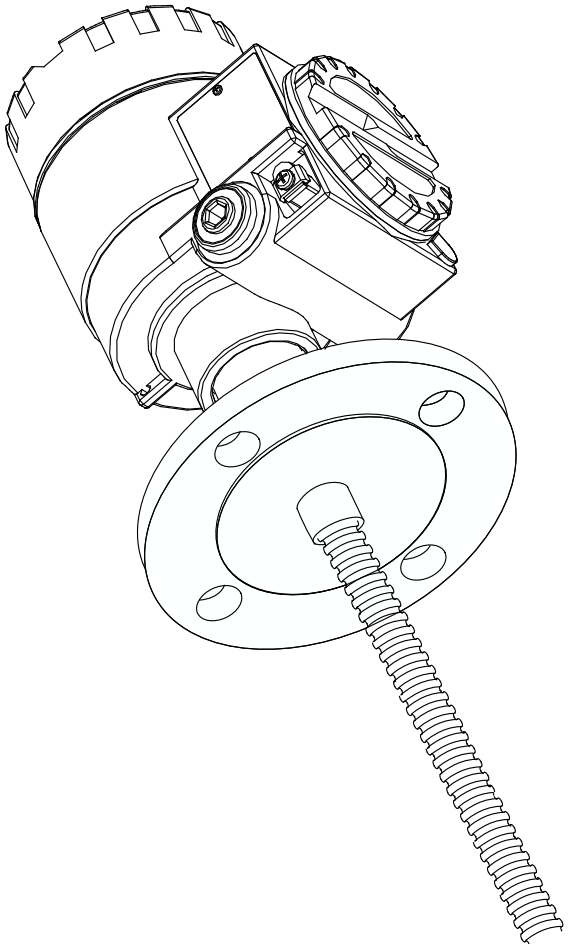
BA01032G/00/EN/22.19
71440635
2019-05-23

Operating Instructions
Prothermo NMT532

Average temperature device



Endress+Hauser
People for Process Automation

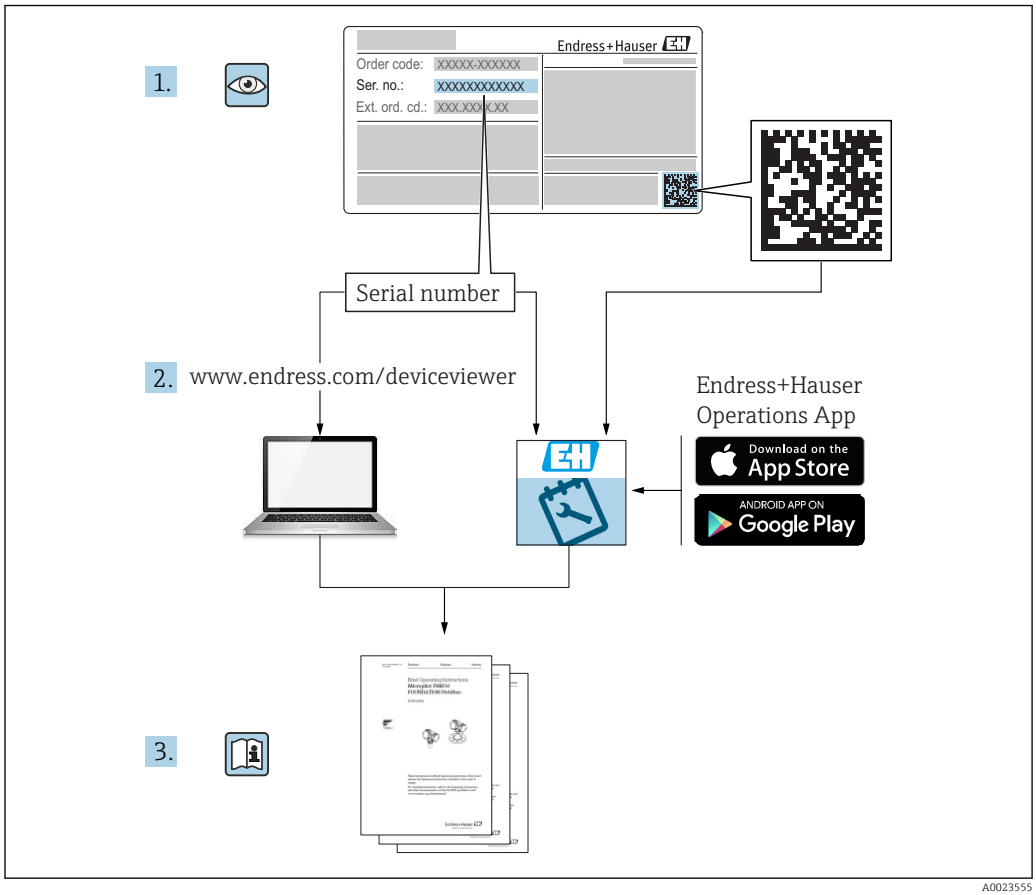

1.
Endress+Hauser
Order code: XXXXX-XXXXXX
Ser. no.: XXXXXXXXXXX
Ext. ord. cd.: XXX XXX-XXXX
Serial number
2. www.endress.com/deviceviewer
Endress+Hauser
Operations App
Download on the App Store
ANDROID APP ON Google Play
3.
A0023555

Table of contents

1 About this document

1.1 Document function

These 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.

1.2 Symbol

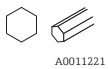
1.2.1 Safety symbols

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.

1.2.2 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.

1.2.3 Tool symbols

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

1.2.4 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

1.2.5 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

1.2.6 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.

1.3 Documentation

For an overview of the scope of the relevant Technical Documentation included with the product, refer to the following:
- The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer).
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

1.3.1 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.

Device	Technical Information
Prothermo NMT532	TI00049G

1.3.2 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.

The Operating Instructions also contain detailed descriptions of each parameter in the operation menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

Device	Operating Instructions
Prothermo NMT532	BA01032G

1.3.3 Safety instructions (XA)

Feature 010 ("Approval")	Meaning	Ex / XA
B	ATEX Ex ia IIB T4-T6	XA00584G
F	IEC Ex ia IIB T4-T6	XA00581G
G	NEPSI Ex ia IIB T4-T6	XA01260G
M	INMETRO Ex ia IIB T4-T6	XA00581G
7	FM C/US IS Ci. I Div.1 Gr. C-D	Ex461-852-1

1.4 Registered trademarks

FieldCare®
Registered trademark of the Endress+Hauser Process Solutions AG, Reinach, Switzerland.

HART®
Registered trademark of the FieldComm Group, Austin, USA.

2 Basic safety instructions

2.1 Requirements for personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:
- Be specialists who are trained and have a relevant qualification for this specific function and task.
- Be authorized by the plant owner-operator.
- Be familiar with local/national regulations.
- Before starting work, read and understand the instructions in the Operating Instructions and supplementary documentation as well as the certificates (depending on the application).
- Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:
- Be instructed and authorized according to the requirements of the task by the facility's owner-operator.
- Follow the instructions in this manual.

2.2 Designated use

Application and measured materials
Depending on the version ordered, the device can also be used with potentially explosive, flammable, poisonous or oxidizing materials.

Devices that are used in hazardous areas have corresponding labels on their nameplates.

To ensure that the device remains in proper condition for the operation time:
- Only use the device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- Check the nameplate to verify if the device can be put to its intended use in hazardous areas.
- If the device is not operated at an atmospheric temperature, compliance with the relevant basic conditions specified in the relevant device documentation is absolutely essential.
- Protect the device permanently against corrosion from environmental influences.
- Observe the limit values in the "Technical Information".

The manufacturer is not liable for damage caused by improper or non-designated use.

2.3 Workplace safety

For work on and with the device:
- Wear the required personal protective equipment according to local/national regulations.

2.4 Operational safety

Risk of injury!
- ▶ Operate the device in proper technical conditions and fail-safe conditions only.
- ▶ The plant owner-operator is responsible for interference-free operation of the device.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:
- ▶ If modifications are nevertheless required, contact your Endress+Hauser Sales Center.

Repair

To ensure continued operational safety and reliability:
- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe local/national regulations pertaining to repair of an electrical device.
- ▶ Use only original spare parts and accessories from Endress+Hauser.

Ex-area

Observe the following notes to eliminate the risk of danger to persons or the facility when the device is used in Ex-areas (e.g. explosion protection, pressure equipment safety):
- ▶ Check the model nameplate to ensure that the ordered device is explosion proof.
- ▶ Observe the specifications in the separate supplementary documentation attached to these Instructions.

2.5 Product safety

This device was designed in accordance with GEP (Good Engineering Practice) to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. It meets the general safety standards and legal requirements.

3 Product description

3.1 Product design

Prothermo NMT532 is a multi-spot Pt100 average thermometer combined with a local HART signal converter to meet the demand of temperature measurement for inventory control applications. NMT532 consists of Max. 6 temperature elements which have different length with fixed (2m or 3m) interval. It is best suited connected to Proservo NMS5, NMS8x, or Endress+Hauser Micropilot S-series radars and the Tank Side Monitor NRF590. Mounted on the tank top, NMT532 provides temperature information on the two wire, intrinsically safe (i.s.) powered local HART loop.

3.2 Technical data

Item	Details		
Application	NMT532 performs precise liquid and gas phase average temperature measurement in bulk storage tank applications. ▪ Flange installation: Standard 50.8 mm (2 in) ▪ temperature measurement range: Overall18.5 m (60.70 ft)		
Measuring principle	Temperature measurement ▪ Up to 6 temperature elements spaced evenly over the length of the flexible tube ▪ Pt100, IEC 60751/DIN EN 60751 Class A temperature elements		
Measured variable	Temperature conversion range: −200 to 100 °C (−328 to 212 °F)		
Measuring range	−200 to 100 °C (−328 to 212 °F)		
Output signal	Local HART protocol (multi drop local HART loop connection)		
Alarm signal	Error information can be accessed via the following interfaces and transmitted digital protocol ▪ NRF590 (BA00256F, BA00257F) ▪ NMS5 (BA00401G) ▪ NMS8x (BA1456G, BA1459G, BA1462G) ▪ NMR8x (BA01450G, BA01453G) ▪ NRF81 (BA01465G)		
Local HART load	Minimum loading for local HART circuit: 250 Ω		
Cable entry	▪ Thread NPT1/2 ▪ Thread M20		
Supply voltage	DC 16 to 30 V: Ex ia		
Power consumption	6 mA		
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 the reference conditions (including linearity, repeatability, hysteresis). **Conversion accuracy**		
	Temperature	Standard spec.	± 0.1 °C (0.18 °F)
	Probe system		
	Temperature	Standard spec.	± 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
	Overall accuracy		
	Temperature	Standard spec.	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|)
Ambient temperature	−40 to 85 (−40 to 185)		
Storage temperature	−40 to 85 (−40 to 185)		
Climate class	DIN EN 60068-2-38 (test Z/AD)		

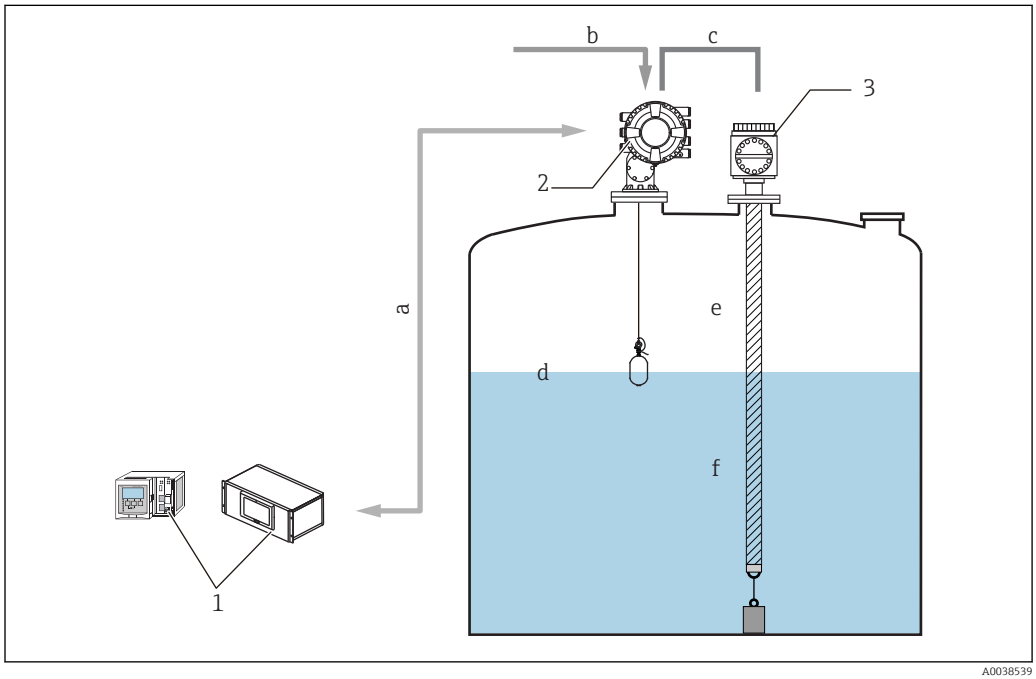
Item	Details	
Protection class	IP66/68 NEMA4X/6P:housing with temperature probe	
Electromagnetic compatibility	When installing the probes to metal or concrete tanks and when using a coax probe: ▪ Interference emission according to EN 61326, Electrical Equipment Class B ▪ Interference immunity according to EN 61326, Annex A (Industrial)	
Process temperature range	Temperature probe: −20 to 100 °C (−4 to 212 °F)	
Process pressure	Atmospheric pressure (absolute pressure 1 bar, 100 kPa, 14.5 psi) ▪ Pressure tank: If the pressure inside the tank exceeds the process pressure shown above, install a stilling well (protective tube) without holes or slits in the NMT532 to protect the probe from the pressure. ▪ Static pressure: Because NMT532 has undergone an airtightness test at an absolute pressure of 7 bar, it can withstand static pressure head in the 50 m (164 ft) range in petroleum/chemical product applications.	
Data transmission	▪ Minimum cable diameter: #24 AWG ▪ Cable type: Twist pair with a shield	
Weight	Approx. 8 kg Conditions ▪ Number of elements: 6 points ▪ Temperature probe: 11.5 m (37.72 ft) ▪ Flange: NPS 2" Cl.150 RF, 304 flange ASME B16.5	
Material	▪ Temperature measurement elements: Class A Pt100, IEC60751/DIN EN60751/JISC1604 ▪ Housing: Aluminum die cast ▪ Temperature probe: SUS316, SUS316L flexible tube (refer to "Dimension")	
Process connection	▪ NPS 2" Cl.150 RF, 304 flange ASME B16.5 ▪ DN50 PN10 B1, 304 flange EN1092-1 (DIN2527 C)	
CE approval	By attaching the CE mark, Endress+Hauser confirms that the instruments have passed the required tests.	
External standards and guidelines	EN 60529	Protection class of housing (IP-code)
	EN 61326	Emissions (equipment class B), compatibility (appendix A – industrial area)
Ex approvals	ATEX	II 1/2 G Ex ia IIB T4-T6 Ga/Gb
	IEC	Ex ia IIB T4- T6 Ga/Gb
	FM C/US	IS Cl. I, Div. 1, Gr. C, D, T6, T4 IS Cl. I, Zone 0, AEx ia IIB, T6, T4 NI Cl. I, Div. 2, Gr. C, D, T6, T4
	NEPSI	Ex ia IIB T4- T6 Ga/Gb

3.3 Description of functions

The NMT532 is compact and economical. The average temperature sensor consists of six Pt100 elements which have fixed interval of 2 m (6.57 ft) or 3 m (9.84 ft) from the next sensor. Temperature data is transmitted to the NRF560, NRF81, NMS5, NMS8x, or NMR81x via an intrinsically safe (i.s.) 2-wire local HART signal.

3.3.1 NMT532 Ex ia and NMS8x Exd [ia] combination

The connection of NMT532 shown below is only available for connection with NMS5 or NMS8x.



1 *NMS8x and NMS532 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 *NMT532*

Typical application of NMT532 and NMS8x

NMT532 is used most effectively with NMS8x to provide average temperature, level, interface, and density measurement. All the necessary configuration and parameter settings for NMT532 are performed via either NMS5, NMS8x, or FieldCare. NMT532 receives liquid level data from NMS5 or NMS8x, then calculates liquid and gas phase average temperature. Calculated data and basic information including raw data for each temperature element and device status are transmitted to NMS5 or NMS8x.

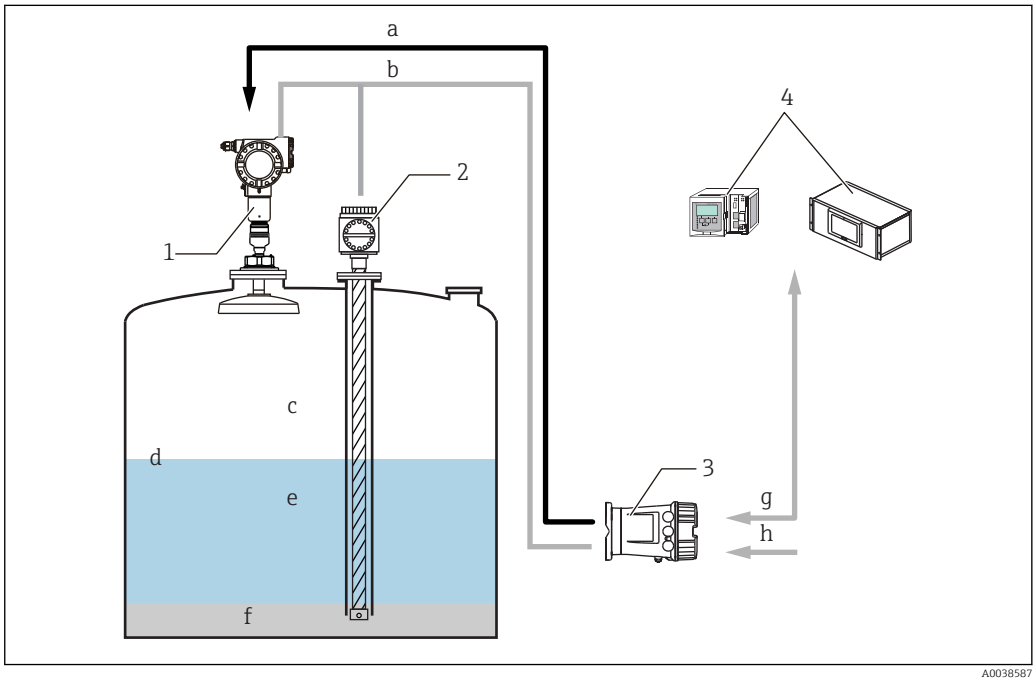
All gathered data in the field interface unit are sent to inventory management software (Tankvision) or to NMS8x, NMS5x, NMS7, NMR8x, NRF8x or NRF590.

3.3.2 NMT532 Ex ia and Micropilot FMR S-series combination

Typical application of NMT532 converter + temperature probe

Temperature and level measurement with data collection and calculations via NRF81 allows for optimal inventory control. Basic functionality of NMT532 is displayed and configured on NRF81. Detailed NMT532 functionality and data access can be performed by FieldCare. NMT532 receives radar level data from NRF81 and then calculates liquid and gas phase average temperature. Calculated and standard data including temperature element raw data and device status are transmitted to NRF81.

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



2 *NMT532 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 *NMT532*
3 *NRF81/NRF590*
4 *Tankvision*

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Upon receipt of the goods check the following:
- Are the order codes on the delivery note and the product label identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): Are the Safety Instructions (XA) enclosed?

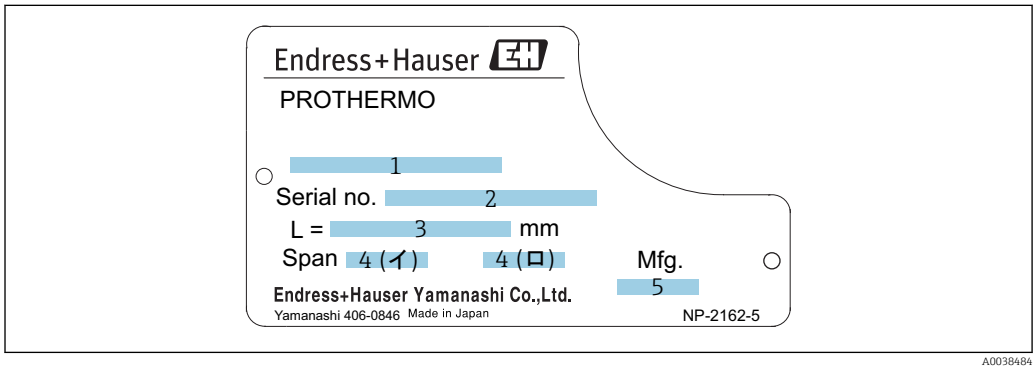
If any one of these conditions is not met, contact your Endress+Hauser Sales Center.

4.2 Product identification

The following options are available for the identification of the device:
- Nameplate
- Extended order code with a breakdown of the device features on the delivery note
- Enter serial numbers from nameplates into the *W@M Device Viewer* (www.endress.com/deviceviewer); all information on the device will be displayed.
- Enter serial numbers from nameplates into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*; all the information on the device will be displayed.

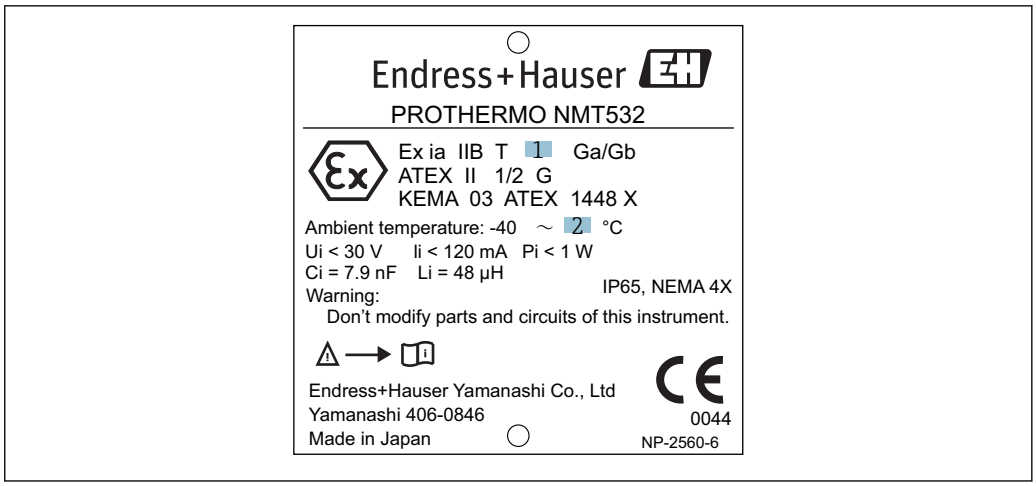
For an overview of the scope of the relevant Technical Documentation included with the product, refer to the following:
- The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer).
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

4.2.1 Nameplate



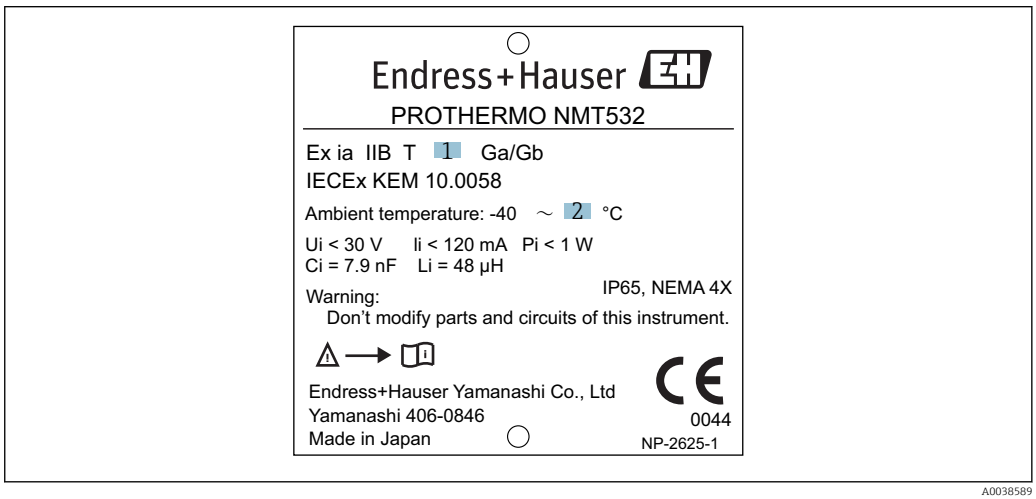
3 NMT532 Nameplate

1 *Order code*
2 *Serial number*
3 *Temperature probe length*
4 *Temperature measurement range*
5 *Manufacturing date*



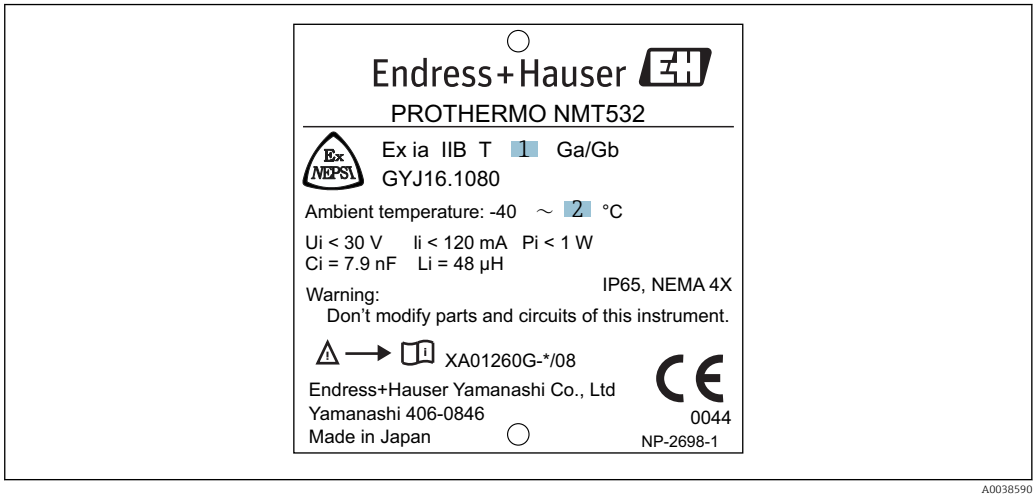
4 *ATEX approval Ex ia nameplate*

1 *Temperature class*
2 *Ambient temperature*



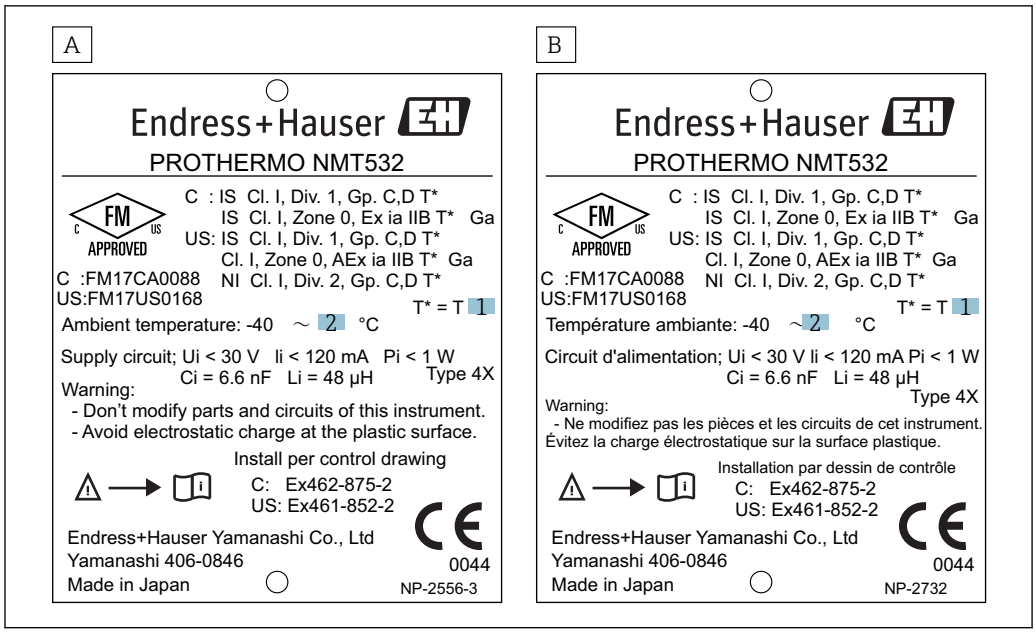
5 *IEC approval nameplate*

1 *Temperature class*
2 *Ambient temperature*



6 *NEPSI approval nameplate*

1 *Temperature class*
2 *Ambient temperature*



7 *FM C/US approval nameplate*

A FM C/US for English
B FM C/US for France
1 Range of measurement temperature
2 Maximum ambient temperature

4.3 Manufacturer contact address

Endress+Hauser Yamanashi Co., Ltd.
862-1
Mitsukunugi, Sakaigawa, Fuefuki, Yamanashi, Japan
Address of the manufacturing plant: See nameplate.

4.4 Storage and transport

4.4.1 Storage conditions

- Storage temperature: −40 to +85 °C (−40 to 185 °F)
- Store the device in its original packaging.

4.4.2 Transport

NOTICE

The housing may become damaged or dislodged.
Risk of injury

- ▶ Transport the device to the measuring point in its original packaging or hold by the process connection.
- ▶ Do not fasten lifting devices (hoisting slings, lifting eyes etc.) at the housing; instead, secure it to the process connection. Take into account the center of gravity of the device in order to avoid unintended tilting.
- ▶ Comply with the safety instructions, transport conditions for devices over 18 kg (39.6 lbs) (IEC61010).

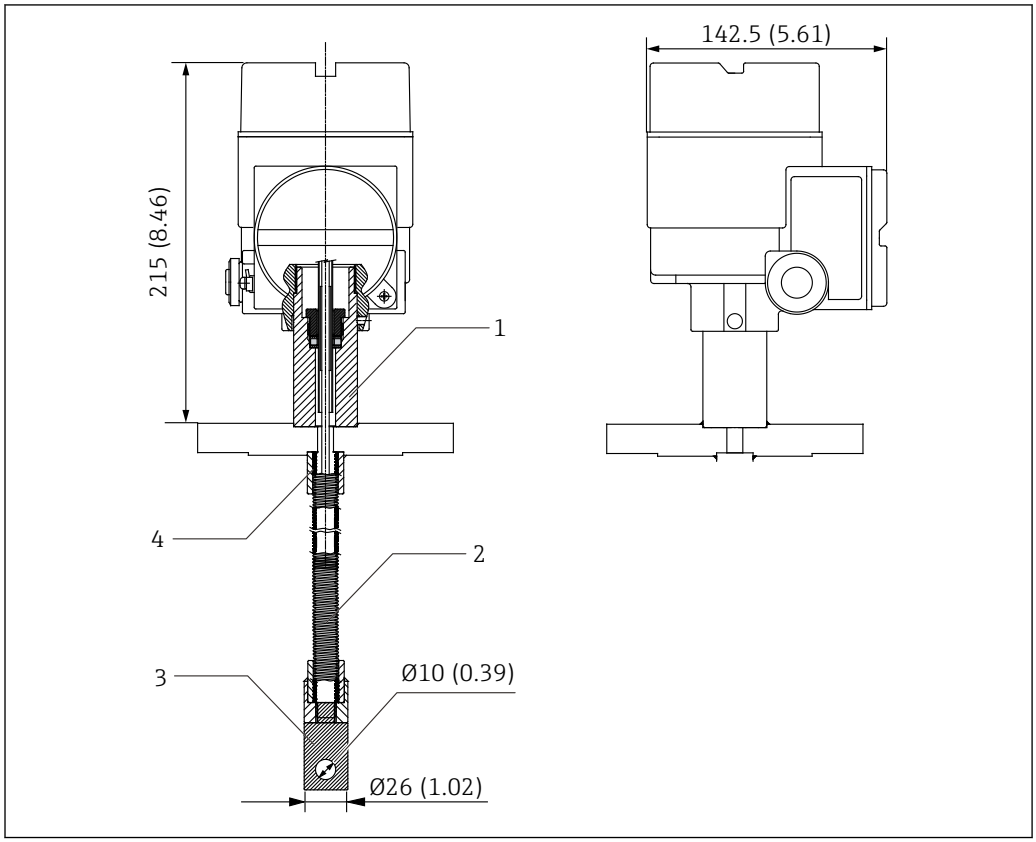
NOTICE

Risk of injury

- Transport the measuring device to the measuring point in its original packaging.
- Take into account the center of gravity of the device in order to avoid unintended tilting.
- Comply with the safety instructions, transport conditions for devices over 18 kg (39.6 lbs) (IEC61010).

5 Installation

5.1 Dimensions of NMT532

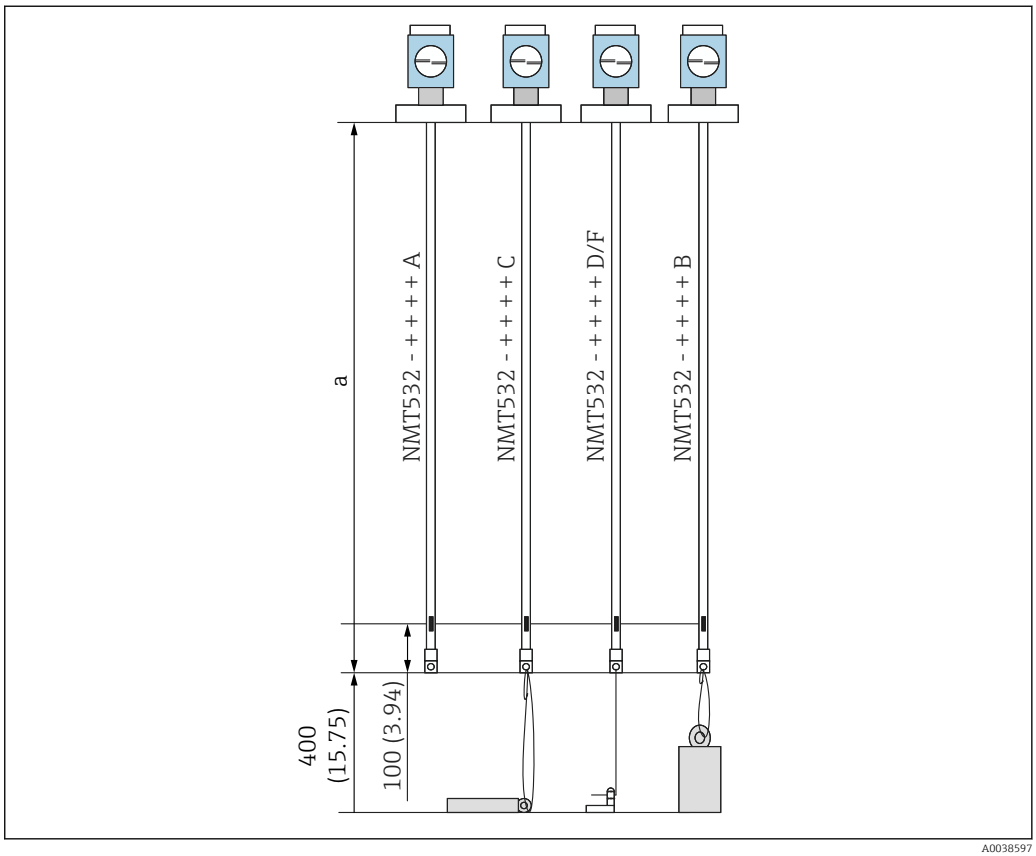


8 Dimensions of NMT532. Unit of measurement mm (in)

1 SUS304
2 Temperature probe (SUS316L) (see tips below.)
3 Bottom hook (SUS316)
4 SUS316

The specifications of temperature probe vary depending on the tank height.

5.2 Position of NMT532 element No. 1 based on the installation method

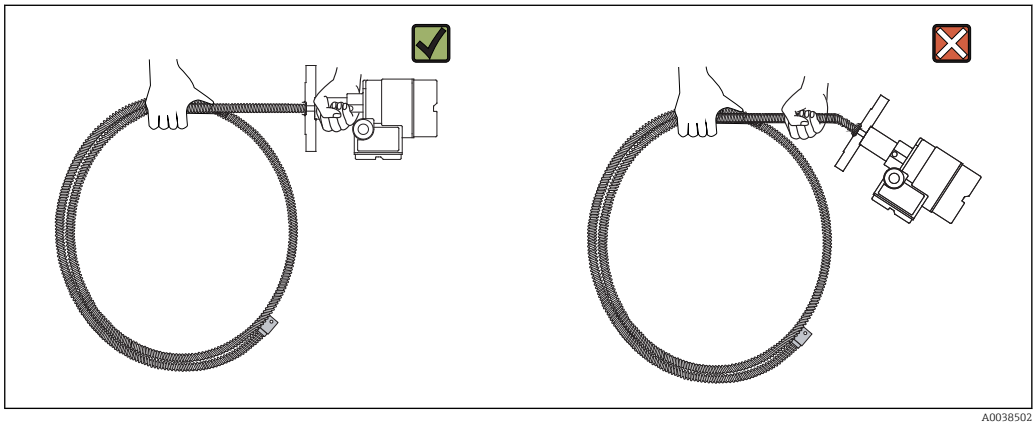


9 *Element No. 1 position*

a Height below the flange to the end of the temperature probe for all types of NMT532

5.3 Unpacking

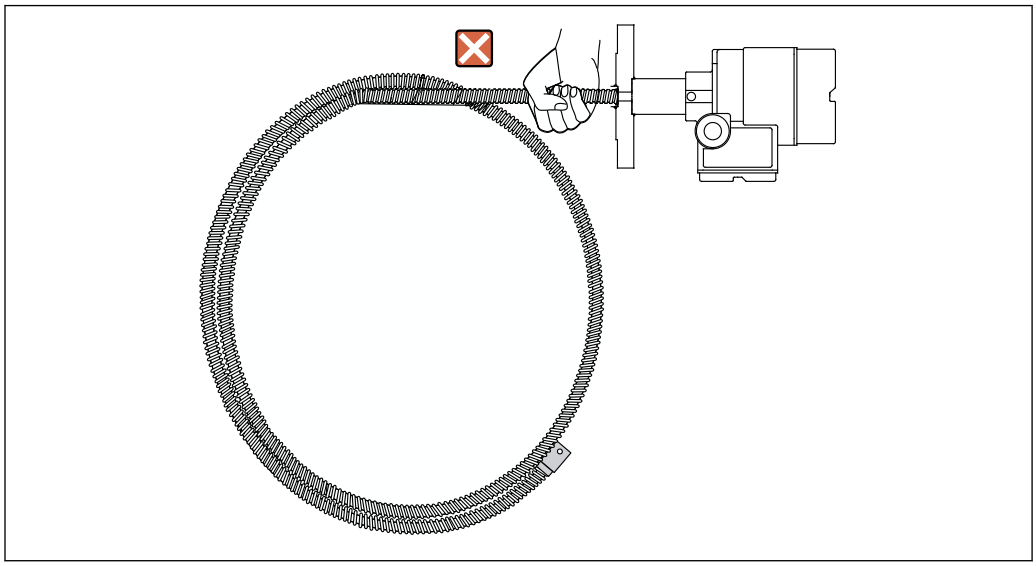
Unpack NMT532 with multiple people. If one person unpacks NMT532, the temperature probe may become bent or twisted.



10 *Unpacking NMT532*

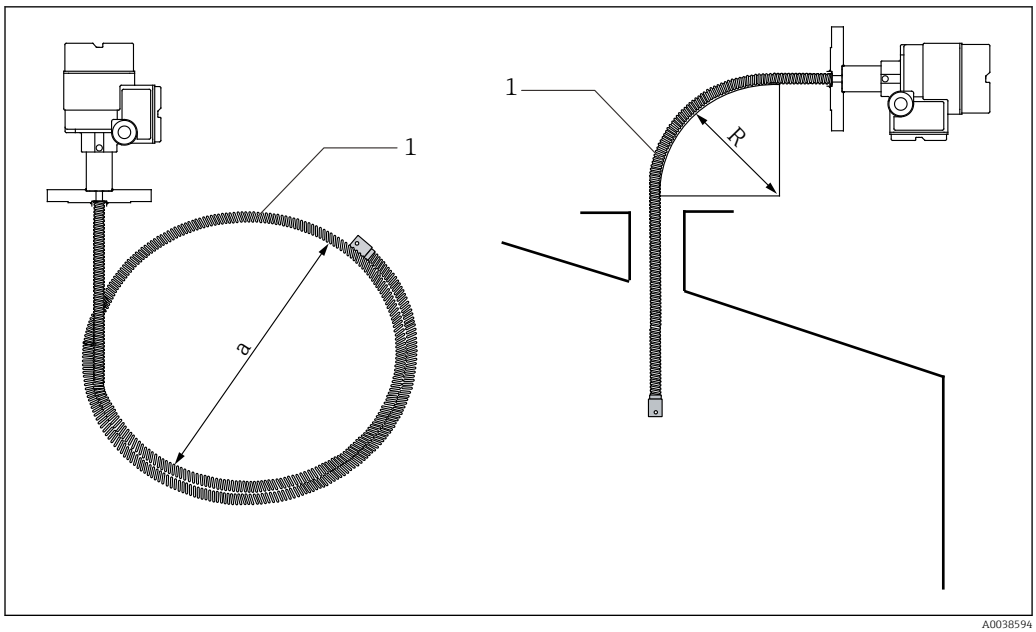
5.4 Flexible tube handling

Do not hold the flexible tube at a single point and lift the sensor. This may cause the system to malfunction.



11 *Flexible tube*

When winding the flexible tube, keep the diameter of the tube at a minimum of 600 mm (23.62 in) or more. When installing the temperature probe onto a tank or if it is necessary to bend the temperature probe, ensure that the bent portion is at least R = 300 mm (11.8 in) or more.



12 *Installation and winding of a flexible tube*

a *600 mm (23.62 in) or more*
R *300 mm (11.8 in) or more*
1 *Temperature probe*
2 *Element protection pipe*

If the bend in the flexible tube is made with R = 300 mm (11.8 in) or smaller, it may damage the tube and elements.

5.5 Mounting NMT532 on fixed roof tank

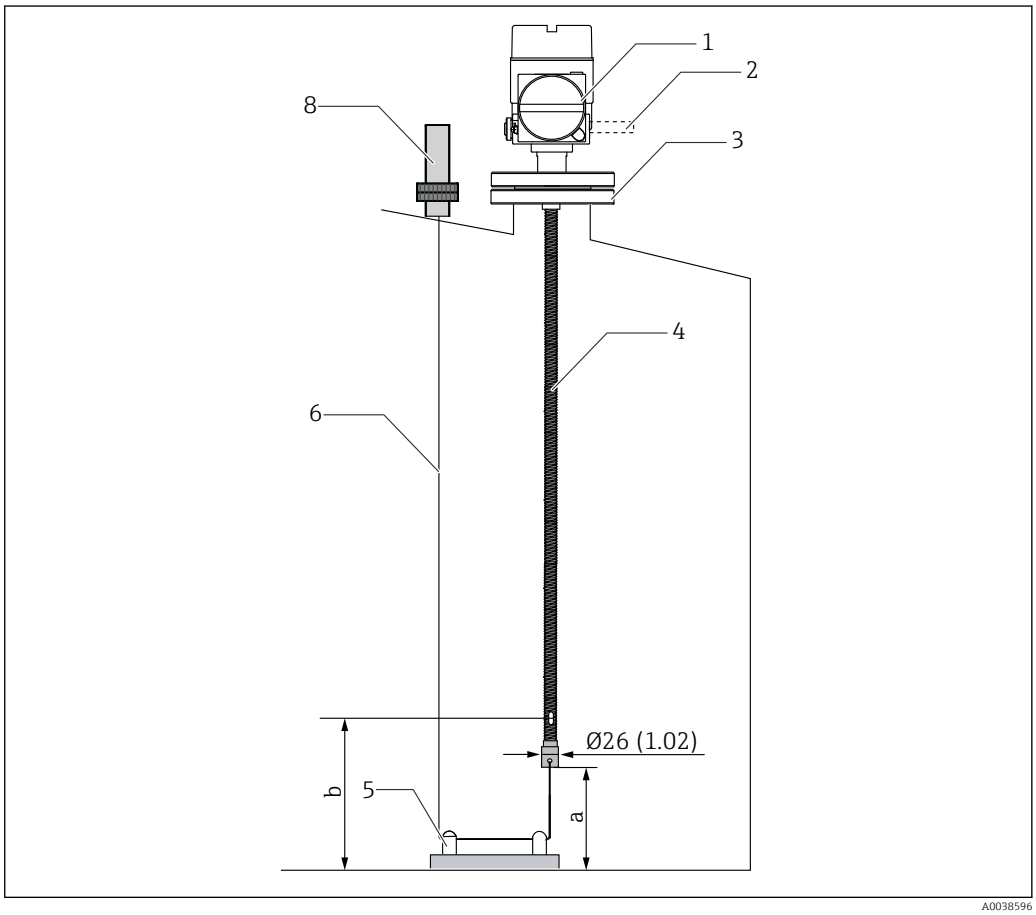
There are three ways to install NMT532 onto a fixed roof tank:

- Top anchor method
- Thermo well method
- Anchor weight method

If a heating coil is attached to the bottom of the tank, the clearance between the bottom hook of the flexible tube and the bottom of the tank may vary depending on the type of heating coil.

5.5.1 Top anchor method

The flexible tube is fixed with a wire hook and a top anchor.



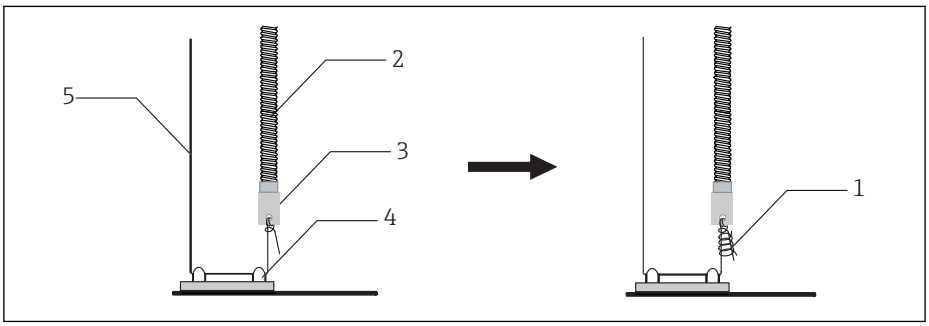
13 *Fixed roof tank. Unit of measurement mm (in)*

a *400 mm (15.57 in) (Clearance below bottom hook)*
b *Approx.500 mm (20 in) (From the bottom of the tank to the temperature element position #1)*
1 *Electrical compartment*
2 *Cable entry as specified*
3 *Flange*
4 *Temperature probe*
5 *Wire hook*
6 *Tensioning wire*
7 *Top anchor*

Top anchor attachment procedure

The flexible tube must be lowered carefully without overbending and scratching the inner edge of the nozzle hole.

1. Insert the flexible tube into a gasket and lower the flexible tube from the nozzle at the top of the tank.
2. Rotate NMT532 for cabling in the most convenient way.
3. Straighten the tensioning wire, temporarily fix the end of the wire to the top anchor and lower the wire.
4. Put the tensioning wire into the wire hook at the bottom of the tank.
5. Secure the tensioning wire twice through the hole at the bottom hook
6. Tighten the tensioning wire.
7. Wind the provided wire around the tensioning wire to secure the tensioning wire.

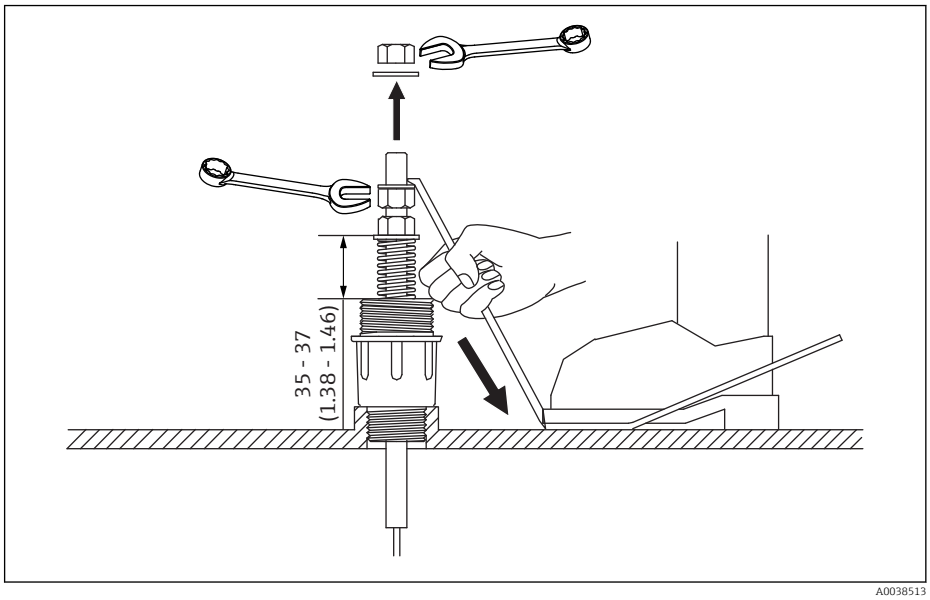


14 Top anchor attachment 1

1 Provided wire
2 Temperature probe
3 Bottom hook
4 Wire hook
5 Tensioning wire

8. Use bolts to secure the flange of NMT532 to the installation nozzle on the top of the tank.
   ↳ Compress the anchor spring until it is 35 to 37 mm (1.38 to 1.46 in).
9. Secure the tension wire to the top anchor while drawing it by holding it down with a foot or a hand.
10. Wrap the end of the tension wire once around the top anchor's axis, and tighten it using two nuts.
11. Cut the excess tension wire.

12. Rotate the nuts clockwise until the top anchor's spring is 35 to 37 mm (1.38 to 1.46 in).



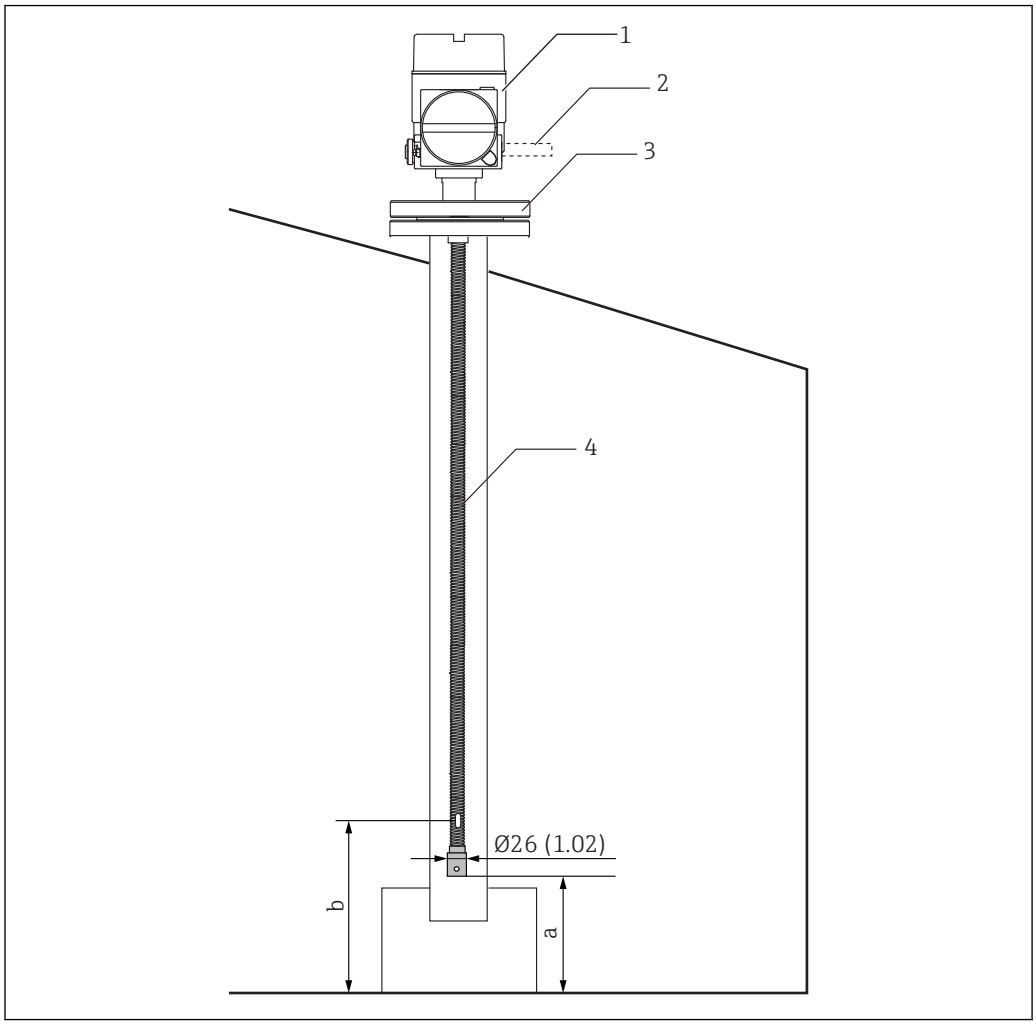
15 *Top anchor installation 2. Unit of measurement mm (in)*

13. Cover the top anchor.

This completes the procedure for installing a top anchor.

5.5.2 Thermo well method

The flexible tube is inserted into a thermo well with a diameter of 80.8 mm (2 in) or more.



16 *Thermo well. Unit of measurement mm (in)*

1 *Electrical compartment*
2 *Cable entry as specified*
3 *Flange*
4 *Temperature probe*
5 *400 mm (15.57 in) (Clearance below bottom hook)*
6 *Approx.500 mm (20 in) (From the bottom of the tank to the temperature element position #1)*

Thermo well attachment procedure

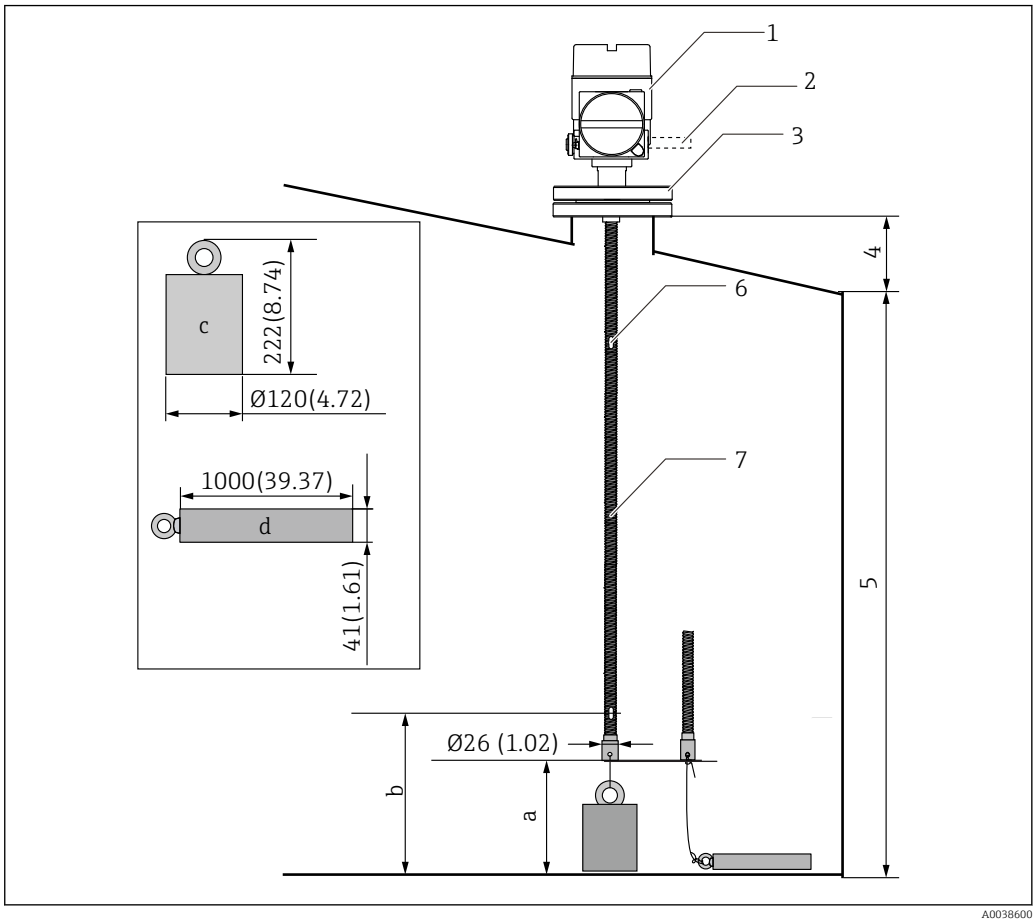
The flexible tube must be lowered carefully without overbending and scratching the inner edge of the nozzle hole.

1. Insert a flexible tube into a gasket and lower the flexible tube into the inlet of the thermo well.
2. Rotate NMT532 for cabling in the most convenient way.
3. Using bolts, fix the mounting flange of NMT532 to the nozzle at the top of the tank.

This completes the thermo well attachment procedure.

5.5.3 Anchor weight method

The flexible tube is fixed with an anchor weight.



17 *Anchor weight*

a *400 mm (15.57 in) (Clearance below bottom of the hook to the bottom of the tank)*
b *500 mm (20 in) (From the bottom of the tank to the temperature element position #1)*
c *Anchor weight for high profile*
d *Anchor weight for low profile*
1 *Electrical compartment*
2 *Cable entry as specified*
3 *Flange*
4 *Nozzle height*
5 *Tank height*
6 *Upper temperature element*
7 *Flexible tube*

⚠ CAUTION

Installation of an anchor weight

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

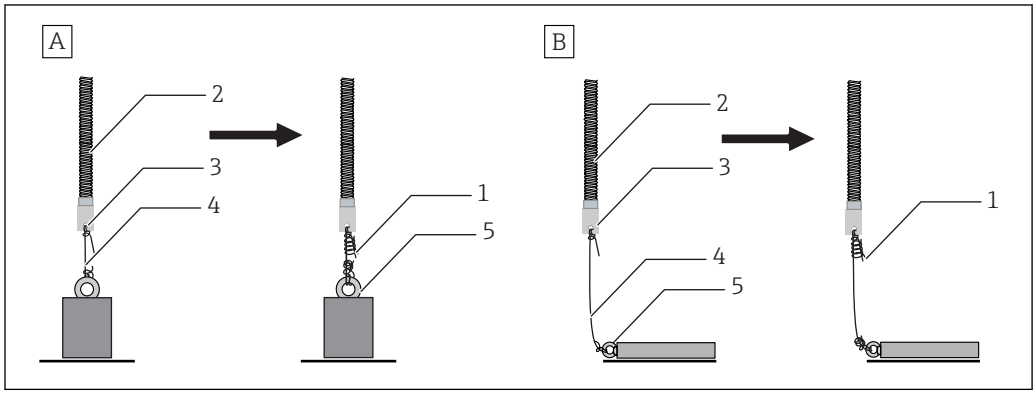
- ▶ Ensure that the anchor weight is stable at the bottom of the tank. When installing NMT532 with a suspended anchor weight, use an anchor weight that weighs 16 kg or less.
- ▶ The flexible tube must be lowered carefully without overbending and scratching the inner edge of the nozzle hole.

Anchor weight attachment procedure

1. Insert a gasket and lower the flexible tube [2] from the nozzle at the top of the tank.
2. Rotate NMT532 for cabling in the most convenient way.

3. Put the tensioning wire [4] through the anchor weight hook [5] twice and also tie the other end to the bottom hook [3].
4. Wind the provided wire [1] around both ties of the hooks to secure the tensioning wire.
5. Using the bolts, fix the mounting flange of NMT532 to the nozzle at the top of the tank.

This completes the mounting anchor weight procedure.



18 *Anchor weight attachment*

A Anchor weight (high profile)
B Anchor weight (low profile)
1 Provided wire
2 Flexible tube
3 Bottom hook
4 Tensioning wire
5 Anchor weight hook

5.5.4 Mounting on floating roof tank

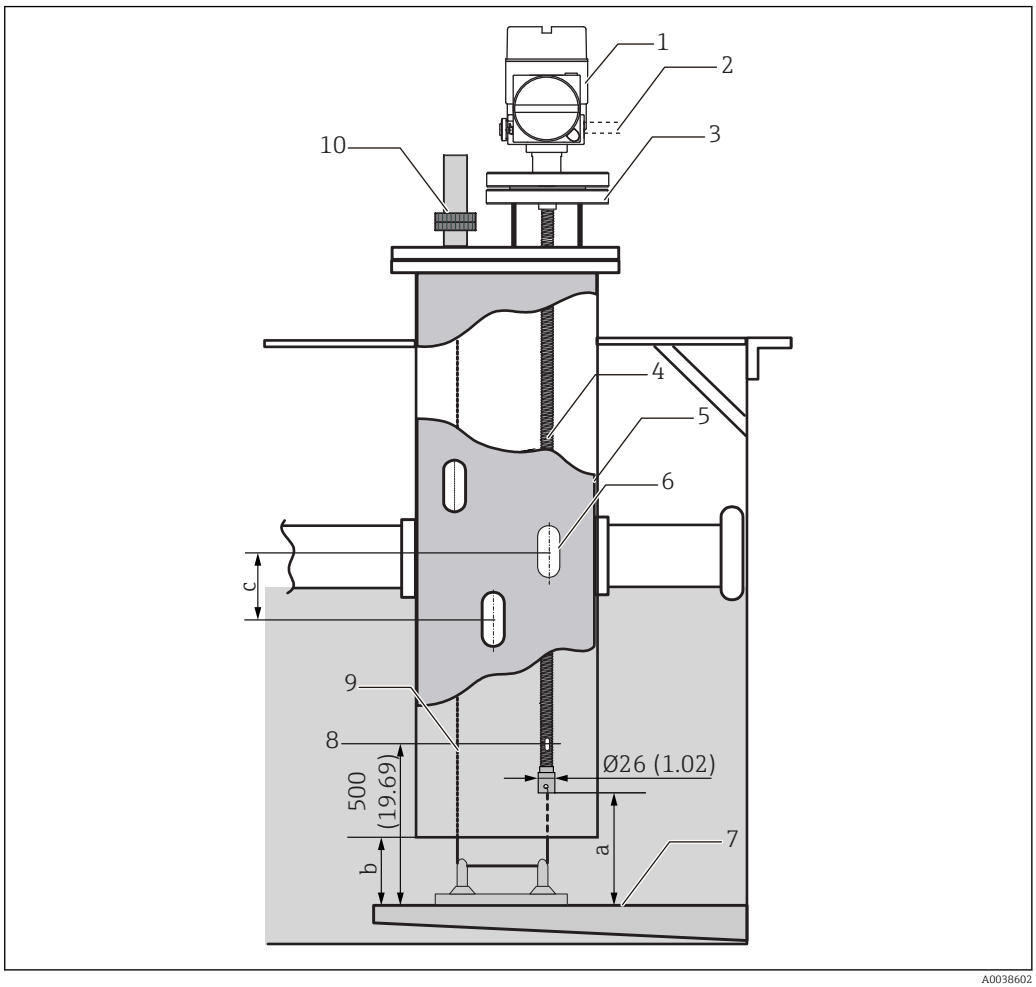
There are three methods of mounting NMT532 on a floating roof tank as follows.

- Top anchor method
- Thermo well method
- Guide wire ring method

If a heating coil is attached to the bottom of the tank, the clearance between the bottom hook of the flexible tube and the bottom of the tank may vary depending on the type of heating coil.

5.5.5 Top anchor method

The flexible tube is installed in a fixed pipe and fixed with the top anchor. NMS5 or NMS8x and NMT532 can be mounted in the same fixed pipe.



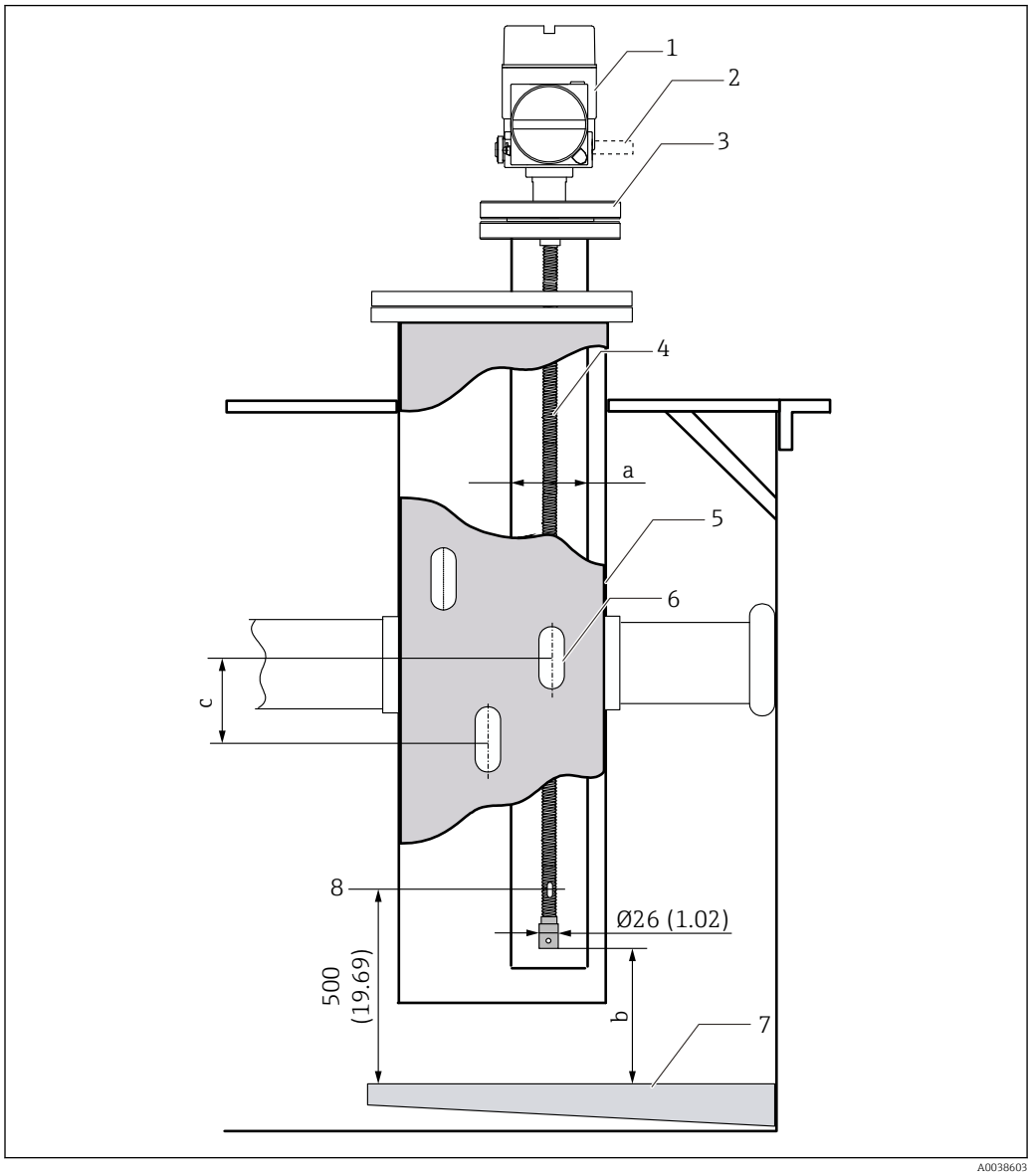
19 *Floating roof tank. Unit of measurement mm (in)*

a *400 mm (15.57 in), Clearance of the bottom hook*
b *100 to 150 mm (3.94 to 5.91 in)*
c *500 to 1 000 mm (19.69 to 39.37 in)*
Electrical compartment
Cable entry as specified
Flange
Temperature probe
Fixed pipe
Gas hole
Gauge plate
Temperature element position #1 (bottom temperature element)
Tensioning wire
Top anchor

The installation procedure is the same as in the mounting on fixed roof tanks using the top anchor.

5.5.6 Thermo well method

The flexible tube is inserted into a thermo well in the fixed pipe.



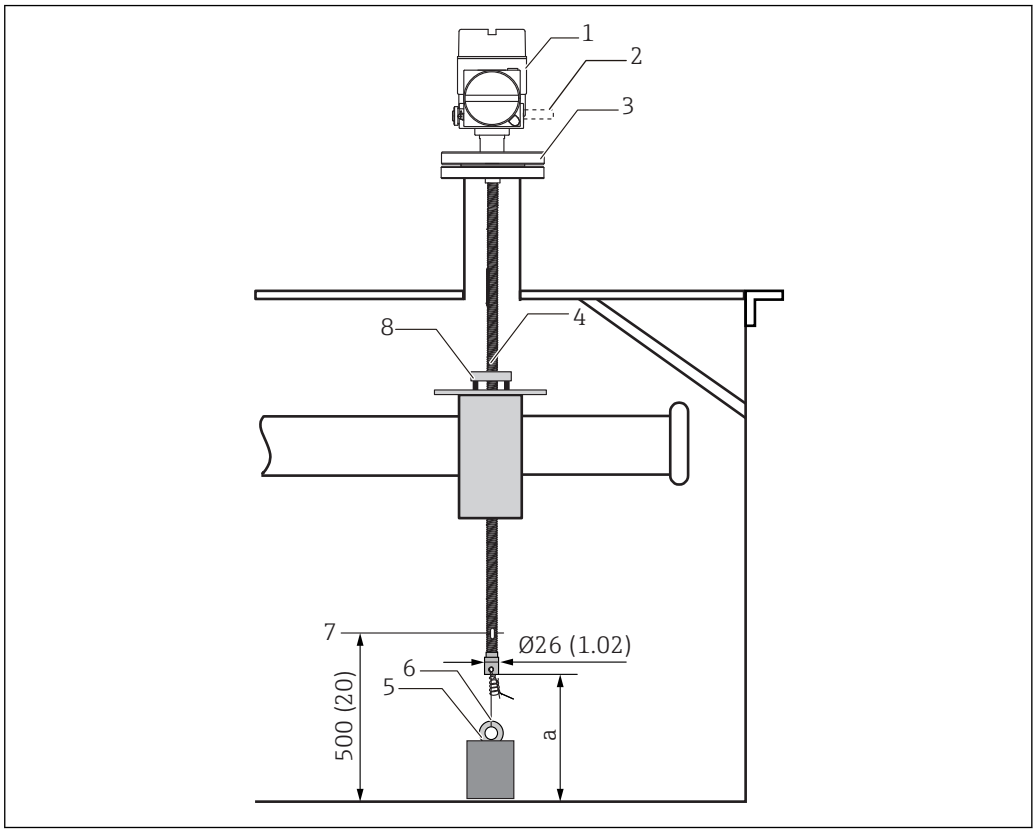
20 *Thermo well method. Unit of measurement mm (in)*

a *Stilling pipe, Ø 50.8 mm (2 in) or more, depending on specifications*
b *400 mm (15.57 in), Clearance of bottom hook*
c *500 to 1000 mm (19.69 to 39.37 in)*
1 *Electrical compartment*
2 *Cable entry as specified*
3 *Flange*
4 *Temperature probe*
5 *Fixed pipe*
6 *Gas hole*
7 *Gauge plate*
8 *Temperature element position #1 (bottom temperature element)*

The installation procedure is the same as in the mounting on fixed roof tanks using the top anchor.

5.5.7 Guide ring and anchor weight method

The flexible tube is fixed with a guide ring and an anchor weight.



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

a *400 mm (15.57 in), Clearance of bottom hook*
b *500 to 1 000 mm (19.69 to 39.37 in)*
1 *Electrical compartment*
2 *Cable entry as specified*
3 *Flange*
4 *Temperature probe*
5 *Anchor weight hook*
6 *Tensioning wire*
7 *Temperature element position #1 (bottom temperature element)*
8 *Guide ring*

⚠ CAUTION

Installation of an anchor weight

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

- ▶ Ensure that the anchor weight is stable at the bottom of the tank. When installing NMT532 with a suspended anchor weight, use an anchor weight that weighs 16 kg or less.
- ▶ The flexible tube must be lowered carefully without overbending and scratching the inner edge of the nozzle hole.

Guide ring and anchor weight attachment procedure

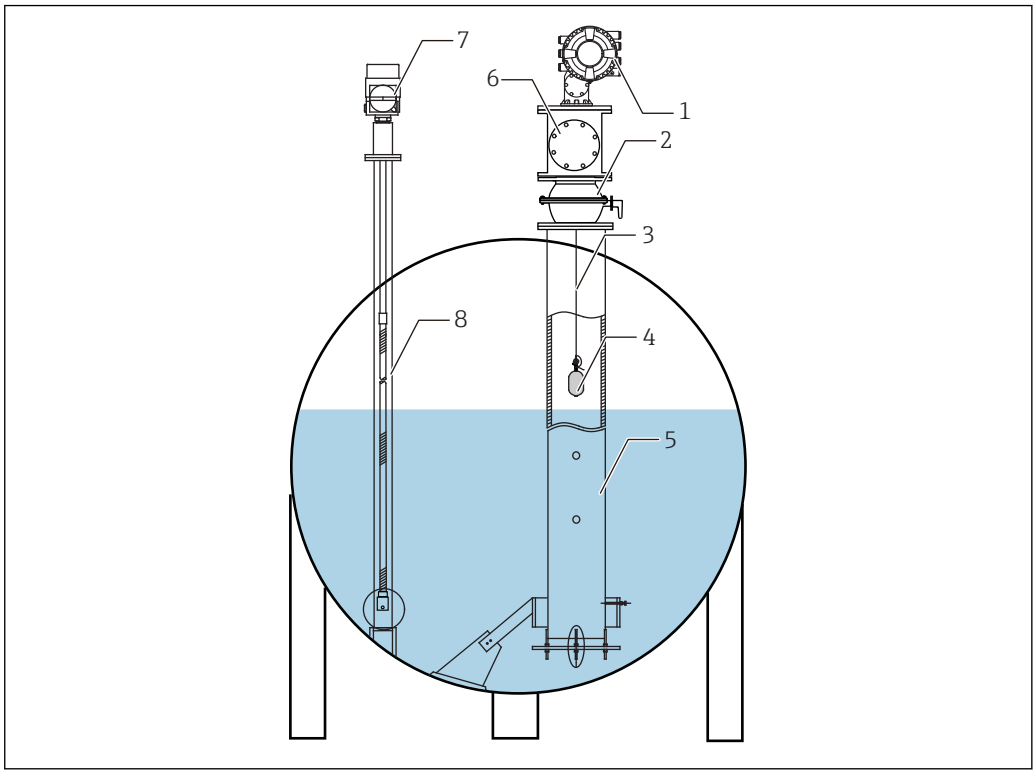
1. Set the guide ring to the floating roof.
2. Insert the flexible tube into a gasket and lower the flexible tube from the nozzle at the top of the tank.
3. Rotate NMT532 for cabling in the most convenient way.

4. Put the tensioning wire through the anchor weight hook twice and also tie the other end to the bottom hook.
5. Wind the provided wire around both ties of the hooks to secure the tensioning wire.
6. Using the bolts, fix the mounting flange of NMT532 to the nozzle at the top of the tank.

This completes the mounting guide ring and anchor weight procedure.

5.5.8 Mounting on pressurized tank

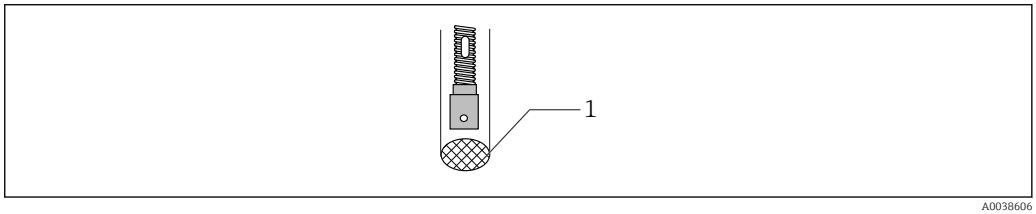
Pressurized tank is required to install a thermo well to protect the probe from the pressure.



22 *Thermo well for a pressurized tank*

1 *NMS8x / NMS5*
2 *Ball valve*
3 *Measuring wire*
4 *Displacer*
5 *Stilling well*
6 *Calibration / maintenance chamber*
7 *NMT532*
8 *Thermo well*

- If the pressure inside a tank exceeds the atmospheric pressure (absolute pressure 1 bar, 100 kPa, 14.5 psi), install a thermo well (protective pipe) with no holes or slits onto NMT532. However, NMS8x requires a stilling well with holes and slits.
- NMT532 is installed in the thermo well (protective pipe) from the top of the tank nozzle.
- Cover the bottom of the thermo well for NMT532 and weld it to protect the probe from the pressure.



23 *Thermo well welding*

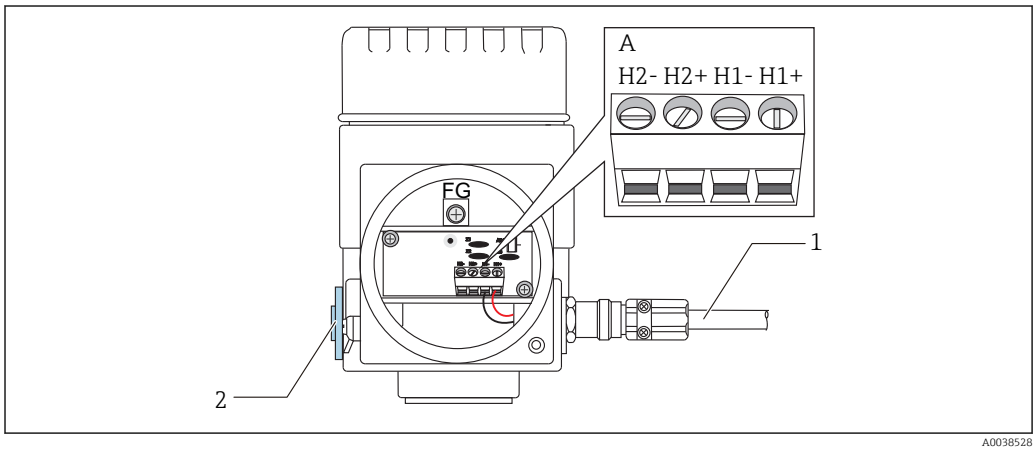
1 *Welding point*

6 Electrical connection

6.1 Terminal connection

6.1.1 NMT532 (Ex ia) intrinsically safe connection

NMT532, 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.



24 NMT532 terminal (ATEX・Ex ia)

A Temperature data / NMT532 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.

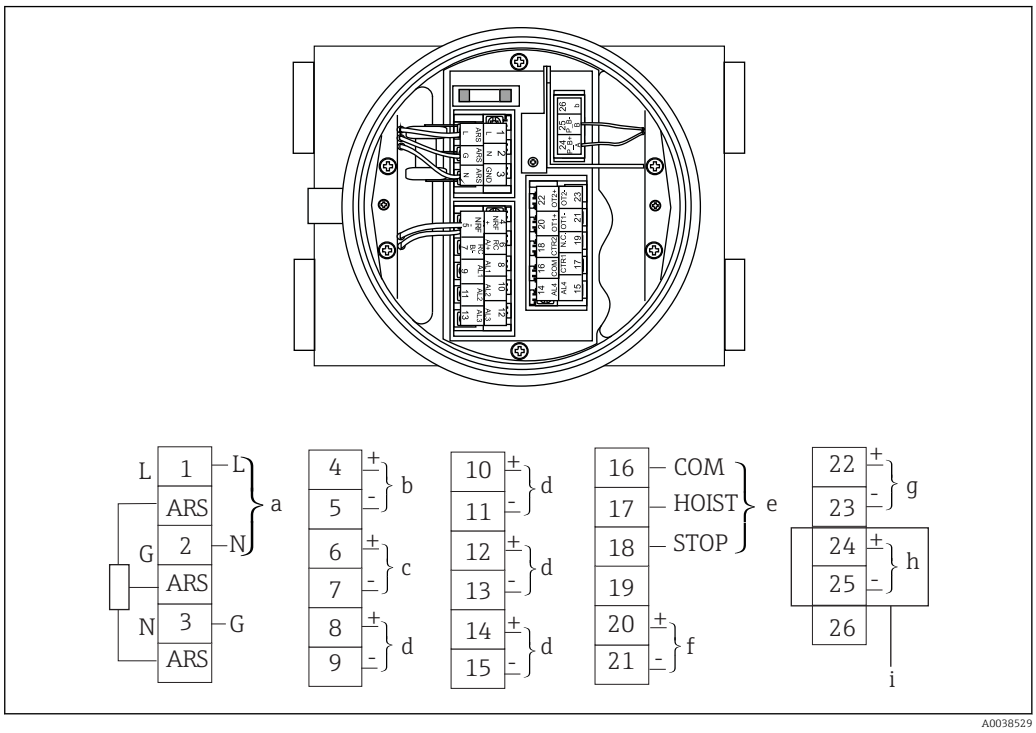
Connection table

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.

6.1.2 NMS5 (Ex d [ia]) intrinsically safe connection

The intrinsically safe NMT532 must be connected to the intrinsically safe local HART terminal on NMS5.



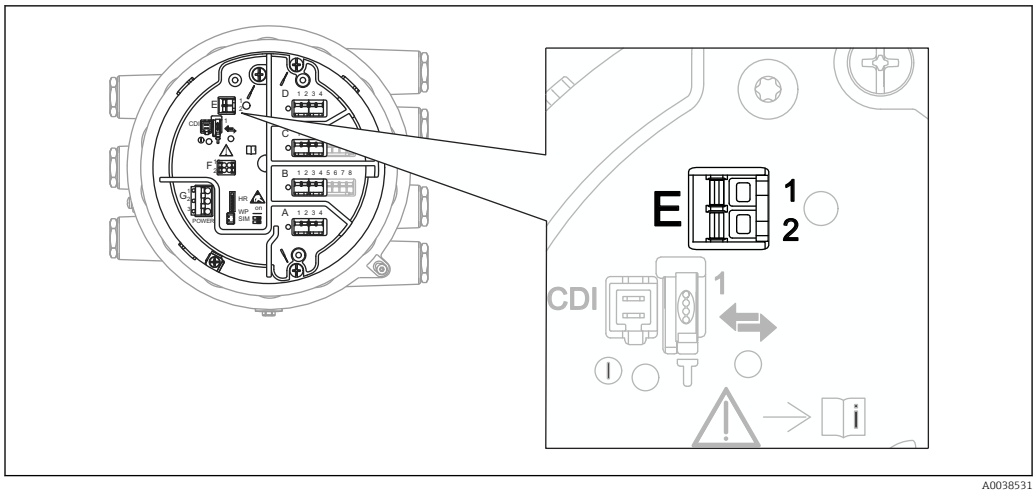
25 *NMS5 terminal*

a Power supply AC 85: 264 V50/60 Hz or DC20: 62 V AC20: 55 V
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 NMT532 Ex ia

Do not connect NMT532 local HART communication cable to terminals 4 and 5 on NMS5/NMS7. These terminals are designed to connect to Ex d local HART communication.

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

To connect an intrinsically safe NMT532, E1 and E2 are used to connect with NMS8x, NMR8x and NRF81.

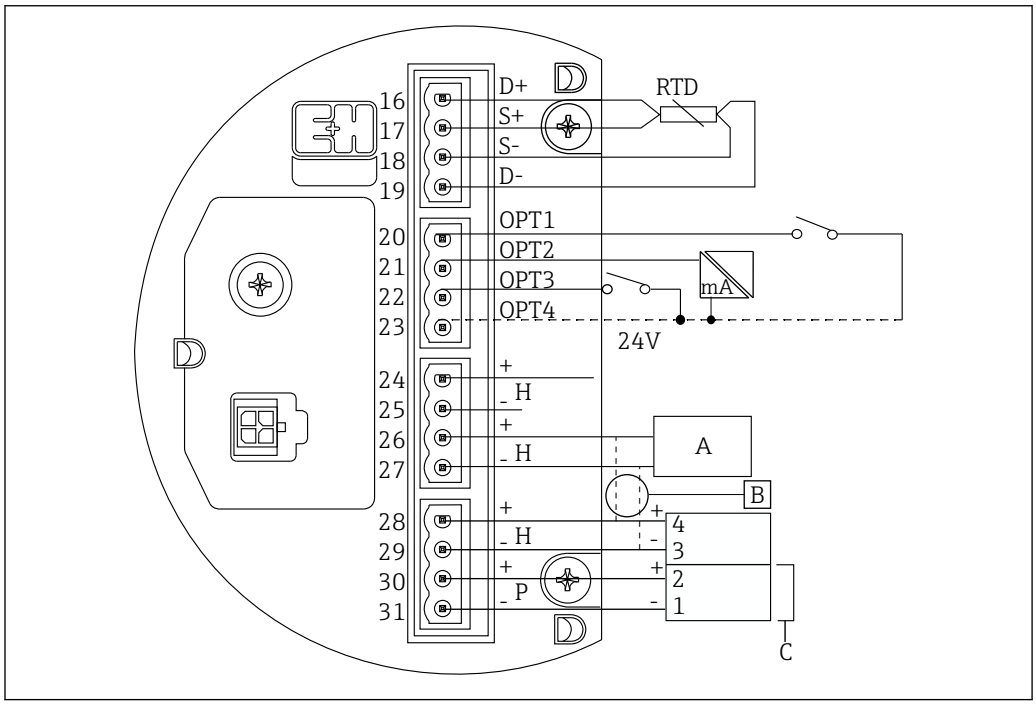


26 *NMS8x terminal for NMT532*

E1 H+ terminal
E2 H- terminal

6.2 NRF590 terminals

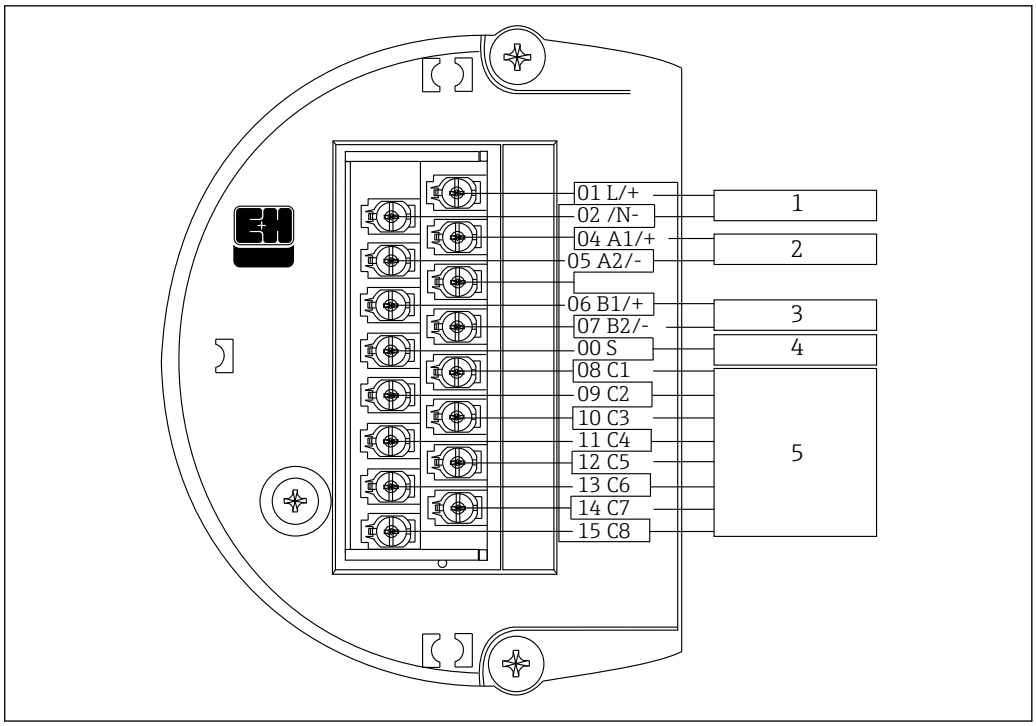
NRF590 has three sets of intrinsically safe local HART terminals.



27 *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 NMT532 to terminals 30 and 31. These terminals are an intrinsically safe 24 V_{DC} power supply for the Micropilot S Series (FMR53x, FMR540).

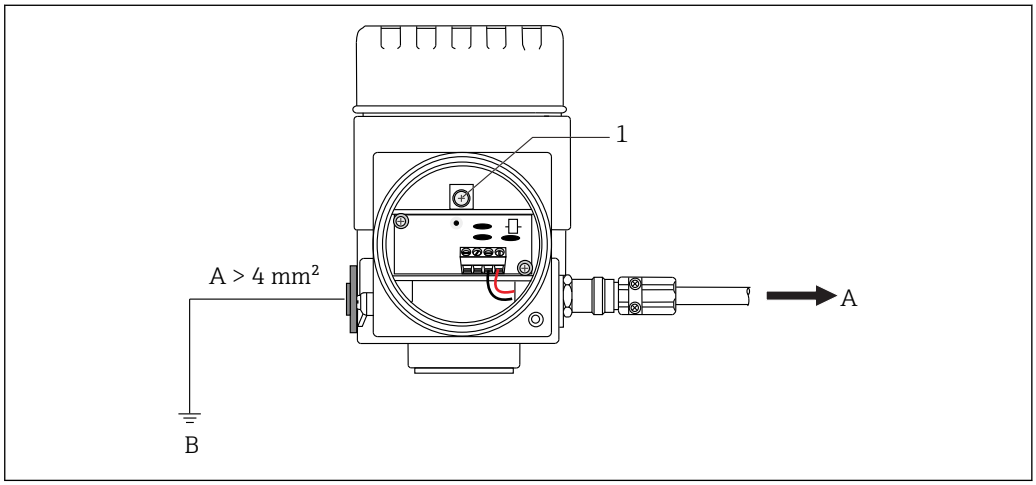


28 *NRF590 (TIIS flameproof) terminal*

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

6.3 Grounding

NMT532 must be grounded to the tank potential before communication and power connections are made. The connections from ground terminal of NMT532 to the tank ground must be made before any other wiring connections are made. All grounding must comply with local and company regulations and must be checked before the equipment is commissioned.



29 *Grounding*

A To NRF590, NMS5, NMS8x, NMR8x, or NRF81
B Tank ground
1 Ground terminal

7 Adjustment and settings

7.1 Local HART connection

7.1.1 Endress+Hauser tank gauging instrument

NMT532 is developed and designated primarily to work with Endress+Hauser tank gauging host instruments NRF590, NMS5, NMS8x, NMR8x, or NRF81. Temperature information is transmitted on a two wire intrinsically safe local HART loop to the host instrument. Since NRF590, NMS5, NMS8x, NMR8x, and NRF81 have a pre-configured menu for NMT series functionality as default, simple wiring to NMT532 will complete the initial setup for NMT532.

The parameters listed in this document are parameters that can be checked when the instruments are connected to NMT532 with FieldCare. Since the parameters that can be checked from the HMI of the connected HART Master, such as NMS8x and NMS5, differ depending on which HART Master is being used, refer to the respective operating instructions.

7.1.2 Measuring functions

Temperature measurement

0	Converter only
1	Temperature + converter

These four types of basic data are available as standard.

- Average liquid temperature
- Average gas temperature
- Level (VH02 measured distance)
- Device status

7.2 Device configuration: NRF590

Connect the loop-powered local HART communication cable from NRF590 (intrinsically safe side compartment) to NMT532. NRF590 has been designed to recognize NMT532 as a specific Endress+Hauser local HART device.

7.2.1 HART scanner

Once NMT532 and NRF590 have been wired together, all HART devices will be scanned automatically when NRF590 is turned on.

Not all NRF590 are fully compatible for recognizing NMT532. Contact your Endress +Hauser Sales Center for information on NRF590 software and hardware version compatibility.

7.2.2 NMT532 specific parameter setup for NRF590

The configuration of NMT532 parameters displayed on NRF590 depends on the installed software and hardware versions of NRF590. Refer to the NRF590 operating manual to determine accessible parameters. All default settings and parameter configurations can be carried out using FieldCare. Detailed information will be provided in the following sections.

7.3 Device configuration: NMS5/NMS7

NMS5/NMS7 are specifically designed to recognize NMT532 as HART Master. Terminals 24 and 25 of NMT532 and NMS5/NMS7 are connected with a local HART cable.

Connection between NMS5/NMS7 and NMT532 is required for Ex Approval refer to "Terminal connection."

7.3.1 Preparation for NMS5/NMS7 configuration

NMS5/NMS7 must be set to default before connecting to NMT532.

Code	Display	Details
GVH362	NMT Connection	Select "NMT Connection" and "Average" and configure the NMT. To change this parameter, an access code is required.

7.3.2 Configuring NMT532 with NMS5/NMS7

NMT532 parameters can be configured using the NMS5/NMS7 programming matrix G4 "Temperature Device."

Typical NMT532 parameters are displayed in the NMS5/NMS7 matrix.

G0 Static Matrix

Code	Display	Details
GVH010	Liquid temp	NMT532 displays the average liquid temperature.
GVH013	Gas temp	NMT532 displays the average gas temperature.

G4 Temperature Matrix

Code	Display	Details
GVH440	Liquid temp	Displays the same value indicated in GVH010: Liquid temp
GVH441	Gas temp	Displays the same value indicated in GVH013: Gas temp
GVH442	Level	The liquid level collected from NMS5/NMS7 is selected as either GVH000: Level (Displacer position) or GVH008: Level data (Level). NMT532 calculates both liquid and gas phase temperatures based on this liquid level data.
GVH447	Element No. 0 temp	Checks that the measuring temperature resistor temperature conversion is executed correctly. The tolerance range is −1.0 to 1.0 °C (−30.2 to 33.8 °F).
GVH449	Element temp 17 temp	This temperature is used for checking when shipping from the factory.
GVH450-459	Element temp No.1-10 temp	The measured temperature is the temperature data collected from each element (maximum 16 points).The temperature measurement elements 11 to 16 are selected from GVH470 "Select point," and the selected element is displayed in GVH473 "Element temp."
GVH460-469	Element No.1-10 position	Indicates the position of each element in the probe. Temperature measurement elements 11 to 16 are selected from GVH470 "Select point," and the selected element is displayed in GVH474 "Element position."
GVH470	Select point	A matrix is selected for GVH471 "Zero Adjust," GVH473 "Element temp" and GVH474 "Element position," and required element data are input.

Code	Display	Details
GVH480	Diagnostic	Displays error code messages. Refer to the error code chart in this manual.
GVH482	Element number	The number of elements installed on the temperature measurement tube is entered.
GVH485	Type of interval	Sets measurement element intervals. If the element intervals are equal, select GVH487 "Element interval" to set the interval, and then select GVH486 "Bottom point" to set the height of the lowest edge of the elements. If the element intervals are not equal, manually set the intervals. This parameter configuration is only used to change the theoretical element position within NMT532's software for average temperature calculation. The physical positions of the elements will not change.
GVH486	Bottom point	Sets the height of the lowest element. This is only set when the elements have equal intervals. This parameter configuration is only used to change the theoretical element position within NMT532's software for average temperature calculation. The physical positions of the elements will not change.
GVH487	Element interval	The element interval is entered if "Equal interval" was selected in GVH485 "Type of interval." This parameter configuration is only used to change the theoretical element position within NMT532's software for average temperature calculation. The physical positions of the elements will not change.

7.4 Configuring NMT532 with NMS8x/NMR8x/NRF81

NMS8x, NMR8x and NRF81 are specifically designed to recognize NMT532 as HART Master. Terminals E1 and E2 or B3 and C3 of NMR8x, NRF81 and NMS8x are connected to NMT532 with a local HART cable.

Connection from NMS8x, NMR8x and NRF81 to NMT532 is required for Ex Approval. Follow the connection instructions in the separate BA01025G operating instructions, "Terminal connection."

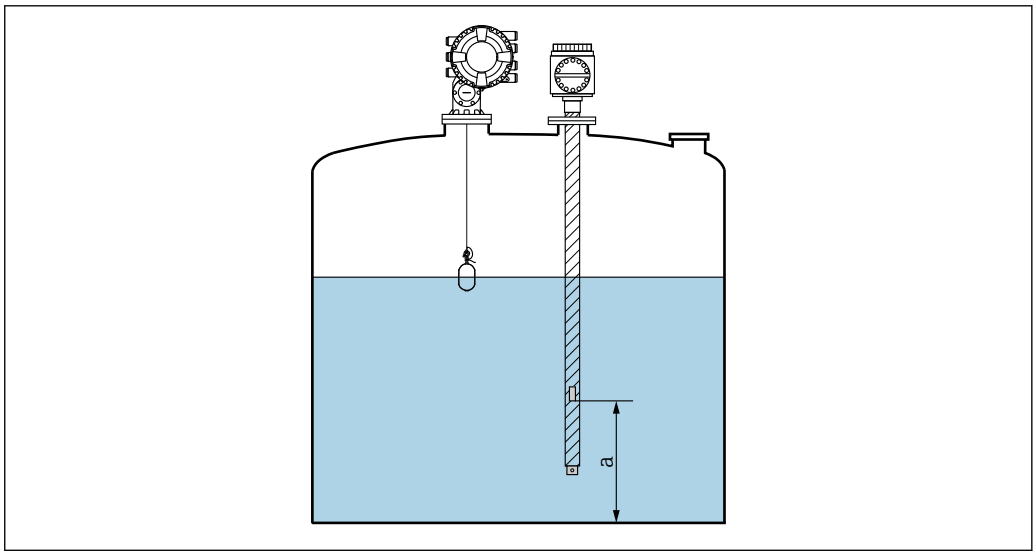
7.4.1 Preparation for configuring NMS8x/NMR8x/NRF81

NMS8x, NMR8x and NRF81 must be set to default before connecting to NMT532.

Setting procedure

1. From the Expert menu, choose **Input/Output → HART device → HART device(s) → NMT device configuration**.
2. Select **"Yes"** for **Config. device?**
3. Enter the bottom temperature element in **Bottom point** (see diagram below).

This completes the setting procedure.



30 Position of the bottom-point temperature element

a Distance between the bottom-point temperature element to the reference (tank bottom or reference plate)

Default a is 500 mm (19.69 in), but this can be modified as needed.

Liquid temperature display

Item	Details
Navigation	Operation → Temperature → Liquid temp
Description	Displays the average or spot temperature of the measured liquid.
Additional information	Read access: Operator
	Write access: -

Vapor temperature

Item	Details
Navigation	Operation → Temperature → Vapor temperature
Description	Displays the measured vapor temperature.
Additional information	Read access: Operator
	Write access: -

Display of element temperature 1-24

Item	Details
Navigation	Operation → Temperature →NMT element values → Element temperature → Element temperature 1 to 24
Description	Displays the temperature of an temperature element in the NMT.
Additional information	Read access: Operator
	Write access: -

Element position 1 to 24

Item	Details
Navigation	Operation → Temperature → NMT element values → Element temperature → Element position 1 to 24
Description	Displays the position of the selected temperature element in the NMT.
Additional information	Read access: Operator
	Write access: -

Selection of liquid level

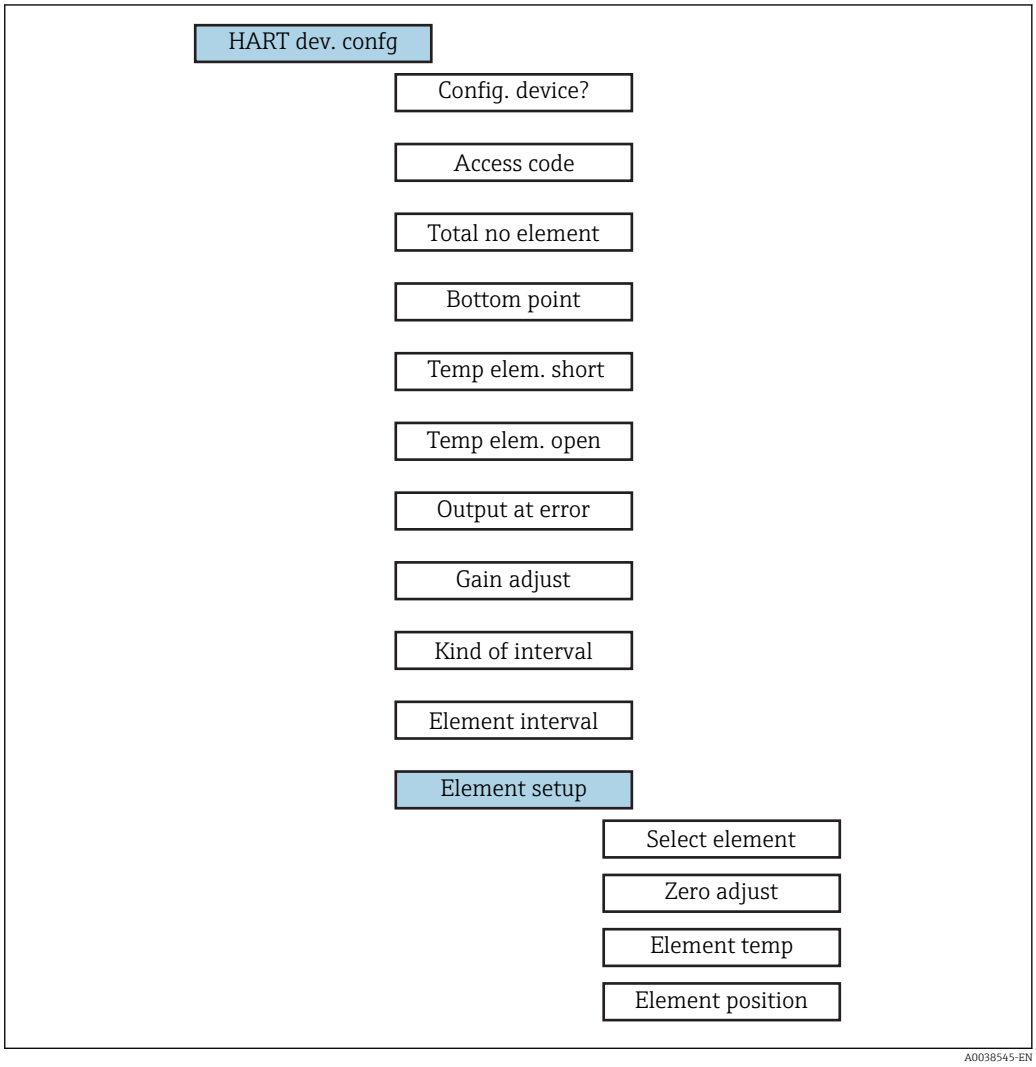
Item	Details
Navigation	Setting → Advanced settings → Application → Tank settings → Level → Select liquid level
Description	Sets the liquid level source.
Selection	No input
	HART device, Level 1-15
	Level SR (see Note)
	Liquid level (see Note)
	Displacer position (see Note)
	AIO B1-3 value
	AIO C1-3 value
	AIP B4-8 value
	AIP C4-8 value
Factory setting	The setting is different depending on the device.
Additional information	Read access: Operator
	Write access: -

The display will be different depending on the selected options and equipment settings.

7.4.2 NMS8x/NMR8x/NRF81 configuration

Below are NMT532-related parameters. For details on the operation of NMS8x, NMR8x and NRF81, see their respective operating instructions.

The following parameters can be checked from the display accessed through the Main Menu → Expert → Input/Output → HART device → HART device(s) [MenuName].



31 Parameter structure

Configure device?

Item	Details
Navigation	Expert → Input/Output → HART Device → HART device(s) [MenuName] → HART device configuration → Config. device? (14728)
Description	Configures the NMT device.
Selection	Yes (The device is recognized as NMT)
	No (The device will not be recognized)
Factory setting	No
Additional information	Read access: Operator
	Write access: Maintenance

Access code

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) [MenuName] → HART Device configuration → Access code (14714)
Conditions	Configure device? = Yes
Description	Displays the access code.
Input range	0-65535
Factory setting	0
Additional information	Read access: Operator
	Write access: Maintenance

Total number of elements

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) [MenuName] → HART Device configuration → Total No. elements (14730)
Description	Displays the total number of elements that can be configured.
Additional information	Read access: Operator
	Write access: -

Bottom point

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) [MenuName] → HART Device configuration → Bottom point (14729)
Description	Displays the bottom-point temperature element.
Input unit	Numerical value (mm)
Factory setting	0 mm
Additional information	Read access: Operator
	Write access: Maintenance

Temp element short

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) [MenuName] → HART device configuration → Temp elem. short (14731)
Description	Configures the error code for when an element short-circuits.
Input unit	Numerical value (℃)
Factory setting	0 ℃
Additional information	Read access: Operator
	Write access: Maintenance

Temp element open

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) [MenuName] → HART device configuration → Temp elem. open (14732)
Description	Configures the error code for when an element is open.
Input unit	Numerical value (℃)
Factory setting	0 ℃
Additional information	Read access: Operator
	Write access: Maintenance

Output error

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) [MenuName] → HART device configuration → Output error (14733)
Description	Selects the error display for when an element shorts and opens.
Selection	OFF
	ON
Additional information	Read access: Operator
	Write access: Maintenance

Gain adjust

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) [MenuName] → HART device configuration → Gain adjust (14736)
Description	Adjusts the temperature of all elements and references 0 and 17.
Input unit	Numerical value
Factory setting	0
Additional information	Read access: Operator
	Write access: Maintenance

Kind of interval

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) [MenuName] → HART Device configuration → Adjust interval (14744)
Description	Sets the type of element interval.
Selection	Equal
	Unequal
Factory setting	Equal
Additional information	▪ Equal division: Bottom point + Element interval ▪ Unequal: Set manually
	Read access: Operator
	Write access: Maintenance

Element interval

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) [MenuName] → HART device configuration → Element interval (14743)
Conditions	Kind of interval: Equal
Description	Sets the interval of each element.
Input unit	Numerical value
Factory setting	0 mm
Additional information	Read access: Operator
	Write access: Maintenance

Select element

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) → NMT device configuration → Element configuration → Select element (14734)
Description	The element to be configured is manually selected.
Input unit	1-16
Factory setting	1
Additional information	Read access: Operator
	Write access: Maintenance

Zero adjust

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) → NMT device configuration → Element configuration → Zero adjust (14735)
Description	Adjusts the offset of the selected element.
Input unit	Numerical value
Factory setting	0 (None)
Additional information	Read access: Operator
	Write access: Maintenance

Element temperature

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) → NMT device configuration → Element configuration → Element temp (14737)
Description	Displays the element temperature.
Additional information	Read access: Operator
	Write access: -

Element position

Item	Details
Navigation	Expert → Input/Output → HART device → HART device(s) → NMT device configuration → Element configuration → Element position (14738)
Description	Adjusts the element position.
Input unit	Numerical value
Factory setting	0 mm
Additional information	Read access: Operator
	Write access: Maintenance

8 Operation

The following configuration uses FieldCare.

⚠ WARNING

Modification of modules

Changing the jumper setting by disassembling the internal module of NMT532 may invalidate the accuracy of the calibration that was performed at the factory. It may also cause serious accidents.

► Do not disassemble a module or change the jumper setting.

8.1 HART device codes

Code	Details	Descriptions
184	Device code for temperature measurement function	184 is specially designed for the NMT532.

8.2 Device data

Item	Details	Descriptions
Tag number	Read / Write Default: HART	This number is for customer-specified device identification and control number, tank name, site name and other ID
Assembly number	Read / Write Default: 0	This number is for manufacture control based on production process.

8.3 Temperature measurement

HART device code 184 is designed for the temperature measurement function. Available parameters and functions are as follows. The description of parameters is based on the FieldCare display screen.

The HART device code appears in the default header position or on the FieldCare display screen only when VH99 "Device Type Code" has been selected.

8.3.1 Primary value: VH00-VH09

Code	Display	Details	
VH00	Liquid Temp (Average liquid temperature)	Item type	Read only
		Range	−200 to 240 °C (−328 to 464 °F)
		Display of the average temperature of the liquid phase The measured liquid levels that are required for calculating the average temperature of the liquid phase are provided by Micropilot FMR Series (via NRF590) or NMS5, NMS7 or NMS8x.	
VH01	Gas Temp (Average gas temperature)	Item type	Read only
		Range	−200 to 240 °C (−328 to 464 °F)
		Displays the average temperature of the measured gas (vapor) phase Gas phase measurements that are required for calculating the average gas phase temperature are provided by Micropilot FMR series (via NRF590) or NMS5, NMS7 or NMS8x.	
VH02	Measured Distance	Item type	Read only

Code	Display	Details	
	(Liquid level)	Range	0 to 99 999 mm
		Displays the liquid level inside the tank as configured by a level gauge. If a level gauge is not connected, a directly input liquid level can be used as a device test.	
VH07	Temperature 0 (Element 0 temperature)	Item type	Read only
		Tolerance	−1.0 to 1.1 °C (30.2 to 33.8 °F)
		Checks that the measuring temperature resistor temperature conversion is executed correctly.	
VH09	Temperature 17 (Element 17 temperature)	Item type	Read only
		This temperature is used for checking when shipping from the factory.	

8.3.2 Temperature measurement elements 1: VH10 to VH15 (VH16 to 19 are not available in NMT 532)

Code	Display	Details	
VH10-19	Temperature 1-10 (Temperature of elements 1 to 10)	Item type	Read only
		Range	−200 to 240 °C (−328 to 464 °F)
		Displays individual temperature measurement elements.	

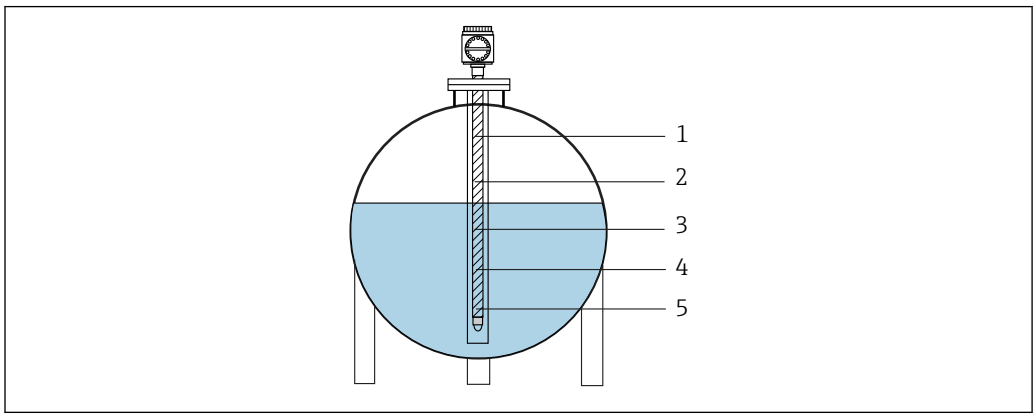
8.3.3 Temperature measurement elements 2: VH20 to VH25 (VH26 to 29 are not available in NMT532)

Code	Display	Details	
VH20-25	Temperature 11-16 (Temperature of elements 11 to 16)	Item type	Read only
		Range	−200 to 240 °C (−328 to 464 °F)
		Displays individual temperature measurement elements.	
VH26	Selec. Ave Method (Average temperature calculation method)	Item type	Selection
		Selection	Standard / Advanced
		Selects the method of average temperature calculation.	

Standard calculation method

Regardless of the shape of the tank, average temperature is calculated using the following formula:

Formula: (T1 + T2 + T3) / Number of elements in liquid phase = Average temperature
(3.5 °C (38.3 °F) + 3.0 °C (37.4 °F) + 2.0 °C (35.6 °F)) / 3 = 2.83 °C (37.1 °F)



32 *Standard calculation method for liquid temperature*

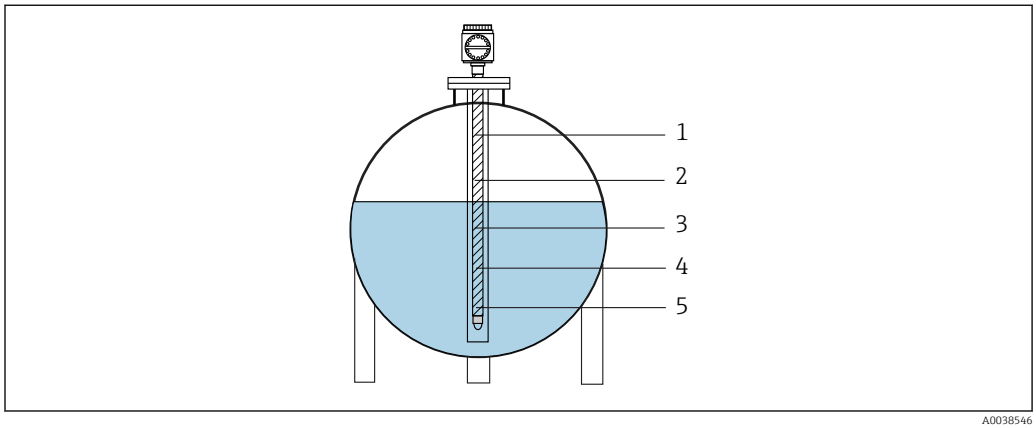
1 *Element No.5: 4.5 °C (40.1 °F) (T5)*
2 *Element No.4: 4.0 °C (39.2 °F) (T4)*
3 *Element No.3: 2.0 °C (35.6 °F) (T3)*
4 *Element No.2: 3.0 °C (37.4 °F) (T2)*
5 *Element No.1: 3.5 °C (38.3 °F) (T1)*

Advanced calculation method

Average temperature is calculated by adding a corrective factor for unequal volume distribution.

Formula: (T1*V1 + T2*V2 + T3*V3) / (V1 + V2 + V3) = Average temperature

Parameters that are related to V = additional volume factors are determined in VH53, 54 and 55.



33 *Standard calculation method for liquid temperature*

1 *Element No.5: 4.5 °C (40.1 °F) (T5)*
2 *Element No.4: 4.0 °C (39.2 °F) (T4)*
3 *Element No.3: 2.0 °C (35.6 °F) (T3)*
4 *Element No.2: 3.0 °C (37.4 °F) (T2)*
5 *Element No.1: 3.5 °C (38.3 °F) (T1)*

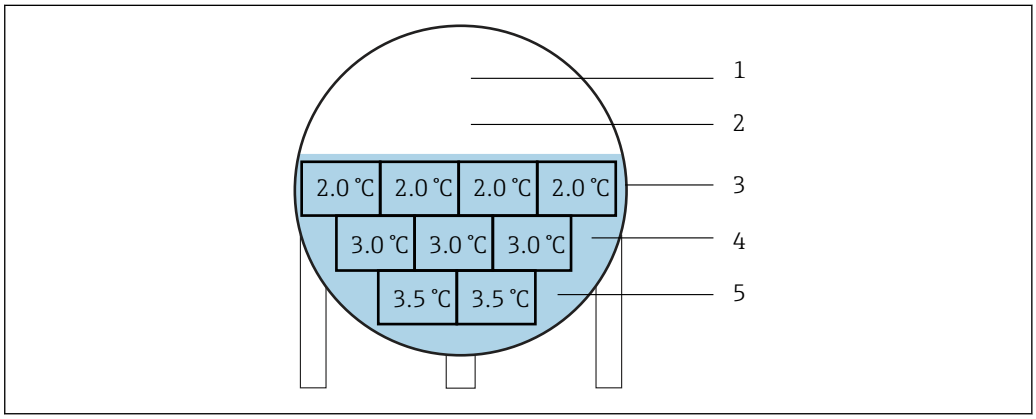
Advanced calculation method 2

Average temperature is calculated by adding a corrective factor for unequal volume distribution.

Formula: (3.5 °C (38.3 °F) x 2 + 3.0 °C (37.4 °F) x 3 + 2.0 °C (35.6 °F) x 4) / (2 + 3 + 4) = 2.67 °C (36.8 °F)

In the diagram below, □ represents V (volume factor).

(3.5 °C (38.3 °F) x 2 + 3.0 °C (37.4 °F) x 3 + 2.0 °C (35.6 °F) x 4) / (2 + 3 + 4) = 2.67 °C (36.8 °F)

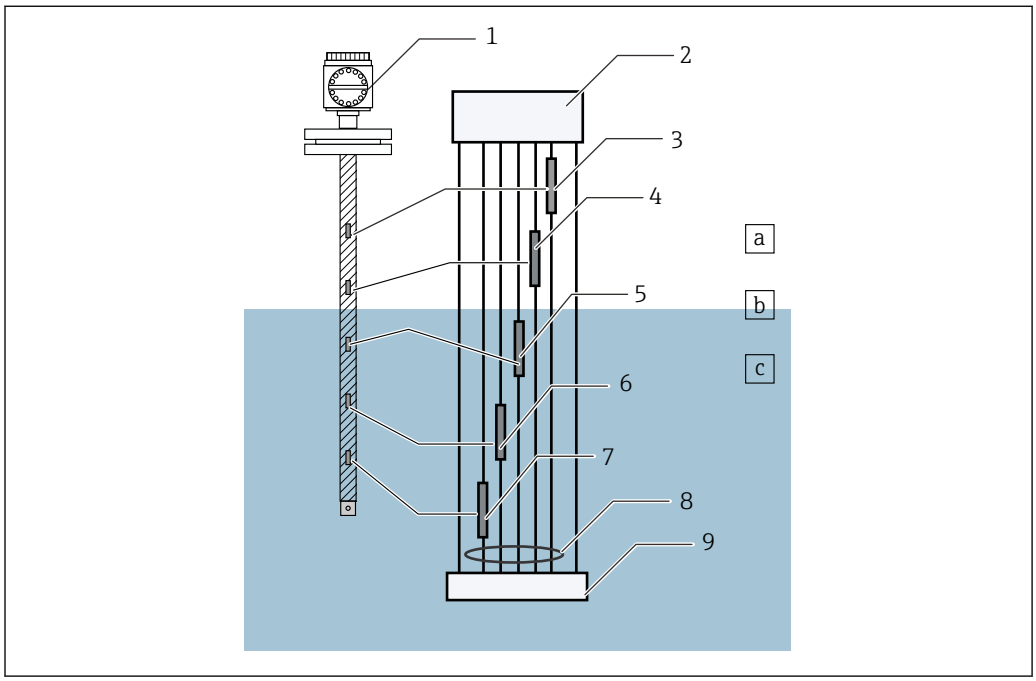


34 *Advanced calculation method 2*

1 *Element No.5 : 4.5 °C (40.1 °F) (T5)*
2 *Element No.4: 4.0 °C (39.2 °F) (T4)*
3 *Element No.3: 2.0 °C (35.6 °F) (T3)*
4 *Element No.2: 3.0 °C (37.4 °F) (T2)*
5 *Element No.1: 3.5 °C (38.3 °F) (T1)*

Spot temperature of the display array

When some temperature elements (resistance and material) are located in each input cable in the probe; average calculation is performed based on sum of submerged temperature element value/total number of temperature element submerged.



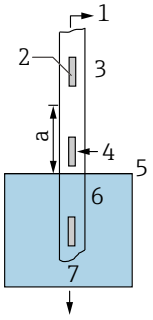
35 *Spot temperature*

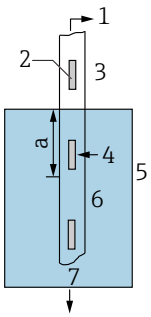
a Gas (vapor phase)
b Level
c Liquid phase
1 NMT532
2 Converter
3 Pt100 element No.5: 2.45 °C (76.1 °F) (T5)
4 Pt100 element No.4: 24 °C (75.2 °F) (T4)
5 Pt100 element No.3: 26.0 °C (78.8 °F) (T3)
6 Pt100 element No.2: 25.5 °C (77.9 °F) (T2)
7 Pt100 element No.1: 25.0 °C (77.0 °F) (T1)
8 Input signal cable
9 Probe bottom

8.3.4 Element position 1: VH30 to VH35 (VH36 to VH39 are not available in NMT 532)

Code	Display	Details	
VH30-VH39	Position 1-10 (Element positions 1 to 10)	Item type	Read / Write
		Range	0 to 99 999 mm
		Displays individual temperature measurement elements.	
		Sets the element position from the bottom of the tank. Calculation is automatically performed if "Equal" was selected as the element interval in VH85. If "Unequal" was selected, all element positions must be entered manually.	

8.3.5 Element position 2: VH46 to VH49 (VH40 to VH45 are not available in NMT532)

Code	Display	Details	
VH46	Hysteresis Width (Hysteresis width)	Item type	Read / Write
		Default	10 mm (0.39 in)
		Range	0 to 99 999 mm
		Sets the hysteresis of an element switch position. Hysteresis entered as an offset value can prevent hunting caused by fluctuations of the level surface. This changes according to the range of fluctuations.	
VH47	Clear Memory (Memory deletion)	Item type	Selection
		Default	None (0)
		Range	0 to 99 999 mm
		Selection	None, Clear
		Resets the matrix parameter to the default setting.	
VH48	Gas Offset (Gas offset)	Item type	Read / Write
		Default	300 mm (11.81 in)
		Range	0 to 99 999 mm
		When a temperature element in the gas (vapor) phase is within the shown range below, it is not used for average gas temperature calculations.	
		 A0038550 *36 Gas offset* *a VH48 gas offset 300 mm (11.81 in) (Default)* *1 To NMT532 converter* *2 Temperature element* *3 Gas phase* *4 Exclusion range (see Note)* *5 Level* *6 Liquid phase* *7 To tank bottom* Although temperature elements in this range are in the gas phase, they are excluded from average gas temperature calculations in order to avoid effects from the interface between the liquid phase and the gas phase.	
VH49	Liquid Offset (Liquid offset)	Item type	Read / Write
		Default	300 mm (11.81 in)

Code	Display	Details	
		Range	0 to 99 999 mm
		 A0038551 *37 Liquid offset* *a VH48 gas offset 300 mm (11.81 in) (Default)* *1 To NMT532 converter* *2 Temperature element* *3 Gas phase* *4 Exclusion range (see Note)* *5 Level* *6 Liquid phase* *7 To tank bottom* Although temperature elements in this range are in the liquid phase, they are excluded from average liquid temperature calculations in order to avoid effects from the interface between the liquid phase and the gas phase.	

8.3.6 Advanced temperature: VH50-VH59

Code	Display	Details	
VH53	Element Point (Element point)	Item type	Selection
		Default	0
		Selection	0-15 (Element No.1 = 0, Element No. 16 = 15)
		Selects the number of elements for "Advanced" average temperature calculations in VH26. The positions of the selected elements are displayed in VH54 "Element Position," and additional volume factors can be modified in VH55 "Element Volume."	
VH54	Element Position (Element position)	Item type	Read only
		Range	0 to 99 999 mm
		Displays the position of the element that was selected in VH53.	
VH55	Element Volume (Element volume)	Item type	Read only
		Range	1 to 99 999.9
		Sets the additional volume factor for the element that was selected in VH53. Additional volume can be added to individual elements for advanced average temperature calculations (for details, see "VH26: Selec. Ave Method").	

8.3.7 Operation power adjustment: VH60 to VH69

Code	Display	Details	
VH67	Common Voltage (Common voltage)	Item type	Read only
		Range	0 to 255 (0 to 3 V)
		Displays the operating voltage of the temperature measurement line (signal and common). Voltage across the common line (between 0 and 3 V) is converted into a range from 0 to 255.	
VH68	Output Current (Output current)	Item type	Read only
		Range	0 to 65 535
		Set as the output current according to specifications. **⚠ CAUTION** **Changing the parameters:** The default value is adjusted at the time of shipping, and is determined based on the device's specifications. ► Do not change the parameters as it will cause the device to malfunction.	
VH69	Ref Voltage (Reference voltage)	Item type	Read / Write
		Default	200
		Range	0 to 255
		Triggers a power supply failure alarm. In normal operating conditions, this is activated via a HART communication loop at a supply voltage of 15 V_{DC} or higher. If the consumed voltage decreases to 15 V_{DC} or lower, an error message is sent.	

8.3.8 Temperature adjustment: VH70-VH79

Code	Display	Details	
VH70	Element Select (Element number assignment)	Item type	Selection
		Range	0 to 19
		The element number for performing temperature adjustments is selected (Element 0-15 = Element 1-16, 19 = Reference 100 Ω resistance).	
VH71	Zero Adjust (Zero adjustment of temperature measurement element)	Item type	Read / Write
		Default	0
		Range	−1000.0 to 1000.0
		Performs zero adjustment for individual elements that were selected in VH70. Unlike a standard temperature device, the reading value can be adjusted when the measured temperature shows minor correction values. If element No.2 displays 25.4 °C (77.72 °F) and a standard temperature device displays 25.2 °C (77.36 °F), the matrix is set to -0.2.Once set, the correction value of element No.2 based on the actual measured value will be −0.2 °C (31.6 °F).	
VH72	Adjust Span (Adjustment of temperature measurement element span)	Item type	Read / Write
		Default	1
		Range	0.8 to 1.2
		Span adjustment is applied to all installed temperature measurement elements. This correction value is multiplied by the actual measured values.	
VH73	Temperature X (Temperature X)	Item type	Read only
		Temperature of the elements that were selected in VH70. Also displays each temperature measurement element that was displayed in VH10-VH25. The value is calculated based on the following formula: VH73: Temperature X = Unadjusted temperature x span (VH72) + Zero offset (VH71)	
VH74	Position X (Element position)	Item type	Read / Write
		Range	0 to 99999 mm
		Position of the elements that were selected in VH70. If "Unequal" was selected in VH85, the position of each element can be set here.	
VH75	Resistance X (Element resistance)	Item type	Read only
		Shows the measured resistance for elements that were selected in VH70.	
VH76	Resistance Adj. (Element resistance adjustment)	Item type	Read / Write
		Default	0
		Range	−1000.0 to 1000.0
		Adjusts the resistance of elements selected in VH70. Minor resistance adjustments can be applied on the reading value. Under identical environmental conditions, if the selected element No.5 displays 100.3 Ω and a standard high-precision resistor displays 100 Ω, -0.3 is set in this matrix. Once set, the correction value of element No.5 based on the actual measured value will be −0.3 Ω. Be careful when configuring this setting in VH76, as it will apply to all elements.	
VH77	Element Type (Element type)	Item type	Selection
		Selection	Pt100, Cu90, Cu100, PtCu100, JPt100

Code	Display	Details	
		The element conversion formula is selected for when another brand's average temperature probe is connected to the NMT532. **CAUTION** **Changing the parameters:** NMT532 is comprised of spot, element array and PT100 element types. ► Changing the parameters may cause erroneous calculations or unnecessary error displays.	
	Element conversion formula	Pt100 (formula above 0 °C): R = -0.580195 x 10-4 x T2 + 0.390802 x T +100	
		Pt100 (formula below 0 °C): R = -4.2735 x 10-10 x T4 + 4.273 x 10- 8 x T^3 - 0.58019 x 10- 4 x T^2 + 3.90802 x T + 100	
		Cu90: R = 0.3809 x T + 90.4778	
		Cu100: R = 0.38826 x T + 90.2935	
		PtCu100: R = 3.3367 x 10-7 x T3 - 2.25225 x 10-5 x T2 +0.38416 x T + 100.17	
		R: Resistance, T: Temperature	
VH78	Average Number (Sampling number)	Item type	Read / Write
		Default	1
		Range	1 to 10
		The number of resistance samplings from all temperature measurement elements can be changed, including that of the reference resistance installed on the circuit of the main unit. Increasing the sampling number will allow for a more accurate measurement, but it will slow down the device's overall scan time. Element selection frequency: Approx. 2 seconds/element, sampling maximum element number 21 (Number of elements: 16, Internal reference resistance: 5)	
VH79	Protect Code (Access code)	Item type	Read / Write
		Default	0
		Range	0 to 999
		Access code 530 enables selection and writing.	

8.3.9 Device setting 1: VH80-VH89

Code	Display	Details		
VH80	Present Error (Error information)	Item type	Read only	
		Screen where error information is displayed. The following error codes will be displayed. For details, refer to "Troubleshooting" .		
		Error code	0	No error presence
			1	Common line open
			3	#1 element open
			4	#1 element short
			5	#2 element open
			6	#2 element short
			7	#3 element open
			8	#3 element short
			9	#4 element open
			10	#4 element short

Code	Display	Details		
			11	#5 element open
			12	#5 element short
			13	#6 element open
			14	#6 element short
			23	#0 element over range
			24	Memory defect (ROM)
			29	Element exposed (liquid level below #1 element position)
			41	Memory defect (RAM)
			42	Memory defect (EEROM)

Code	Display	Details	
VH81	Temperature Unit (Temperature unit)	Item type	Selection
		Default	℃
		Selection	℃, ℉, K
		Screen used to select the temperature display unit. Based on the HART configuration, ℃ (HART code: 32), ℉ (HART code: 33), and K (HART code: 35) are available. Leave this parameter in ℃ if you are changing the default ℃ in the host gauge (NMS8x, NMR8x, NRF81, NMS5, NMS7, NRF590, TMD1) to another unit.	
VH82	Element Number (Number of temperature measurement elements)	Item type	Read / Write
		Default	2
		Range	1 to 16
		The number of available temperature measurement elements is entered. This function is mainly used with the NMT532. Do not change the default parameter on the NMT532. The number of elements is predetermined by the customer. Changing the default parameter may cause erroneous calculations or unnecessary error displays. **CAUTION** **Changing the parameters:** Do not change the default parameter on the NMT532. The number of elements is predetermined by the customer. ▶ Changing the default parameter may cause erroneous calculations or unnecessary error displays.	
VH83	No. of Preambles (Number of preambles)	Item type	Read / Write
		Default	5
		Range	2 to 20
		Sets the number of preambles for HART communication. **CAUTION** **Changing the value:** Do not change the default value. ▶ This may cause erroneous calculations or unnecessary error displays.	
VH84	Distance Unit (Distance unit)	Item type	Selection
		Default	mm
		Selection	ft., m, inch, mm

Code	Display	Details	
		▪ Selects the level display unit. This applies to the display of VH02 "Liquid level" and VH50 "WB". Based on the configuration of HART, the available level units are: ft. (HART code: 44), m (HART code: 45), inch (HART code: 47) and mm (HART code: 49). ▪ Leave this parameter in mm if you are changing the default mm in the host gauge (NMS8x, NMR8x, NRF81, NMS5, NMS7, NRF590, TMD1) to another unit.	
VH85	Kind of Interval (Element interval configuration)	Item type	Selection
		Default	Equal interval
		Selection	Equal interval, unequal interval
		Screen that selects the element interval.	
		CAUTION **Changing the parameters:** Do not change the default parameter on the NMT532. The number of elements and the position of each element is predetermined by the customer. ► Changing the default parameter may cause erroneous calculations or unnecessary error displays. Do not change the parameters on the NMT532.	
VH86	Bottom Point (Position of the bottom-point element)	Item type	Read / Write
		Default	500 mm (19.69 in)
		Selection	0 to 99 999 mm
		The position of the bottom-point element from the tank bottom (element No.1) is entered. If "Equal interval" has been selected in VH85, the position of element No.1 is extremely important, as the rest of the elements' positions will be determined by the position of the bottom-point element.	
VH87	Element Interval (Element interval)	Item type	Read / Write
		Default	1 000 mm (39.37 in)
		Range	0 to 99 999 mm
		Changing the element interval and setting the element position are only applied to reconfigure switching points for average temperature calculations. The physical positions of elements will not change. The default setting is 1 000 mm (39.37 in)	
VH88	Short Error (Output data from element short circuit)	Item type	Read / Write
		Default	−49.5
		Range	−49.5 to 359.5
		This data is output when the selected element short-circuits. The display format can be configured in VH92 "Error Display Select."	
VH89	Open Error (Output data when element is open)	Item type	Read / Write
		Default	359.0
		Range	−49.5 to 359.5
		This data is output when the selected element is open. The display format can be configured in VH92 "Error Display Select."	

8.3.10 Device setting 2: VH90-VH99

Code	Display	Details	
VH90	Device ID Number (Device ID number)	Item type	Read / Write
		Default	0

Code	Display	Details	
		Range	0 to 16 777 214
		Screen used for distinguishing the device ID when the NMT532 connects to a HART communication loop. **NOTICE** **Device ID and HART address:** When a device ID is changed, a communication error may occur due to inappropriate device ID and HART address combination. ▶ Ensure that the device ID and HART address are correct.	
VH91	Previous Error (Previous error)	Item type	Read only
		Displays the error history. The error messages are the same as those in VH80.	
VH92	Error Dis. Sel. (Error display selection)	Item type	Selection
		Default	0
		Selection	0: OFF 1: ON
		Selects the display of VH88 "Short Error Value" and VH89 "Open Error Value."	
		OFF: VH88 and VH89 error messages are not sent to the host gauge. This function automatically excludes defective elements in average temperature calculations. ON: Error messages are sent to the host gauge. As a result, the error codes of VH88 and VH89 will appear on the host gauge's default screen, and sent to the upper receiver as well.	
VH93	Custody Mode (Custody mode)	Item type	Read only
		Default	Configured at the factory according to specifications.
		The overwrite protection of hardware is located on the main CPU board (CN3 connector).	
VH94	Polling Address (Polling address)	Item type	Read / Write
		Default	2
		Range	1 to 15
		Polling address used in local HART communication.	
VH95	Manufacture ID (Manufacturer ID)	Item type	Read only
		Default	17 (Endress+Hauser)
		Screen showing the manufacturer ID.	
VH96	Software Version (Software version)	Item type	Read only
		Screen showing the installed software version.	
VH98	Below Bottom	Item type	Selection
		Default	0
		Selection	0: OFF 1: ON
		Displays an error when the liquid level drops below the bottom-point element. If "ON" is selected, error code 29 will be displayed in VH80 and VH91.	
VH99	Device Type Code (Device code)	Item type	Read only
		Screen displaying the device type. 190: Temperature measurement function	

8.4 WB (water bottom) level input from host

This function is available in V1.53 and later versions. If the specification does not have a WB probe, VH50 WB can be entered manually from the HART Master.

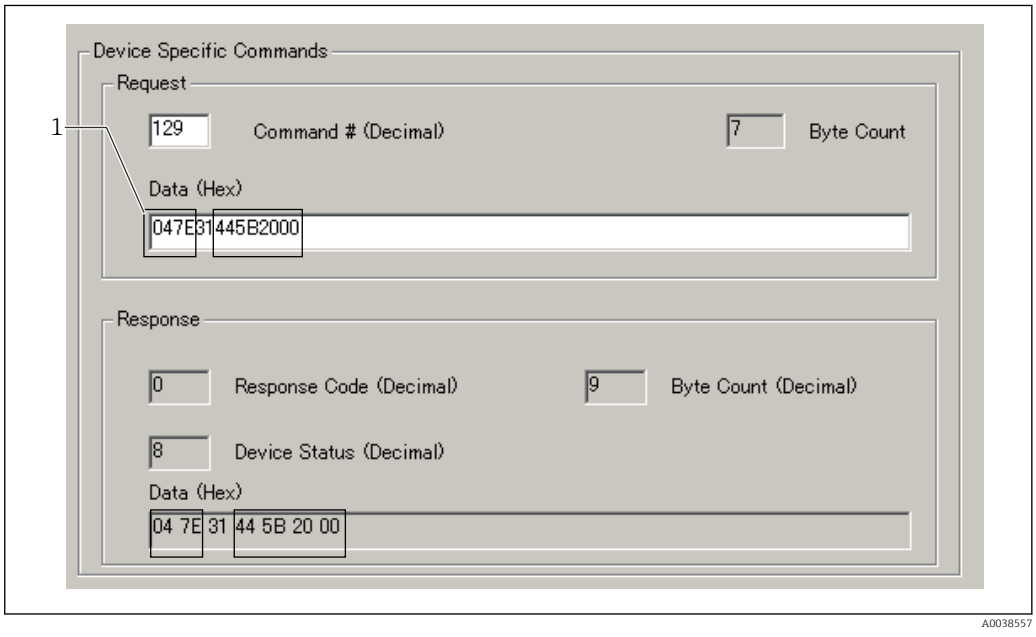
This function is available for specifications that do not have a WB probe. It will not be applied to multi-element calculations. If the WB probe error is resolved, the previous value will be used. It is 0 mm when the power is turned off or on.

Process for entering 876.5 mm (34.51 in) (example) as a WB value:

1. Enter 129 in Device Specific Commands.
2. Enter 047 (0x047E/VH50) in Data (Hex).
   ↳ 047E indicates variable address 1150.
3. Enter float value 445B2000.
   ↳ It will show the WB value 876.5 mm (34.51 in).

This completes the input process.

31 indicates millimeter (mm).



38 Screen 1

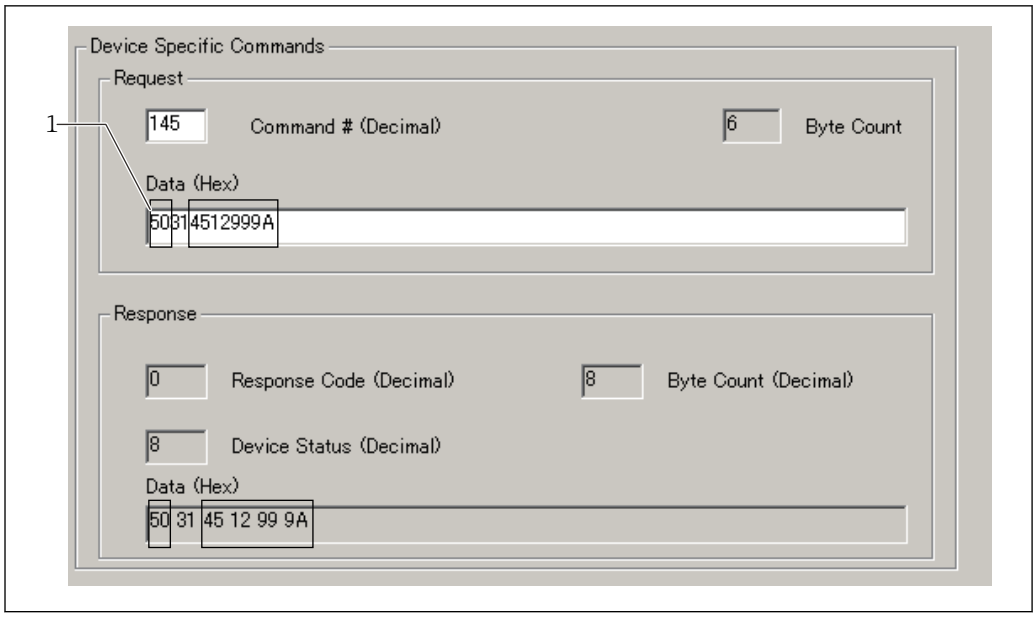
1 Variable address

Process for entering 2 345.6 mm (92.35 in) (example) as a WB value:

1. Enter 145 in Device Specific Commands.
2. Enter 50 (VH50) in Data (Hex).
   ↳ VH50 will be the matrix for NMT532, NMT532 and NCT530.
3. Enter the float value 4512999A.
   ↳ It will show WB value 2 345.6 mm (92.35 in).

This completes the input process.

31 indicates millimeter (mm).



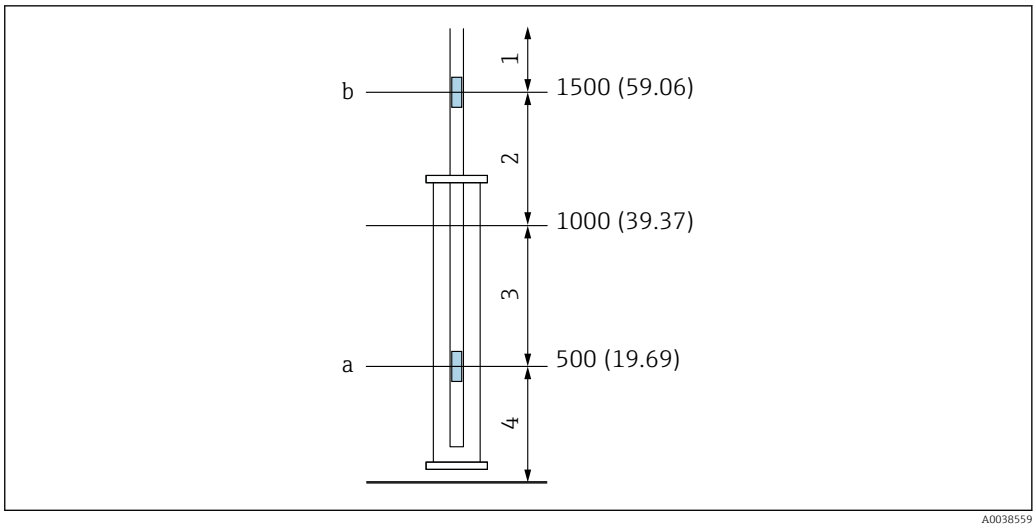
39 Screen 2

1 VH number

8.5 Temperature element near the tank bottom

This function is available in V1.53 and later versions. Temperature elements that are less than 1 m (3.28 ft) from the tank bottom are handled as shown in the following table in average liquid temperature calculations. Refer to the following figures for Case 1 and Case 2 in the following table.

Case		Application to average temperature calculation for temperature element
1	Elements that are at 1 m (3.28 ft) or higher	Not applicable
2	The level is 1 m (3.28 ft) or higher but elements are below 1 m (3.28 ft)	Applicable
3	The level is below 1 m (3.28 ft), and the elements below that are below the level	Applicable
4	The temperature element is not in the liquid	Not applicable



40 *Example of temperature elements near the tank bottom*

a Temperature element 1
b Temperature element 2
1 Case 1
2 Case 2
3 Case 3
4 Case 4

- Case 1: If the liquid level is within this range, temperature element a will not be used in average liquid temperature calculations.
- Cases 2 and 3: If the liquid level is within this range, temperature element a will be used in average liquid temperature calculations.
- Case 4: If the liquid level is within this range, none of the temperature elements will be used in average liquid temperature calculations.

8.5.1 Temperature adjustment: VH92

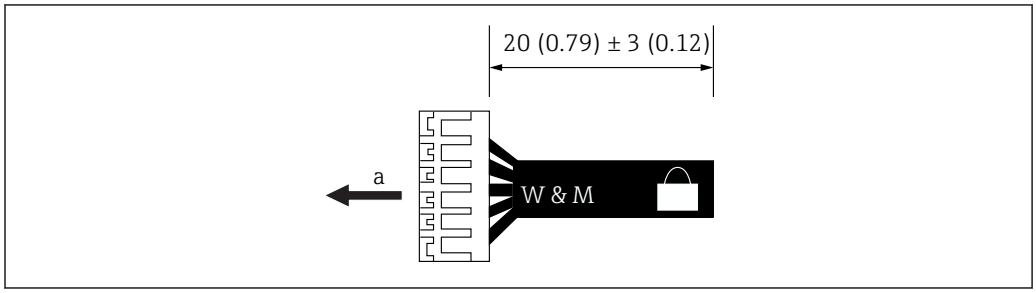
The following table shows the settings.

VH92 setting	Presence of liquid in tank	Temp. element open (disrupted)	Temp. element short (short circuit)	Average liquid temperature error output
ON	No	No	No	358 °C (676.4 °F)
	No	Yes	No	358 °C (676.4 °F)
	No	No	Yes	358 °C (676.4 °F)
	Yes	No	No	Average liquid temperature
	Yes	Yes	No	Open error set value (default 359 °C (678.2 °F))
	Yes	No	Yes	Short circuit error set value (default −49.5 °C (−57.1 °F))
OFF (Default)	No	No/Yes	No/Yes	Average gas temperature (The malfunctioning temperature element is skipped)
	Yes	No/Yes	No/Yes	Average liquid temperature (The malfunctioning temperature element is skipped)

8.6 Write-protection switch (write-protection plug)

When the write-protection switch in software version 1.53 or later is used, all parameters become write protected. In PTB specifications, this comes with the product.

Do not disconnect and reconnect while the power is on.



41 Write-protection switch

a To NMT532 CPU CN3

8.7 Module configuration

After replacing the electric housing module, parameters must be re-entered manually into the electric housing module to maintain proper operation. Check the following matrix parameters after replacing the electric housing module.

NMS5/NMS7 GVH	FieldCare / Details
443	Level select
450-459	Element position No. 1-9
470	Select point (elements 0-15)
474	Position X (element position that was set in GVH=470)
482	Element number
485	Kind of interval
486	Bottom point
487	Element interval (when selecting equal interval at GVH=485)

9 Diagnostics and troubleshooting

9.1 System error messages

Code	Text	Description	Remedy
0	No Error presence	There is no error.	No action is required.
1	Common line open	The common line is open.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #1 temperature element (brown).
3	#1 element open	The cable for a temperature element (#1) is open.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #1 temperature element (brown).
4	#1 element short	The cable for a temperature element (#1) is short-circuited.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #1 temperature element (brown).
5	#2 element open	The cable for a temperature element (#2) is open.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #2 temperature element (red).
6	#2 element short	The cable for a temperature element (#2) is short-circuited.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #2 temperature element (red).
7	#3 element open	The cable for a temperature element (#3) is open.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #3 temperature element (orange).
8	#3 element short	The cable for a temperature element (#3) is short-circuited.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #3 temperature element (orange).
9	#4 element open	The cable for a temperature element (#4) is open.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #4 temperature element (yellow).
10	#4 element short	The cable for a temperature element (#4) is short-circuited.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #4 temperature element (yellow).
11	#5 element open	The cable for a temperature element (#5) is open.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #5 temperature element (green).
12	#5 element short	The cable for a temperature element (#5) is short-circuited.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #5 temperature element (green).
13	#6 element open	The cable for a temperature element (#6) is open.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #6 temperature element (blue).
14	#6 element short	The cable for a temperature element (#6) is short-circuited.	Check the module's connections, and check the impedance between the common cable (white/black or white/purple) and the cable for the #6 temperature element (blue).
23	#0 element over range	Reference temperature element #0 in the module is damaged.	Replace the module.
24	Memory defect (ROM)	Program memory is defective.	Replace the module.
29	Element exposed	The level is below temperature element #1.	Liquid temperature cannot be measured. The error will disappear when the level rises above temperature element #1.
32	Low power supply	The power supply from the host device through the Multidrop HART loop is below Prothermo's specifications.	Check the power supply from the host device and the connected HART device's power consumption.

Code	Text	Description	Remedy
41	Memory defect (RAM)	Data memory is defective.	Replace the module.
42	Memory defect (EEROM)	Non-volatile data memory is defective.	Replace the module.

Error codes appear on the screen when FieldCare is properly connected. For methods and descriptions of error display on a host device, see documents for NRF590, MS5, NMS7 or NMS8x.

10 Maintenance

10.1 Maintenance work

No special maintenance work is required.

10.1.1 Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing or the seals.

10.2 Endress+Hauser services

Endress+Hauser offers a wide variety of services for maintenance such as recalibration, maintenance service or device tests.

Your Endress+Hauser Sales Center can provide detailed information on the services.

11 Repair

11.1 General information on repairs

11.1.1 Repair concept

The Endress+Hauser repair concept assumes that the devices have a modular design and that repairs can be done by the Endress+Hauser Service Department or specially trained customers.

Spare parts are included in appropriate kits. They contain the related replacement instructions.

For more information on service and spare parts, contact the Endress+Hauser Service Department.

11.1.2 Repairs to Ex-approved devices

When carrying out repairs to Ex-approved devices, note the following:

- Repairs to Ex-approved devices may only be carried out by trained personnel or by the Endress+Hauser Service Department.
- Comply with the prevailing standards, national Ex-area regulations, safety instructions (XA) and certificates.
- Only use original spare parts from Endress+Hauser.
- When ordering a spare part, note the device designation on the nameplate. Only replace parts with identical parts.
- Carry out repairs according to the instructions. On completion of repairs, perform the specified routine test on the device.
- Only the Endress+Hauser Service Department may convert a certified device into a different certified variant.
- Document all repair work and conversions.

11.2 Spare parts

Some interchangeable device components are listed on an overview label on the connection compartment cover.

The spare part overview label contains the following information:
- A list of the most important spare parts for the device, including their ordering information
- The URL for the *W@M Device Viewer* (www.endress.com/deviceviewer):
  All the spare parts for the device, along with the order code, are listed here so that they can be ordered. If available, users can also download the associated Installation Instructions.

11.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

Your Endress+Hauser Sales Center can provide detailed information on the services.

11.4 Return

The device must be returned if it is in need of repair or a factory calibration, or if the wrong device has been delivered or ordered. According to legal regulations, Endress+Hauser, as an ISO-certified company, is required to follow certain procedures when handling returned products that have come into contact with measured materials.

To ensure safe, swift and professional device returns, refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at http://www.endress.com/support/return-material.

11.5 Disposal

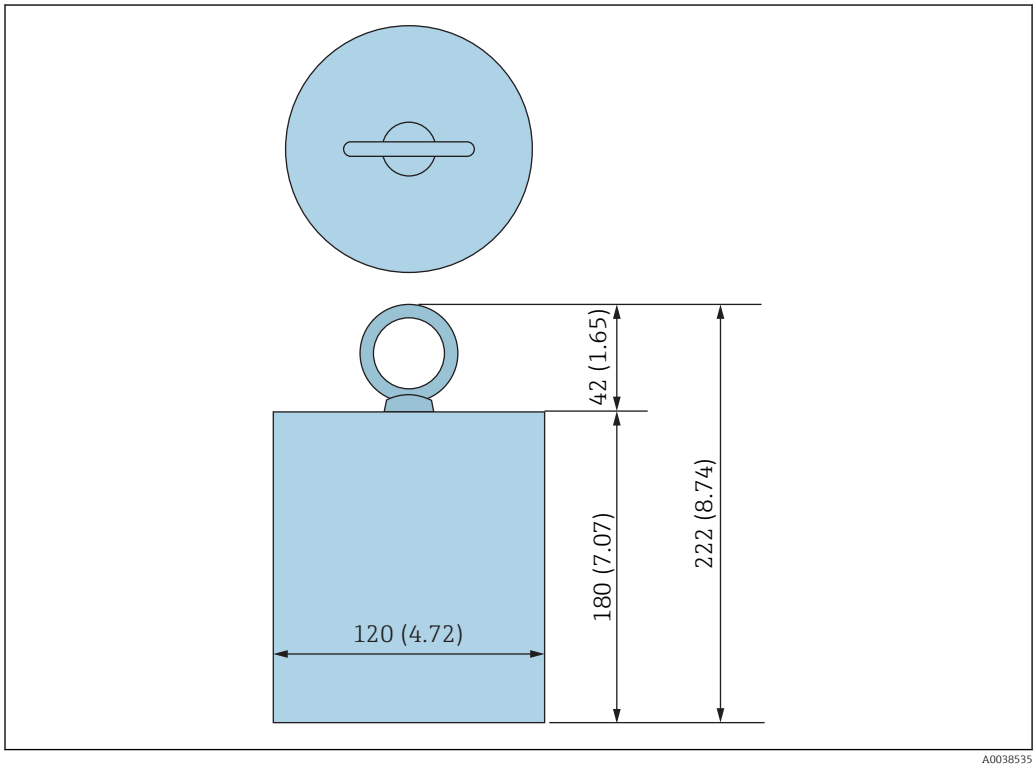
Observe the following notes during disposal:
- Observe valid federal/national regulations.
- Ensure proper separation and reuse of the device components.

12 Accessories

12.1 Device-specific accessories

12.1.1 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").



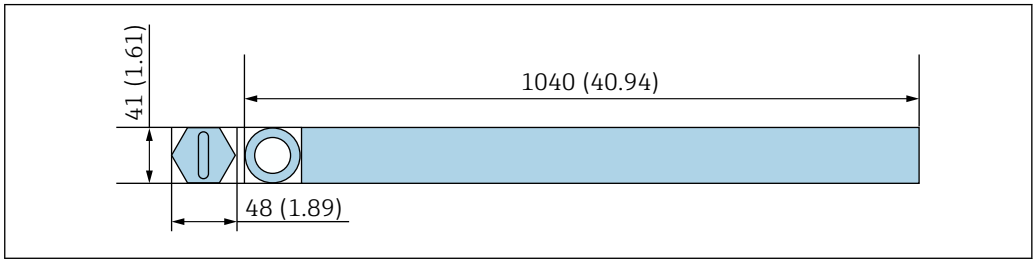
42 *Installation attachment / Option B . Unit of measurement mm (in)*

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)

12.1.2 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.

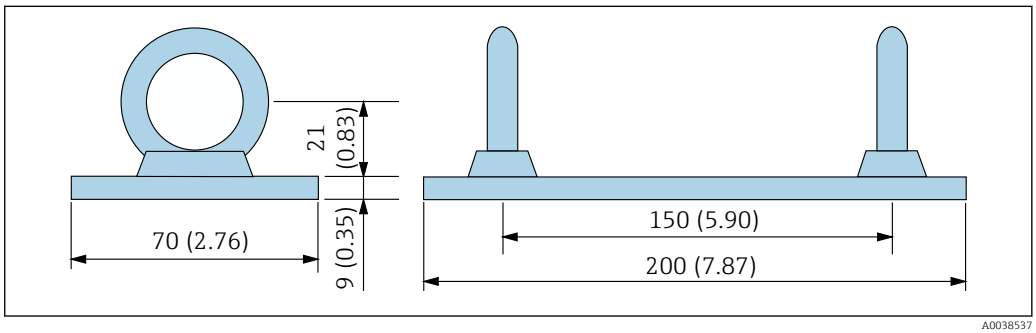


43 *Installation attachment / option C/G. Unit of measurement mm (in)*

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

12.1.3 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)).

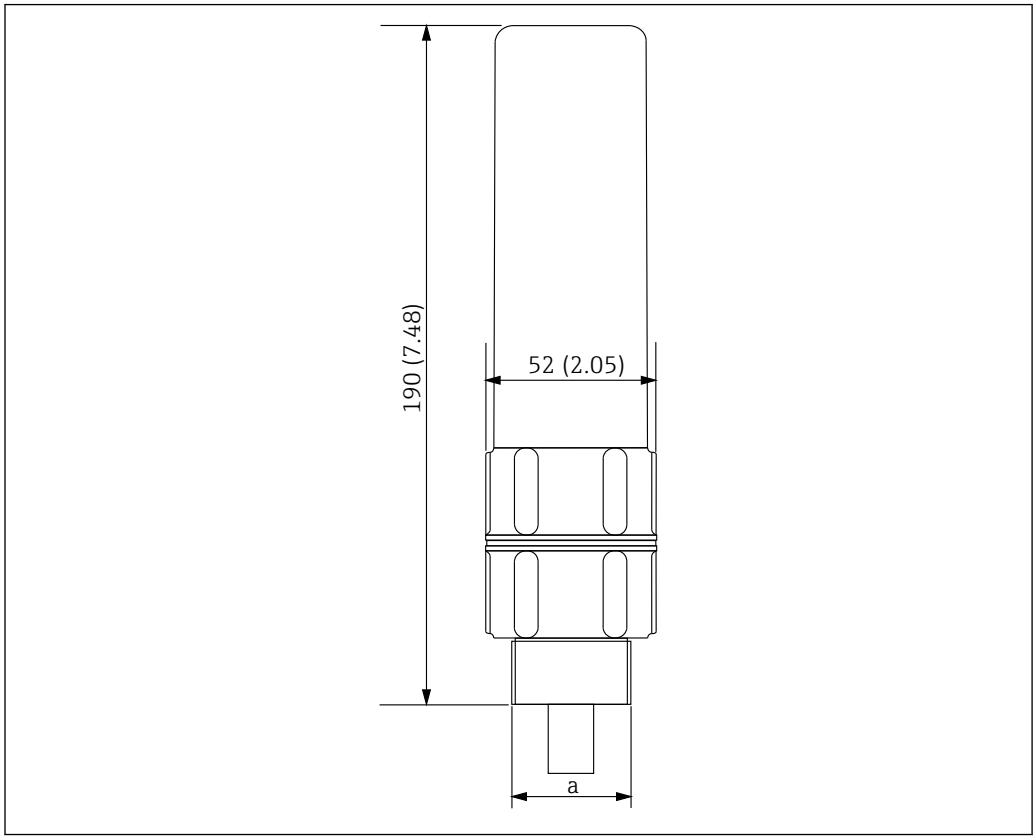


44 *Wire hook / option D/F. Unit of measurement mm (in)*

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

12.1.4 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.



45 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)

Index

Symbols

C

D

E

P

R

W

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