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Technical Information
Prothermo NMT539

Intelligent high precision average temperature device + capacitance water bottom device for tank gauging

Application

Prothermo NMT539 is based on the API (American Petroleum Institute) Manual of Petroleum Measurement Standard, Chapter 7, and enables highly accurate temperature measurement. At the same time, it is an intelligent average temperature sensor for tank gauging with an optional WB capacitance sensor at the bottom of the temperature probe.

For average temperature measurement, it comprises precision multi-spot Pt100 elements capable of accurately measuring temperature.

NMT539 is a highly capable solution that provides both constant average temperature data and water level data via local HART communication.

For customs bonding applications, it can provide accurate inventory management when used in conjunction with a tank gauge liquid surface meter such as Endress +Hauser's Proservo, Tank Side Monitor, or Micropilot radar.

Features

- 2-wire local HART communication is employed and complete digital design without data transmission error is used.
- Intrinsically safe device allowing for the safest electrical configuration possible
- Available in three different versions based on customer requirements:
  - Converter Only
  - Converter and Temperature probe
  - Converter, temperature and water bottom (WB) probe
- Converter is compatible with Pt100, Cu90, and PtCu100.
- Variety of process connections and cable entries available to meet worldwide classifications.

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About this document

Symbol

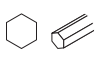
Safety symbols

Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury, as well as a risk of fire or explosion.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in a risk of serious or fatal injury, fire or explosion.
CAUTION	**Note** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in a risk of minor or moderate injury and damages to properties.
NOTICE	**NOTE!** This symbol contains information on procedures and other facts that do not result in personal injury.

Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	Direct current and alternating current
	**Ground connection** A grounded terminal that, as far as the operator is concerned, is grounded via a grounding system.
	**Protective ground connection** A terminal that must be connected to the ground prior to establishing any other connections.
	**Equipotential connection** This connects with the grounding system at the plant. It includes equipotential line and single point ground systems, depending on the norms of each country or company.

Tool symbols

Symbol	Meaning
 A0013442	Torx screwdriver
 A0011220	Flat blade screwdriver
 A0011219	Phillips screwdriver
 A0011221	Allen key
 A0011222	Open-ended wrench

Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted
	**Preferred** Procedures, processes or actions that are preferred
	**Forbidden** Procedures, processes or actions that are forbidden
	**Tip** Indicates additional information
	Reference to documentation
	Reference to page
	Reference to graphic
	Notice or individual step to be observed
1., 2., 3. ...	Series of steps
	Result of an operation or commissioning
	Help in the event of a problem
	Visual inspection
	Operation via the local display
	Operation via operating tool
	Write-protected parameter

Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1., 2., 3. ...	Series of steps
A, B, C, ...	Graphics
A-A, B-B, C-C, ...	Cross-sections
	**Hazardous area** Indicates the hazardous area
	**Safe area (non-hazardous area)** Indicates the non-hazardous area

Device symbol

Symbol	Meaning
	**Safety instructions** Observe the safety instructions contained in the associated Operating Instructions.
	**Temperature resistance of the connection cables** Specifies the minimum value of the temperature resistance of the connection cables.

Function and system design

Measurement system

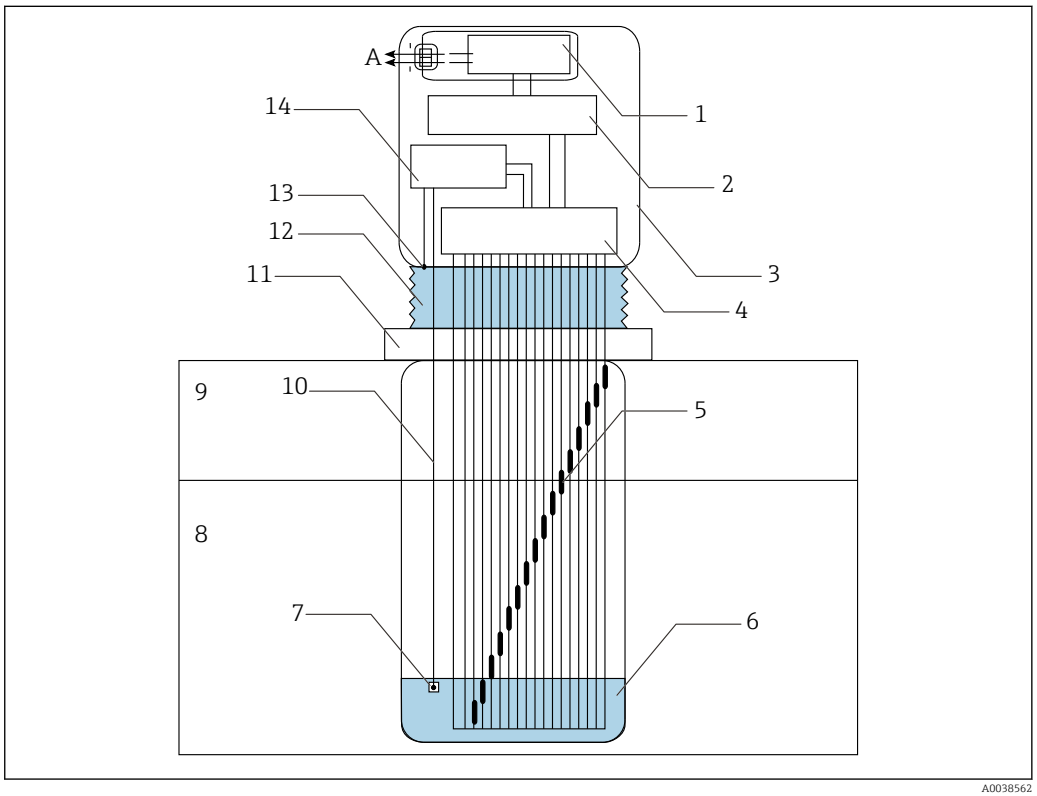
NMT539 is available in three different versions:

- Converter version
- Converter + Average Temperature Probe
- Converter + Average Temp Probe + Water Bottom Probe

The converter-only version can be retrofitted without large-scale modifications onto existing third-party average temperature probes such as Whessoe Varec 9909/1700 and Weed Beacon MW type probes. The converter + average temperature probe version is a combination of a local HART communication converter and a probe for establishing a temperature measurement function. The converter + average temperature probe + water bottom probe version is a multi-functional sensor that sends the temperature and water bottom data to NMS5, NMS8x, NMR8x, NRF81, TGM5, TMD1 or NRF590 on the host side via 2-wire local HART communication.

NMT539 operation principle (converter + average temperature probe + water bottom probe version)

Each type of NMT539 including converter only or converter + average temperature is a simplified version of a combination of converter + average temperature probe + WB (Water Bottom) probe. Up to 2 points of platinum resistance elements can be fitted inside the water bottom probe.

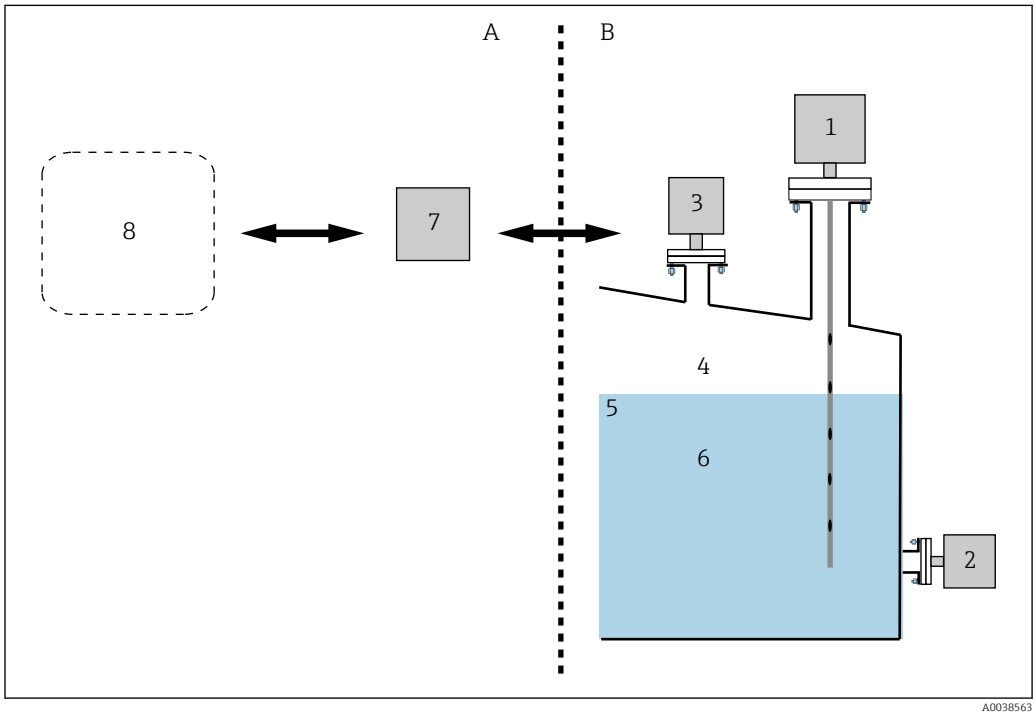


1 NMT539 operation principle

A Local HART communication
1 Noise filter
2 Power supply module
3 Converter (electrical compartment)
4 CPU module
5 Platinum resistance element (Pt100) 16 points maximum
6 Capacitance WB probe
7 WB probe coaxial signal cable
8 Liquid
9 Gas
10 Capacitance signal to C/F module
11 Flange
12 Flange height adjustment screw
13 WB probe frame ground
14 C/F module

System design

Endress+Hauser offers a wide range of tank gauge system solutions, including field equipment. The following diagram describes a typical solution based on Ex concepts. For your application-based requests, contact your Endress+Hauser Sales Center.

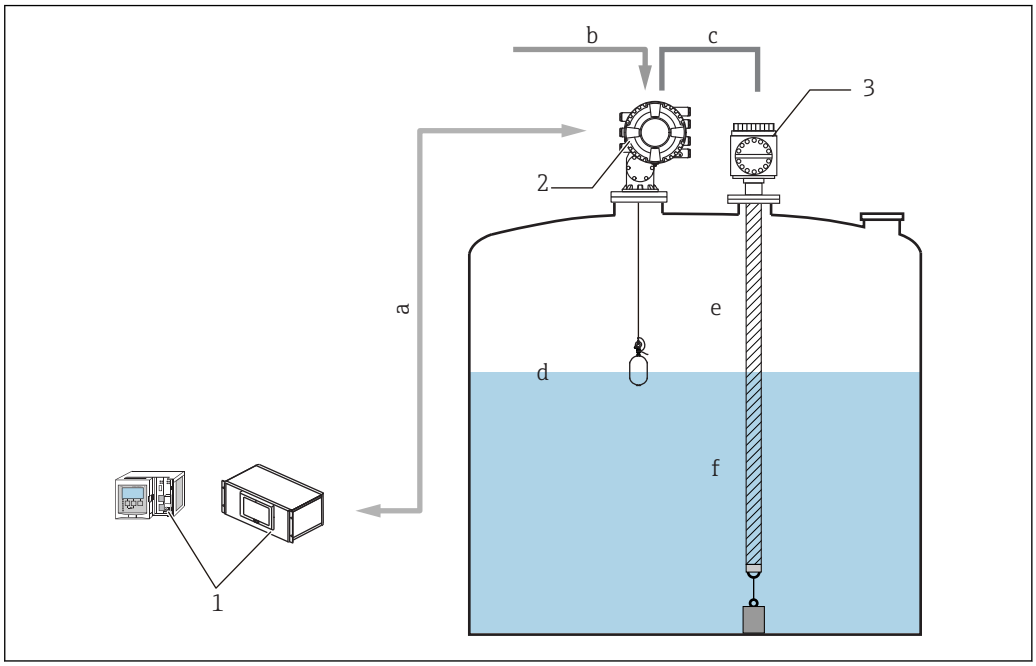


2 *System design*

A Data management
B Field process
1 Temperature device
2 Pressure measuring device
3 Float level gauge
4 Gas temperature
5 Level
6 Liquid temperature
7 System (Field interface NXA820/NXA83)
8 Host application (Tankvision NXA85/NXA86, DC, PLC, etc.)

NMT539 Ex ia and NMS8 Ex d [ia] combination

The connection of NMT539 shown above is only available for connection with NMS8 or NMS Ex d [ia].



3 *NMS8x and NMS539 system design*

a *Fieldbus protocol*
b *Power supply*
c *Local HART (Ex i) loop (data transmission)*
d *Level*
e *Gas temperature*
f *Liquid temperature*
1 *Tankvision*
2 *NMS8x*
3 *NMT539*

NMT539 converter + temp. version typical installation diagram

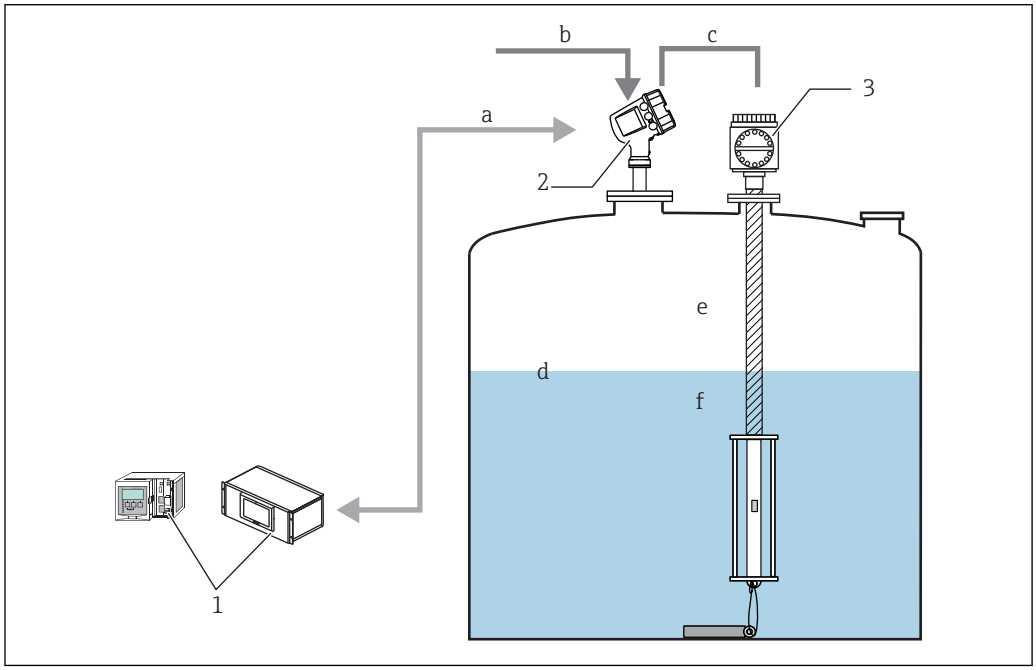
NMT539 is the successor of the former NMT535. For proper migration, NMT539 has inherited all the functionality and specifications of NMT535, including connection flange specifications, cable entries and wiring method. Since NMS5 or NMS8x is provided with WB measurement function, they can be combined with the converter + average temperature probe version of NMT539. When the converter + average temperature probe + WB probe version is combined with NMS5 or NMS8, the product in the tank will simultaneously be managed with level, continuous temperature and WB measurements. Most changes and parameter settings for NMT539 can be performed by NMS5 or NMS8x. NMT539 receives liquid level data from NMS5 or NMS8x and then calculates the average temperature of the liquid and gas phases. The calculated average temperature data of the liquid and gas phases are transmitted to NMS8x or NMS5 along with the measured temperature of each element and the NMT539 device status.

All gathered data in the field interface unit are sent to inventory management software (Tankvision) or to NMS8x, NMS5x, NMS7, NMR8x, NRF8x or NRF590.

NMT539 Ex ia and NMR8x Ex d [ia] combination

The connection of NMT539 shown below is only available for connection with NMR8x Ex d [ia].

NRF81 is required as a gateway for FMR5xx and NMT539 Tankvision when using FMR5xx Ex ia radar.



4 *NMT539 Ex ia and NMR8x combination*

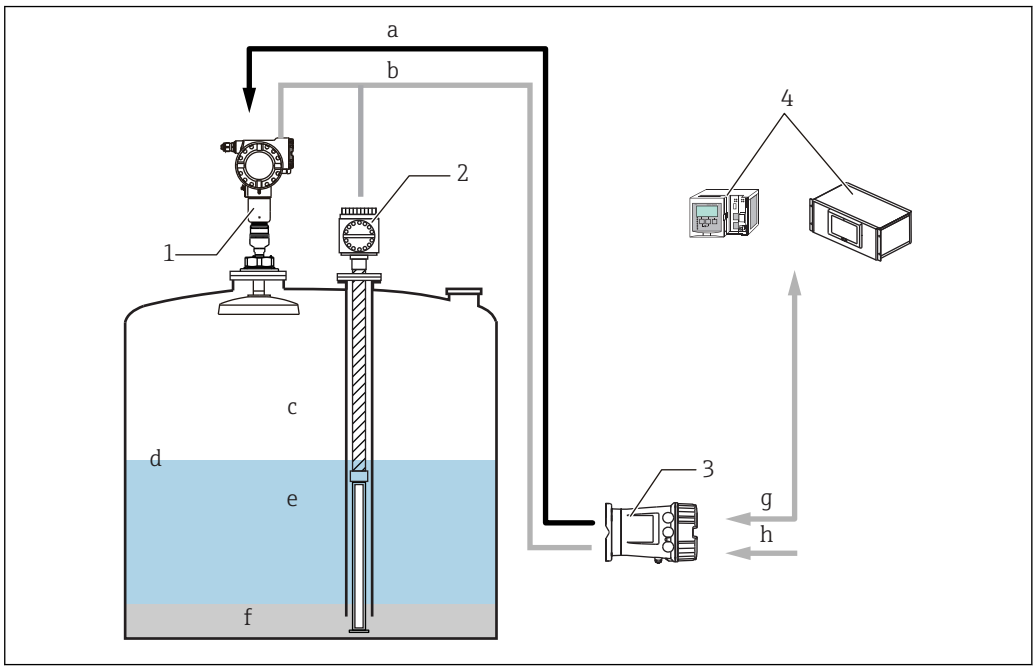
a Fieldbus protocol
b Power supply
c Local HART (Ex i) loop (data transmission)
d Level
e Gas temperature
f Liquid temperature
1 Tankvision
2 NMR8x
3 NMT539

NMT539 Ex ia and NRF590 Ex d [ia] combination

Typical application of NMT539 converter + temperature probe + WB probe version

The NMT539 converter + temperature probe + WB probe version is utilized most effectively in combination with radar level gauging. Water interface, temperature and liquid level measurement, with data collection and calculations via the NRF590 or NRF81, allow for optimal inventory control. Details on NMT539 functions and data can be accessed from NRF81 or NRF590. NMT539 receives radar level data from NRF590 or NRF81 and then calculates the average temperature of the liquid and gas phases. The calculated average temperature data of the liquid and gas phases are transmitted to NRF81 or NRF590 along with the measured temperature of each element and the NMT539 device status.

All gathered data in the field interface unit are sent to inventory management software (Tankvision) or to NMS8x, NMS5x, NMS7, NMR8x, NRF8x or NRF590.

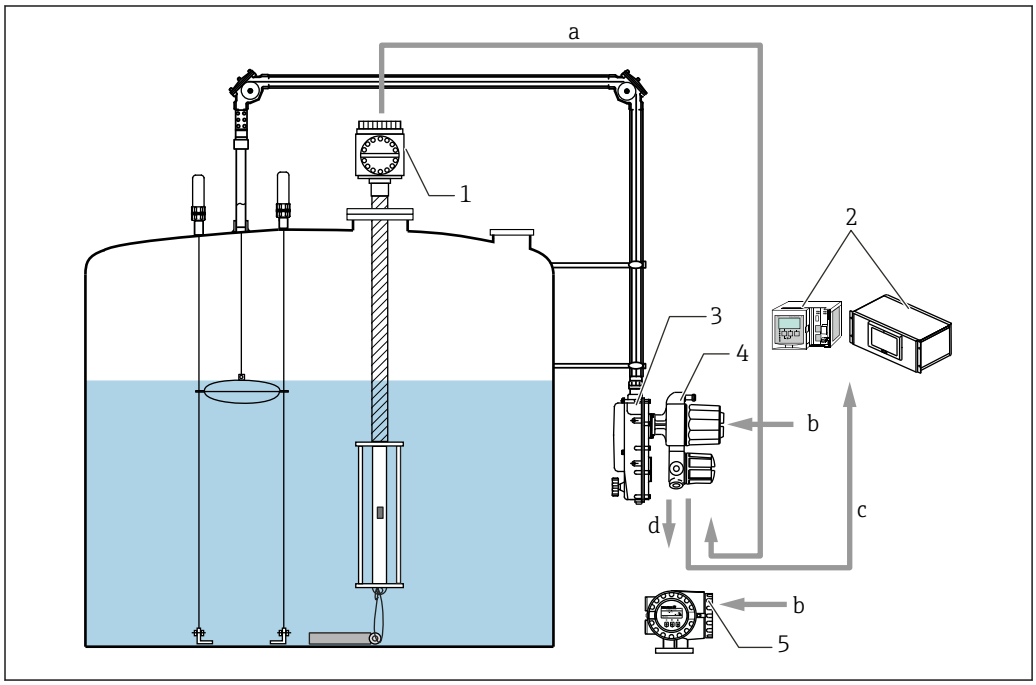


5 *NMT539 Ex ia and NRF590 Ex d [ia] combination*

a *FMR power supply (DC/Ex i)*
b *Local HART (Ex i) loop (data transmission)*
c *Gas temperature*
d *Level*
e *Liquid level temperature*
f *Water*
g *Fieldbus protocol*
h *Power supply*
1 *FMR540*
2 *NMT539*
3 *NRF81/NRF590*
4 *Tankvision*

NMT539 Ex d [ia] and TMD1 Ex d combination

Average temperature device NMT539 can be connected to Transmitter TMD1 or Servo Level Gauge TGM5 via local HART (Ex d) communication. Because local HART communication is digital, it is able to send a larger volume of information compared to the conventional RTD method. This means that NMT539 can work with not just DRM9700 but also with NRF560. If NMT539 WB probe and NRF560 are used together, confirm that the supply voltage to TMD1 is stable at 100 VAC or higher.

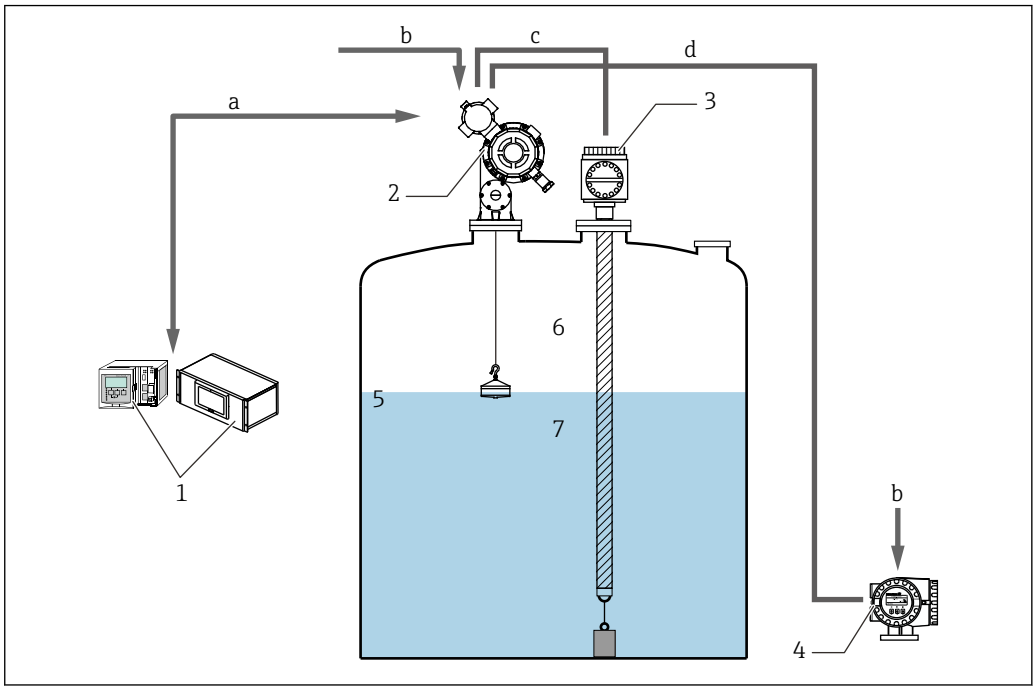


6 NMT539 Ex d [ia] and TMD1 combination

a Local HART (Ex d) loop (data transmission)
b Power supply
c Fieldbus protocol
d HART (Ex d) loop (data transmission)
1 NMT539
2 Tankvision
3 LT5
4 TMD1
5 NRF560

NMT539 Ex d [ia] and TGM5 combination

When NMT539 with WB probe and NRF560 are used together, confirm that the supply voltage to TGM5 is stable at 100 VAC or higher.



7 *NMT539 Ex d [ia] and TGM5 combination*

a Fieldbus protocol
b Power supply
c Local HART (Ex d) loop (NMT539 and TGM5)
d Local HART (Ex d) loop (TGM5 and NRF560)
1 Tankvision
2 TGM5
3 NMT539
4 NRF560
5 Level
6 Gas temperature
7 Liquid temperature

Input/output

Measuring range

Measuring range

Temperature conversion	−200 to 235 °C (−328 to 455 °F) (−170 to 235 (−274 to 455) TIIS)
Standard	−40 to 100 °C (−40 to 212 °F) (−20 to 100 °C (−4 to 212 °F) TIIS)
Wide range	−55 to 235 °C (−67 to 455 °F) (−20 to 235 °C (−4 to 455 °F) TIIS)
Cryogenic	−170 to 60 (−274 to 140)
Probe length	Maximum 99.999 m (328.08 ft) (ATEX, IECEx, NEPSI, INMETRO, FM C/US) Maximum 40.000 n (131.23 ft) (TIIS)

The range of −200 to 100 °C (−328 to 212 °F) can be accommodated upon request.

Water bottom measurement

Standard	1 m (3.28 ft) or 2 m (6.56 ft)

For larger measurements, contact your local Endress+Hauser Sales Center.

Compatible elements (converter-only version)

NMT539 converter + temperature probe version only has Pt100 elements installed. However, since the software in the converter is equipped with a function that converts elements with different characteristics, it is possible to use another brand's temperature probe, such as the Whessoe Varec 9909/1700 or Weed Beacon MWR. It is also compatible with other brands' multi-element and multi-spot average temperature probes.

- Pt100
- Cu90
- Cu100
- PtCu100
- JPt100

TIIS is only available for Pt100 and JPt100.

Number of elements

2 to 16 points

Minimum element interval (distance)

Standard specifications	150 mm (5.9 in) (Order code: 030, options 1, 4, 5)
High temperature / low temperature	400 mm (15.75 in) (Order code: 030, options 2, 3, 6)

If NMT539 comes with a WB (water bottom) probe option, the maximum number of WB internal elements is two, because of the restriction posed by the internal diameter.

Communication

Local HART protocol (exclusively for local host device)

- Proservo NMS5/NMS7/NMS8x
- Micropilot NMR8x
- Tank side monitor NRF590/NRF81
- Digital transmitter TMD1
- Servo level gauge TGM5

Local HART

Local HART is Endress+Hauser's proprietary signal format that only uses local HART protocol digital transmission without a 4 to 20 mA signal. It is used for communications in NMT539, NRF560, NMS5, NMS7, NMS8x, NMR8x, NRF590, NRF81, TMD1 and TGM5.

Alarm signal

Error information can be accessed via the following interface and transmission digital protocol. Refer to operating instructions for details on each device.

NMS5	BA00401G, MS7: BA01001G, NMS8x: BA1456G, BA1459G, BA1462G
NMR8x	BA01450G, BA01453G
NRF590	BA00256F, BA00257F, NRF81: BA01465G
TMD1	BA00427G
TGM5	BA00415G

Output signal

Local HART protocol

Connection

- Proservo NMS5/NMS7/NMS8x
- Micropilot NMR8x
- Tank side monitor NRF590/NRF81
- Digital transmitter TMD1
- Servo level gauge TGM5

Power supply

Load local HART

Minimum loading for local HART circuit: 250 Ω

Overvoltage protection

NMT539 has an internal surge arrester that complies with EN / IEC 61000-4-5 (Line to Line 1.0 kV).1.0 kVConnect the metallic housing of NMT539 directly to the tank wall with an electrically conductive lead to ensure reliable potential matching.

Supply voltage

16-30 $_V$DC	Ex ia
20-24$_V$DC	TIIS Ex d [ia] (only connectible to TGM5, TMD1, NMS, Ex d)

Power consumption

Ex ia

- 6 mA (temperature measurement)
- 12 mA (water bottom measurement)

TIIS, Ex d [ia]

- 8 mA (temperature measurement)
- 14 mA (water bottom measurement)

Cable entries

Wiring of NMT539 must meet the flameproof and intrinsic safety requirements. The following cable entries are available:

- Thread G1/2
- Thread NPT1/2
- Thread M20

Only G1/2 can be selected for TIIS Ex d [ia], and two SXC-16B cable glands are attached.

Always use the cable glands attached to NMT539.

Cable glands are not provided for NMT539 specifications other than for TIIS Ex d [ia].

The size and condition of the communication cable must meet the requirements for intrinsically safe local HART communication.

Process connection

Converter-only version

NMT539's local HART converter is compatible to other brands' average temperature sensors with the following mechanical connection sizes and types:

- G 3/4" (NPS 3/4" or equivalent product) universal coupling: housing type 1
- M20 threaded: specifications that are compatible with housing type 2 and Varec 1700 terminal housing

- Use sealing tape to secure the connection between the converter and the temperature probe.
- Refer to the NMT539 Operating Instructions (BA01025G) for detailed installation procedures.

"Converter + temperature probe" and "converter + temperature probe + WB probe" versions

These two versions can be fitted to a tank nozzle using the same installation method.

The following flange standards are available:

- 10K 50A RF, SUS316, flange JIS B2220
- NPS 2", Cl.150 RF, SUS316 flange ASME B16.5
- DN50 PN10 B1, SUS316, flange EN1092-1 (DIN2527 B)
- 50A 150lbs RF, SUS316, flange JPI 7S-15

Electrical connection

Terminal wiring (TIIS, Ex d [ia])

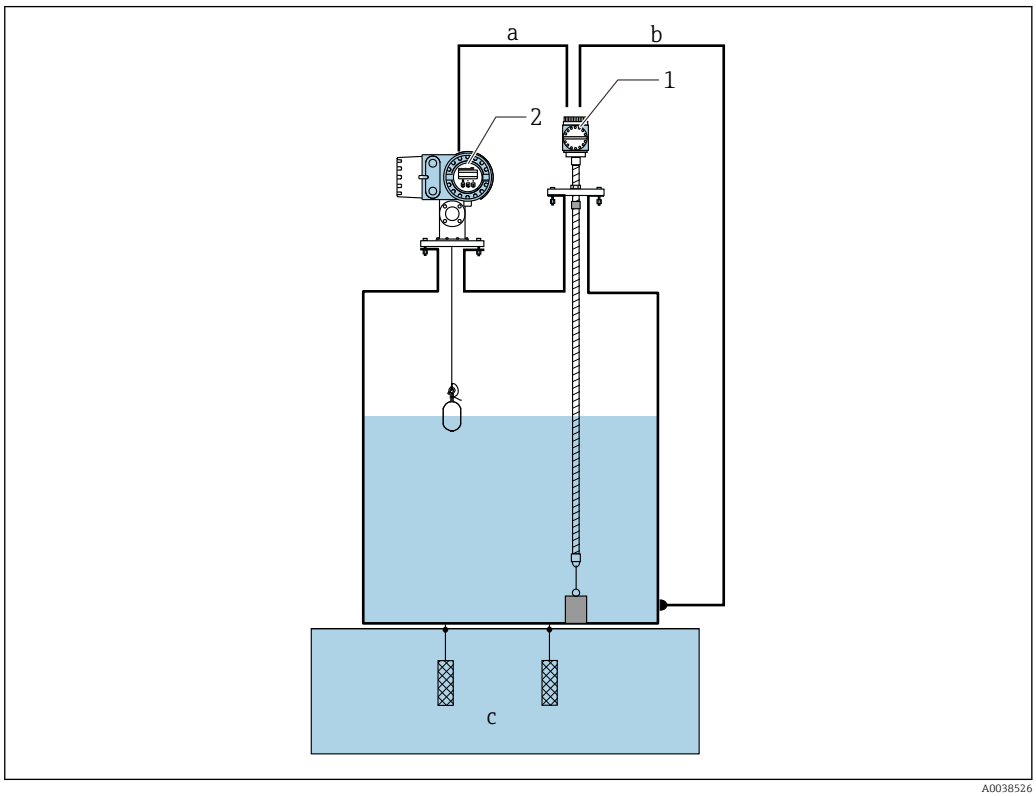
When NMT539 has a flameproof and intrinsically-safe structure (Ex d[ia]), class A grounding is required as shown below.

- The zener barrier that is built into NMT539 (PE) should be grounded to a grounding point in a non-hazardous location, independent of any other types of grounding wires (arresters), as per class A grounding standards.
- The cross-sectional area of the core of the grounding cable must be at least 2 to 2.6 mm^2. In an instrumentation room, a field device with class A grounding may be connected in common to the communication cable shield.

Overview of class A grounding

Ground resistance value	10 Ω or less
Grounding cable	▪ Tensile strength: metal wire with tensile strength of at least 1.04 kN ▪ Cable core cross-sectional area: annealed copper wire with a core cross-sectional area of at least 2 to 2.6 mm^2 ▪ External diameter of the finished cable: minimum φ 8 mm (0.31 in)

Example of grounding procedure



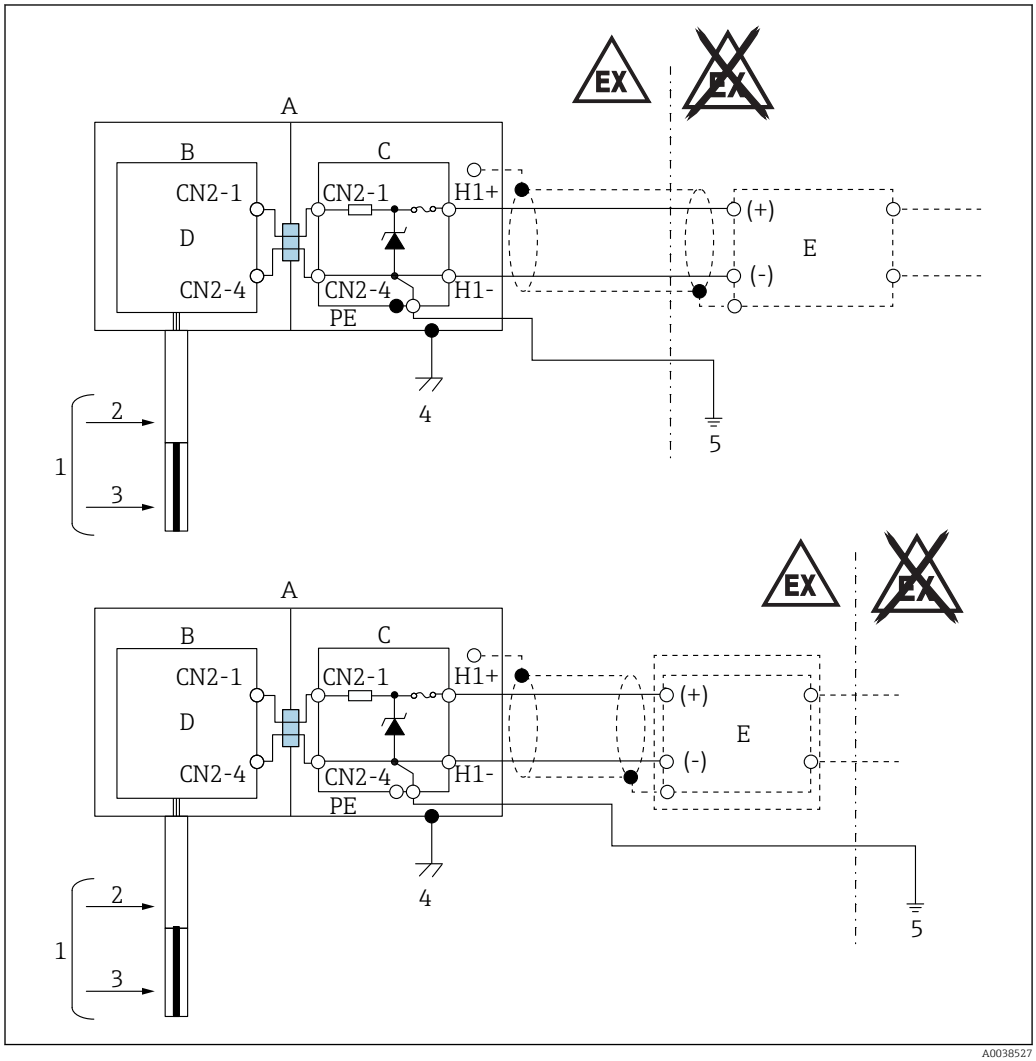
8 Grounding procedure

a Local HART (Ex d) communication
b Ground wire (see Note)
c Non-hazardous/class A grounding work/underground
1 NMT539
2 NMS5

When grounding a zener barrier (PE), the external diameter of the cable to be attached to a tank must be Ø 8 mm (0.31 in) or larger.

Wiring diagram

When wiring an intrinsically safe device, ensure that a current or voltage that can compromise the intrinsic safety feature of the intrinsically safe circuit is not generated on the intrinsically safe circuit due to electromagnetic or static induction.



9 *Wiring diagram*

A Meter in tank
B Flameproof enclosure (terminal compartment)
C Intrinsically safe circuit
D Generic device (DC 20 to 26.4 V)
1 Measured site (see Note)
2 Temperature measurement probe
3 WB probe
4 External grounding terminal
5 Class A grounding (see Note)

A WB probe is not included when the only measurement function is average temperature measurement.

NOTICE

Common grounding wire with an arrester

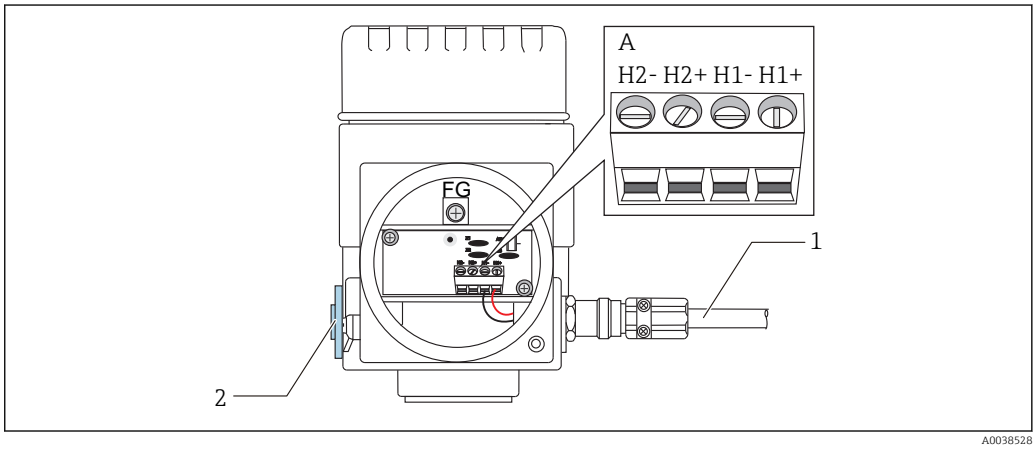
Flow of significant current due to a lightning strike will cause the NMT539 to malfunction.

- Although grounding wire A can be used with the grounding wires of other safety barriers, do not use it with the grounding wire of an arrester.

Terminal connection

NMT539 (Ex ia) intrinsically safe connection

NMT539, which uses intrinsically safe local HART communication, must be connected to the device's intrinsically safe terminal to be connected. Refer to the intrinsic safety regulations for establishing wiring and field device layout.



10 *NMT539 terminal (ATEX・Ex ia)*

A Temperature (WB) data / NMT539 intrinsically safe 2-wire HART communication (see Information)
1 Shielded twisted pair wire or steel-armored wire
2 Standard aluminum (die-cast plug)

Only a metal cable gland may be used. The shielded wire on the HART communication line must be grounded.

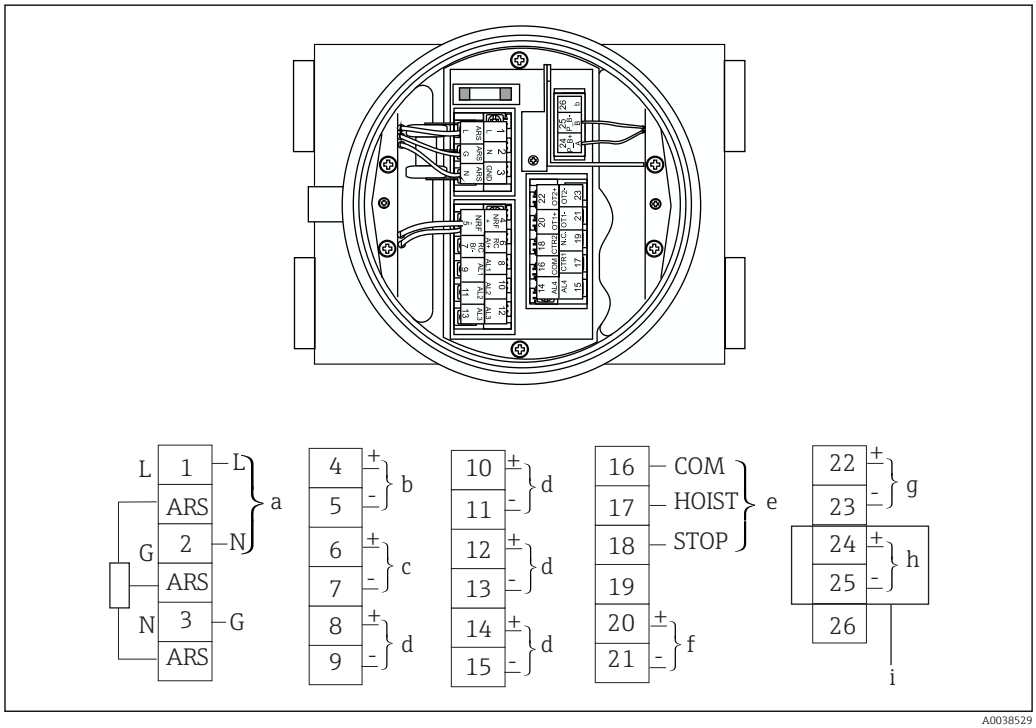
Connection table

Connection to NRF590		Connection to NMS5		Connection to NMS8x/NMR8x/NRF81	
+ Terminal	24, 26, 28	+ Terminal	24	+ Terminal	E1
- Terminal	25, 27, 29	- Terminal	25	- Terminal	E2

+H1 and +H2 are + terminals, and -H1 and -H2 are - terminals.

NMS5 (Ex d [ia]) intrinsically safe connection

The intrinsically safe NMT539 must be connected to the intrinsically safe local HART terminal on NMS5.



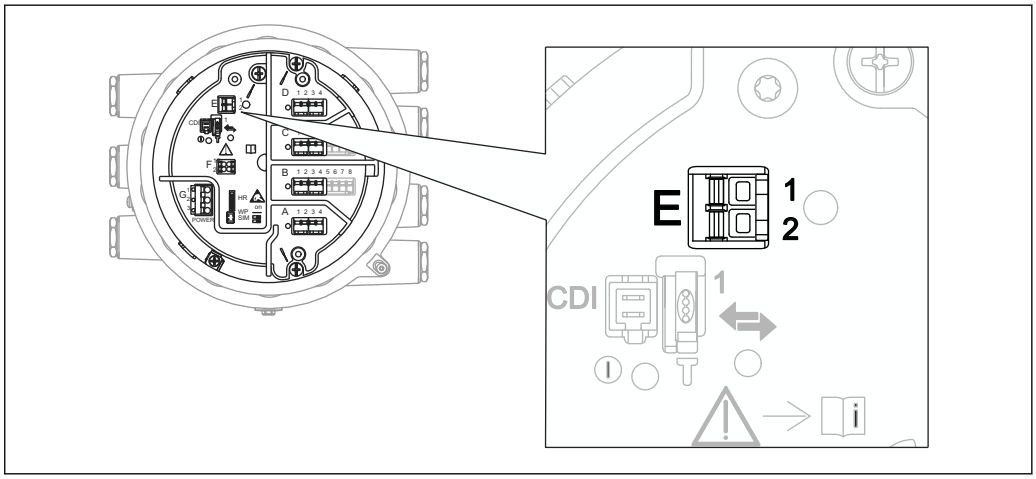
11 NMS5 terminal

a Power supply AC85: 264V 50/60 Hz or DC20: 62V AC20: 55V
b Non-intrinsically safe HART communication: NRF, etc.
c Digital output Modbus, RS485 serial pulse or HART
d Alarm contact point
e Operation contact point input
f 4 to 20 mA channel 1
g 4 to 20 mA channel 2
h Intrinsically safe HART
i From NMT539 Ex ia

Do not connect NMT539 local HART communication cable to terminals 4 and 5 on NMS5/ NMS7. These terminals are designed to connect to Ex d local HART communication.

NMS8x/NMR8x/NRF81 (Ex d [ia]) intrinsically safe connection

To connect an intrinsically safe NMT539, E1 and E2 are used to connect with NMS8x, NMR8x and NRF81.

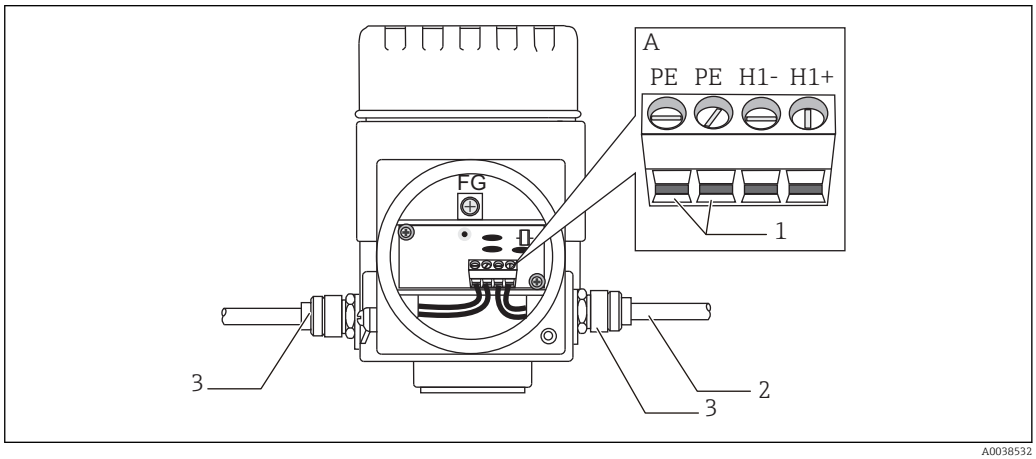


12 *NMS8x terminal for NMT539*

E1 H+ terminal
E2 H- terminal

NMT539 (TIIS, Ex d [ia]) terminal

Connect a flameproof local HART communication NMT539 to the flameproof terminal of the device to be connected. Wiring and on-site equipment layout must be in accordance with the Safety Guide for Electric Equipment.



13 *NMT539 terminal (TIIS ・Ex d [ia])*

A Temperature (WB) data / NMT539 flameproof 2-wire HART communication (see Information)
1 Class A grounding work at a non-hazardous location (1 to 1.5 mm²: 1 wire)
2 Shielded twisted pair wire or steel-armored wire
3 Cable gland (SXC-16B)

The shielded wire on the HART communication line must be grounded.

NOTICE

Common grounding wire with an arrester

Flow of significant current due to a lightning strike will cause the NMT539 to malfunction.

- Although grounding wire A can be used with the grounding wires of other safety barriers, do not use it with the grounding wire of an arrester.

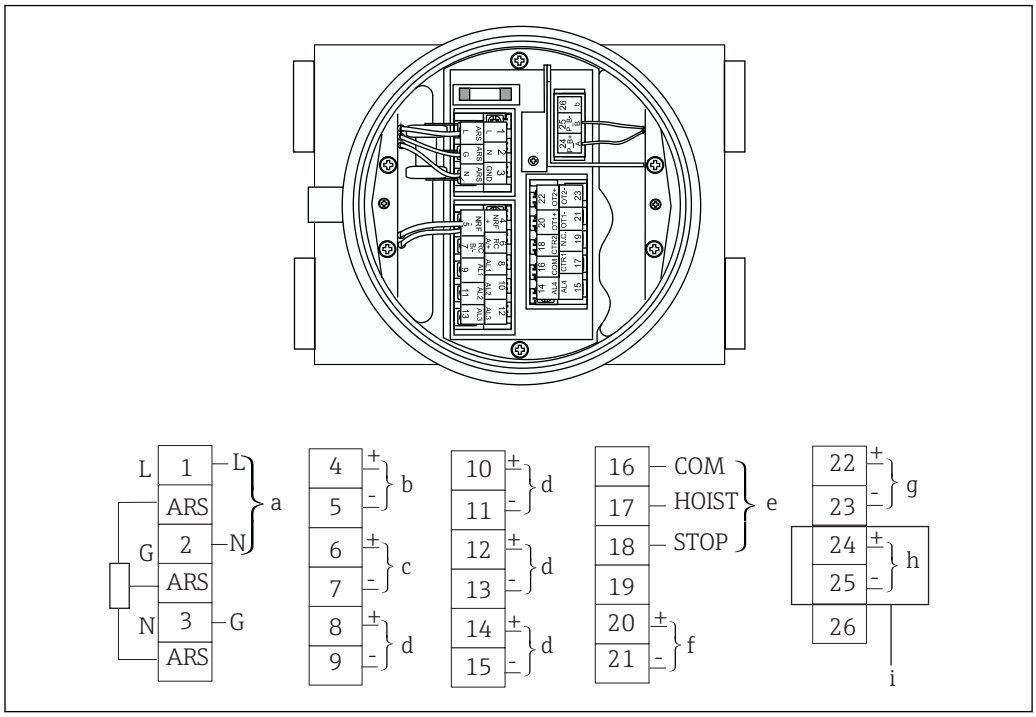
Connection table

Connection to NRF590		Connection to NMS5	
+ Terminal	13	+ Terminal	24
- Terminal	12	- Terminal	25

+H1 and +H2 are + terminals, and -H1 and -H2 are - terminals.

NMS5 (Ex d [ia]) intrinsically safe connection

The intrinsically safe NMT539 must be connected to the intrinsically safe local HART terminal on NMS5.



14 *NMS5 terminal*

a *Power supply AC85: 264V 50/60 Hz or DC20: 62V AC20: 55V*
b *Non-intrinsically safe HART communication: NRF, etc.*
c *Digital output Modbus, RS485 serial pulse or HART*
d *Alarm contact point*
e *Operation contact point input*
f *4 to 20 mA channel 1*
g *4 to 20 mA channel 2*
h *Intrinsically safe HART*
i *From NMT539 Ex ia*

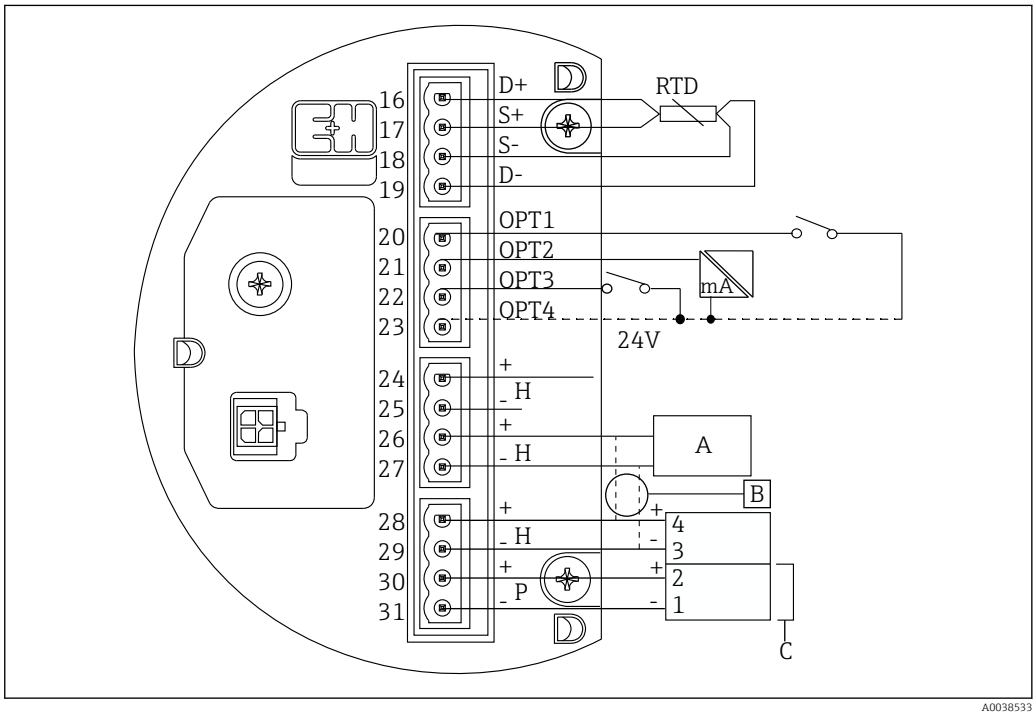
TGM5 and TMD1 terminals

TGM5 is equipped with local HART communication function except for when "Sakura code (collector common), BCD (emitter common), BCD (collector common)" has been selected in "Output 1. "Although connection with an Ex d [ia] device is possible, the terminal numbers are different depending on the specifications. To connect, see the TGM5 terminal table.

In the case of TMD1-xBxxxxxxxxx (with local HART input), it is possible to connect Ex d [ia] devices; however, terminal numbers are different depending the specifications. To connect, see the TMD1 terminal table.

NRF590 terminals

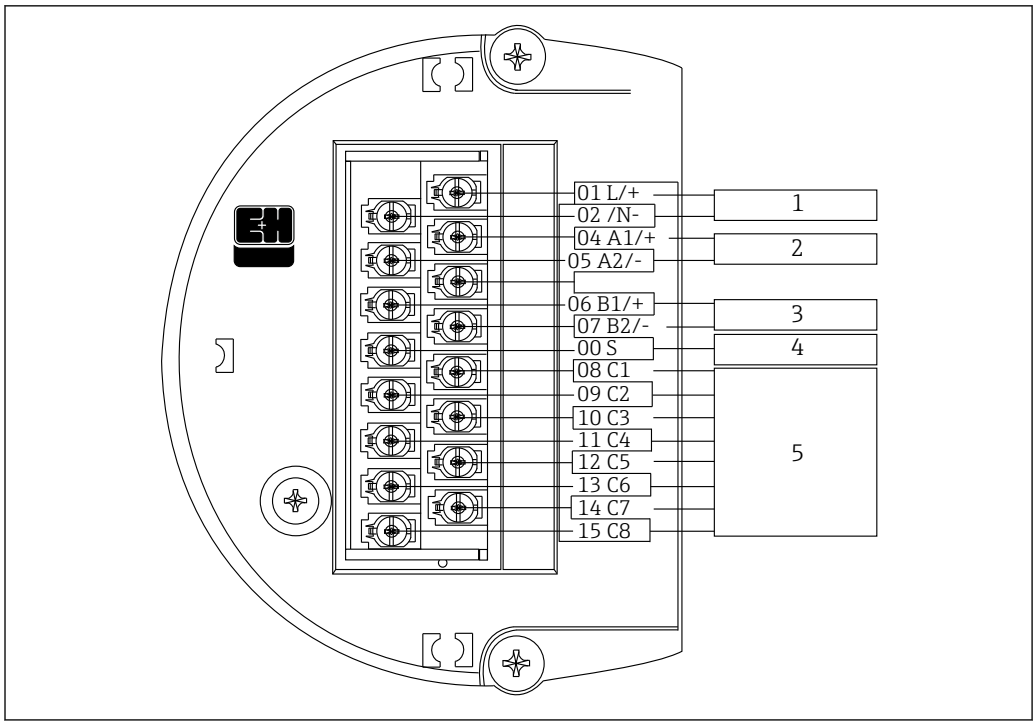
NRF590 has three sets of intrinsically safe local HART terminals.



15 *NRF590 (intrinsically safe) terminals*

A A HART sensor (mutually connected as a single HART fieldbus loop on the inside)
B Fieldbus loop
C Only in Micropilot S series

A signal local HART line cannot be connected from NMT539 to terminals 30 and 31. These terminals are an intrinsically safe DC 24V power supply for the Micropilot S Series (FMR53x, FMR540).



16 NRF590 (TIIS flameproof) terminal

1 Power supply
2 Digital I/O A
3 Digital I/O B
4 Cable shield
5 Field protocol and analog I/O

Performance characteristics

Reference operating conditions

- Temperature: 25 °C (77 °F) ± 5 °C (9 °F)
- Pressure: 1013 mbar abs. ± 20 mbar abs. (1013 hPa abs. ± 20 hPa abs. , 14.7 psi abs. ± 0.3 psi abs.)
- Relative humidity (air): 65 % ± 20 % (linearity)
- Converter and precision resistor combination or converter and probe combination
  - WB measurement range: 80 % (100 to 900 mm (3.94 to 35.43 in))
  - The factory default setting is DC (er) = 2.1. Adjustment should be made on-site when necessary.

Measured value resolution

Temperature	≤ 0.1 °C (0.18 °F)
WB	≤ 0.1 mm (0.004 in)

Maximum measurement error

The values below represent performances under reference operating conditions (including linearity, repeatability, hysteresis).

Conversion accuracy

Function	Options	Accuracy
Temperature	Standard/PTB	± 0.1 °C (0.18 °F)
WB	1 m (3.28 ft)	± 2 mm (0.08 in)
	2 m (6.56 ft)	± 4 mm (0.16 in)

Probe accuracy

Function	Options	Accuracy
Temperature	Standard	± 0.15 °C + 0.002 °C x |t| (0.27 °F + 0.0036 °F |t|) IEC 60751 / DIN EN 60751 / JIS C1604 class A temperature element
	PTB	± (0.3 °C + 0.005 °C x |t|) / 10 ((0.54 °F + 0.009 °F x |t|) / 10) Class 1/10B temperature element
WB	1 m (3.28 ft)	± 2 mm (0.08 in)
	2 m (6.56 ft)	± 5 mm (0.2 in)

Overall accuracy

Function	Options	Accuracy
Temperature	Standard	Conversion accuracy ± 0.1 °C (0.18 °F) + environmental effect ± 0.05 °C (0.09 °F) + Class A temperature element ± 0.15 °C + 0.002 °C x |t| (0.27 °F + 0.0036 °F x |t|)
	PTB	Conversion accuracy ± 0.1 °C (0.18 °F) + environmental effect ± 0.05 °C (0.09 °F) + Class 1/10B temperature element ± (0.3 °C + 0.005 °C x |t|) / 10 (0.54 °F + 0.009 °F x |t| / 10)
WB	1 m (3.28 ft)	Conversion accuracy ± 2 mm (0.08 in) + probe accuracy ± 2 mm (0.08 in)
	2 m (6.56 ft)	Conversion accuracy ± 4 mm (0.16 in) + probe accuracy ± 5 mm (0.2 in)

- Accuracy can be improved for each application by making adjustments on-site, such as adjusting the offset.
- \|t\| represents the temperature of the measured item.

New module

NMT539 employs a newer electronic module compared to the NMT535.

Items	NMT539	NMT535
CPU performance	16 bit	8 bit
Clock speed	2.7648 MHz	0.9216 MHz
Memory capacity (RAM)	20 KB	176 B
EEPROM	2 KB	256 B
Flash memory	256 KB	16 KB
Total # of print boards	4 (5: with capacitance board)	5
Power consumption (converter + temperature probe)	16 mA: 16 V_{DC} Ex ia 8 mA: 16 V_{DC} Ex d [ia]	10 mA : 16 V_{DC}
Power consumption (converter + temperature probe + WB probe)	12 mA mA: Ex ia 14 mA: Ex d [ia]	

All-in-one program

By introducing a new module, all measurements can now be processed logically while maintaining a simple substrate configuration because of the processor's large memory capacity and high speed.

RTD temperature calculation

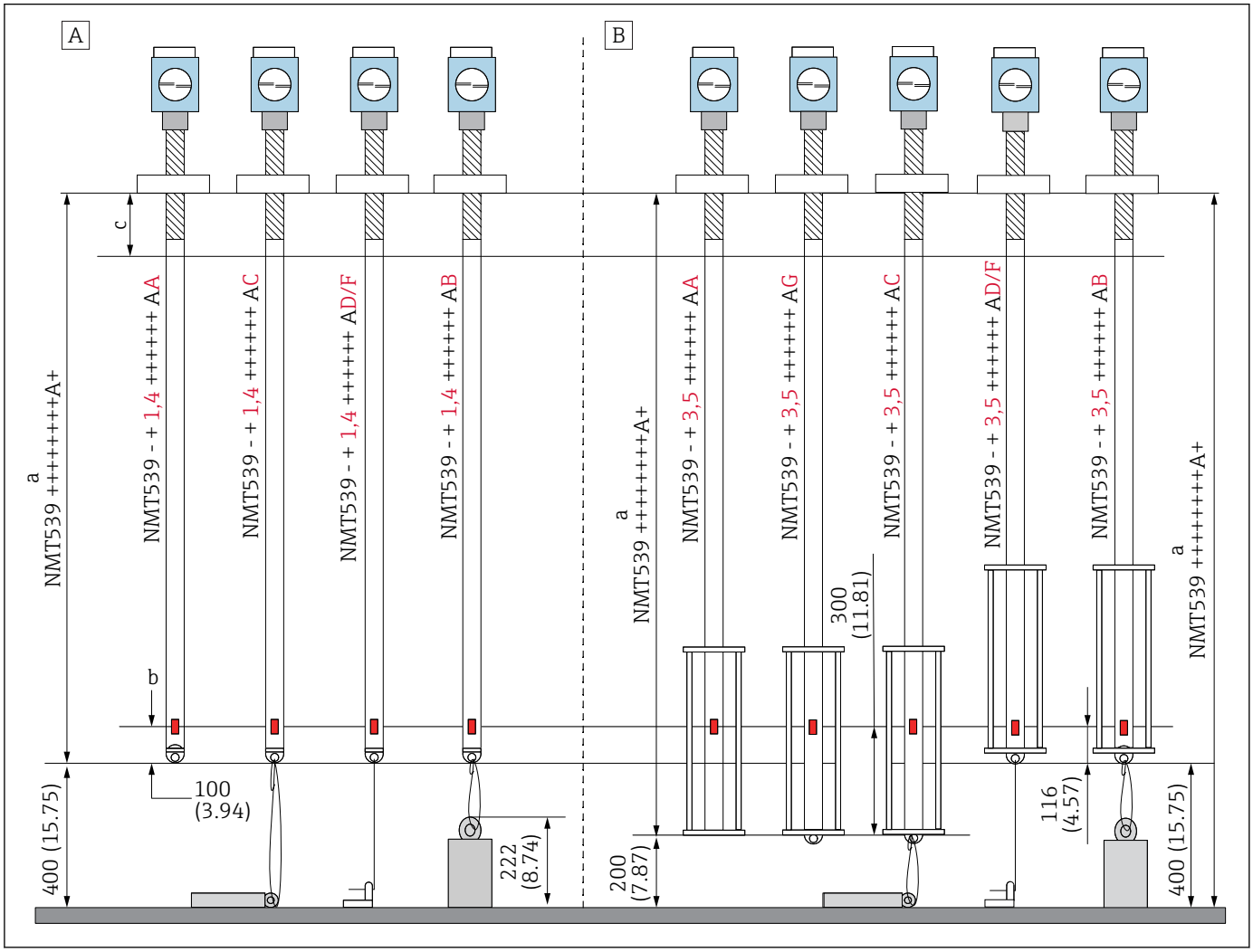
The main CPU board now has all the required data processing functionality, including RTD - local HART conversion.NMT538 required various programs due to different characteristics of the temperature measurement elements, such as Pt100, Cu90, Cu100 and PtCu100.However, the new NMT539 has all the programs in one powerful processor.

Capacitance - local HART signal conversion

An individual C/F (Capacitance - Frequency) module is connected directly to the CPU board when NMT539 is equipped with a WB probe.

Installation

Element No. 1 position



17 *Position of NMT539 element No. 1 based on the installation method*

A Converter + temperature probe
B Converter + temperature probe + WB probe
a Below the flange
b Element No.1
c Distance from flange bottom to flexible probe: 269 mm (10.59 in)

Installation height adjustment

A unique feature of NMT539 is its ability to adjust its height by approx. ±180 mm (7.09 in) from the original position.

The height adjustment feature is not available on the welding flange type and the converter-only version.

NOTICE

Tightening the lock nut

A loose lock nut may lead to improper tank sealing or unexpected leakage into the tank.

► Tighten the lock nut securely after wrapping sealing tape to secure the flange of NMT539.

WB blocking distance

The WB probe bottom clearance can be adjusted in small increments using the installation height adjustment function. The capacitance WB device in NMT539 has a unique structure in which the gland reference is established with the main unit alone, so it is barely affected by the bottom and the wall of the tank. Because of this, measurements can be taken very close to the bottom of the tank. Due to the mechanical design of the WB probe, the bottom plate is approximately 10 mm (0.39 in) in thickness. This will become the blocking distance (ineffective measuring range).

NOTICE

Setting the WB probe bottom clearance

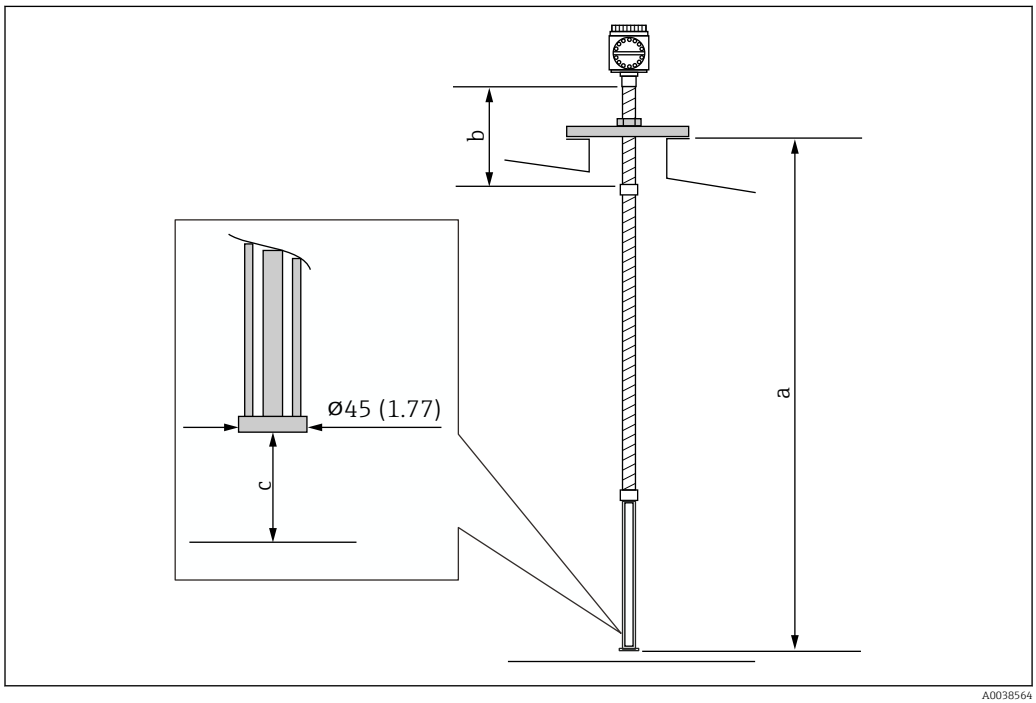
When a WB probe touches the bottom of a tank, an excessive weight load is applied to the entire NMT539 on the WB probe, and this may prevent accurate and stable WB measurement.

- ▶ Calculate the vertical movement for the NMT539 installation height prior to setting the WB probe bottom clearance. Approx. 20 to 30 mm (0.79 to 1.18 in) of vertical movement should be taken into consideration even with external deformation (warping) of a typical tank.

Recommended installation height

The required bottom clearances of both a temperature probe and a WB probe vary depending on the installation method (see figure of element No. 1 position). Consider the required bottom clearance when ordering NMT539. Use the recommended clearance in the figure above as a reference, or contact your Endress+Hauser Sales Center.

- When ordering NMT539 with a special element interval and bottom clearance, select "Ordering information: item 080 (temperature element interval 4). " The minimum element interval for standard temperature specifications is 150 mm (5.91 in). For high-temperature and low-temperature specifications, it is 400 mm (15.75 in). The maximum number of elements in a WB probe is two elements.
- The standard position of the lowest temperature element should be set at 500 mm (19.69 in) from the bottom of the tank regardless of the probe type.



18 *Recommended installation. Unit of measurement mm (in)*

a Recommended installation
b Approx. ± 180 mm (7.09 in) Total 360 mm (14.17 in) (adjustable range)
c Varies depending on the specifications

The installation height of "a" in the figure is the probe length from the bottom of the flange to the bottom of the temperature probe or bottom of the WB probe.

Recommended stilling well installation

When installing a base plate at the bottom of a tank, A requires at least 300 mm (11.81 in) clearance from the bottom of a stilling well (perforated protective pipe).

If an anchor weight is not used when installing a stilling well, install a WB probe below the stilling well's bottom so that the pipe can be filled with liquid.

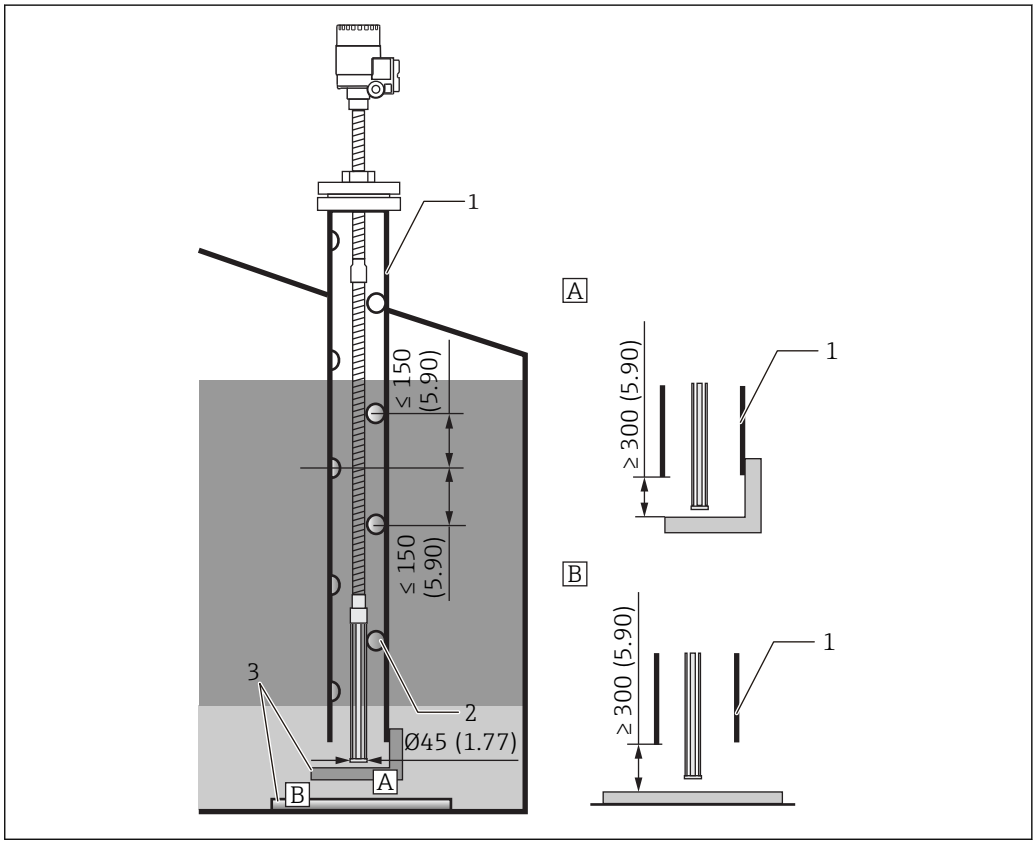
Stilling well is available from 50A (2") (JIS, ANSI) pipe.

NOTICE

Using an anchor weight

Moving a WB probe side ways or swinging it may damage the WB probe.

- ▶ Use a pipe that is at least 100A (4") (JIS, ANSI) when using an anchor weight.



19 *Stilling well. Unit of measurement mm (in)*

A Base plate case 1
B Base plate case 2
1 Stilling well
2 Hole (Ø 25 mm (0.98 in))
3 Base plate

Installation attachments

If "Ordering information: item 100, installation attachments, A: none" is selected, the WB probe version will not come with a bottom hook (see Figure 16) but a bottom hook is included with the temperature probe version.

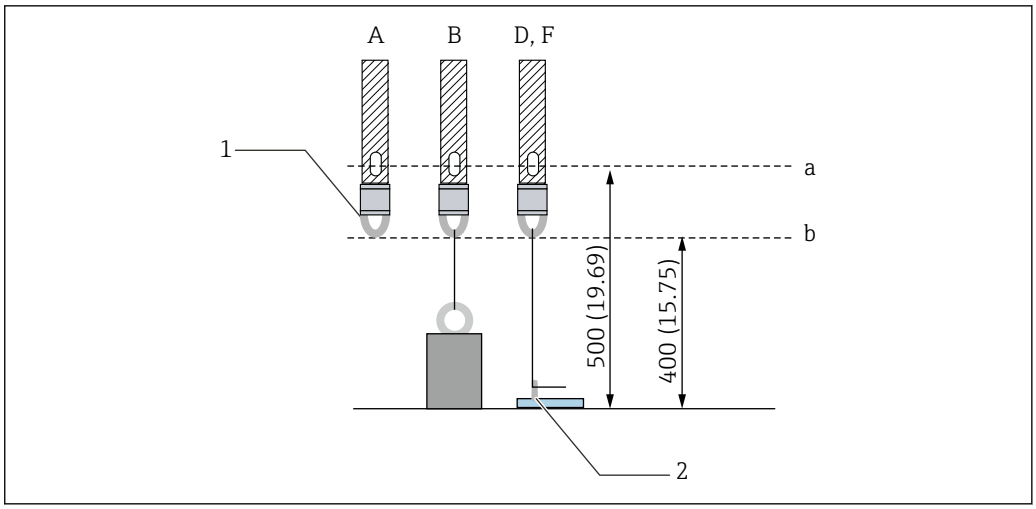
Details of fixture products: ordering information 100: standard contents of installation attachments

020		A: installation attachments not selected	B: anchor weight (high profile, D120)	C: anchor weight (low profile, hexagon H41)	D: tension wire + wire hook + NPT1 top anchor	F: tension wire + wire hook + R1 top anchor	G: bottom hook low profile
100	0 converter version	not selected	not selected	not selected	not selected	not selected	not selected
	1, 4 Temperature probe + converter version	Bottom hook	Bottom hook Anchor weight Sling wire	Bottom hook Anchor weight Sling wire	Bottom hook Base plate Wire hook NPT1 Top anchor Tension wire	Bottom hook Base plate Wire hook R1 top anchor Tension wire	-
	3, 5 Temperature probe + WB probe + converter version	not selected	Same as above	Same as above	Same as above	Same as above	Bottom hook

Installation attachment 1 (converter + temperature probe)

A	Bottom hook
B	Anchor weight: high profile (D120)
D	Tension wire + wire hook + NPT1 top anchor
F	Tension wire + wire hook + R1 top anchor

The high-profile anchor weight is an anchoring method designed for the converter + temperature probe versions. Both the temperature probe and WB probe with high-profile anchor weight and tension-wire anchor methods have a recommended clearance of approx. 400 mm (15.75 in) between the tank bottom and the anchor hook. This clearance can be changed easily by using the height adjuster at the top of the tank.



20 *Installation attachment 1 (converter + temperature probe). Unit of measurement mm (in)*

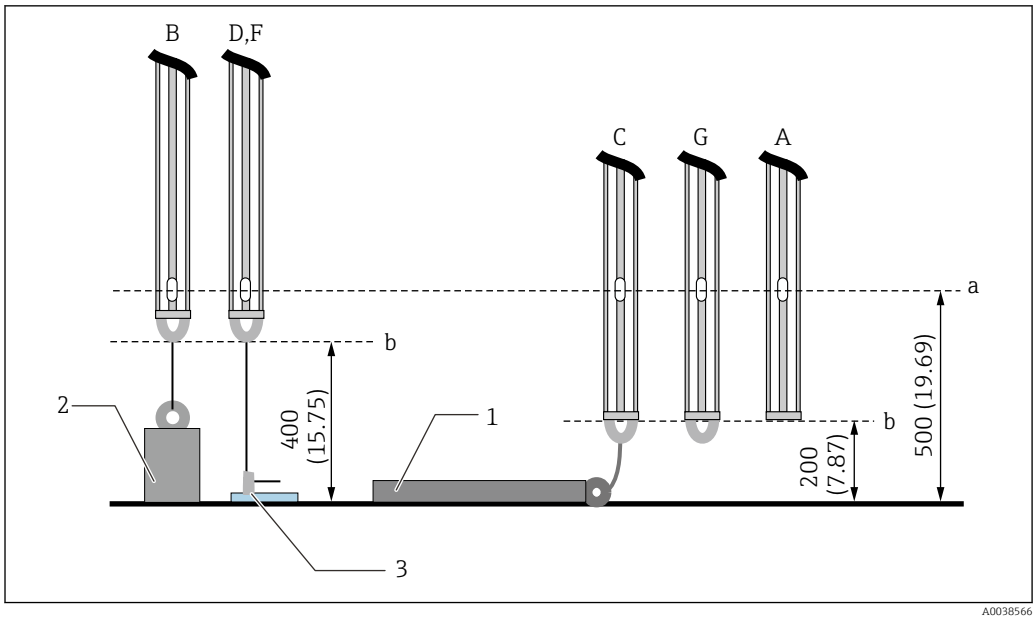
a Lowest element position
b Clearance from bottom of tank to bottom hook
1 Bottom hook
2 Wire hook

When ordering NMT539, refer to "Ordering information: item 80 (temperature element interval)."

Installation attachment 2 (converter + temperature probe + WB probe)

A	not selected
B	Anchor weight: high profile (D120)
C	Anchor weight: low profile (hexagon H41)
D	Tension wire + wire hook + NPT1 top anchor
F	Tension wire + wire hook + R1 top anchor
G	Bottom hook: low profile

The low-profile anchor weight is mainly designed to secure a WB probe for measuring the WB measurement range accurately. It can also be used as an installation tool for the converter + temperature probe version when installing a small tank nozzle (50A (2") or smaller). For a temperature probe and WB probe with a low-profile anchor weight, a clearance of 200 mm (7.87 in) from the WB probe bottom is recommended when "Ordering information: item 100 (installation C or G)" is selected.



21 *Installation attachment 2. Unit of measurement mm (in)*

a Lowest element position
b Clearance from WB probe
1 Anchor weight (low profile)
2 Anchor weight (high profile)
3 Wire hook

The lowest possible WB measuring point is approximately 10 mm (0.39 in) from the bottom of the tank when "Ordering information: item 100 (installation attachment A: none)" is selected. If necessary, use the height adjuster to set it to the desired installation height. Select "Ordering information: item 100 (installation attachment A: none)" when a bottom hook is not needed. A bottom hook is attached on WB probe when installation attachment G is selected, but it does not come with an anchor weight.

Mounting NMT539 on a cone roof tank

When installing a WB probe, check "point zero" (reference position) on the WB probe by comparing it to a manual dipping reference.

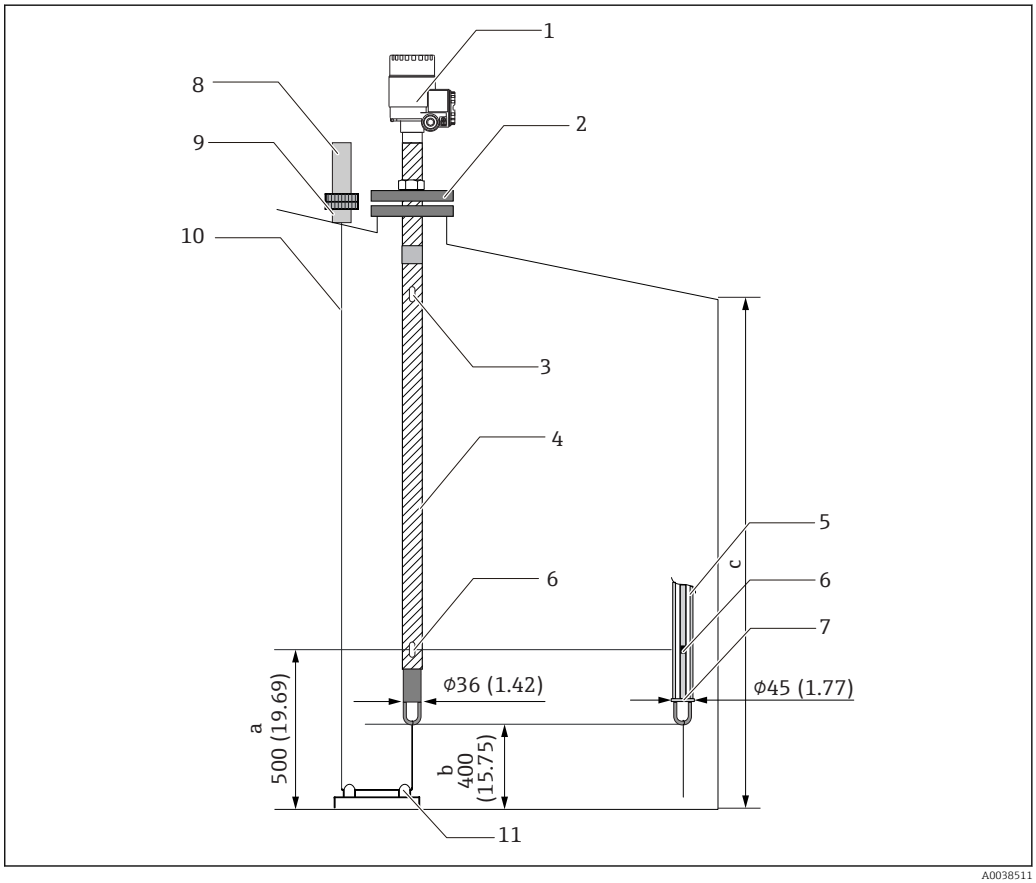
There are three ways to install NMT539 onto a cone roof tank:

- Top anchor method
- Stilling well method
- Anchor weight method

If a heating coil is attached to the bottom of the tank, install NMT539 so that the bottom of the temperature probe or WB probe is not too close to the heating coil (distance varies depending on the type of heating coil).

Top anchor method

In this method, the temperature probe or the WB probe is secured using a wire hook and a top anchor.

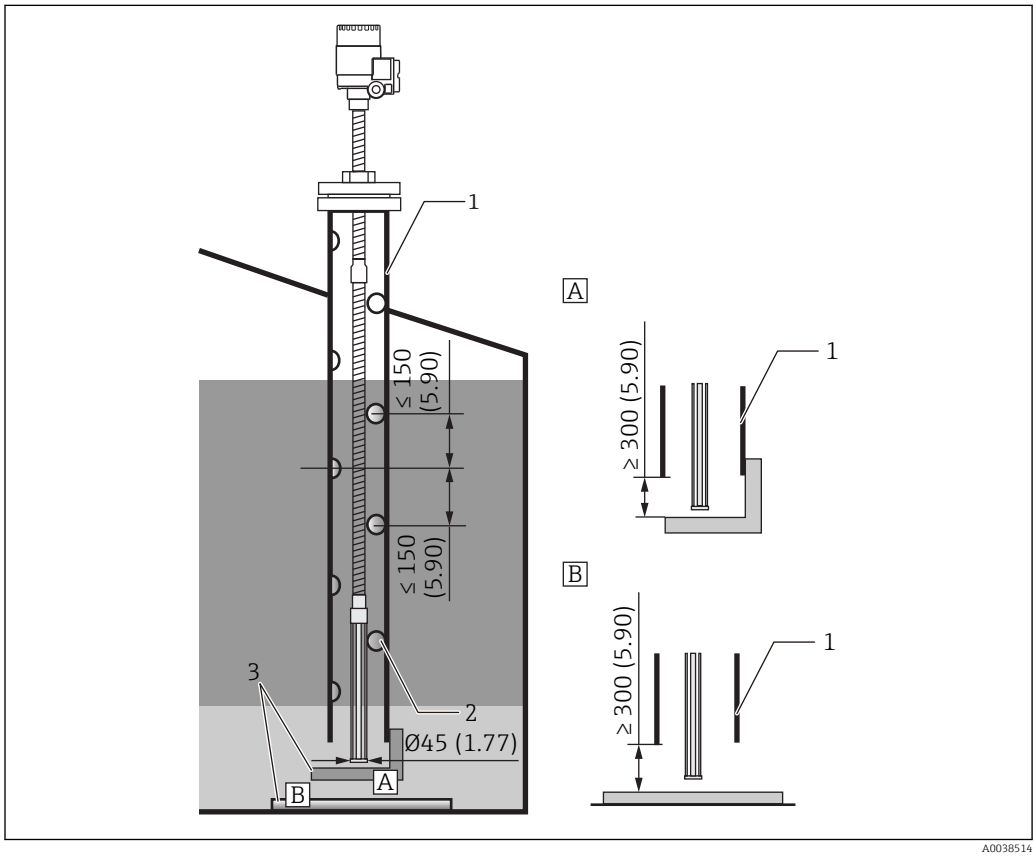


22 *Top anchor method . Unit of measurement mm (in)*

a From the tank bottom to the lowest element
b From the tank bottom
c Tank height
1 Electrical compartment
2 Flange
3 Highest temperature element
4 Temperature probe
5 WB probe
6 Element position #1 (lowest element)
7 Zero point
8 Top anchor
9 Socket
10 Tension wire
11 Wire hook

Stilling well method

Insert a temperature probe and a WB probe into a stilling well that is 50A (2") or larger.



23 Stilling well. Unit of measurement mm (in)

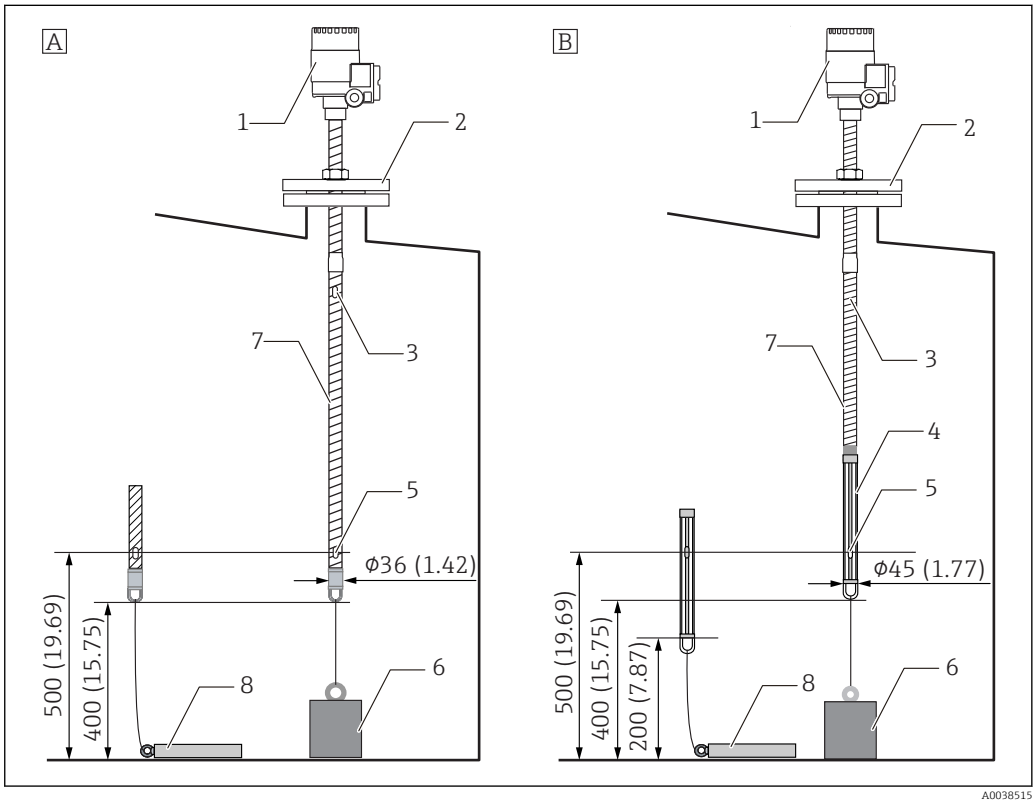
A Base plate case 1
B Base plate case 2
1 Stilling well
2 Hole (Ø 25 mm (0.98 in))
3 Base plate

- If an anchor weight is not being used in the stilling well method, install the WB probe so that its end is below the bottom of the stilling well. This will allow the pipe to be filled with liquid.
- A stilling well is available from a 50A (2") (JIS, ANSI) pipe.
- When using an anchor weight, use a pipe that is 100A (4") (JIS, ASME) or larger.
- Do not move the WB probe horizontally or swing it. This will cause turbulence, which could damage the WB probe.
- The temperature probe and WB probe can be easily damaged. Ensure that they do not hit a corner when they are being inserted from the installation nozzle.

Anchor weight method

This method secures a temperature probe using an anchor weight.

The temperature probe can be easily damaged. Ensure that it does not hit a corner if it is being inserted from the installation nozzle.



24 *Anchor weight method. Unit of measurement mm (in)*

A Without WB probe
B With WB probe
1 Electrical compartment
2 Flange
3 Top terminal
4 WB probe
5 Bottom terminal
6 High-profile weight
7 Temperature probe
8 Low-profile weight

⚠ CAUTION

Installation of an anchor weight

Using an anchor weight that is heavier than 16 kg may cause internal damages to the temperature probe.

- ▶ Ensure that the anchor weight is stable at the bottom of the tank. When installing NMT539 with a suspended anchor weight, use an anchor weight that weighs 16 kg or less.

Mounting NMT539 on a floating roof tank

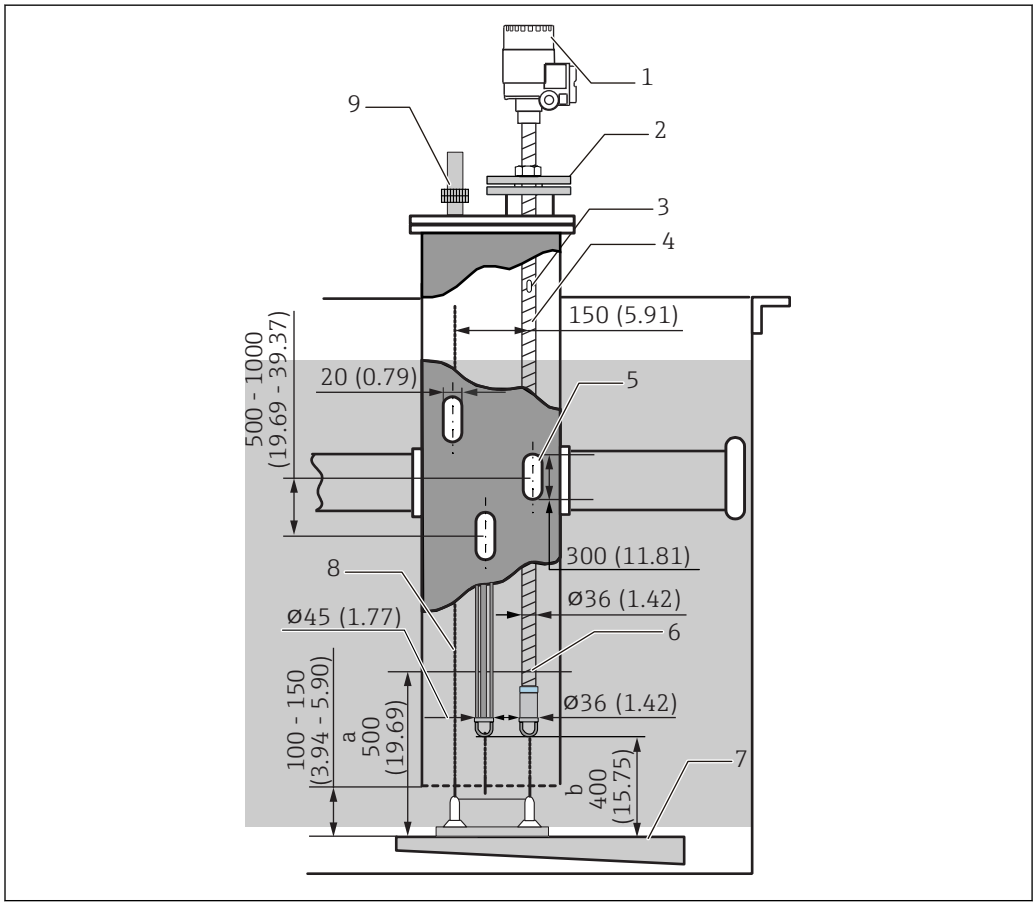
There are three ways to mount NMT539 on to a floating roof tank.

- Top anchor method
- Stilling well method
- Guide ring and anchor weight method

If a heating coil is attached to the bottom of the tank, install NMT539 such that the bottom hook of a temperature probe or a WB probe is not too close to the heating coil.

Top anchor method

Insert a temperature probe or a WB probe into a fixed pipe, and secure it with a top anchor. In NMS5, NMS7, NMS8x and NMT539, both can be installed in one fixed pipe.

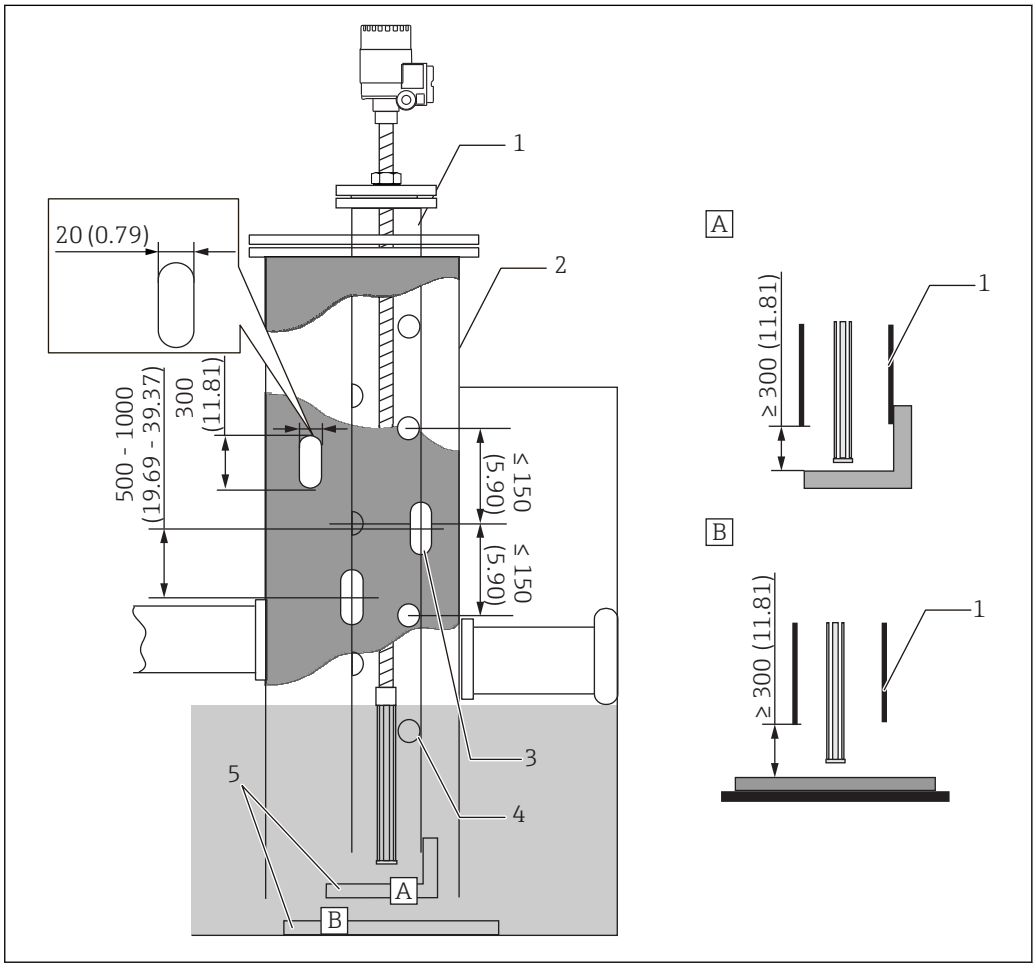


25 *Top anchor method. Unit of measurement mm (in)*

a Distance between the base plate and the bottom element
b Distance between the base plate and the WB probe
1 Converter (electrical compartment)
2 Flange
3 Top element
4 Temperature probe (without WB probe)
5 Stilling well hole
6 Temperature probe (with WB probe)
7 Element position #1 (lowest element)
8 Base plate
9 Tension wire
10 Top anchor

Stilling well method

Insert a temperature probe and a WB probe into a stilling well that is 50A (2") or larger.



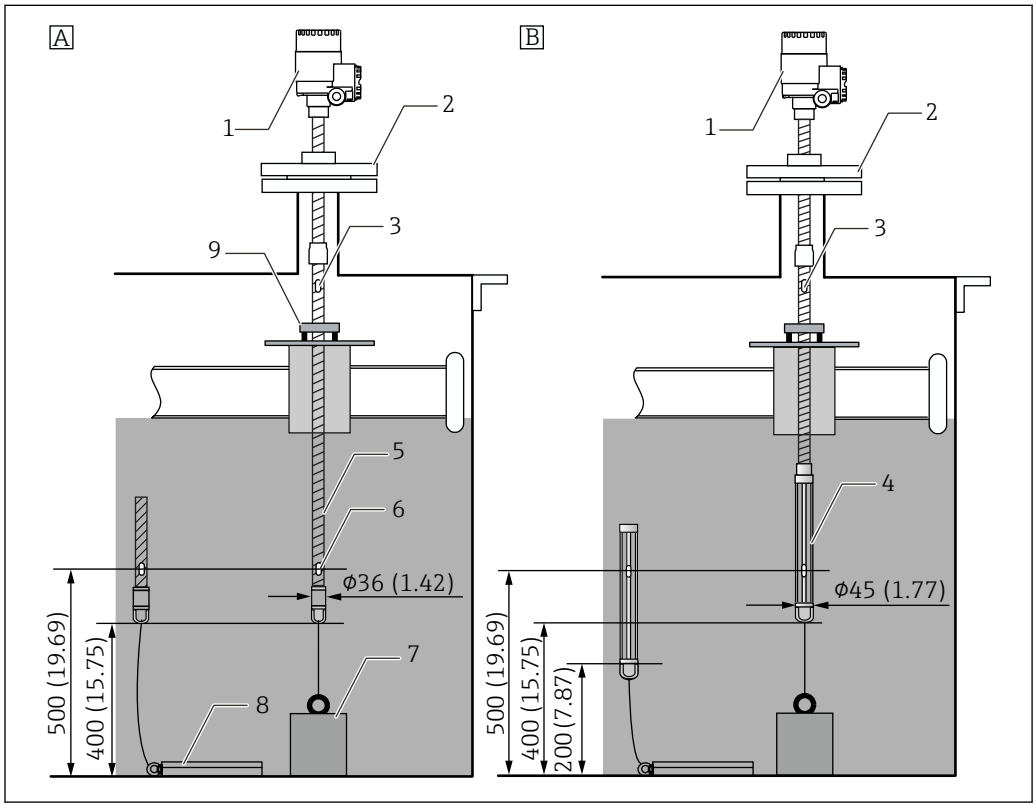
26 Stilling well method. Unit of measurement mm (in)

A Base plate case 1
B Base plate case 2
1 Stilling well
2 Fixed pipe
3 Stilling well hole
4 Hole (Ø 25 mm (0.98 in))
5 Base plate

Guide ring and anchor weight method

Secure a temperature probe and/or a WB probe using a guide ring and an anchor weight.

The temperature probe and WB probe can be easily damaged. Ensure that they do not hit a corner when they are being inserted from the installation nozzle.



27 *Guide ring and anchor weight method. Unit of measurement mm (in)*

A Without WB probe
B With WB probe
1 Electrical compartment
2 Flange
3 Top element
4 WB probe
5 Temperature probe
6 Bottom element
7 High-profile weight
8 Low-profile weight
9 Guide ring

CAUTION

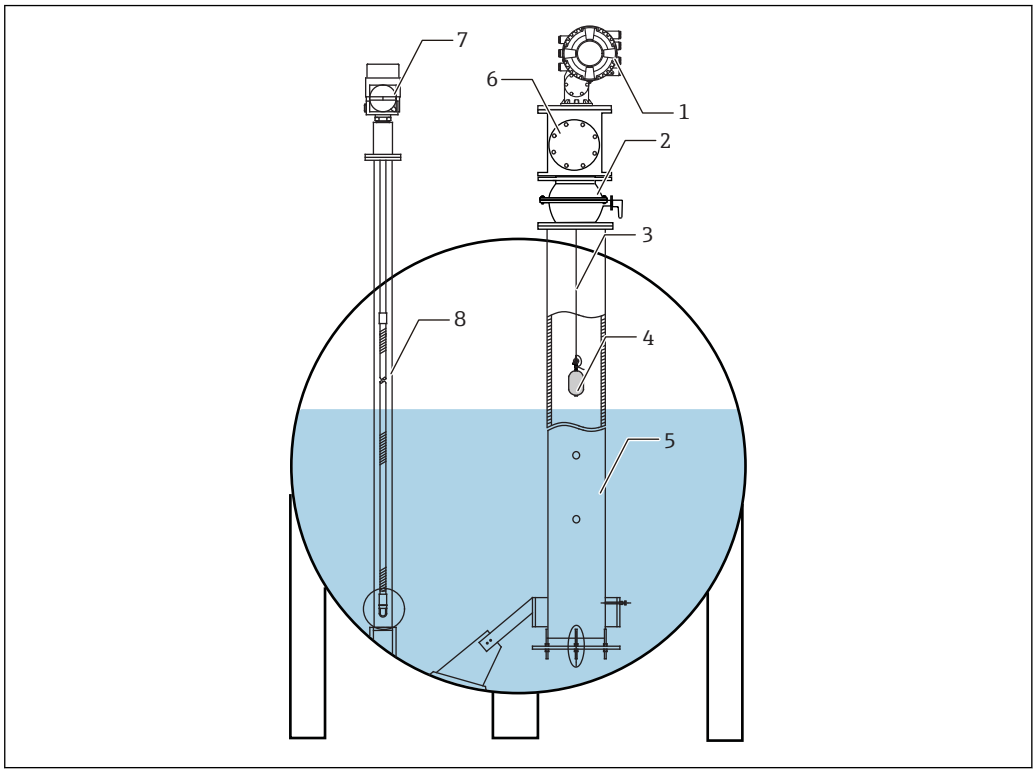
Installation of an anchor weight

Using an anchor weight that is heavier than 16 kg may cause internal damages to the temperature probe.

- Ensure that the anchor weight is stable at the bottom of the tank. When installing NMT539 with a suspended anchor weight, use an anchor weight that weighs 16 kg or less.

Mounting NMT539 on a pressurized tank

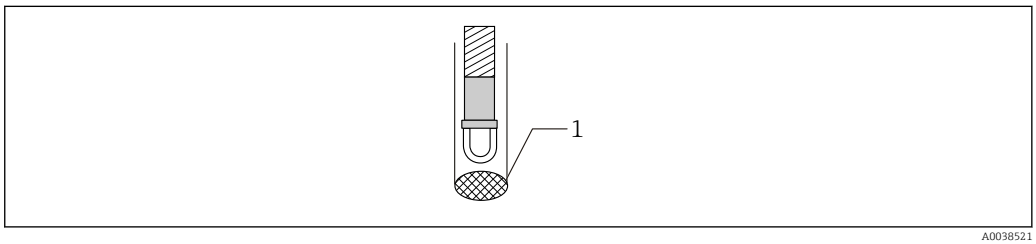
With pressurized tanks, a stilling well (protective pipe) must be installed in order to protect the probes from pressure.



28 *Stilling well for a pressurized tank*

1 *NMS8x / NMS5*
2 *Ball valve*
3 *Measuring wire*
4 *Displacer*
5 *Stilling well*
6 *Calibration / maintenance chamber*
7 *NMT539*
8 *Thermowell*

- If the pressure inside a tank exceeds the atmospheric pressure (absolute pressure 1 bar, 100 kPa, 14.5 psi), install a thermowell (protective pipe) with no holes or slits onto NMT539. However, NMS8x requires a stilling well with holes and slits.
- NMT539 is installed in the thermowell (protective pipe) from the top of the tank nozzle.
- Cover the bottom of the thermowell for NMT539 and weld it to protect the probe from the pressure.

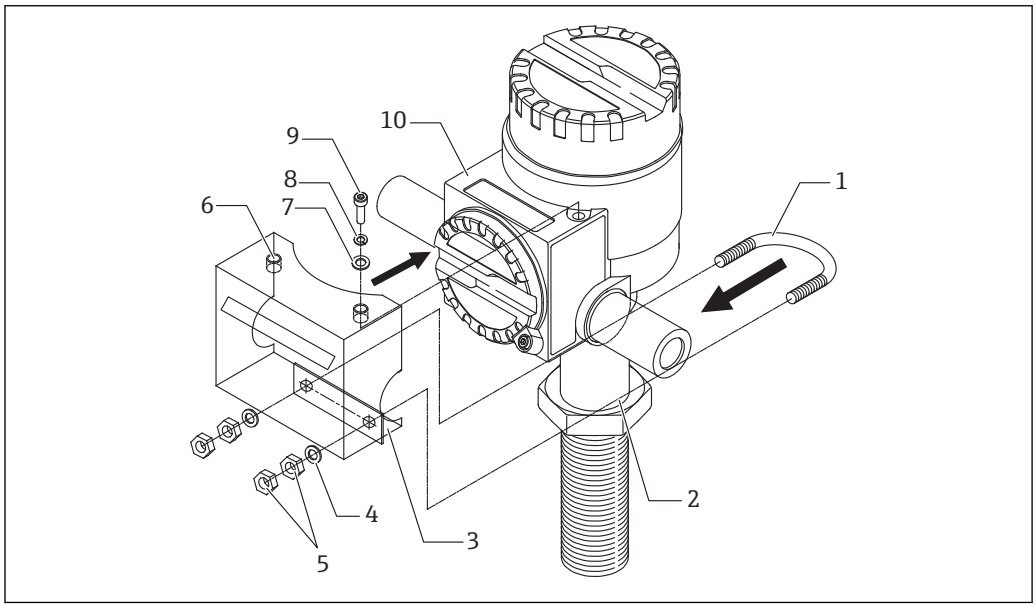


29 *Thermowell welding*

1 *Welding point*

Protective cover

NMT539 TIIS Ex d [ia] requires a protective cover to be installed.



30 *Protective cover installation*

1 *U bolt*
2 *WB adapter*
3 *Protective cover*
4 *Washer*
5 *Double nut*
6 *Boss*
7 *Washer*
8 *Spring washer*
9 *Bolt with hole*
10 *Housing*

- Over-tightening the nuts may deform the protective cover.
- TIIS Ex d [ia] comes with two SXC-16B cable glands. Always use the cable glands that are provided with NMT539.

Environment

Ambient temperature

- −40 to 85 °C (−40 to 185 °F)
- −20 to 60 °C (−4 to 140 °F) (TIIS)

Storage temperature

−40 to 85 °C (−40 to 185 °F)

Climate class

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

Protection class

IP66/68	Converter set with a temperature device or a WB device
IP65 NEMA4X	Converter only (open housing: IP20)

Electromagnetic compatibility (EMC)

When installing the probes to metal or concrete tanks and when using a coax probe:

Emission	Conforms to EN 61326, electrical device class B
Immunity	Conforms to EN 61326, Annex A (Industrial)

Process temperature range

Temperature probe	−170 to 235 °C (−274 to 455 °F)
WB probe	0 to 100 °C (32 to 212 °F)

Process pressure limits

Atmospheric pressure (absolute pressure 1 bar, 100 kPa, 14.5 psi)

- Pressurized tank: When using a tank that exceeds this process pressure, install a thermowell (protective pipe) with no holes or slits onto NMT539 to protect the probes from the pressure inside the tank.
- Static pressure: Because NMT539 has undergone an airtightness test at absolute pressure of 7 bar, it can withstand static pressure in the 50 m (164 ft) range in petroleum/chemical product applications.

Data transmission

Minimum cable diameter	#24 AWG
Cable types	Twist pair with a shield

Stainless steel conversion table

The stainless steel material used in Endress+Hauser Yamanashi products uses expressions that conform to Japanese industrial standards such as JIS (Japanese Industrial Standard). Each country or region may have different expressions. The following conversion table shows the expression of equivalent stainless steel material based on chemical composition and mechanical properties.

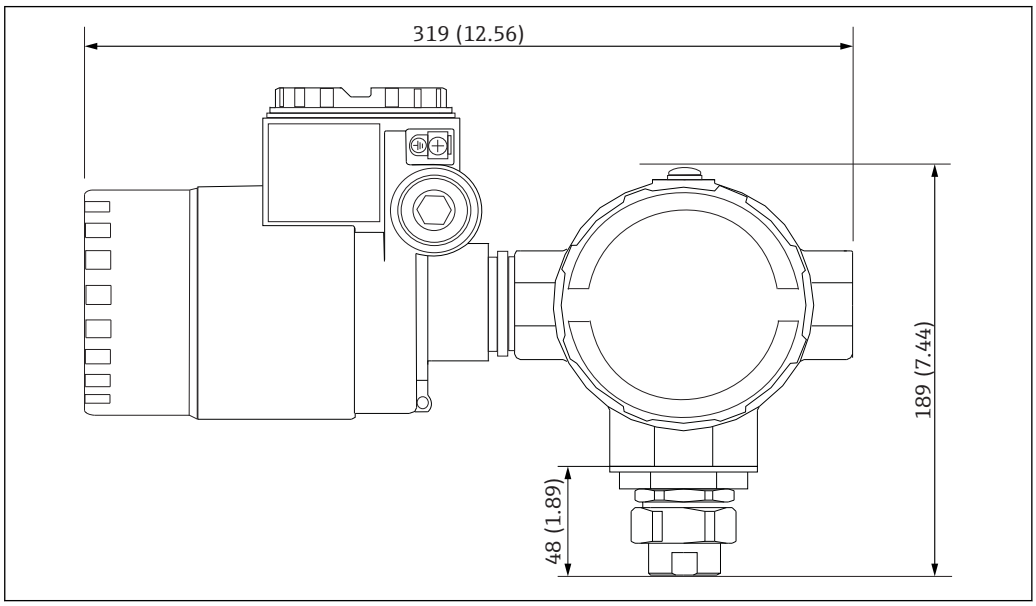
Country	Standard	Expressions			
Japan	JIS	SUS304	SUS304L	SUS316	SUS316L
Germany	DIN 17006	X5 CrNi 18 10 X5 CrNi 18 12	X2 CrNi 18 11	X5 CrNiMo 17 12 2 / 1713 3	X2 CrNiMo 17 13 2
	W.N. 17007	1.4301 1.4303	1.4306	1.4401 / 1.4436	1.4404
France	AFNOR	Z 6 CN 18-09	Z 2CN 18-10	Z 6 CND 17-11 / 17 12	Z2 CND 17-12
Italy	UNI	X5 CrNi 1810	X2 CrNi 1911	X5 CrNiMo 1712 / 1713	X2 CrNiMo 1712
U.K.	BSI	304S15 / 304S16	304S11	316S31 / 316S33	316S11
U.S.A.	AISI	304	304L	316	316L
E.U.	EURONORM	X6 CrNi 1810	X3 CrNi 1810	X6 CrNiMo 17 12 2 / 17 13 3	X3 CrNiMo 17 12 2
Spain	UNE	X6 CrNi 19-10	X2 CrNi 19-10	X6 CrNiMo 17-12-03	X2 CrNiMo 17-12-03
Russia	GOST	08KH18N10 06KH18N11	03KH18N11	-	03KH17N14M2

Country	Standard	Expressions			
-	ISO	11	10	20	19
-	ASME	S30400	S30403	S31600	S31603

The standards may not necessarily correspond exactly to JIS because they are defined by their respective mechanical and chemical criteria.

Mechanical construction

Type 1: converter



31 Type 1: converter (standard G3/4 (NPS 3/4) universal coupling connection). Unit of measurement mm (in)

Type 1: measurement functions

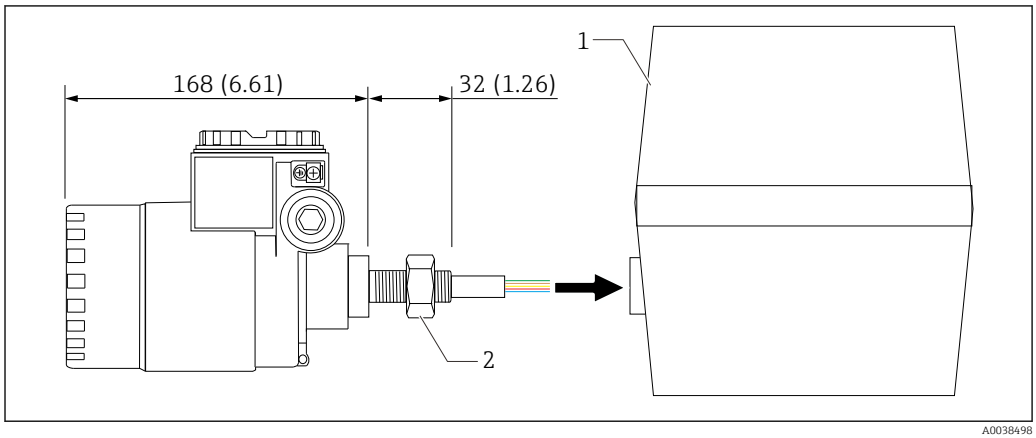
The converter-only version is the successor to NMT538. Because of its connections and compatibility profile, it can be used with other brands' temperature probe with various elements. Unlike NMT538, the powerful NMT539 processor calculates and converts the following element types without altering the program (EPROM-installed software):

- Pt100
- Cu100
- Cu90
- PtCu100

The type 1 converter can also be connected to a dual-function average temperature probe and WB probe by Weed Beacon MWR.However, it requires the isolation of the RTD temperature signal from the capacitance WB signal on coaxial cable because of the wiring of the existing probe. The wiring of temperature signal is exactly the same as Endress+Hauser's 1700, 9909 and other RTD probes. The coaxial (WB) cable must be routed from the existing auxiliary capacitance to local HART (or 4-20 mA) converter via NMT539's terminal compartment.

- NMT539 is compatible with MRTs (Multi-Resistance Thermometers) and/or MSTs (Multi-Spot Thermometers), but it is not compatible with a thermo coupling temperature device.
- The physical connection between a probe and NMT539 is completed by zinc-plated carbon steel G 3/4" (NPS 3/4") universal threaded coupling. In case a different thread size is required, Endress+Hauser can provide the simplest and most efficient solution by adapting a variety of coupling sizes and materials based on existing temperature probe specifications. Contact your Endress+Hauser Sales Center.
- A power supply and data transmission line are both provided from the host gauge of NMS5, NMS8x, NMR8x, NRF81 or NRF590 through a 2-wire local HART loop connection. NMT539 can be configured and operated using FieldCare, which has a user-friendly interface.

Type 2: converter



32 Type 2: converter (Varec 1700, M20 threaded connection). Unit of measurement mm (in)

1 Lock nut
2 1700 series RT probe terminal box

The UK model is designed specifically to connect with a Whessoe Varec 1700 series average temperature probe. WB data is not available for the UK model.

Type 2: measurement functions

Type 2 has the same functions as type 1; however, type 2 is designed such that a special M20 threaded connection opening fits directly in the existing terminal housing of Varec 1700. The wiring of RTD signals from the probe to NMT539 is done in the terminal box of Varec 1700 and not on the NMT539 side. For this reason, a type 2 converter is equipped with a main housing that contains the electronic devices of NMT539, and there is no additional housing.

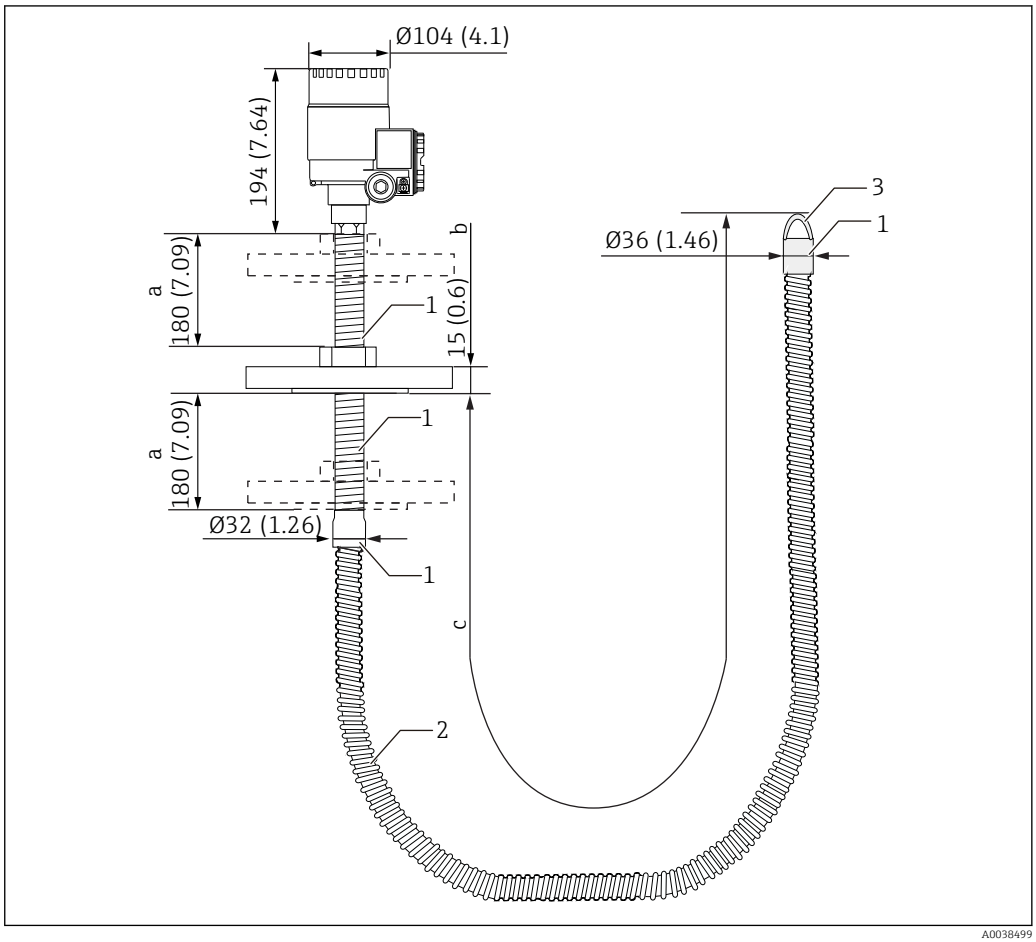
NOTICE

Protection of connection openings

A loose connection of NMT539 and Varec 1700 terminal housing may lead to a malfunction caused by flooding and other factors.

- ► Protect the threaded connection opening with sealing tape, and tighten it securely with a lock nut.

Converter + average temperature probe version



33 *Converter + average temperature probe. Unit of measurement mm (in)*

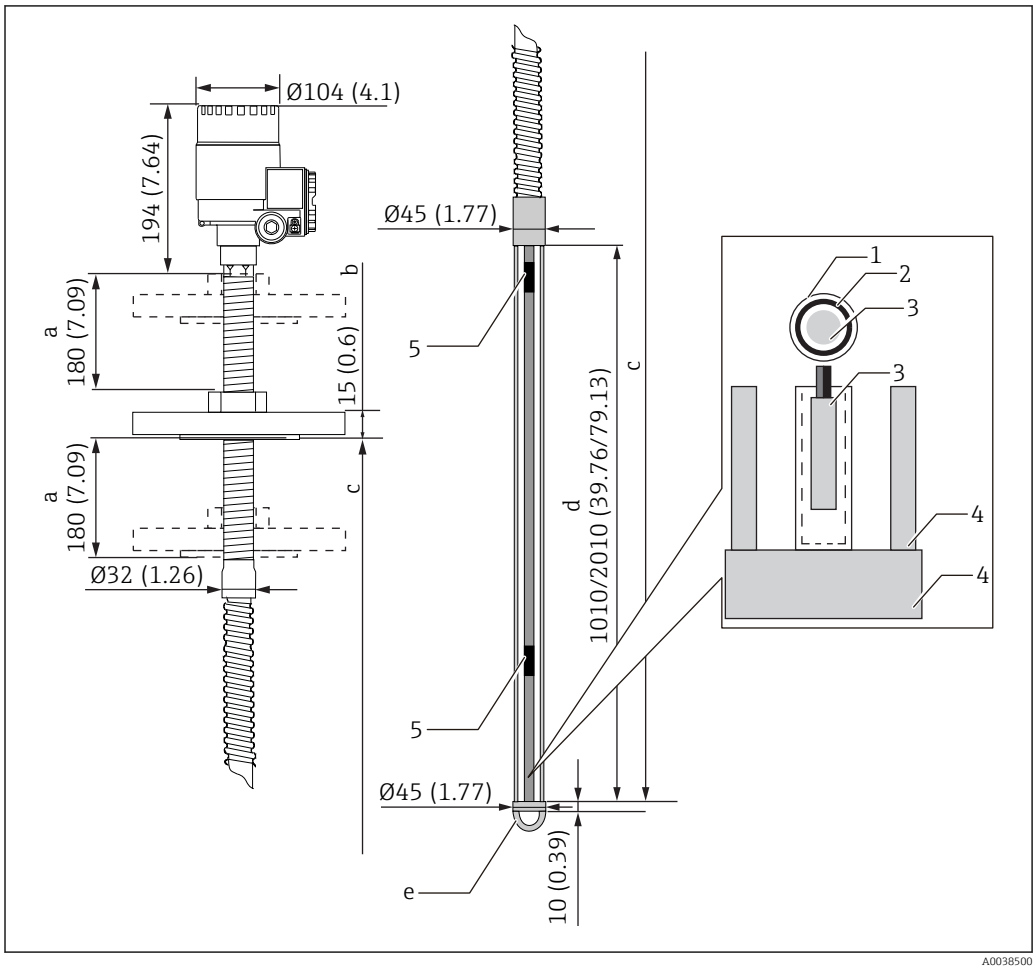
a Adjustable installation height
b Based on flange standards
c Temperature probe length (see below)
1 SUS316
2 SUS316L
3 SUS316

The following tolerances are applied regardless of whether or not there is an optional WB probe.

- If the probe length is 50 000 mm (1 968.5 in) or less, tolerance is ± 50 mm (1.97 in).
- If the probe length is 50 001 to 99 999 mm (1 968.54 to 3 936.97 in), tolerance is ± 100 mm (3.94 in).

The position of the flange cannot be adjusted in a welding flange type.

Converter + average temperature probe + water bottom probe



34 *Converter + temperature probe + WB probe. Unit of measurement mm (in)*

a Adjustable installation height
b Based on flange standards
c Probe length (from flange bottom to the tip of WB probe) (see below)
d Capacitance WB probe
e Anchor weight hook (optional) (SUS316)
1 PFA protection tube (SUS316: thickness 1 mm (0.04 in))
2 Intermediate rod (SUS304)
3 Pt100 element
4 Base plate / side rod (SUS316)
5 Element (Pt100 element can be installed up to 2 points)

The following tolerances are applied regardless of whether or not there is an optional WB probe.

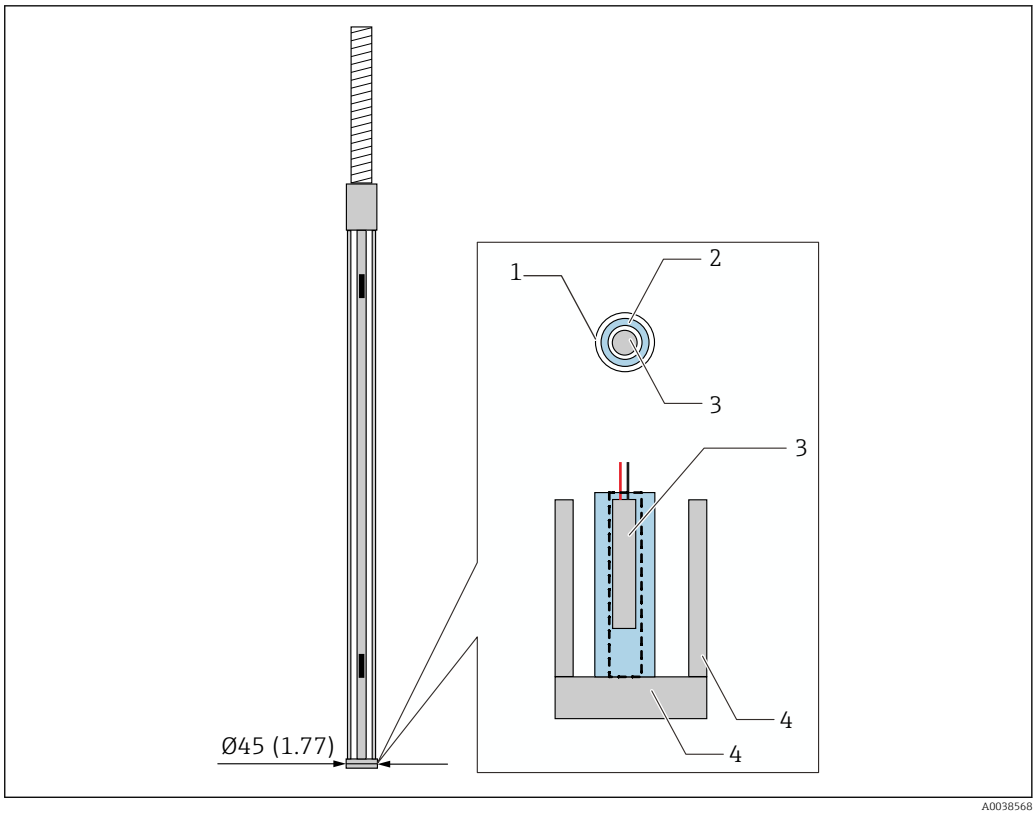
- If the probe length is 50 000 mm (1 968.5 in) or less, tolerance is ± 50 mm (1.97 in).
- If the probe length is 50 001 to 99 999 mm (1 968.54 to 3 936.97 in), tolerance is ± 100 mm (3.94 in).

The position of the flange cannot be adjusted in a welding flange type.

WB probe design

The integrated WB sensor (capacitance water interface measurement) is set at the bottom of an average temperature probe.The standard water interface measurement ranges are 1 m (3.3 ft) and 2 m (6.6 ft). A pipe WB probe is made of a stainless steel (SUS304) pipe, and the core electrode in the exterior is protected by a 1 mm (0.04 in) thick PFA tube. Up to two Pt100 temperature elements can be set inside this electrode. This allows for constant and accurate temperature measurement regardless of whether or not there is water.

- Due to the characteristic of capacitance measurement, precise initial calibration must be performed in order to achieve the maximum measurement accuracy. Perform the calibration on-site using the actual liquid. The condition of tank contents (both oil and water), liquid temperature and individual probe characteristics can greatly affect the measurement performance.
- NMT539 cannot measure the water interface if the water inside the tank is frozen. Ensure that the water in the tank does not freeze.



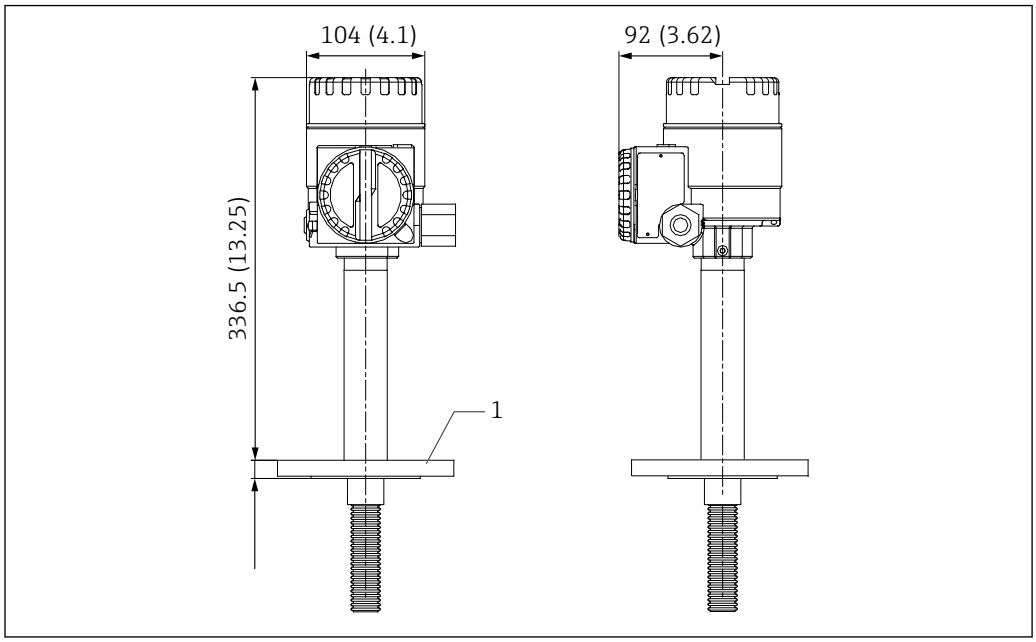
35 *WB probe design. Unit of measurement mm (in)*

1 *PFA protective tube (thickness: 1 mm)*
2 *Intermediate rod*
3 *Pt100 element*
4 *Base plate / side rod (SUS316)*

Up to two Pt100 elements can be installed.

Welding flanges

Welding flanges are more water-resistant because the joint is completely welded together. However, the position of welding flanges cannot be adjusted. The only anti-explosion specification is TIIS.

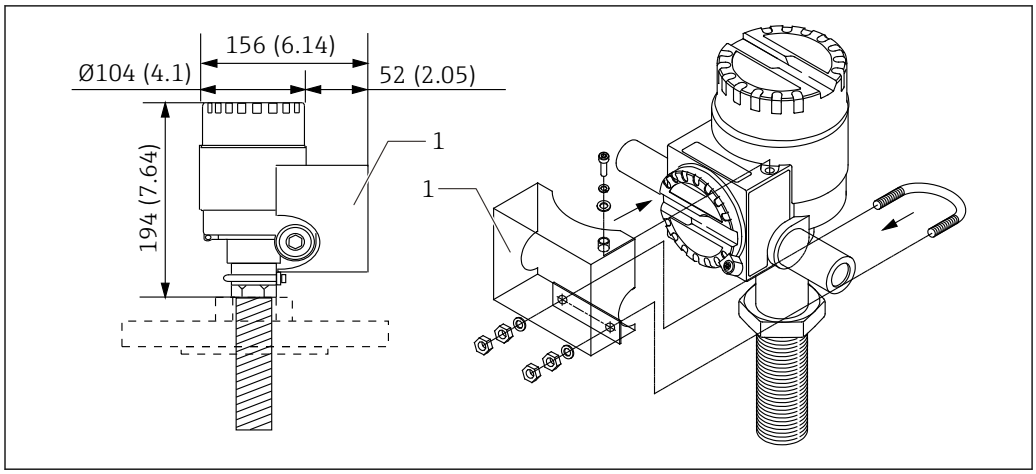


36 Welding flanges. Unit of measurement mm (in)

1 Flange (JIS, ASME, JPI, DIN)

Protective cover for TIIS Ex d (ia)

The protective cover only comes with TIIS Ex d [ia] specification.



Mass

Mass	13 kg (28.66 lb)
Number of elements	16 elements
Temperature probe	10 m (32.8 ft)
WB probe	1 m (3.28 ft)
Flange	NPS 2", Cl.150 RF, SUS316 flange ASME B16.5

Material

Temperature measurement element	Class A Pt100, IEC60751/DIN EN60751/JIS C1604
Housing	Aluminum die cast
Temperature probe	SUS316, SUS316L (see Figure 31 for details)
WB probe	SUS316 (core rod SUS 304 / PFA cover)

Operability

Operation using FieldCare

NMT539 can be operated with FieldCare. This program supports commissioning, securing of data, signal analysis and documentation of the instruments.

FieldCare supports the following functions:

- Online configuration of transmitters
- Loading and saving of instrument data (upload/download)
- Measurement position confirmation

Certificates and approvals

Temperature configuration and approvals

NMT539 converter + average temperature probe is the successor of NMT535. The W&M-approved (PTB in Germany) high-accuracy temperature device is well suited for temperature control in tank inventory control applications. Based on the product temperature range and specific application, NMT539 has six different temperature ranges to meet application requirements:

			010: Approval							
			TIIS Ex ia IIB T4	ATEX Ex ia IIB T2-T6	TIIS Ex ia IIB T2	TIIS Ex d (ia) IIB T4	IEC Ex ia IIB T2-T6	NEPSI Ex ia IIB T2-T6	Weather proof, IP65 NEMA4X	FM C/US IS Cl.I Div.1 Gr.C-D
			A	B	C	E	F	G	0	7
030: Temperature Measuring Range		Application								
1	-40 to +100 °C (-40 to +212 °F)	Most standard temperature range for inventory control applications.	-	T4	-	-	T4	T4	N/A	T4
2	-55 to +235 °C (-67 to +455 °F)	Capability of high and, or low temperature product applications like sulfur & asphalt and moderate liquid / gas application.	-	T2	-	-	T2	T2	N/A	T2
3	-170 to +60 °C (-274 to 140 °F)	Cryogenic, e.g. LNG, ethylene.	T4	T6	-	-	T6	T6	N/A	T6
4	-20 to +120 °C (-4 to 248 °F)	PTB (Germany): W&M certified applications.	-	T3	-	-	T3	T3	N/A	T3
5	-20 to +100 °C (-4 to +212 °F)	Most standard temperature range for inventory control applications.	T4	-	-	T4	-	-	N/A	-
6	-20 to +235 °C (-4 to +455 °F)	Capability of high and / or low temperature product applications like sulfur & asphalt and moderate liquid / gas application.	-	-	T2	-	-	-	N/A	-

A0038567-EN

NMT539 converter + average temperature probe version can be loaded with IEC 60751/DIN EN 60751 class A or 1/10 class Pt100 elements in its protective pipe for up to 16 elements. It is able to accurately change the temperature using the physical properties of platinum, which can change stable resistance through the temperature change of temperature measurement resistance elements. NMT539 converter + temperature probe version conforms to intrinsic safety standards, and because NMT539 consumes very little power, it guarantees superior safety as an electrical device that is installed in tanks in hazardous locations. It now has a new adjustment device for customers' convenience, allowing the installation height to be adjusted to a maximum of ± 180 mm (7.09 in) (flange connection) depending on the shape and condition of the tank.

Custody mode

In the NMT539 converter + temperature probe version, once NMT539 is configured to "custody mode," all accesses to configurable parameters are denied through software and a mechanical protection switch.

CE mark

By attaching the CE mark, Endress+Hauser confirms that the instruments have passed the required tests.

RoHS

In compliance with RoHS directive 2011/65/EU (RoHS 2).

Approval

Approval	Class
ATEX	II 1/2 G Ex ia IIB T2 -T6 Ga/Gb (converter with a temperature device or a WB device) II 2G Ex ia IIB T2 -T6 Gb (converter only)
IECEx	Ex ia IIB T2 -T6 Ga/Gb (converter with a temperature device or a WB device) Ex ia IIB T2 -T6 Ga (converter only)
FM C/US	Converter with a temperature device or a WB device IS Cl. I, Div. 1, Gr. C, D T2-T6 IS Cl. I, Zone 0, AEx ia IIB Ga T2-T6 NI Cl. I, Div. 2, Gr. C, D T2-T6
	Converter only IS Cl. I, Div. 1, Gr. C, D T4 IS Cl. I, Zone 0, AEx ia IIB Ga T4 NI Cl. I, Div. 2, Gr. C, D T4
TIIS	Ex ia IIB T4 (converter with a temperature device or WB device) (converter only) Ex ia IIB T2 (converter with a temperature device) Ex d[ia] IIB T4 (converter with temperature device and/or WB device)
NEPSI	Ex ia IIB T2 -T6 (converter with temperature device and/or WB device) Ex ia IIB T2 -T6 (converter only)

Ex approvals

PTB 14.70 08.01(Germany)

External standards and guidelines

IEC 61326 Appendix: A, immunity according to table A-1

EN 60529	Protection class of housing (IP-code)
EN 61326	Emissions (equipment class B), compatibility (appendix A – industrial area) EN 61000-4-2 Immunity to electrostatic discharge

Order information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your nearest Endress+Hauser sales organization: www.addresses.endress.com

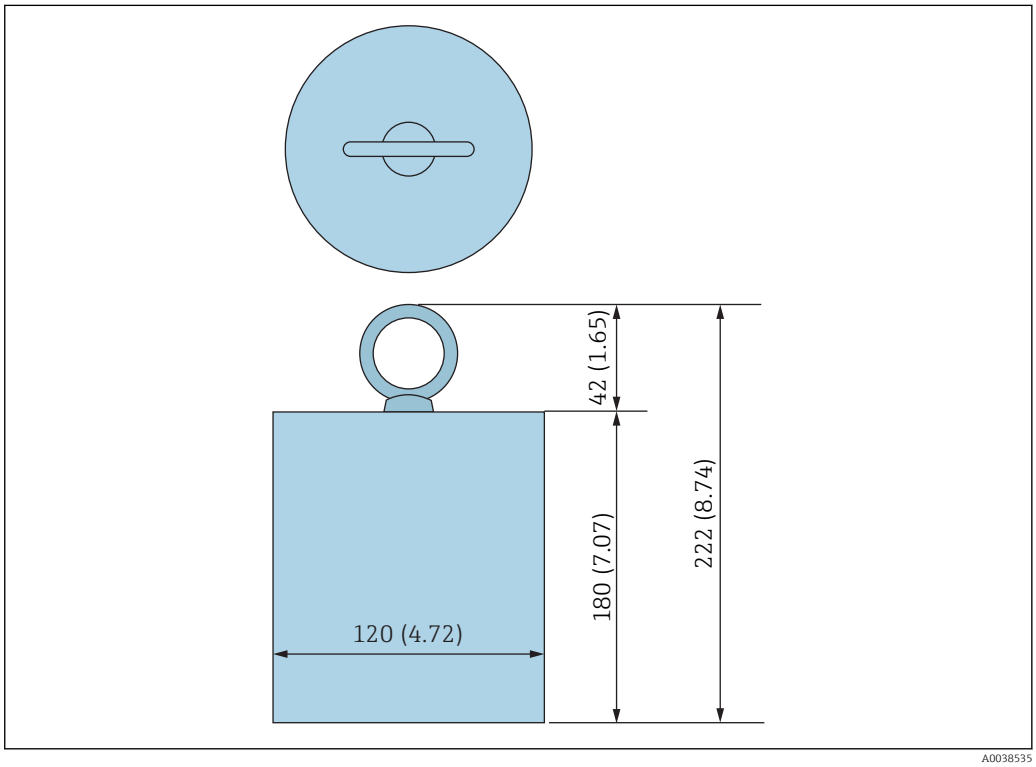
Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Accessories

Device-specific accessories

Anchor weight (high profile)

This anchor weight was designed for the converter + temperature probe version. Even when an anchor weight is used for the installation, the bottom element (bottom point temperature measurement position) will be set at approx. 500 mm above the tank bottom. When installing a high-profile anchor weight from a nozzle at the top of the tank, ensure that the nozzle opening is at least 150A (6").



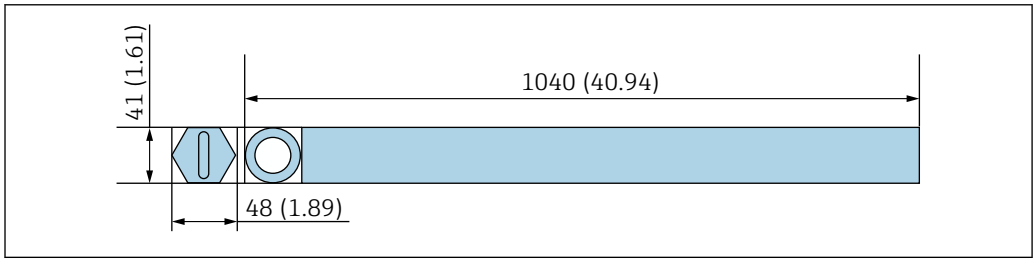
37 *Installation attachment / Option B . Unit of measurement mm (in)*

The anchor weight comes in different dimensions, weight and materials.

Description	Details
Weight	JIS SS400 mild carbon steel
Eye-bolt	JIS SS400 mild carbon steel
Mass	16 kg (35.3 lb)

Anchor weight (low profile)

The low-profile anchor weight is mainly designed to secure a WB probe for measuring the WB measurement range accurately. It can also be used as an installation attachment for the converter + temperature probe version when trying to install a small tank nozzle (50A (2") or smaller) that is in use.

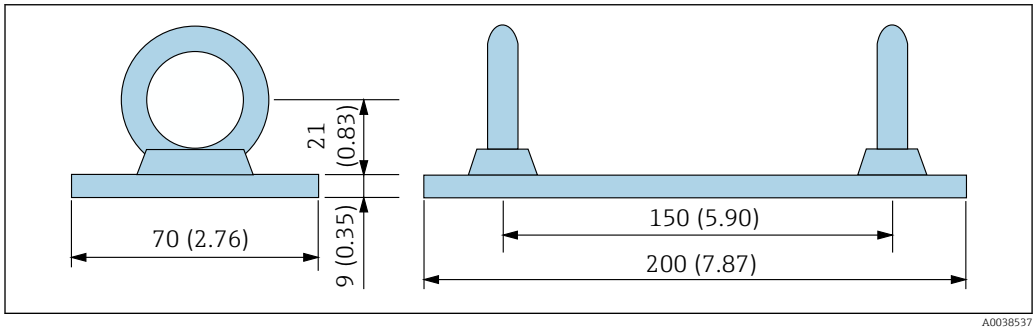


38 Installation attachment / option C/G. Unit of measurement mm (in)

Description	Details
Weight	JIS SS400 mild carbon steel
Eye-bolt	JIS SS400 mild carbon steel
Mass	12 kg (26.46 lb)

Wire hook

Wire hooks come in a variety of wire types, sizes, materials, and special coatings to suit installations for a wide range of applications. The actual tension is created by the securing wire between the wire hook and the top anchor (SUS316, stranded wire with a diameter of 3 mm (0.12 in)).

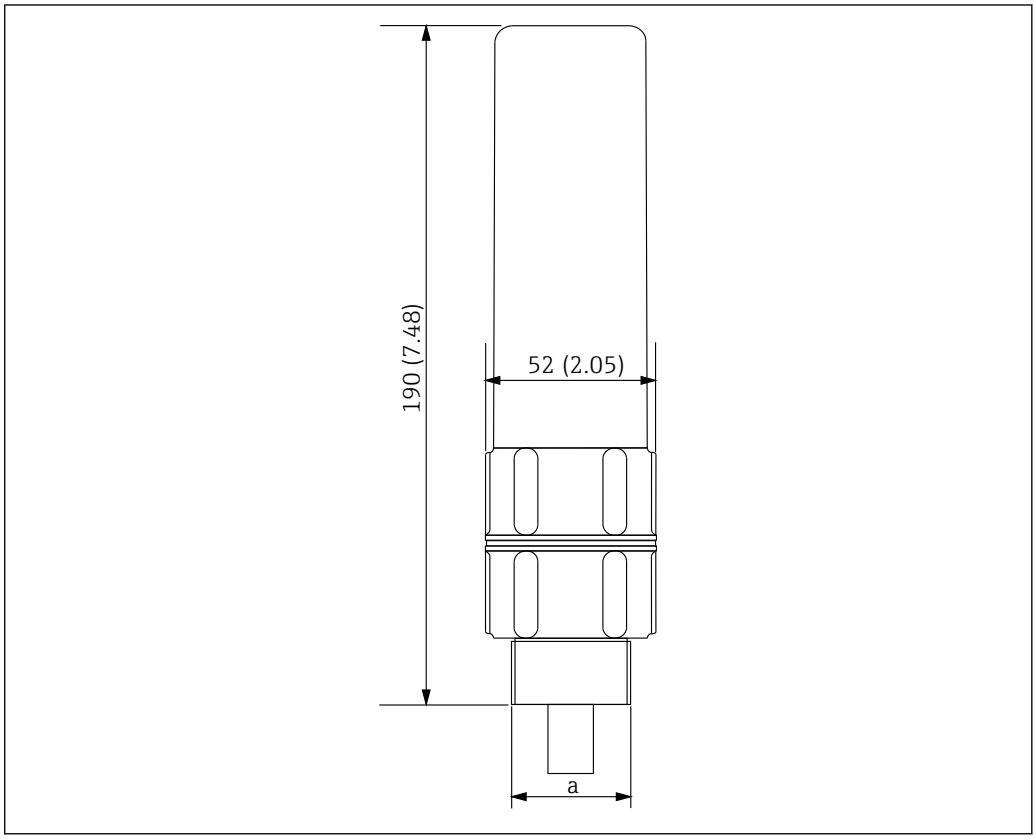


39 Wire hook / option D/F. Unit of measurement mm (in)

Description	Details
Weight	JIS SS400 mild carbon steel
Eye-bolt	JIS SS400 mild carbon steel
Mass	1.5 kg (3.31 lb)

Top anchor

The standard threaded connection for a top anchor is an NPT1 or R1 threaded connection. It can accommodate different thread sizes, materials and special specifications. A joint flange is also possible.



40 Top anchor dimensions. Unit of measurement mm (in)

a R1 or NPT1 (specified by the order code)

Description	Details
Exterior	ADC (aluminum)
Interior	SUS316
Mass	1.2 kg (2.65 lb)

Documentation

For an overview of the scope of the enclosed associated technical documentation, refer to the following:
The *W@M device viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer).

Technical information

The technical information contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

Instrument	Technical information
Prothermo NMT539	TI01005G
Proservo NMS5	TI00452G
Proservo NMS8x	TI01248G / TI01249G / TI01250G
Micropilot NMR8x	TI01252G / TI01253G
Promonitor NRF560	TI00462G
Promonitor NRF81	TI01251G
Servo level gauge TGM5	TI00461G
Digital transmitter TMD1	TI024N (TI00463G)

Operating instructions (BA)

The operating instructions contain all the information that is required during various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.

They also contain detailed information on the parameters in the operation menu. The description is aimed at those who work with the device over its entire life cycle and perform specific configurations.

Instrument	Operating instructions
Prothermo NMT539	BA01025G BA01026G

Safety instructions (XA)

Feature 010 ("approval")	Meaning	Ex / XA
A	Ex ia IIB T4	Ex463-820XJ Ex1060-953XJ Ex496-826XJ
B	ATEX Ex ia IIB T2-T6	XA001790G
C	Ex ia IIB T2	Ex495-823XJ
E	Ex d[ia] IIB T4	Ex1061-986XJ
F	IEC Ex ia IIB T2-T6	XA01790G
G	NEPSI Ex ia IIB T2-T6	XA01259G
7	FM C/US IS Ci. I Div.1 Gr. C-D	Ex461-851-1 Ex461-850-1

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