

Technical Information

Prothermo NMT532

Intrinsically Safe Multi-signal Converter with Precision Average Temperature Sensor for Inventory Control



Application

Prothermo NMT532 consists of an intelligent local HART signal converter and average temperature sensor.

For average temperature measurement, it consists of precision multi-spot Pt100 (Max.6) elements which have fixed interval (2m or 3m).

NMT532 is a highly capable solution for a variety of tank gauging applications and provides constant average temperature data via local HART communication.

For accurate inventory measurement, it is best suited connected to Tank Side Monitor NRF590 with Micropilot radar tank gauge or Proservo NMS5.

Features and Benefits

- High Accuracy
- Intrinsically Safe Device Allowing for Safest Electrical Configuration Possible.
- Compatible with FieldCare
- Simple and Economical
- Compact Size and Weight
- High-reliability and Easy Installation
- Maintenance Free





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Important Document Information

Notes on Safety Conventions and Symbols

Symbols for Safety Conventions

Symbol	Meaning
 <small>A0011189-EN</small>	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 <small>A0011190-EN</small>	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 <small>A0011191-EN</small>	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 <small>A0011192-EN</small>	NOTICE! This symbol contains information on procedures and other facts which do not result in personal injury.

Symbols for Certain Types of Information

Symbol	Meaning
 <small>A0011182</small>	Allowed Indicates procedures, processes or actions that are allowed.
 <small>A0011183</small>	Recommendation Indicates procedures, processes or actions that are recommended.
 <small>A0011184</small>	Forbidden Indicates procedures, processes or actions that are forbidden.
 <small>A0011193</small>	Tip Indicates additional information.

Function and System Design

Measuring System

NMT532 is compact and economical. The average temperature sensor consists of six Pt100 elements at an interval of 2 or 3 meters. Temperature data is transmitted to NRF560 or NMS5 via intrinsically safe (i.s.) 2-wire local HART signal.

Operation Principle

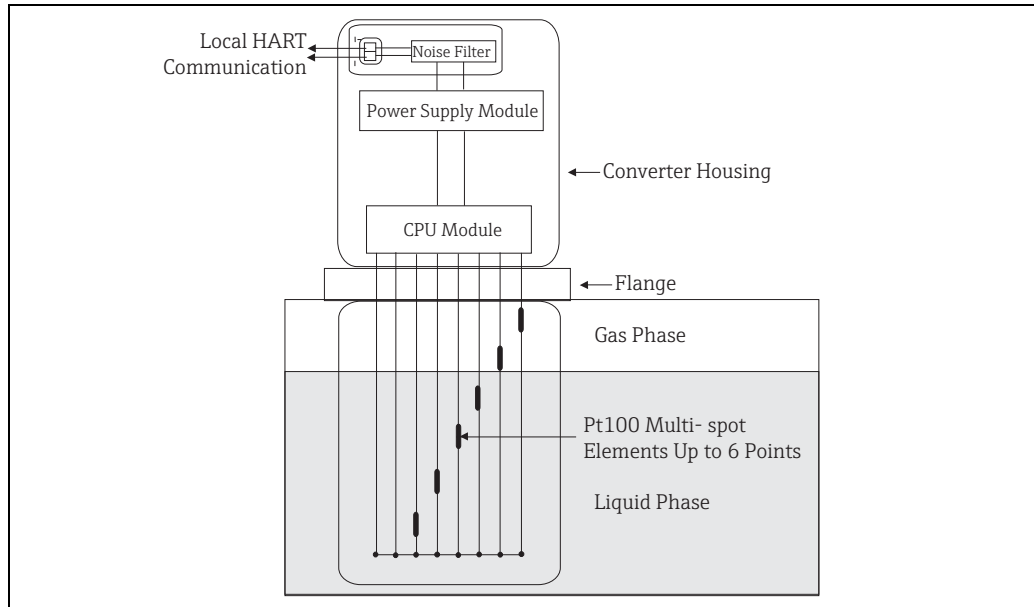


Figure 1: Function and System Design

System Design

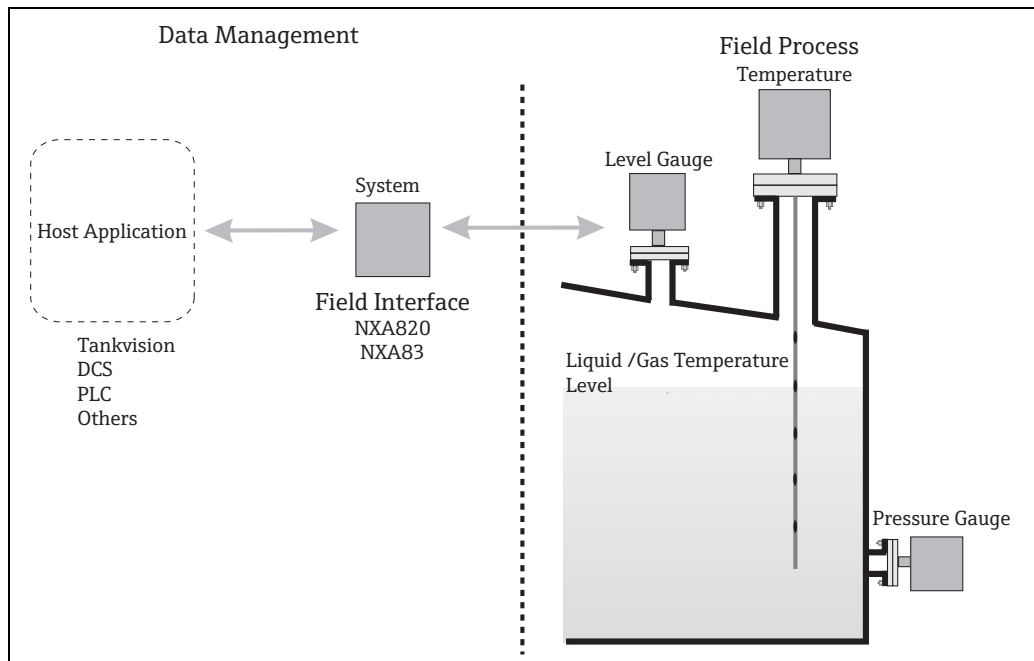


Figure 2: System Layout

Endress+Hauser offers a wide range of solutions to integrate field data into your process management requirement.

The following diagrams describe some individual solutions according to various Ex concepts. For additional application requirements, contact local Endress+Hauser representatives.

Connection with NRF590

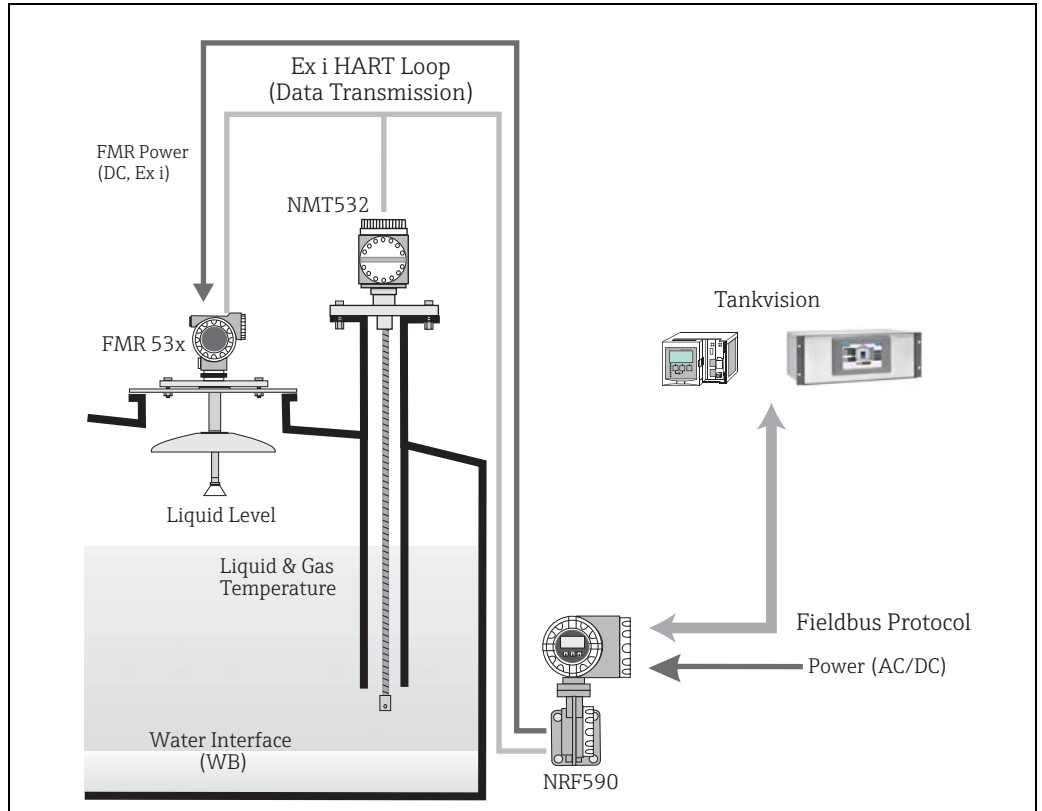


Figure 3: Connection with NRF590

NMT532 + FMR53x + NRF590

Temperature and level measurement with data collection and calculations via NRF590 allows for optimal inventory control. Basic functionality of NMT532 is displayed and configured on NRF590. Detailed NMT532 functionality and data access can be performed by FieldCare.

NMT532 receives radar level data from NRF590 and then calculates liquid and gas phase average temperature. Calculated and standard data including temperature element raw data and device status are transmitted to NRF590.

All gathered data in the interface unit is sent to inventory management software, such as Endress+Hauser tank vision, Tank computer or directly sent to the customer's specific DCS or PLC.

Connection with NMS5

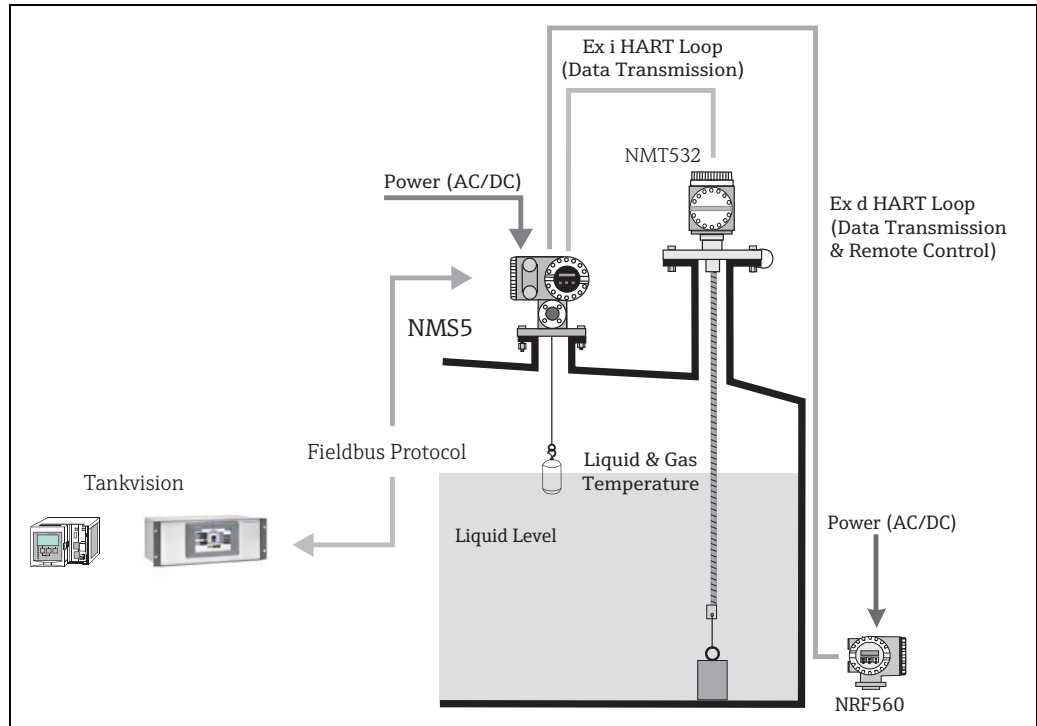


Figure 4: Connection with NMS5

NMT532 + NMS5+ NRF560

NMT532 is used most effectively with NMS5 to provide average temperature, level, water interface, and density measurement.

All the necessary configuration and parameter settings for NMT532 are performed via either NMS5 or FieldCare.

NMT532 receives liquid level data from NMS5, 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.

Since NMS5 is a multi-functional device (measurement and data transmission), a Promonitor NRF560 can act as a tank side remote data indicator and controller for NMS5.

All gathered data in the interface unit is sent to inventory management software, such as Endress+Hauser's Tankvision, Fuelsmanager, Tank computer or directly sent to the customer's specific DCS or PLC.

Input and Output

Measured Variables	Liquid and gas temperature range: -20 to +100 °C (-4 to +212 °F) Probe length: 18.5m (60.6 feet) or less
Number of Elements	Maximum of 6 (2 m or 3 m interval)
Communication	2 wire, Endress+Hauser local HART protocol to host commanding gauge <ul style="list-style-type: none">▪ NRF590▪ NMS5
Alarm Signal	Error information via the following interface and transmission digital protocol. Refer to Operating Instructions of each device. <ul style="list-style-type: none">▪ NMS5: BA00401G▪ NRF590: BA00256F, BA00257F
Output Signal	Temperature data via 2 wire intrinsically safe local HART protocol.
Connection	<ul style="list-style-type: none">▪ NMS5▪ NRF590

Auxiliary Energy

Load HART Minimum loading for local HART circuit: 250Ω

Overvoltage Protection NMT532 has internal surge arrester which complies with EN/IEC 61000-4-5 (Line to Line 1.0kV). Connect the metallic housing of the NMT532 to the tank wall or screen directly with an electrically conductive lead to ensure reliable potential matching.

Cable Entry Wiring of NMT 532 must meet intrinsically safe requirements. The following cable entries are available:

- Thread NPT 1/2
- Thread M 20

Supply Voltage 16 to 30V: Ex ia
Only for connection to a certified intrinsically safe circuit with the following maximum values

$U_i = 30 \text{ V}$ $I_i = 120 \text{ mA}$ $P_i = 1 \text{ W}$	Internal capacitance $C_i = 7.9 \text{ nF}$ Internal inductance $L_i = 48 \text{ } \mu\text{H}$
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Power Consumption 6mA


Grounding NMT532 must be grounded to the tank potential before connection to host gauge. All ground connections must be compliant with local and company regulations, and checked before the equipment is commissioned.

Performance Characteristics

Temperature Accuracy	± 0.1°C or better (at reference condition) *Reference Accuracy of RTD - Temperature Conversion
Temperature Measuring Range	-20 to +100°C (-4 to +212°F)
Reference Operating Conditions	<ul style="list-style-type: none"> ▪ Temperature = +25°C(77°F) ±5 (9°F) ▪ Pressure = 1013mbar abs. ±20mbar abs. (1013hPa abs. ±20hPa abs.,14.7 psi abs. ±0.3 psi abs.) ▪ Relative humidity (air) = 65% ±20%
Maximum Measured Error	<p>Typical statements for reference conditions, include linearity, repeatability, and hysteresis:</p> <ul style="list-style-type: none"> ▪ Linearity: <ul style="list-style-type: none"> - Temperature: ±0.15°C (0.27°F) + element deviation (based on IEC 60751/DIN EN 60751class A standard)
New Module	NMT 532 employs a completely new electronic module compared to the previous NMT 535.

	NMT 532	NMT 535
CPU Performance	16 bit	8 bit
Clock Speed	2.7648 MHz	0.9216 MHz
Memory Capacity (RAM)	20K bytes	176 bytes
EEPROM	2K bytes	256 bytes
Flash Memory	256K bytes	16K bytes
Total # of Print Boards	4 (5 with Capacitance board)	5
Current Consumption (Converter + Temp. Probe)	6mA@16VDCEx ia 8mA@16VDCEx d [ia]	10mA@16VDC

Operating Condition: Environment and Process

Ambient Temperature Range	-40 C° to +85C° (-40°F to +185°F)
Storage Temperature	-40 C° to +85C° (-40°F to +185°F)
Climate Class	DIN EN 60068-2-38 (test Z/AD)
Degree of Protection	<ul style="list-style-type: none"> ▪ Housing: IP65, NEMA 4X (Converter only, open housing: IP20) ▪ Probe: IP68
Electromagnetic Compatibility	<ul style="list-style-type: none"> ▪ Interference Emission: EN 61326, Electrical Equipment Class B ▪ Interference Immunity: EN 61326, Annex A (Industrial) <p>Interference Emission and immunity apply to each standard shown above when installing probes in metal and concrete tanks and when using coax probes.</p>
Process Temperature Range	Temperature probe: -20 to +100°C (-4 to 212°F)
Process Pressure Limits	<p>1bar (100kPa, 14.5psi)</p> <p> WARNING</p> <p>When the pressure inside the tank exceeds 1 bar (100KPa, 14.5psi), stilling well which does not have any holes or slits must be installed.</p>
Data Transmission	2.5mm coaxial cable & common ground

Operating Condition: Installation

Process Connection

The following flange sizes are available:

- NPS 2" Cl. 150 RF, 304 flange ASME B16.5
- DN50 PN10 B1, 304 flange EN1092-1 (DIN2527 C)

Recommended Installation Height

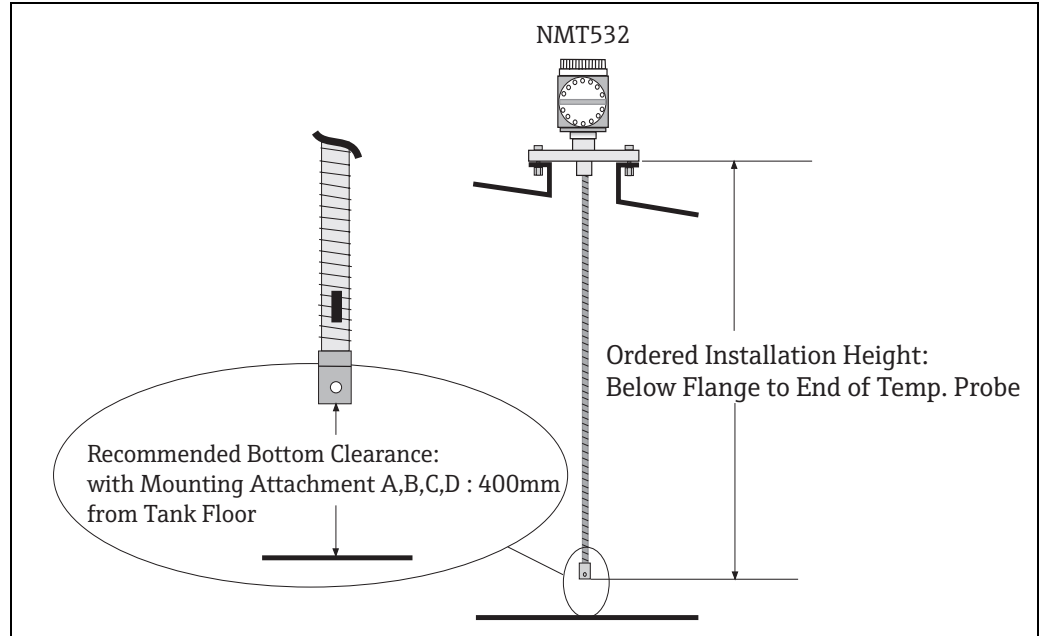


Figure 5: Recommended Installation


NOTICE

The required bottom clearance of both the temperature probe and WB sensor varies depending on the anchoring method. Consider the required bottom clearance when ordering NMT 532. See the recommended bottom clearance in the above illustration and/or consult Endress+Hauser representatives for further information.

The standard location of the lowest temperature element should be set at 500 mm (20") from the bottom of the tank regardless of probe type.

Recommended Stilling Well Installation

CAUTION

Datum plate should be mounted on the bottom of the tank below the slotted stilling well (see ) or located 300mm (12 inches) or more below the slotted stilling well (see ) .

If the anchor weight is not used when installing stilling well, the water should fill the tank up to the bottom from the end of the stilling well, enough to allow liquid to enter/exit the pipe.

WARNING

Avoid turbulence in the water so that WB (Water Bottom) sensor will not be damaged.

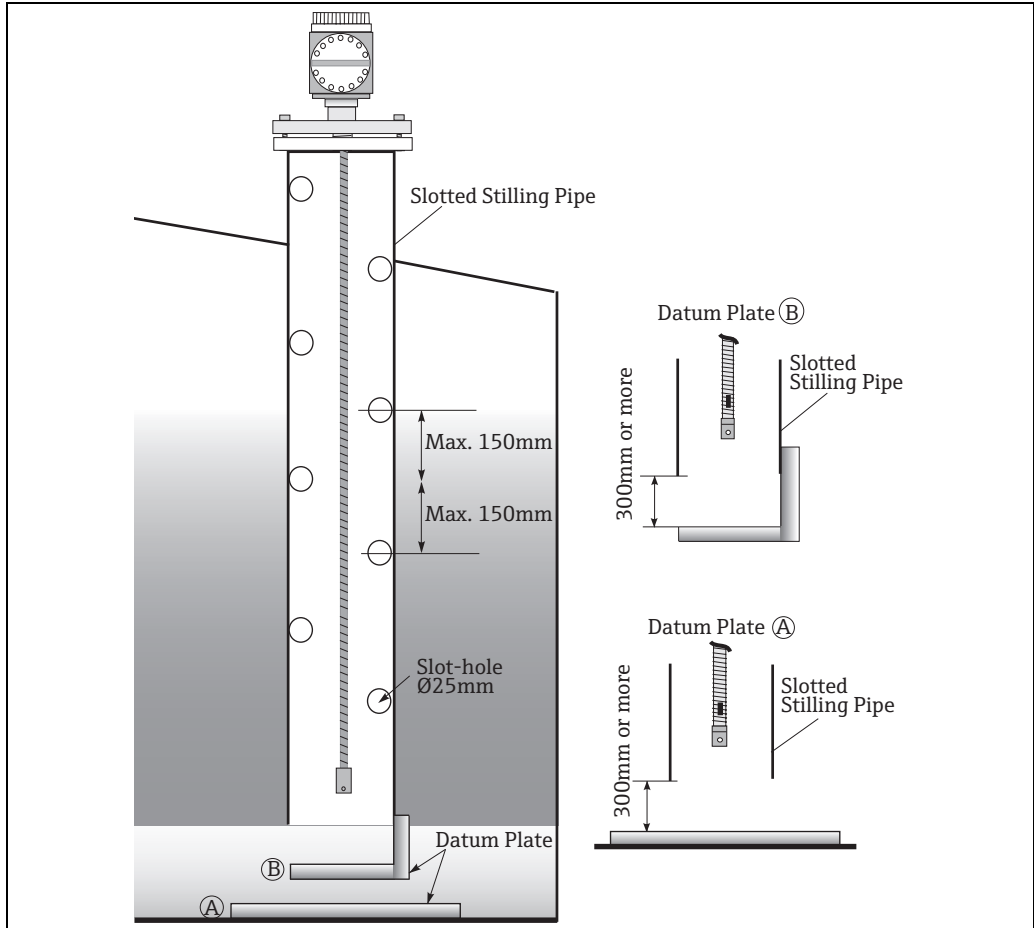


Figure 6: Stilling Well

Installation Equipment

Contents of Anchoring Hardware: Based on The Choice of "100: Mounting Attachment"

	A: No Installation Material	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
Converter + Temp. Probe	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

Anchor Weight

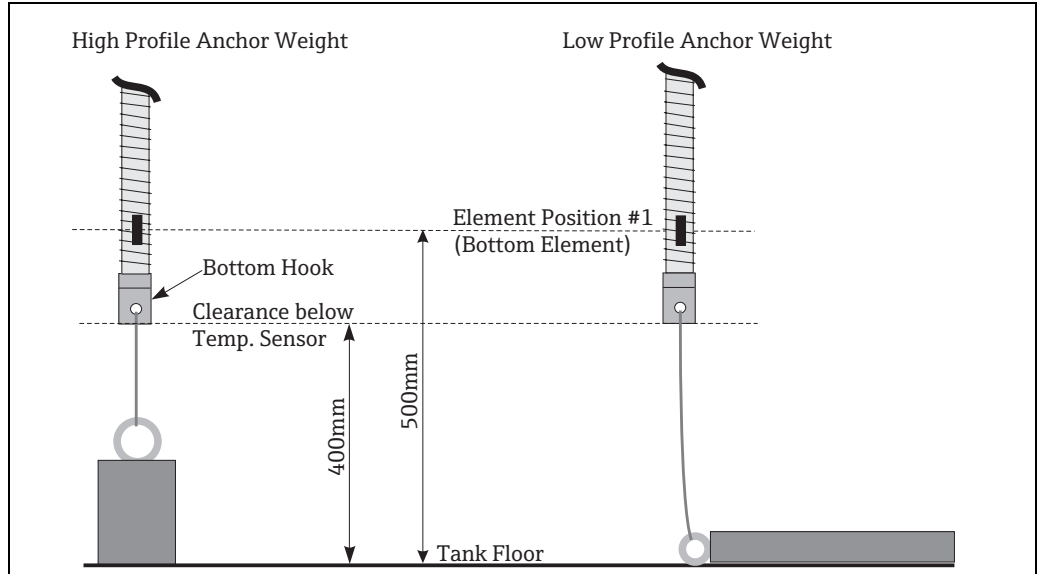


Figure 7: Anchor Weight
 "High profile anchor weight" is the anchor method designed for converter + temperature probe.
 "Low profile anchor weight" is the anchor method designed for small tank nozzle [max. 2 inches (50A)].
 Temperature probes with anchor weights methods have a recommended clearance 400mm (16").

Wire Hook+ Top Anchor & Stilling Well

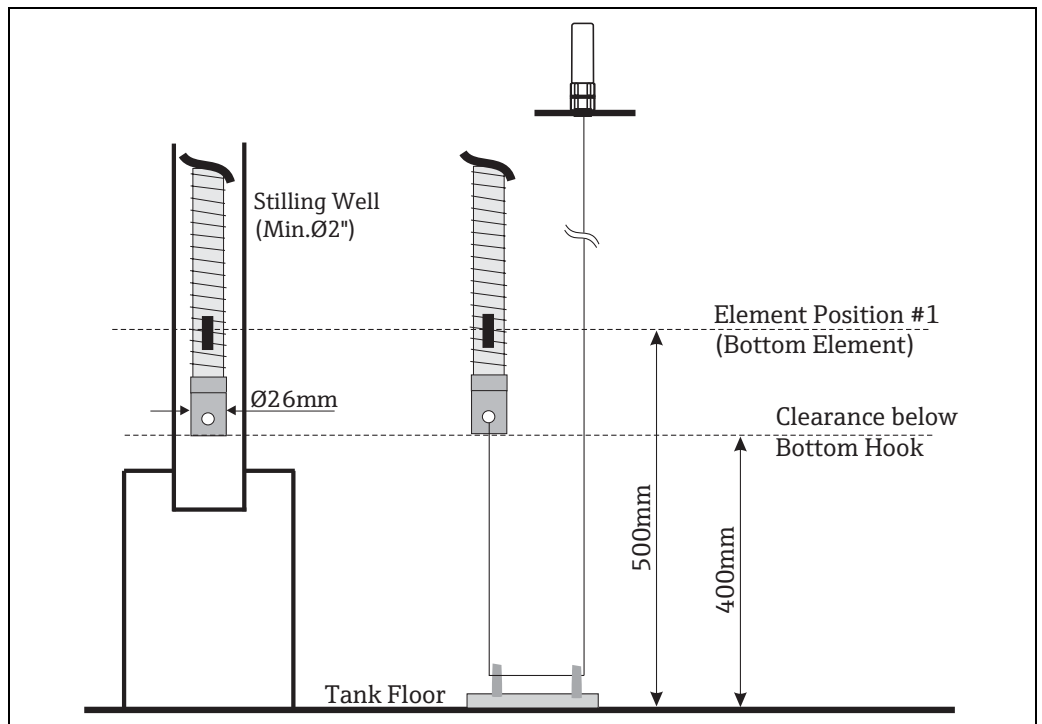


Figure 8: Wire Hook, Top Anchor, Stilling Well

Temperature probes with "wire hook + top anchor" and "stilling well" methods have a recommended clearance 400mm (16").

*Refer to "Accessories" for details of anchor weight, wire hook, and top anchor.

NMT532 #1 Element Position

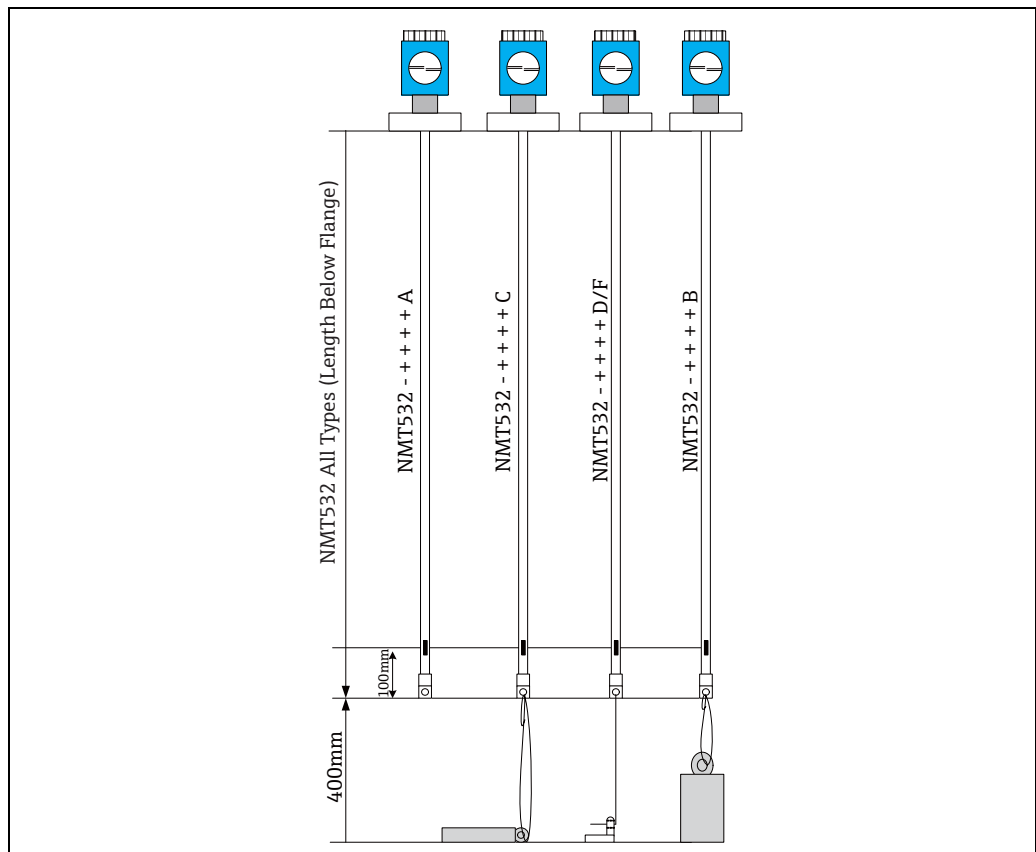


Figure 9: #1 Element Position
Mounting and Element Position of NMT532 Anchor Weight Method

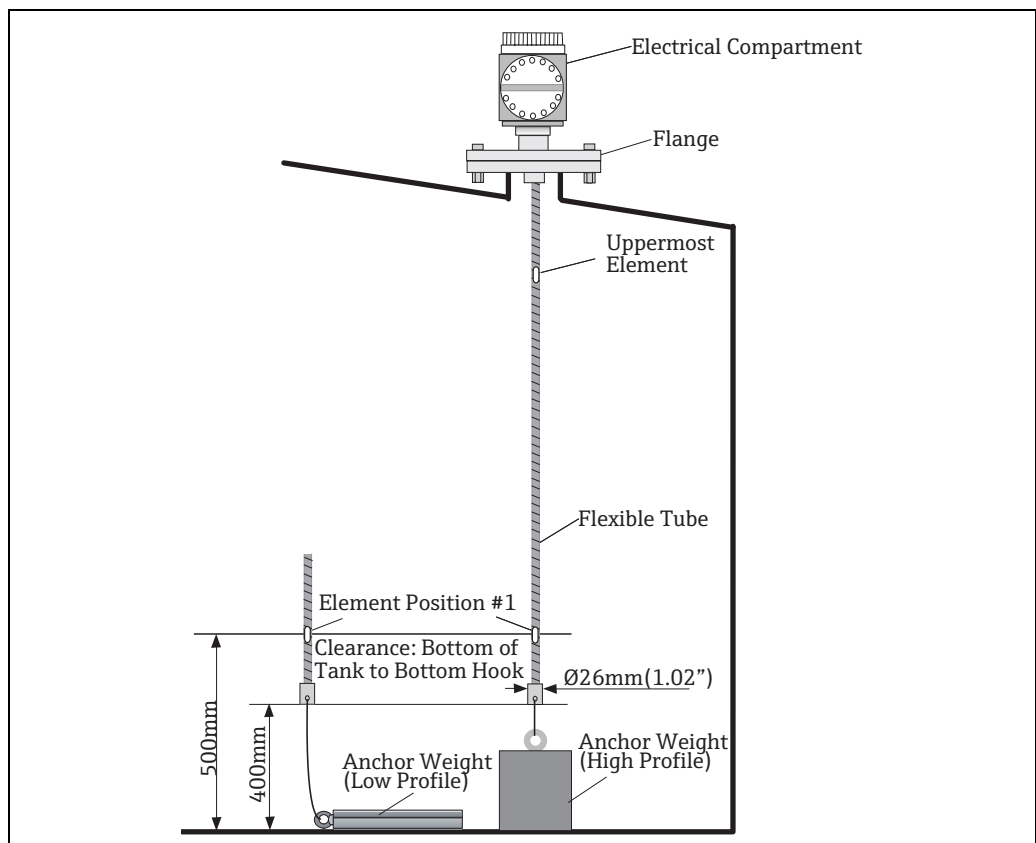


Figure 10: Anchor Weight Method

Mounting on Pressurized Tank

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

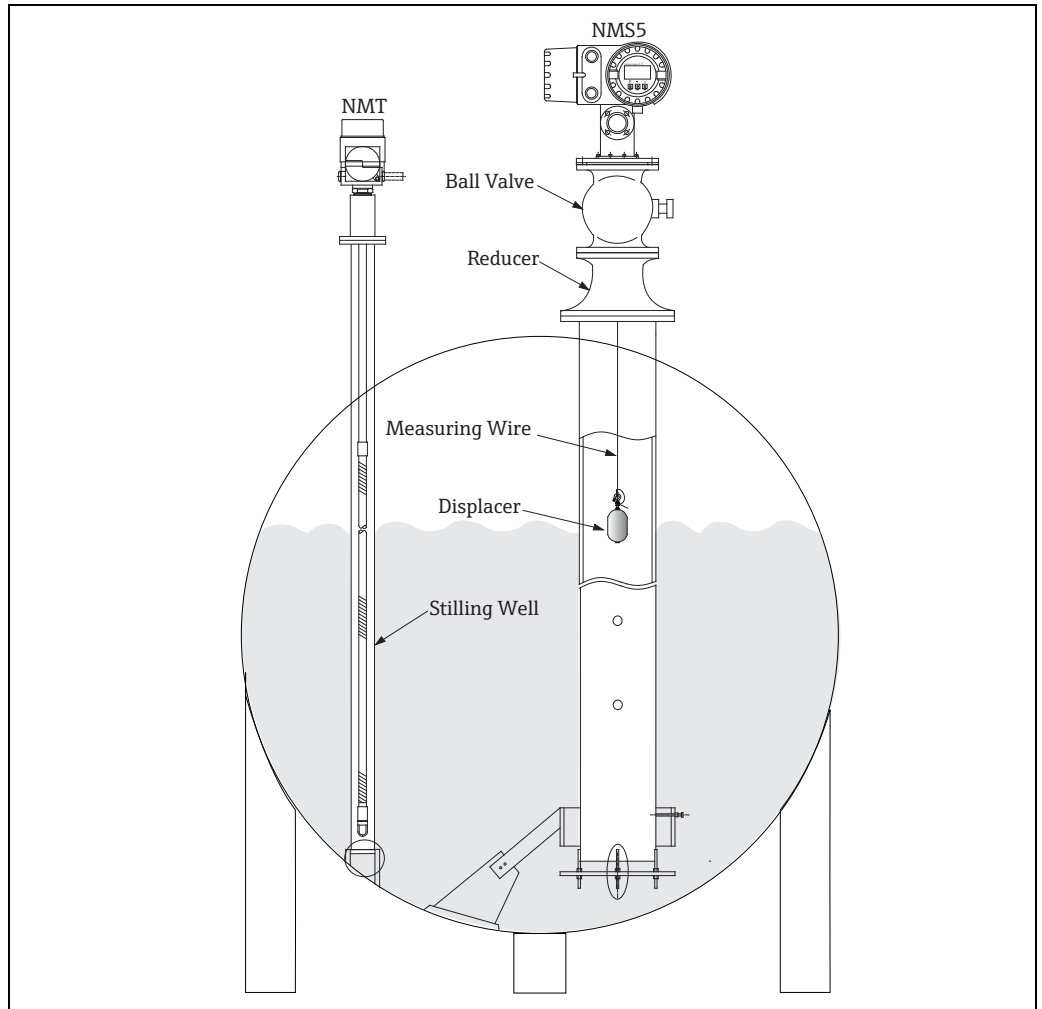


Figure 11: Stilling Well for Pressurized Tank

CAUTION

- When the pressure inside the tank exceeds 1 bar (100KPa, 14.5psi), a stilling well which does not have any holes or slits must be installed.
- NMT532 is installed in the stilling well from the top of the tank nozzle.
- Cover the bottom of the stilling well and weld it to protect the probe from the pressure.

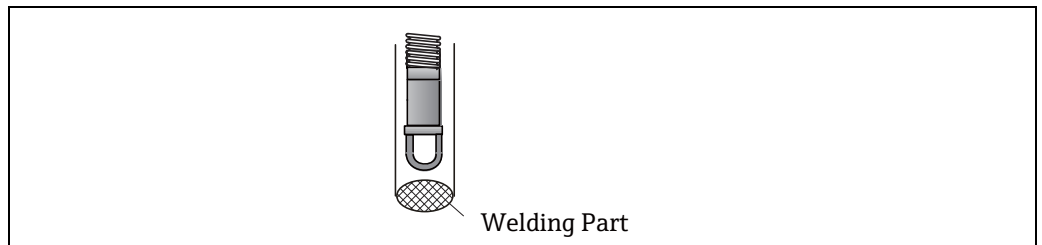


Figure 12: Welding Part of Stilling Well

Operating Condition: Terminal Connection

NMT532 Terminal

NOTICE

NMT532 allows an intrinsically safe HART connection only. Refer to the IS regulation for establishing wiring & field device layout.

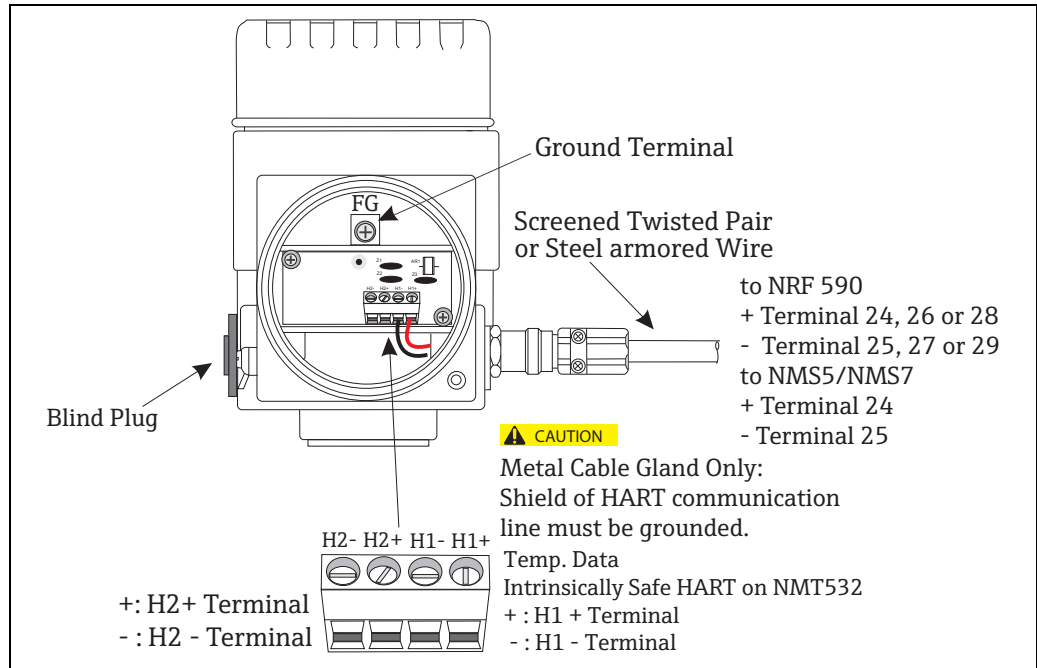


Figure 13: NMT532 Terminal

NMS5 Terminal

Since NMT 532 is an intrinsically safe instrument, the terminal connection to Ex i side on local HART connection is allowed on the NMS terminal housing.

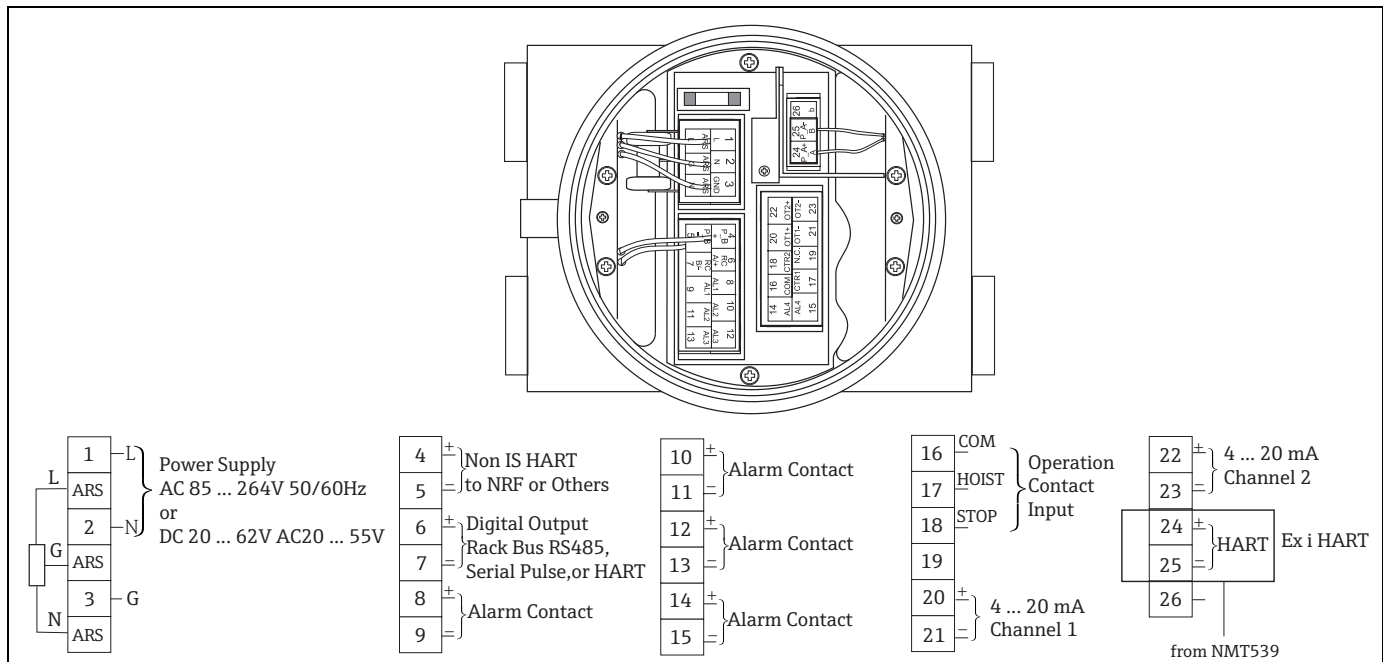


Figure 14: NMS5 Terminal

CAUTION

Do not connect NMT532 HART communication on terminals 4 & 5 on NMS5. These terminals are designed to connect Ex d HART communication.

NRF590 Terminal

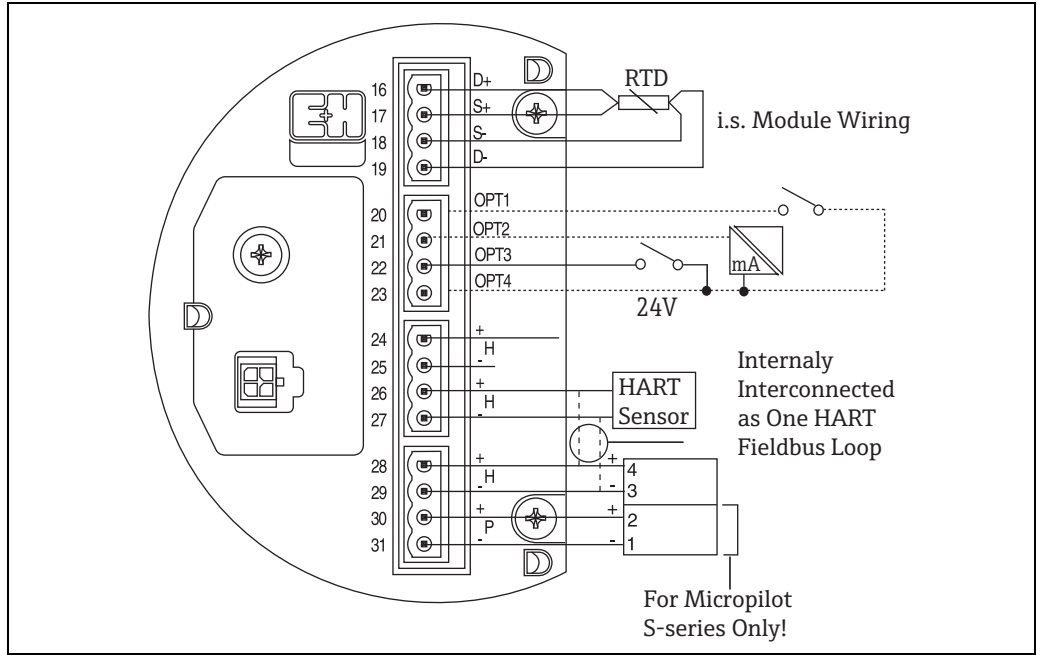


Figure 15: NRF590 Terminal

NOTICE

NRF590 has three sets of IS HART terminals. These three pairs are looped internally.

CAUTION

Do not connect signal HART lines from NMT532 to terminals 30 & 31. These terminals are designed to supply drive power of FMR 53x series only.

Mechanical Construction

NMT532 Dimensions

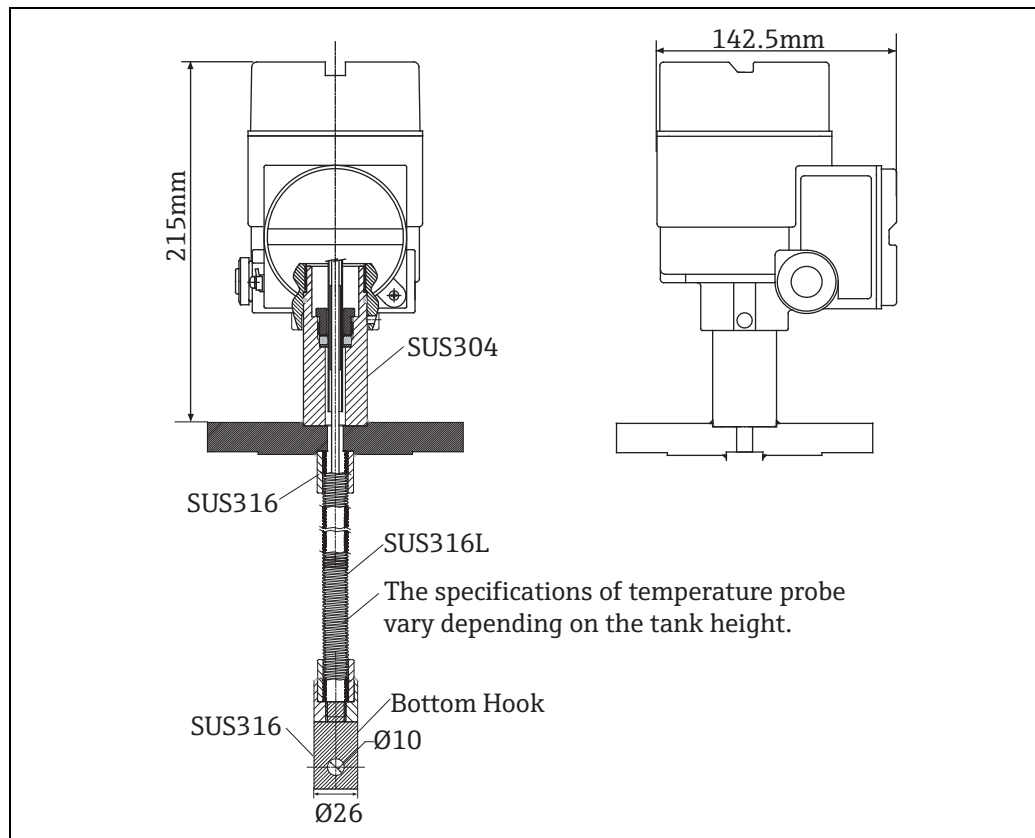


Figure 16: NMT532 Dimensions

Weight

Approx. 8kg
 Condition: 6 elements
 Temp. probe: 11.5m
 Flange: NPS 2" Cl.150 RF, 304 flange ASME B16.5

Material

Elements: Class A Pt100, IEC 60751/DIN EN 60751/ JISC 1604
 Housing: Aluminum die-casting
 Temp. probe: SUS316, SUS316L flexible tube (refer to "Dimension")

Human Interface

Operation Using FieldCare

NMT532 can also be operated via FieldCare. These programs support 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)
- Documentation of measuring points

Certificates and Approvals

CE Mark

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

Ex Approval

Ex Approval	Class
ATEX	II 1/2 G Ex ia IIB T4-T6
IEC	Ex ia IIB T4-T6 Ga/Gb
FM	IS Class I, Div. 1, Gp. C, D, T6, T4, Class I, Zone 0, AEx ia IIB, T6, T4
CSA	Ex ia Class I, Div.1, Gp. C, D, T6, T5, T4, Ex ia IIB T6, T5, T4
NPESI	Ex ia IIB T4-T6 Ga/Gb

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)

Order Information

NMT532

010	Approval:		
	7	FM IS Cl.I Div.1 Gr. C-D	
	8	CSA IS Cl.I Div.1 Gr. C-D	
	B	ATEX Ex ia IIB T4 - T6	
	F	IEC Ex ia IIB T4 - T6	
	G	NEPSI Ex ia IIB T2-T6	
020	Cable Entry:		
	B	Thread NPT1/2	
	D	Thread M20	
030	Process Connection:		
	1	NPS 2" Cl.150 RF, 304 flange ASME B16.5	
	2	DN50 PN10 B1, 304 flange EN1092-1 (DIN2527 C)	
	9	Special version, TSP-no. to be spec.	
040	Probe Length; Element; Interval:		
	022	...mm; 2x Pt100; 2 m	
	032	...mm; 3x Pt100; 2 m	
	042	...mm; 4x Pt100; 2 m	
	052	...mm; 5x Pt100; 2 m	
	062	...mm; 6x Pt100; 2 m	
	023	...mm; 2x Pt100; 3 m	
	033	...mm; 3x Pt100; 3 m	
	043	...mm; 4x Pt100; 3 m	
	053	...mm; 5x Pt100; 3 m	
	063	...mm; 6x Pt100; 3 m	
050	Additional Option:		
	A	Not selected	
	B	Anchor weight, High profile	
	C	Anchor weight, low profile	
	D	Tensioning wire, wire hook, NPT1 top anchor	
	F	Tensioning wire, wire hook, R1 top anchor	
NMT532	Complete product designation		

Accessories

Anchor Weight (High Profile, D120)

Mounting Attachment Option: B

This high profile anchor type is designed for Converter + Temperature Probe Versions.

⚠ CAUTION

The lowest measuring element (lowest temperature measurement position) must be set at a position of approximately 400mm (16") from the bottom of the tank.

Ensure that the opening size of the nozzle is 6 inches (150A) or more when installing the high profile anchor weight from a nozzle at the top of the tank.

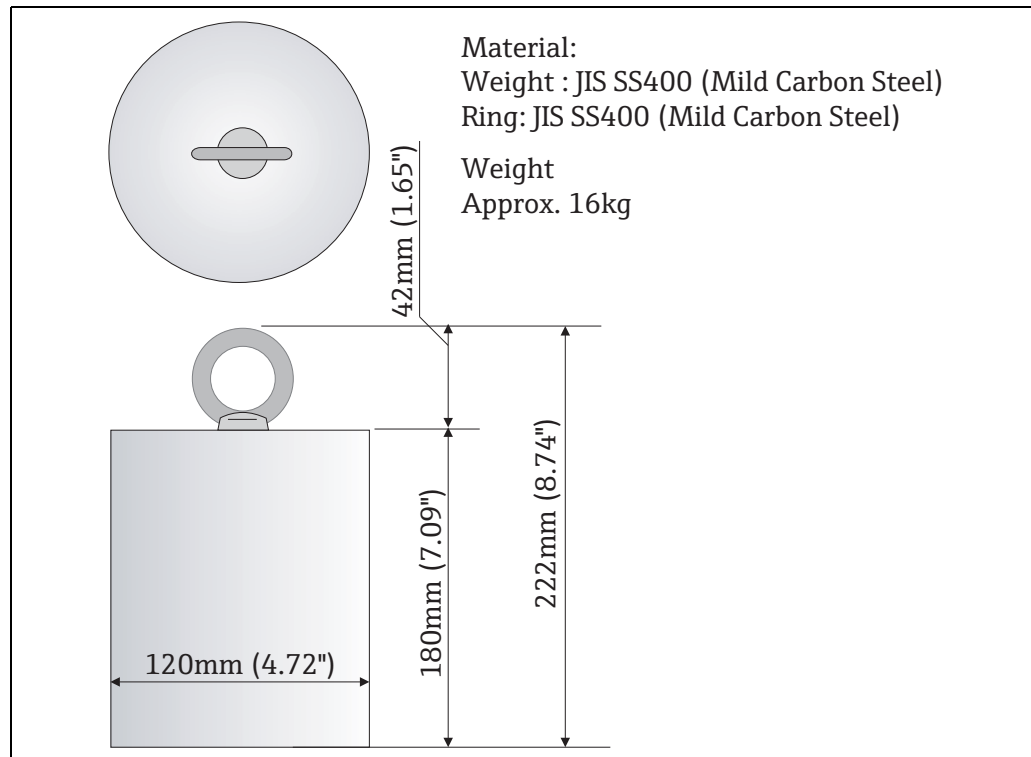


Figure 17: Anchor Weight for High Profile

Different dimensions, weight, and material for the anchor weight are also available.

Anchor Weight (Low Profile, Hexagon H41)

Mounting Attachment Option: C

The low profile anchor weight is mainly designed to secure WB sensor and to measure a range of the measurable water level. The anchor weight can also be used as an attachment of converters or temperature probes when installing it to a small nozzle that is being used.

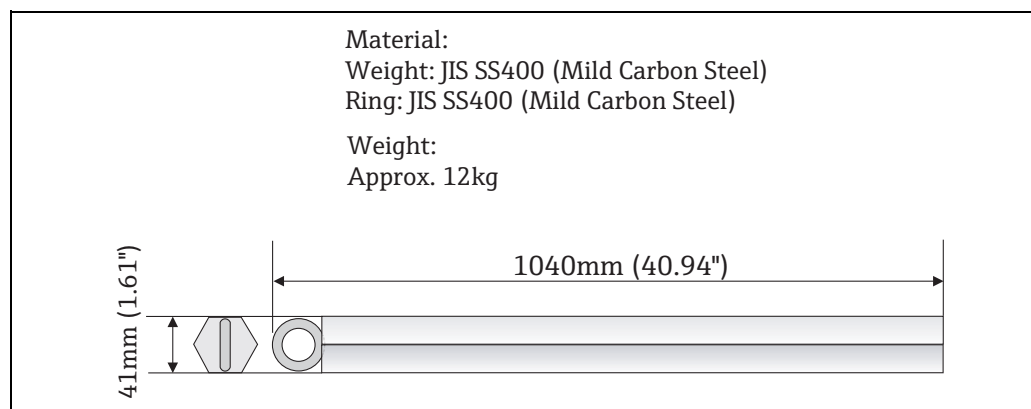


Figure 18: Anchor Weight for Low Profile

Wire Hook and Top Anchor

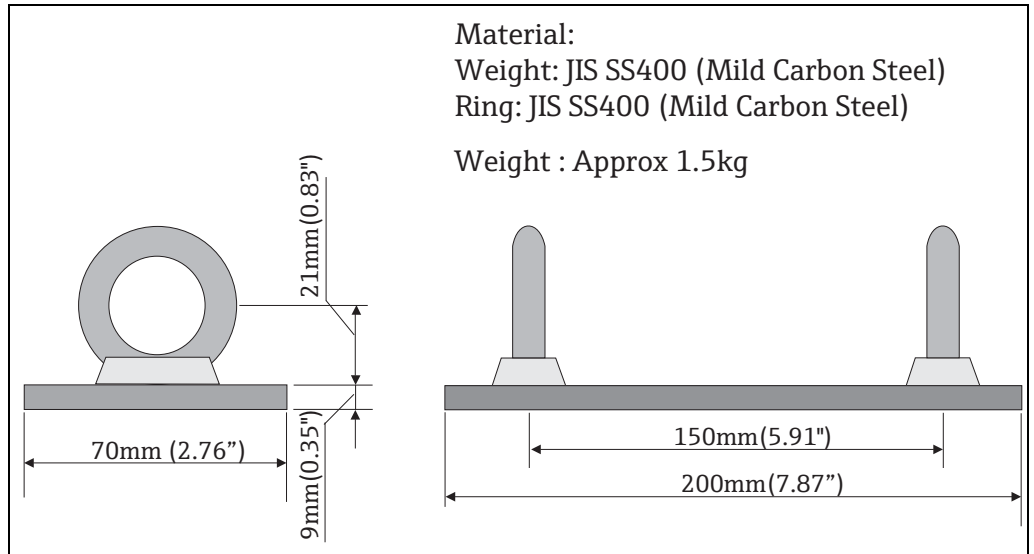


Figure 19: Wire Hook

Actual tensioning can be completed with SUS316 stranded 3mm diameter tension wire between the wire hook and the top anchor.

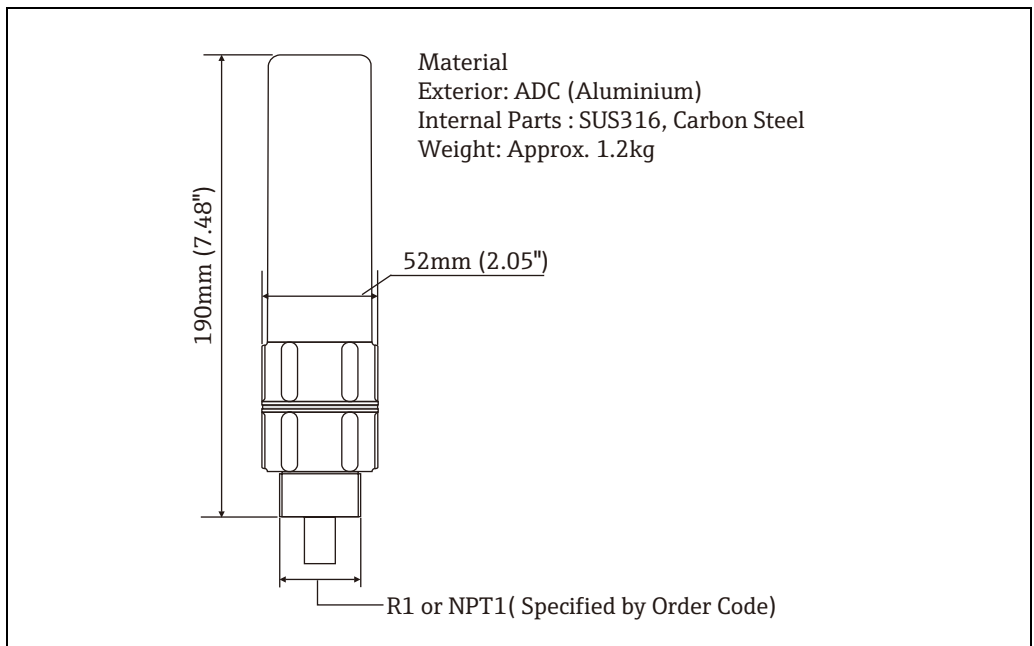


Figure 20: Top Anchor

NOTICE

The standard process connection of the top anchor is R1 or NPT1 threaded connection.

Documentation

Technical Information

TI00452G

Proservo NMS5

TI00462G

Promonitor NRF560

TI024N(TI00463G)

Digital Transmitter TMD1

Operating Instructions

BA01032G

Prothermo NMT532 (Installation Instructions)

Safety Instructions

NMT532	ATEX	IEC	NEPSI	FM	CSA
Average Temperature	XA00584G	XA00581G	XA01260G	Ex461-852-1	Ex462-875-1

Appendix

Stainless Steel Conversion Table

The stainless steel material used in products of Endress + Hauser Japan normally have expressions according to Japanese industrial standards, such as JIS or TIS. Each country or region may have different expressions.

The following conversion table contains the expression of equivalent stainless steel material based on the chemical composition and mechanical properties.

Country	Standard	Expressions			
Japan	JIS / TIS	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	304 L	316	316L
U.E.	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
-	ISO	11	10	20	19
-	ASME	S30400	S30403	S31600	S31603

NOTICE

Since each standard carries its own mechanical and scientific definition, some expressions may not have the straight conversion from the Japanese standard. Consult with the local authority or legislature to ensure the proper comparison with the applied standard prior to determining specification.

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