 A
- Permanent load:
  max. 350 mA
- Current consumption:
  max. 15 mA with EM 12 and EM 13,
  max. 30 mA with EM 22 and EM 23

Technical Data

Materials, Weights

- Housing: aluminium AlSi 12
  Housing protection conforming to DIN 40050: IP 55
  Type »Z« also with mechanical safety cover
- Threaded boss and fork in stainless steel 1.4301 or 1.4308
- Cable with FTM 932 / FTM 932 Z: steel wire
  FTM 932: coated with PE
  FTM 932 Z: coated with PUR
- Weights:
  FTM 930 / FTM 930 Z: 1.4 kg
  FTM 931/FTM 931 Z, L = 500 mm: 2.0 kg
- Weight per meter of extension tube: 2.2 kg
  FTM 932 / FTM 932 Z, L = 1000 mm : 2.3 kg
  Weight per meter cable: 0.5 kg

Operating Data

- Operating pressure in silo:
  max. 16 bar (240 psi) with FTM 930 FTM 931,FTM 930 Z, FTM 931 Z;
  max. 6 bar (90 psi) with FTM 932 / FTM 932 Z
- Minimum bulk solids density (loose): approx. 30 g/l
- Maximum bulk solids grain size: approx. 10 mm
- Lateral load on fork
  (FTM 930 / FTM 930 Z): 600 N
  (FTM 931 / FTM 931 Z): 60 Nm
- Max. permissible stress
  (FTM 932/FTM 932 Z): 6000 N

Length tolerances for FTM 931/FTM 931 Z,

Probe length Tolerance
up to 1 m +0 mm, -5 mm
up to 3 m +0 mm, -10 mm
up to 4 m +0 mm, -20 mm

for FTM 932/932 Z

Probe length Tolerance
up to 3 m +2.5 mm ,- 15 mm
up to 20 m +2.5 mm, - 20 mm

Electrical Functions

- Minimum/maximum fail-safe mode: selectable with switch
- Switch delay:
  on covering probe approx. 1 s;
  on clearing probe approx. 2 s
- Switch indication: red LED lights up when load de-energises

Electrical Connection

Screw terminals: max. 2.5 mm^2
Cable gland: PG 16

Certification

- FTM 930 Z, FTM 931 Z, FTM 932 Z BVS No. St Ex 1/89
- FTM 930 Z, FTM 931 Z, FTM 932 Z CSA No. LR 53988-15, -31
- Further certificates pending.

Certified application

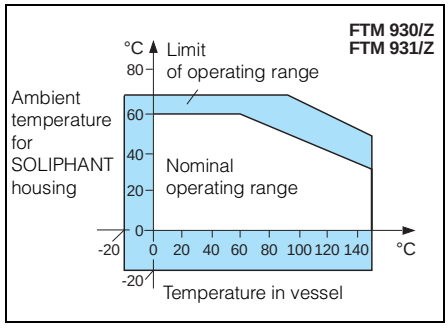
In addition to the instructions in this technical information, the specifications in the certificates and appropriate regulations apply.

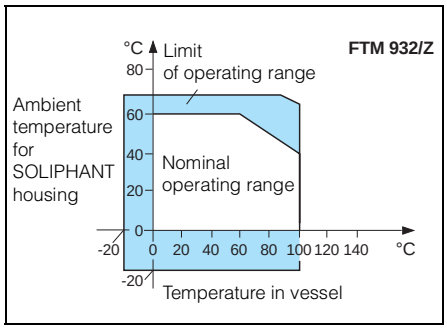
The maximum ambient temperatures are limited by:
- built-in relay module (see TI 083)
- installation with sleeve (max. 80 °C)

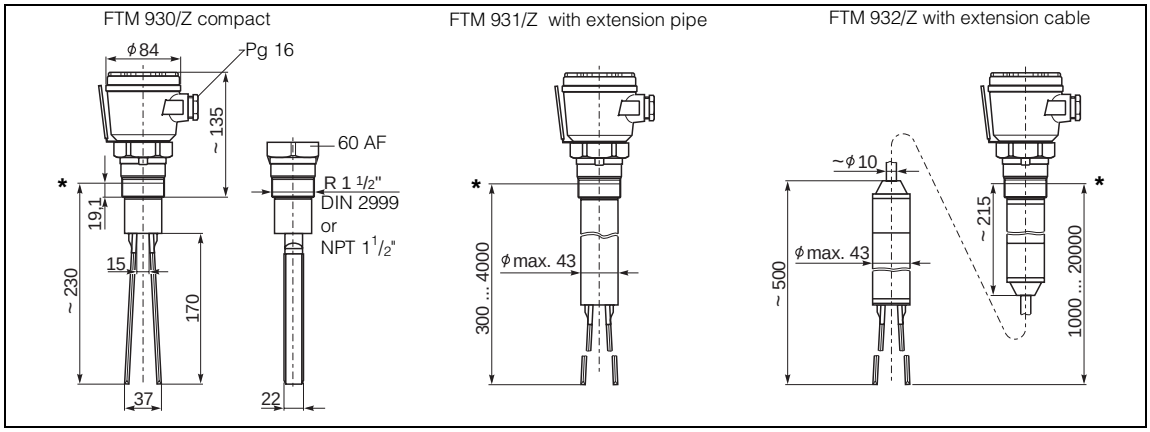
Extended temperature ranges are possible with the separate housing.
See technical information TI 187 F/00/e.
(not for FTM 932 Z in CSA application)

Operating temperatures

x °C = (x . $\frac{9}{5}$ + 32) °F







Dimensions in mm
100 mm = 3.94 in
1 in = 25.4 mm

*Measuring point: second turn from the top

Order Codes

Soliphant FTM 930...932

Fork versions
930 short, L = 230 mm
931 with extension tube, L = 300...4000 mm •
932 with extension cable, L = 1000...20000 mm

Process connection
G thread R 1 1/2", DIN 2999 (conical)
N thread NPT 1 1/2" ANSI B 1.20.1 (conical)
Y special version on request

Certificate
R standard
Y others on request

Surface wetted parts
1 standard 1.4301, 1.4308
9 special version on request

Electronic inserts for FTM 930, 931
ACS EM11, 2-wire, 21 V...250 V 50/60 Hz*
DPS EM12, 3-wire, 10 V...55 V = PNP
DNS EM13, 3-wire, 10 V...55 V = NPN
* relay module see accessories
or
Electronic inserts for FTM 932
ACG* EM21, 2-wire, 21 V...250 V 50/60 Hz
DPG* EM22, 3-wire, 10 V...55 V = PNP
DNG* EM23, 3-wire, 10 V...55 V= NPN
YYY other electronic inserts
* galvanically isolated from sensor

Housing
N Aluminium housing (IP 66) with PG 16 (IP 55)
K PBTP synthetic housing (IP 66) with PG 16 (IP 66)
X Separate housing
Y special version on request

Extension tube material for FTM 931
1 1.4301
9 special version on request
or
Carrying cable material for FTM 932
1 steel / PE
9 special version on request

Sensor (probe) length for FTM 931
3 500 mm (preferred length)
2 ...mm (selectable 300...499 mm)
1 ...mm (selectable 500...4000 mm)
9 special length on request
or
Sensor (probe) length for FTM 932 (can be shortened with set)
3 2500 mm (preferred length)
4 6000 mm (preferred length)
1 ...mm (selectable 1000...20000 mm)
9 special length on request

FTM [ ][ ][ ][ ][ ][ ][ ][ ] Order code for FTM...

[ ] Please state length for FTM 931 or FTM 932 in mm

• Min. probe length for FTM 931 with high pressure sleeve 400 mm

Soliphant FTM 930 Z...932 Z

Fork version
930 Z short, L = 230 mm [B,C]
931 Z with extension tube, L = 300...4000 mm [B,C]
932 Z with extension cable, L = 1000...20000 mm [B,C]

Process connection
G thread R 1 1/2" DIN 2999 (conical) [B,C]
N thread NPT 1 1/2", ANSI B 1.20.1 (conical) [B,C]
S sleeve G2, DIN ISO 228, 1.4571 [B,C] •
U sleeve G2, DIN ISO 228, steel [B,C] •
Y flange acc. to DIN or ANSI (all sizes) on request [B,C]

Certificate
N for dust explosion area, Zone 10 [B]
C CSA (Class II, Div.1, Group G and Coad Dust Class III, Div.1, Type 4)
Y others on request

Surface wetted parts
1 1.4301, 1.4308 [B,C]
9 special version on request

Electronic inserts for FTM 930 Z, FTM 931 Z
ACS EM11, 2-wire, 21 V...250 V 50/60 Hz [B,C*]
DPS EM12, 3-wire, 10 V...55 V = PNP [B,C]
DNS EM13, 3-wire, 10 V...55 V = NPN [B,C]
RM1 EM11 with relay module, 230 V 50/60 Hz [B]
RM3 EM11 with relay module, 200 V, 50/60 Hz [B]
RM2 EM11 with relay module, 110 V, 50/60 Hz [B,C*]
RM4 EM11 with relay module, 100 V, 50/60 Hz [B,C]
YYY other electronic inserts on request
or
Electronic inserts for FTM 932 Z
ACG* EM21, 2-wire, 21 V...250 V 50/60 Hz [B,C]
DPG* EM22, 3-wire, 10 V...55 V = PNP [B,C]
DNG* EM23, 3-wire, 10 V...55 V= NPN [B,C]
YYY other electronic inserts on request
* galvanically isolated from sensor

Housing with safety cover
S Aluminium (IP 66), with PG 16 (IP 55) [B]
C Aluminium (IP 66), with NPT 1/2" [B,C]
T Aluminium (IP 66), coated, with NPT 1/2" [B,C]
K PBTP synthetic housing (IP 66), with PG 16 (IP 66) [B]
X Separate housing [C*]
Y special version on request

Extension tube material for FTM 931 Z
1 1.4301 [B,C]
9 special version on request
or
Extension cable material for FTM 932 Z
1 steel / PUR [B,C]
9 special version on request

Probe length for FTM 931 Z
2 ...mm (selectable 300...499 mm) [B,C]
1 ...mm (selectable 500...4000 mm) [B,C]
9 special length on request
or
Probe length for FTM 932 Z (cannot be shortened)
1 ...mm (selectable 1000...20000 mm) [B,C]
9 special length on request

FTM [ ][ ][ ][ ][ ][ ][ ][ ] Order code for FTM...Z

[ ] Please state length for FTM 931 Z or FTM 932 Z in mm

[B] BVS approval
[C] CSA approval
[C*] special data see CSA certificate
• Min. probe length for FTM 931 Z: 400 mm

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08.93/MTM

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