

Prothermo NMT 539

Intrinsically safe multi-signal converter with precision average temperature and water bottom sensor for inventory control and custody transfer applications



Applications

The Prothermo NMT 539 is an intelligent HART signal converter, with a combined average temperature sensor and water bottom interface probe. For average temperature measurement, it consists of precision multi-spot Pt100 elements. The NMT 539 is a highly capable solution for a variety of tank gauging applications and provides both constant average temperature data and water interface data via HART communication. For accurate inventory measurement, it is best suited connected to Endress+Hauser's Proservo NMS 53x or Tank Side Monitor NRF 590 with Micropilot radar.

Features

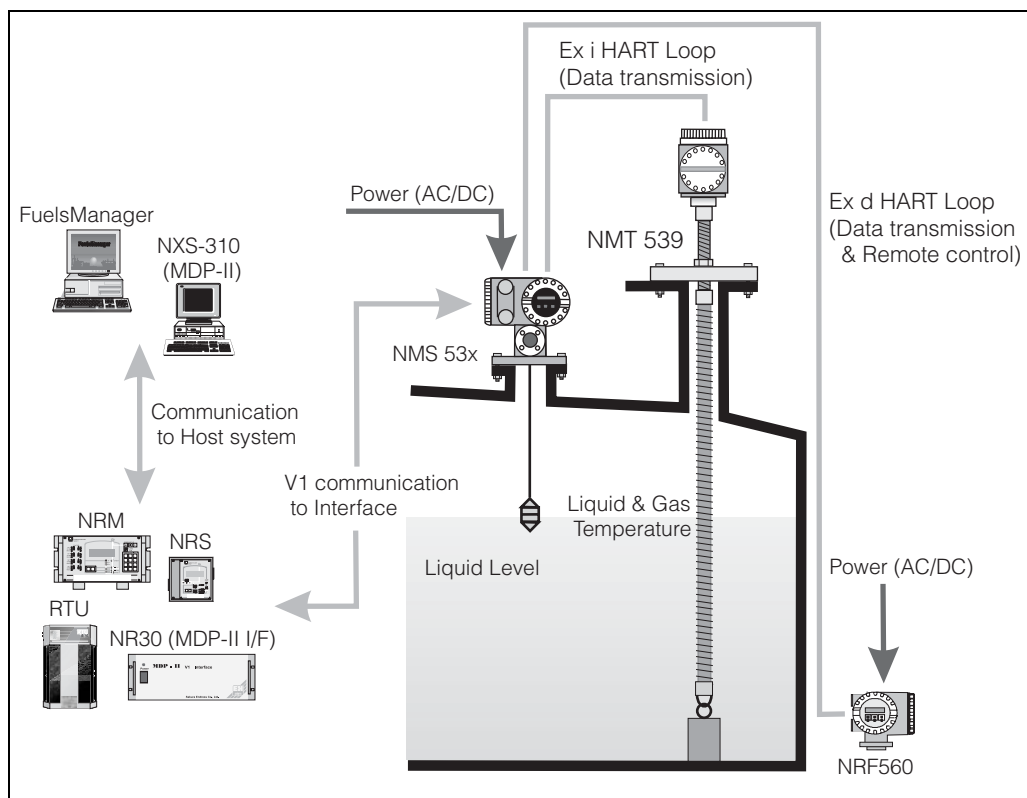
- Intrinsically safe device allowing for the safest electrical configuration possible.
- Available in four different versions based on customer requirements:

Converter Only
Converter and Temperature probe
Converter and water bottom probe
Converter, temperature and water bottom probe

- Converter is compatible with various element types in third party manufacturer temperature probes.
- Compatible with Endress+Hauser's user friendly ToF (Time-of-Flight) tool.
- Variety of process connections and cable entries available to meet worldwide classifications.

System diagram

Connection with Proservo NMS 53x



NMT 539 Converter + Temp. version

The Prothermo NMT 539 is the successor of the former NMT 535 Ex i version. For proper migration, the NMT 539 has inherited all the functionality and specifications of the NMT 535, including process connections, cable entries and wiring method.

Since the Proservo NMS 53x already provides water interface measurement, the NMT 539 Converter + Average temperature may be the best version when used in combination with the Proservo. When the Converter + WB + Average temperature version is used in combination with the Proservo, the product in the tank will be thoroughly managed with level, continuous average temperature and water interface measurement.

All the necessary configuration and parameter settings for the NMT 539 are performed on both the Proservo NMS 53x and ToF tool.

The NMT 539 receives liquid level data from the Proservo, 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 the Proservo.

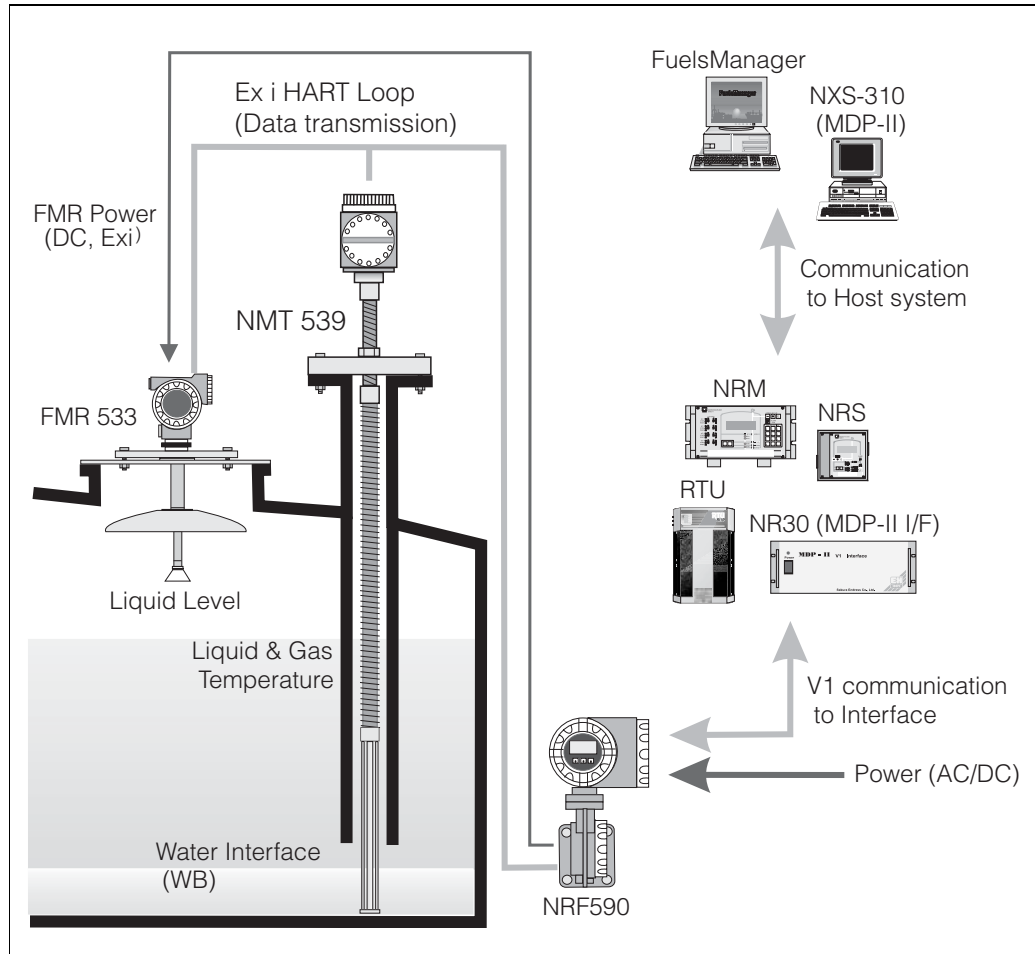
From the Proservo NMS 53x or NRF 590 Tank Side Monitor, all sensor data are sent to the interface unit via V1 communication protocol.

Note!

Since the Proservo is a multi-functional device (measurement and data transmission), the Promonitor NRF 560 acts as a tank side remote data indicator and controller for Proservo. The standard NRF 560 has no data transmission functionality. For special applications, an optical fiber transmission version is available. Please consult with your Endress+Hauser representative for more information.

All gathered data in the interface unit is sent to inventory management software, such as Endress+Hauser's FuelsManager or NXS-310 (MDP-II program), or directly sent to the customer's specific DCS or PLC.

Connection with Tank Side Monitor NRF 590



NMT 539 Converter + Temp. + WB version

The NMT 539 Converter + Temp. + WB is utilised effectively in combination with radar level gauging. Water interface, temperature and level measurement, with data collection and calculations via the NRF 590, allows for optimal inventory control. Basic functionality of the NMT 539 is displayed and configured on the NRF 590. Detailed NMT 539 functionality and data access can be performed by the ToF tool.

The NMT 539 receives radar level data from the NRF 590 and then calculates liquid and gas phase average temperature. Calculated and standard data, including temperature element raw data and device status, are transmitted to the NRF 590..

Depending on the size of the tank farm and data processing functionality, measurement data can be transmitted to various interface units via V1 protocol or other industry standard communication protocols (please see the NRF 590 technical information).

All gathered data in the interface unit is sent to inventory management software, such as Endress+Hauser's FuelsManager or NXS-310 (MDP-II program), or directly sent to the customer's specific DCS or PLC.

Input

Measured variables	Liquid and gas temperature range -200 ...+235 °C (-328 ...+455 °F), RTD signal Water interface level (water bottom) range 1m ...2m (3.3 ...6.6 ft), capacitance signal
Communication	2 wire, Endress + Hauser HART protocol to host commanding gauge <ul style="list-style-type: none"> • The Proservo NMS 53x • The Tank Side Monitor NRF 590
Compatible element (Converter only version)	Pt100 Cu90 Cu100 PtCu100 Note! NMT 539 Converter + Temp. version has only Pt100 elements installed. The element types above can be utilised in third party temperature probes, such as the Endress+Hauser 9909, 1700 or Weed Beacon MWR. Other manufacturer multi-resistant and multi-spot average temperature probes may be compatible. Please consult your Endress+Hauser representative for further details.
Number of elements	Maximum of 16 can be connected.

Output

Data transmission	Temperature & Water Bottom data via 2 wire intrinsically safe Endress + Hauser HART protocol.
Connection	To Endress + Hauser host commanding gauge <ul style="list-style-type: none"> • The Proservo NMS 53x • The Tank Side Monitor NRF 590

Installation

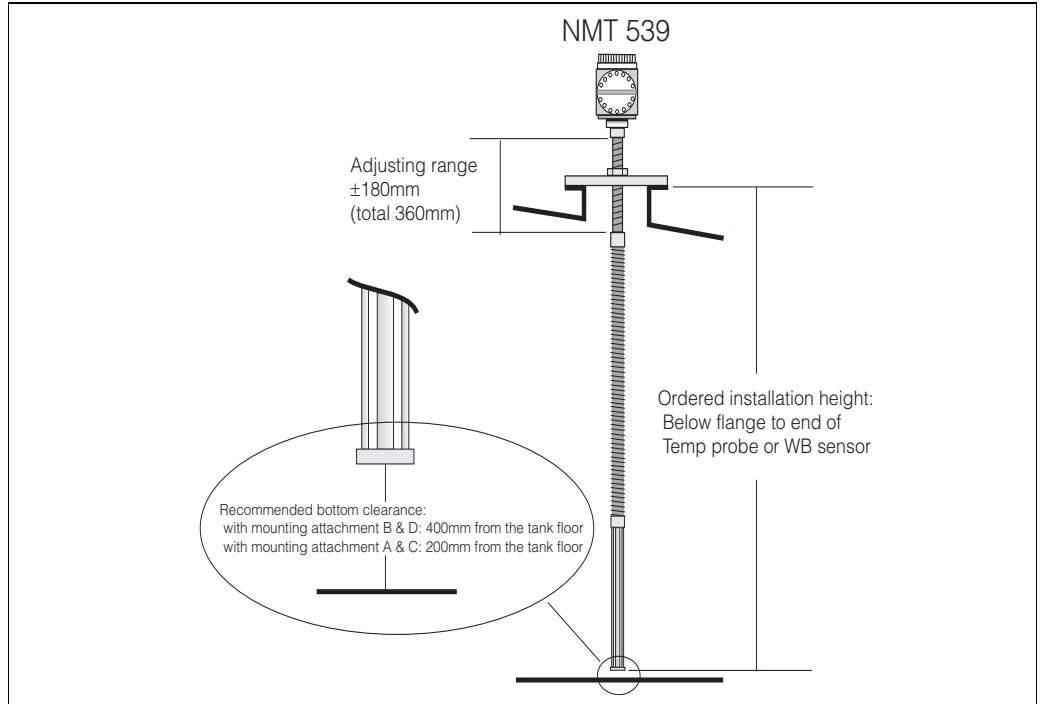
Wiring	<p>Wiring of the NMT 539 must meet intrinsically safe requirements. The following cable entries are available:</p> <ul style="list-style-type: none">• G (PF) 1/2"• NPT 1/2"• PG 16• M 20 <p>Caution! Please prepare a metal cable gland (not a plastic one) that has shield cable grounding functionality to meet the condition of EMC certification. No cable gland is provided with the NMT 539 as standard. Size and condition of the communication cable must meet the requirements of intrinsically safe HART communication.</p>
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Process connection	<p>Converter only version NMT 539's HART converter can fit onto third party average temperature probes with the following mechanical connection size and type:</p> <ul style="list-style-type: none">• PF3/4" (equivalent to NPS 3/4") universal coupling.... Housing type 1• M20 threaded.... housing type 2, specific design to fit to Varec 1700 terminal housing <p>Note! Use seal tape to secure the connection between converter and temperature probe.</p> <p>Please refer to the NMT 539 instruction manual for the detailed installation procedure.</p> <p>Converter + Temp. , Converter + WB, Converter + Temp. + WB version All three versions have the same installation method to fit onto the tank nozzle. The following flange sizes are available:</p> <ul style="list-style-type: none">• JIS 10K 50A RF... mild carbon• ANSI 150lb 2" RF... mild carbon• JPI 150lb 2" RF... mild carbon• DIN DN50 PN 10RF... mild carbon <p>Different sizes and materials can be provided depending on the installation conditions. Please consult your Endress+Hauser representative for the most suitable solution.</p>
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The installation height adjuster	<p>An additional feature of the NMT 539, the height adjuster, can be used to adjust installation height of the NMT 539 within ± 180 mm (7") from original height.</p> <p>Note! The height adjuster is not included in "Converter only" version.</p> <p>Caution! Please tighten the lock nut with seal tape to secure rigidity of the NMT 539 at the end of physical installation and/or if the height adjuster will be used during operation. A loose lock nut can lead to improper tank sealing or unexpected leakage into the tank.</p>
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WB blocking distance	<p>The Water Bottom sensor can be set as low as zero clearance from the tank floor by using height adjuster. Due to mechanical design of WB sensor, bottom plate has approximately 10mm thickness. This will become a blocking distance (ineffective measuring range).</p> <p>Caution! Calculate vertical movement of NMT 539 installation height prior to setting the WB sensor bottom clearance. Typical tank shell deformation causes vertical movement at a minimum 20 ~ 30mm (1"). Excessive weight load of entire NMT 539 on WB sensor by contacting tank floor may cause critical damage that disables accurate & stable WB level measurement.</p>
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Recommended installation height



Note!

The required bottom clearance of both the temperature probe and WB sensor depends on the anchoring method. Consider the required bottom clearance when ordering the NMT 539. Please see the recommended bottom clearance in the above illustration and/or consult your Endress+Hauser representative for further information.

When ordering the NMT 539 with special element position and bottom clearance, please refer to "Ordering Information," section 80, Element Spacing. Select 4, Custom element position and spacing.

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

The factory setting of the height adjuster is set to the middle of adjustable range. Apply necessary adjustment during installation for desired height.

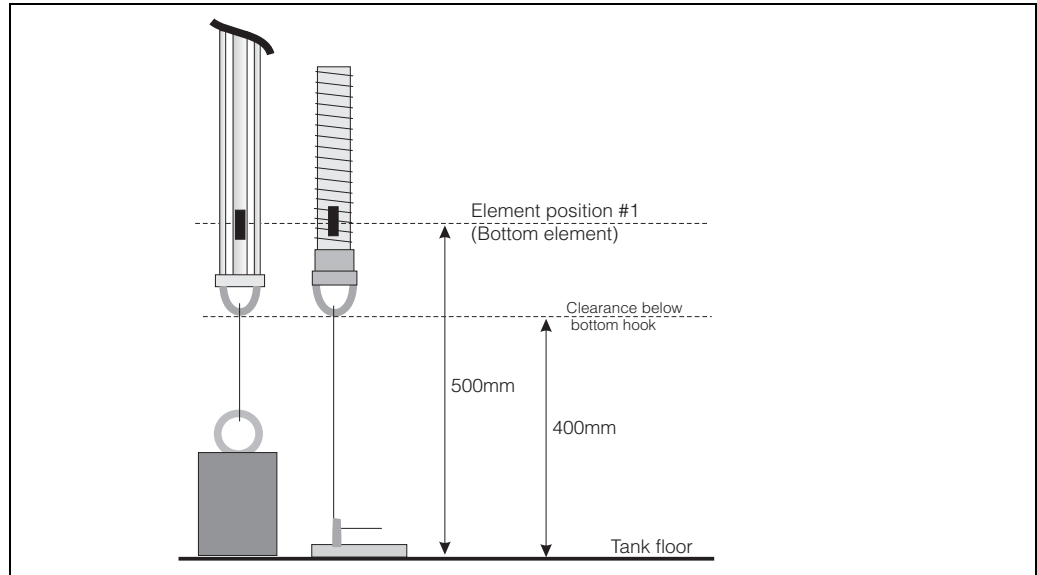
Installation equipment

The bottom anchor hook on the WB sensor is not available when "A: no installation material" is selected. The Converter + Temp. probe version includes the bottom anchor hook as standard, although, "A: no installation material" is selected.

Contents of anchoring hardware: Based on the choice of "100: Mounting attachment"

	A: No installation Material	B: Anchor weight (Tall profile)	C: Anchor weight (Low profile)	D: Tension wire + Top anchor
0: Converter only	none	none	none	none
1: Temp. + Converter	bottom hook	bottom hook anchor weight sling wire	bottom hook anchor weight sling wire	bottom hook base plate top anchor tension wire
2: WB + Converter	none	bottom hook anchor weight sling wire	bottom hook anchor weight sling wire	bottom hook base plate top anchor tension wire
3: Temp. + WB + Converter		bottom hook anchor weight sling wire	bottom hook anchor weight sling wire	bottom hook base plate top anchor tension wire

Mounting attachment B: "Tall profile anchor" or D: "Wire hook + Top anchor (tension wire method)"

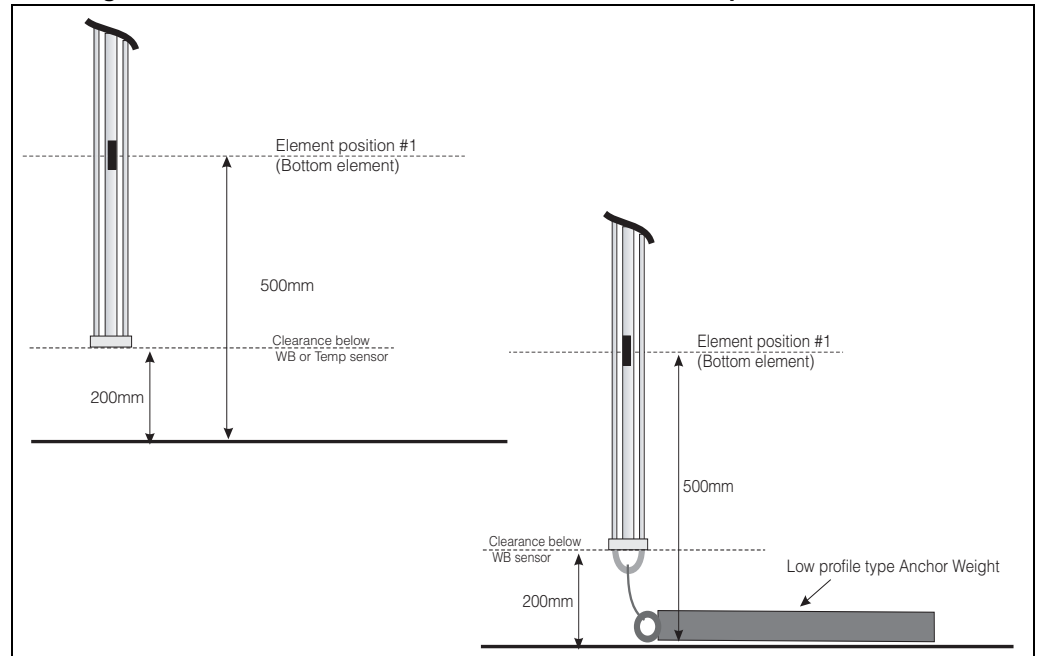


Both temperature probe and WB sensor with "Tall profile anchor weight" and "Tension wire anchor" methods have a recommended clearance below the bottom of the anchor hook of approximately 400 mm (16"). This clearance can be easily changed by turning the height adjuster at the tank top.

Note!

When ordering the NMT 539, please refer to "Ordering Information," section 80, Element Spacing. Select 4, Custom element position and spacing. This allows you to choose the desired element position and intervals. Consult with your Endress+Hauser representative for further assistance.

Mounting attachment A: "No installation material" and C: "Low profile anchor"



Both the temperature probe and WB sensor with "Low profile anchor weight" at 100: Mounting attachment option (see Ordering Information) should have 200 mm (8") of bottom clearance from the edge of probes.

Caution!

The lowest possible WB measuring point can be approx. 10 mm from the tank floor with "No installation material" selected (see Ordering Information). If necessary, use the height adjuster to set at the desired installation height. No bottom anchor hook is available with the WB sensor and 100: Mounting attachment "A: No installation material".

Technical specifications

General specifications

Manufacturer	Endress+Hauser Japan
Designation	Prothermo NMT 539
Function	RTD average temperature signal to HART conversion RTD average temperature measurement + HART converter Capacitance water interface measurement + HART converter Average temperature & Water interface measurement + HART converter
Temperature accuracy	±0.1°C or less (at reference condition) *1
Water Bottom accuracy	4mm (±2mm) or better (at reference condition) *2

Power supply

Input	16 30VDC (via HART line from host gauge)
Power consumption	6mA@16VDC (HART converter only) 6mA@16VDC (Temp. probe + HART converter) 12mA@16VDC (WB sensor + HART converter) 12mA@16VDC (Temp. probe + WB sensor + HART converter)

Converter specifications

Compatible element type	Pt100, Cu90, Cu100, PtCu100
Housing	Aluminum diecast
Process connection	PF 3/4" (NPS 3/4") universal coupling M20 threaded (Varec 1700 connection only)
Cable entry	G (PF) 1/2" NPT 1/2" PG16 M20
Ambient temperature	-40 ...+85 °C (-40 ...+185 °F) (converter housing)

Temperature probe specifications

Temperature element	Class A Pt100, IEC PUB 751 1983 and / or JIS 1604 1989
Installation height adjuster	±360mm threaded, (SUS 316)
Probe material	SUS 316 flexible tube SUS 316 flexible tube + SUS316 armored mesh pending
Operation temperature	-200 ...+235 °C (-328 ...+455 °F)
Process connection	JIS 10K 50A RF ANSI 150lb 2" RF JPI 150lb 50A RF DIN DN50 PN 10RF

Water Bottom (capacitance) sensor specifications

Sensor material	SUS 316 (center rod SUS 304 & PFA protected)
Operation range	1m (3.3 ft) and 2m (6.6 ft)
Operation temperature	-20 ...+100 °C (-4 ...+212 °F)
Data transmission	2.5mm coaxial cable & common ground

Environment

Weather proof	IP 65
Explosion proof	EEx ia IIC T2 ... T4, ATEX
	IS Class 1, Div. 1, Gp. CD FM... pending
	Class 1, Div. 1, Gp. CD CSA... pending
	Ex ia IIB T4, TIIS... pending

Reference *1

Accuracy of RTD - Temperature conversion. Accuracy measurement shall be conditioned with precisely calibrated dial resistor or IEC class A Pt100 ohm temperature element.

Reference*2

Measurement condition is based on 80% span of 1m probe in water / air interface at 25°C.

Performance

New electronics

The Prothermo NMT 539 employs a completely new electronic module compared to the previous NMT 535. The electronics achieve restrictive free multi-drop HART loop configuration with other sensors for specific tank gauging applications.

	NMT 539	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@16VDC	10mA@16VDC

All-in-one program

The powerful processor enables multi-function calculations under a single program. This means that there is no need for a variety of spare parts.

RTD Temperature calculation

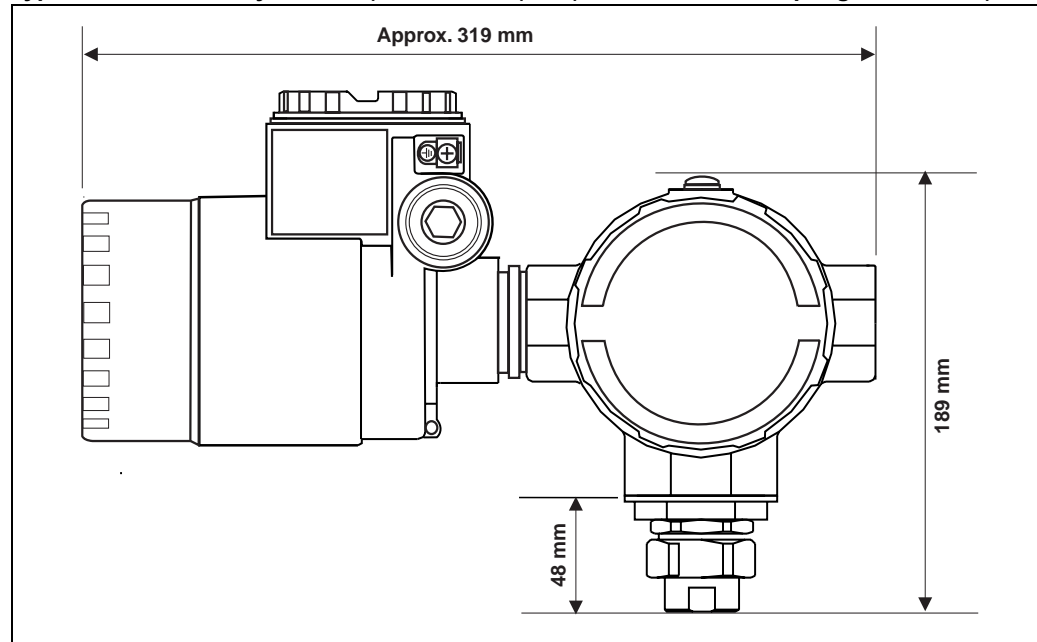
The main CPU board now has all the required data processing functionality, including RTD - HART conversion. With the NMT 538, various programs were required depending on temperature element characteristics, such as Pt100, Cu90, Cu100 and PtCu100. The new NMT 539 has all the programs in one powerful processor.

Capacitance - HART signal conversion

A separate CF (Capacitance - Frequency) board can be connected directly to the CPU board when NMT 539 is equipped with WB sensor.

NMT 539 functionality and Dimensions

Type 1: Converter only version (Standard PF(NPS) 3/4" universal coupling connection)



Type 1 Measuring function

The Converter only version is the direct replacement of the previous NMT 538 series. Connection and compatibility are provided to third party temperature probes with various element types. Unlike the NMT 538, the powerful processor of the NMT 539 calculates and converts the following element types without altering the program (EPROM installed software):

- Pt100
- Cu100
- Cu90
- PtCu100

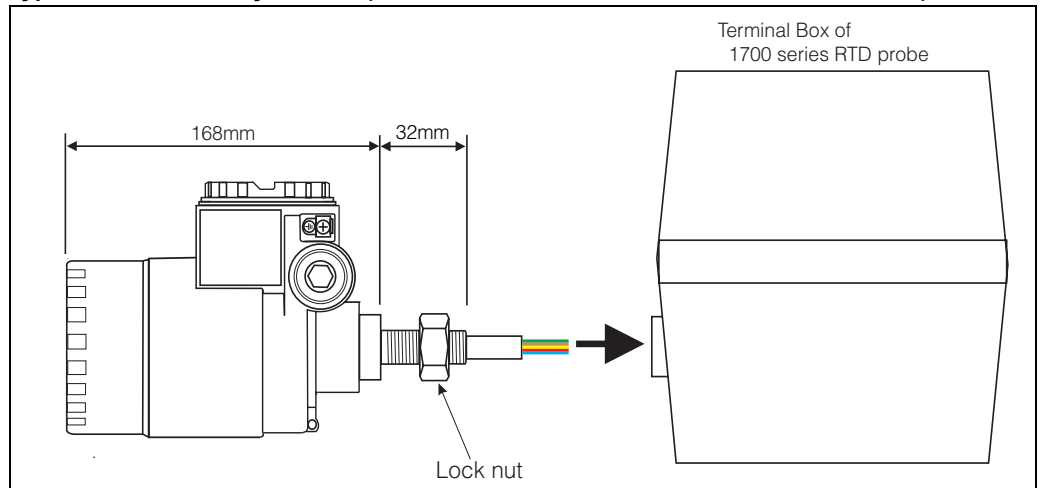
The type 1 converter also enables connection to a dual function average temperature and capacitance WB probe, such as the Weed Beacon MWR. Wiring, however, requires the isolation of the RTD temperature signal from the capacitance WB signal on coaxial cable. The wiring of the temperature signal is exactly the same as Endress+Hauser's 1700, 9909 and other RTD probes. The coaxial (WB) cable must be routed from the existing auxiliary capacitance to the HART (or 4 - 20 mA) converter via NMT 539's terminal compartment.

Caution!

NMT 539 is only compatible with MRTs (Multi-Resistance Thermometers) and/or MSTs (Multi-Spot Thermometers). It is not designed to work with "Thermocouple" type thermometers.

The physical connection between probe to NMT 539 is completed by Zinc plated carbon steel PF 3/4" (NPS 3/4") universal threaded coupling. In case a different thread size is required, Endress+Hauser can provide the simplest and most efficient solution by adapting a variety of coupling sizes and materials based on existing temperature probe specifications.

The power supply and data transmission lines are both fed to the host gauge, Proservo NMS 53x or Tank Side Monitor NRF 590, by one pair of HART loop connections. In addition to the user-friendly display, the NMT 539 can also be configured and operated via the ToF (Time-of-Flight) tool.

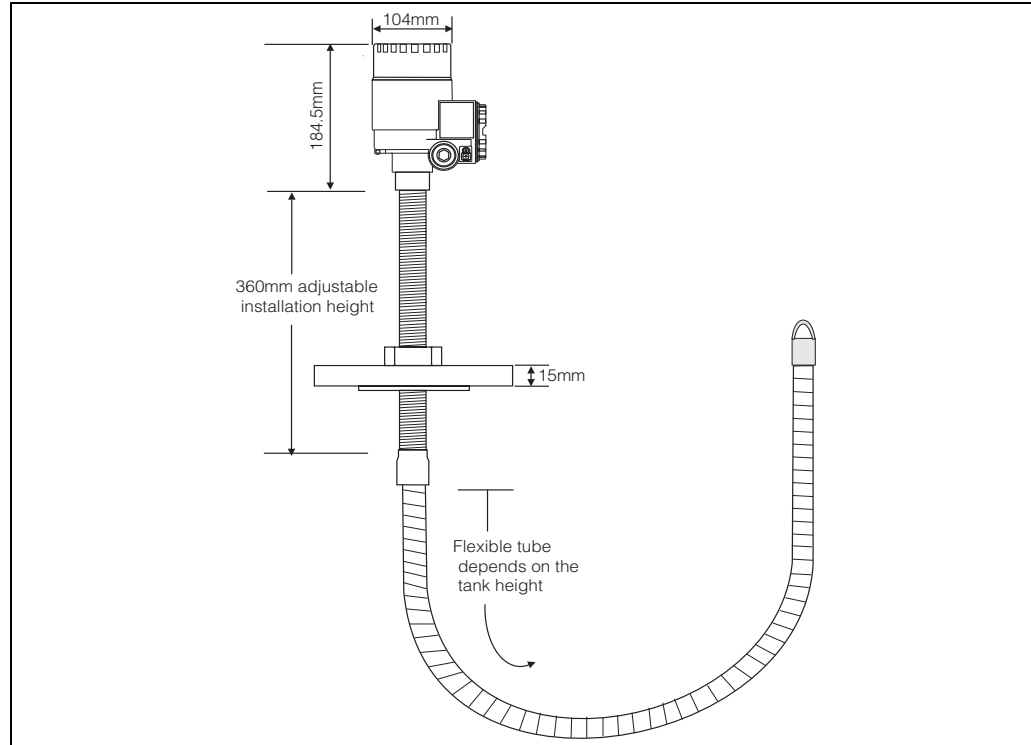
Type 2: Converter only version (for the Varec 1700 win M20 threaded connection)

Type 2 Measuring function Basic functionality remains the same, but the special M20 threaded connection allows the NMT 539 converter to fit directly onto the existing terminal housing of the 1700.

Actual wiring of the RTD signal from the probe to the NMT 539 must be executed in the terminal box of the 1700, not the NMT 539. Therefore, the type 2 converter only has a primary housing that contains NMT 539 electronics and no secondary housing is included.

Caution!

Secure the threaded connection with seal tape and tighten the lock nut at the actual installation. A loose connection of the NMT 539 & Varec 1700 terminal housing can cause serious electrical damage depending on environmental conditions.

Converter + average temperature probe version**Measuring function**

The NMT 539 converter and average temperature probe is the direct replacement for the former NMT 535 Ex i and 537. The W&M approved high accuracy temperature device is well suited for both custody transfer and inventory control applications. Based on the product temperature range and specific application, the NMT 539 has 4 different temperature ranges to meet your application requirements:

- -40 ...+100 °C (-40 ...+212 °F): Most standard temperature range for the custody transfer application
- -55 ...+235 °C (-67 ...+455 °F) : Capability of high and / or low temperature product application like sulfur & asphalt and moderate liquid / gas application.
- -200 ...+71 °C (-328 ...160 °F) : Special design for the refrigerated tank application like LNG, LPG
- -18 ...+80 °C (-0.4 ...176 °F) : Only design to use with W&M certified application.

The NMT 539 converter and average temperature probe consists of up to 16 IEC class A Pt100 elements in the protection tube. The very sensitive sensor elements change resistance values depending on the surrounding temperature. Therefore, applied voltage through this sensor deviates based on resistance change at the element. As a specific design to meet intrinsically safe standards, the NMT 539 converter and temperature version is built with the most efficient power management concept (compared to existing NMT 535, less than 60 percent of current flow is required under normal operating conditions).

In order to achieve the highest degree of measurement accuracy and mechanical & electrical durability, NMT539 employs a powerful processor, large storage capacity, and simple module structure.

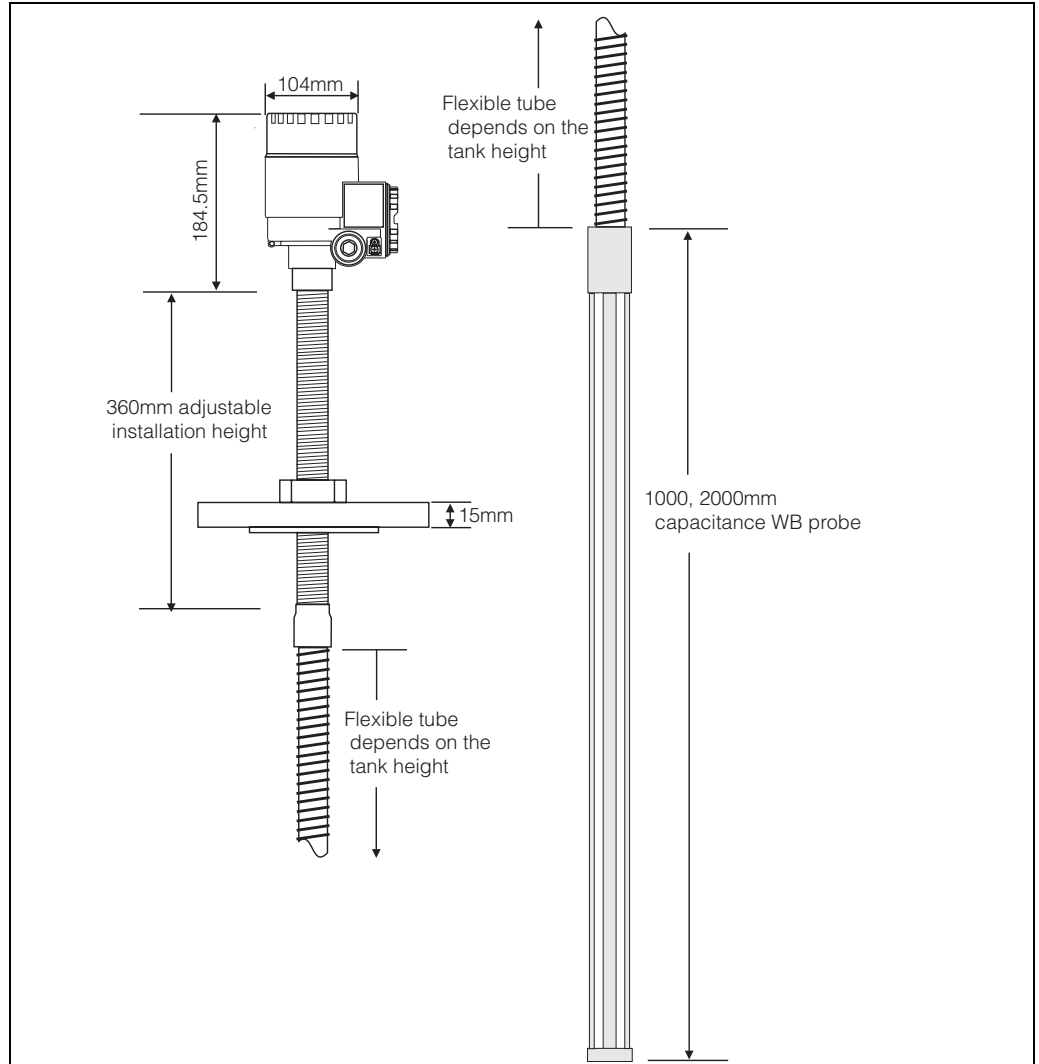
To achieve the user-friendly concept, the newly adopted height adjuster allows the adjustment of the installation height up to 360 mm (14") at the process connection (flange) depending on the tank shape and condition.

Various probe protections are available (pending)

- Standard flexible tube
- Steel armored flexible tube
- Nylon or Teflon outer tube (installation must be in protection pipe only)

W & M function

The NMT 539 converter and temperature probe is custody transfer approved and provides less than ± 0.1 °C of measurement deviation. Once the NMT 539 is configured to "W&M mode", all the changeable parameters are frozen by software and mechanical switch protection.

Converter + WB probe version**Measuring function**

The Prothermo NMT 539 is a temperature measurement device, water interface measuring capacitance probe and HART signal converter. The capacitance probe is important for the detection of water below product (mainly crude oil) and determines water level by sensing the dielectric constant of the product in the tank. Measured data is transmitted via coaxial cable to the converter housing, and the capacitance signal is converted to a HART signal.

Note!

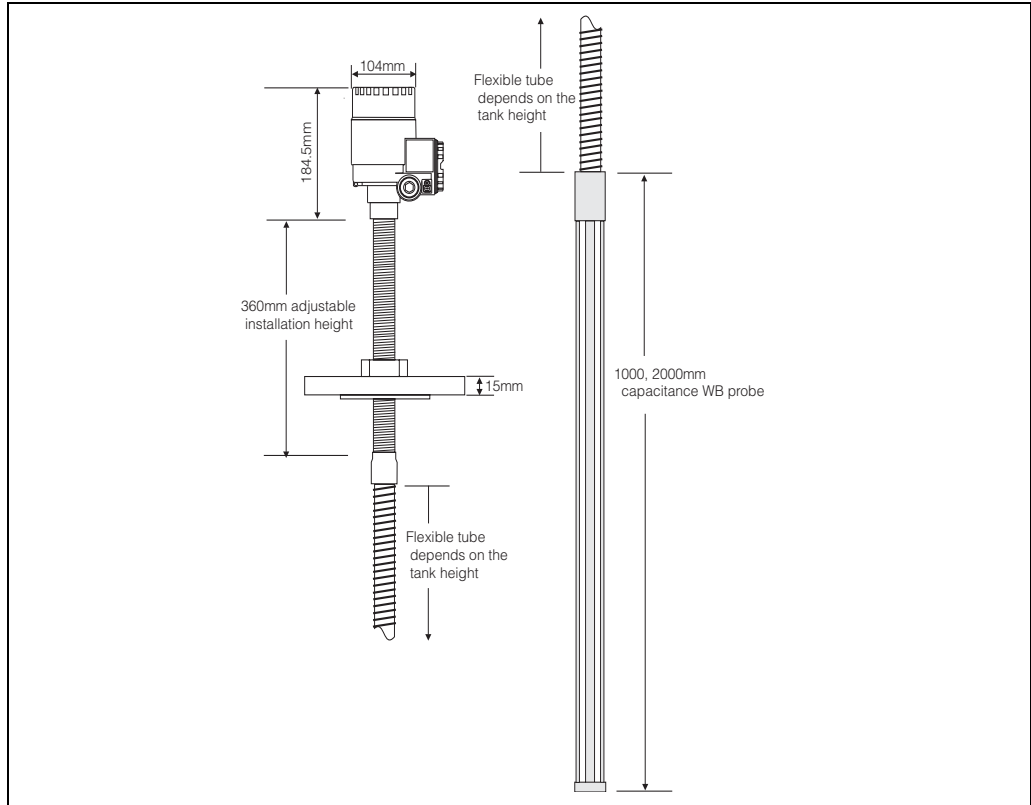
The HART signal converter and capacitance probe are designed and intended to work together. Performance based on separate use or connection to other instruments is not guaranteed.

This version appears to have the exact physical dimensions as the Converter + Temp. + WB version. However, Pt100 elements or signal cables to carry RTD data to the converter are not integrated in the protection tube. Only a coaxial cable for capacitance signal is inserted.

Caution!

Due to the characteristic of capacitance measurement, precise initial calibration must be performed in order to achieve the maximum measurement accuracy. The condition of tank contents (both oil & water), liquid temperature and individual probe characteristic can greatly effect the measurement performance. Specific accuracy & repeatability measurement must be taken within the same environment in order to perform data comparison.

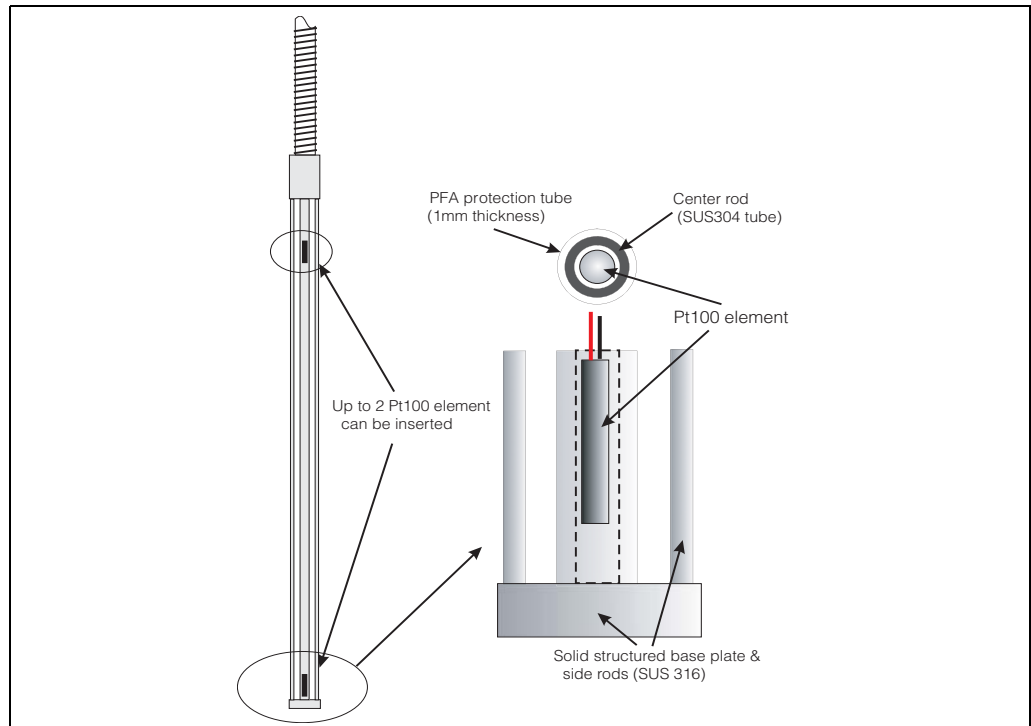
Converter + Temp. + WB probe version



Measuring function

The Prothermo NMT 539 is available in the ultimate all-in-one "Converter + Temp. + WB" version. Both temperature and WB data are fully accessible on one pair of HART communication lines. All of the necessary parameters can be configured via Proservo NMS 53x, the Tank Side Monitor NRF 590 or the ToF tool.

The integrated WB sensor (capacitance water interface measurement) is set at the bottom of the average temperature probe. The standard WB measurement ranges are 1m (3.3 ft) and 2m (6.6 ft). The tube structured WB sensor is made of SUS304 pipe and exterior is protected by an additional 1mm thick teflon tube. Pt 100 elements are set inside of this tube structure, meaning that temperature measurement is not disturbed due to the WB functionality.

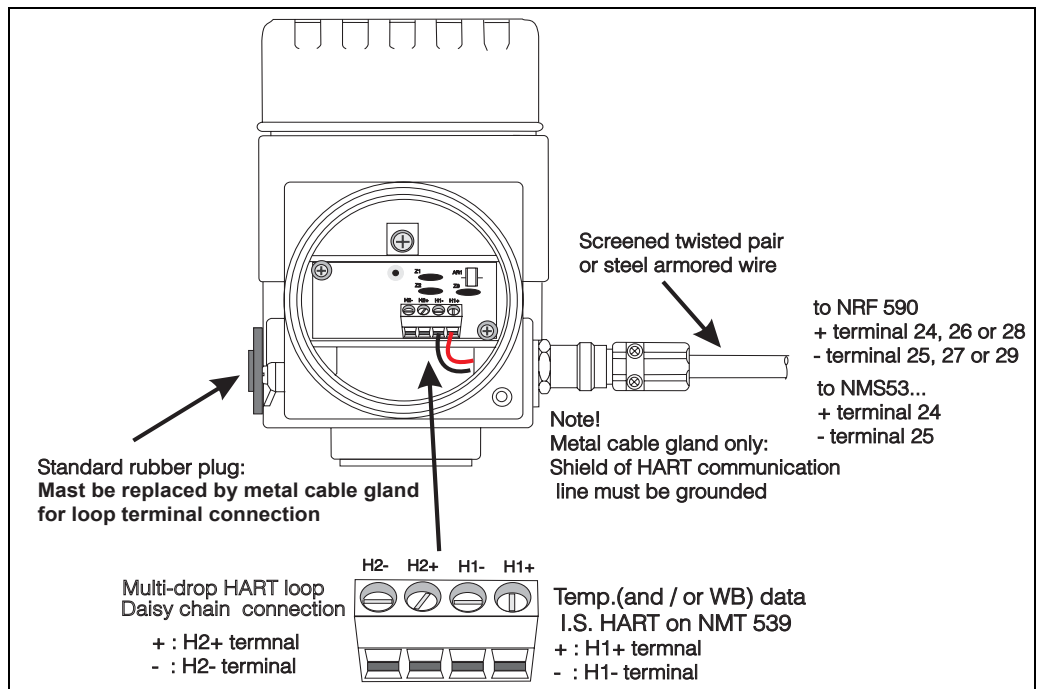


Terminal Connection

NMT 539 terminal

Note!

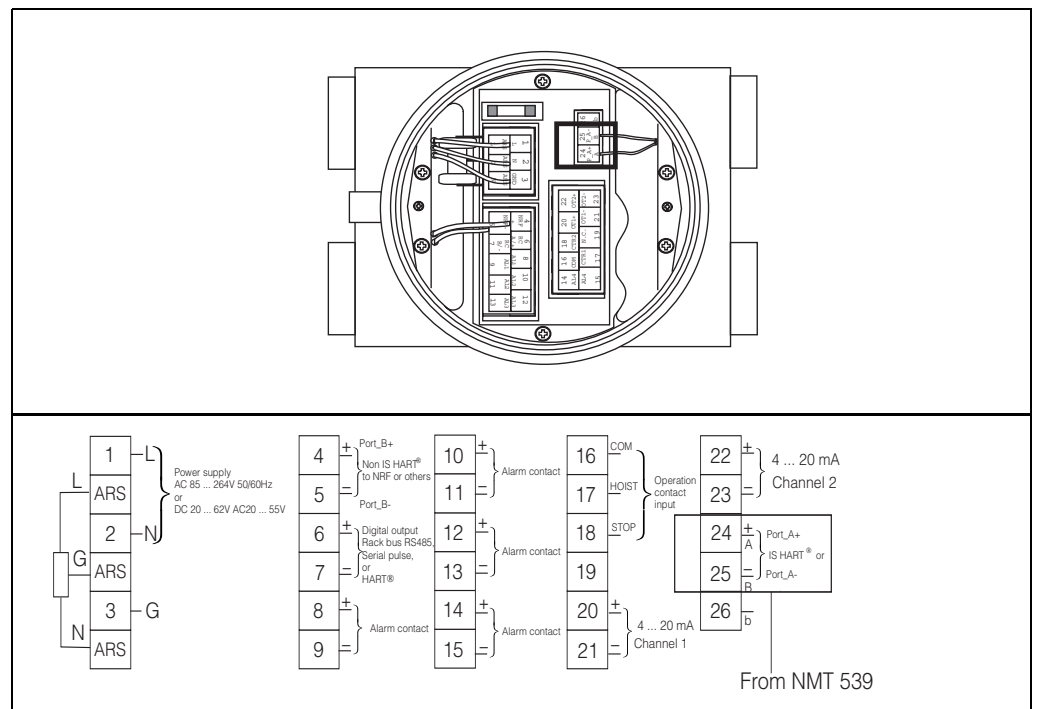
NMT 539 allows an intrinsically safe HART connection only. Please refer to the IS regulation for establishing wiring & field device layout



NMT 539 has convenient Daisy chain HART loop terminals that enable NMT 539 to be a terminal junction of HART multi-drop instruments.

NMS 53x terminal

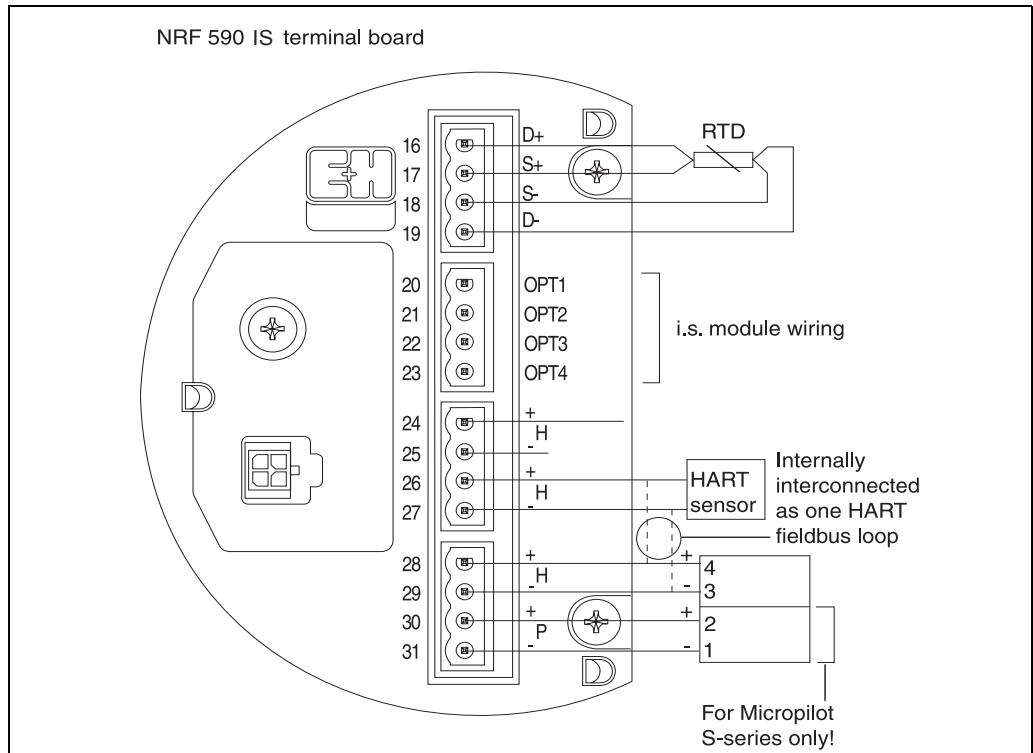
Since the Prothermo NMT 539 is an intrinsically safe instrument, the terminal connection to the Ex i side on HART connection is allowed on the NMS terminal housing.



Note!

Do not connect NMT 539 HART communication on terminal 4 & 5 on the Proservo NMS 53x. These terminals are designed to connect Ex d HART communication.

NRF 590 terminal



Note!

The Tank Side Monitor NRF 590 has three sets of IS HART terminals. These three pairs are looped internally.

Caution!

Do not connect signal HART lines from NMT 539 to terminal 30 & 31. They are designed to supply drive power of FMR 53x series only.

Certificates and approvals

CE approvals	By attaching the CE - mark, Endress+Hauser Japan confirms that the instruments pass the required tests.
Ex approvals	See order information
W & M approval	To be announced
External standards and guide lines	Based on IEC 61326, Immunity according to table A-1 EN 61000-4-5 Immunity to surge on data lines EN 61000-4-4 Immunity to burst on data lines EN 61000-4-2 Immunity to electrostatic discharge EN 61000-4-6 Immunity to conducted RF (high frequency) disturbance EN 61000-4-3 Immunity to electromagnetic field disturbance EN 61326/CISPR 16 Electromagnetic emission

Ordering Information

Prothermo NMT 539

10	Protection class				
	0	IP 65			
	7	IS class1, Div.1, Gp. CD, FM... pending			
	8	Class1, Div.1, Gp. CD (Exi), CSA... pending			
	A	Ex ia IIB T4, TIIS... pending			
	B	EEx ia IIC T2 -T6, ATEX			
	9	Special version			
	20	Measuring function			
		0	Converter only		
		1	Temperature + Converter		
2		Water Bottom + Converter			
3		Temperature + Water Bottom +Converter			
4		Temperature + Converter (PTB, NMI T&W)...pending			
5		Temperature + Water Bottom + Converter (PTB, NMI T&W)			
9		Special version			
30		Temp. measuring range			
		0	Temp. device not selected		
	1	-40 ...+100 °C (-40 ...+212 °F)			
	2	-55 ...+235 °C (-67 ...+455 °F)			
	3	-200 ...+71 °C (-328 ...+160 °F)...pending			
	4	-18 ...+80 °C (-0.4 ...+176 °F) (W&M only)			
	9	Special version			
	40	WB measuring range			
		0	WB device not selected		
		1	1m(3.3 ft)		
2		2m(6.6 ft)			
9		Special version			
50		Cable entry			
		A	G (PF) ½ x1, thread		
		B	NPT ½ x1, thread		
		C	PG16x1, thread		
		D	M20x1, thread		
	Y	Special version			
	60	Process connection			
		0	JIS 10K 50A RF, flange		
		1	ANSI 2" 150lb RF, flange		
		2	DIN DN50 PN 10RF, flange		
3		JPI 50A150lb RF, flange			
4		PF 3/4" (NPS 3/4"), universal coupling...Converter only Type 1			
5		M20, thread...Converter only Type 2			
9		Special version			
70		Number of temp. element			
		A	2...Pt100 elements		
	B	3...Pt100 elements			
	C	4...Pt100 elements			
	D	5...Pt100 elements			
	E	6...Pt100 elements			
	F	7...Pt100 elements			
	G	8...Pt100 elements			
	H	9...Pt100 elements			
	J	10..Pt100 elements			
K	11..Pt100 elements				
L	12..Pt100 elements				
M	13..Pt100 elements				
N	14..Pt100 elements				
O	15..Pt100 elements				
P	16..Pt100 elements				
Q	Element not selected				
Y	Special version				
NMT 539-				Product designation (part 1)	

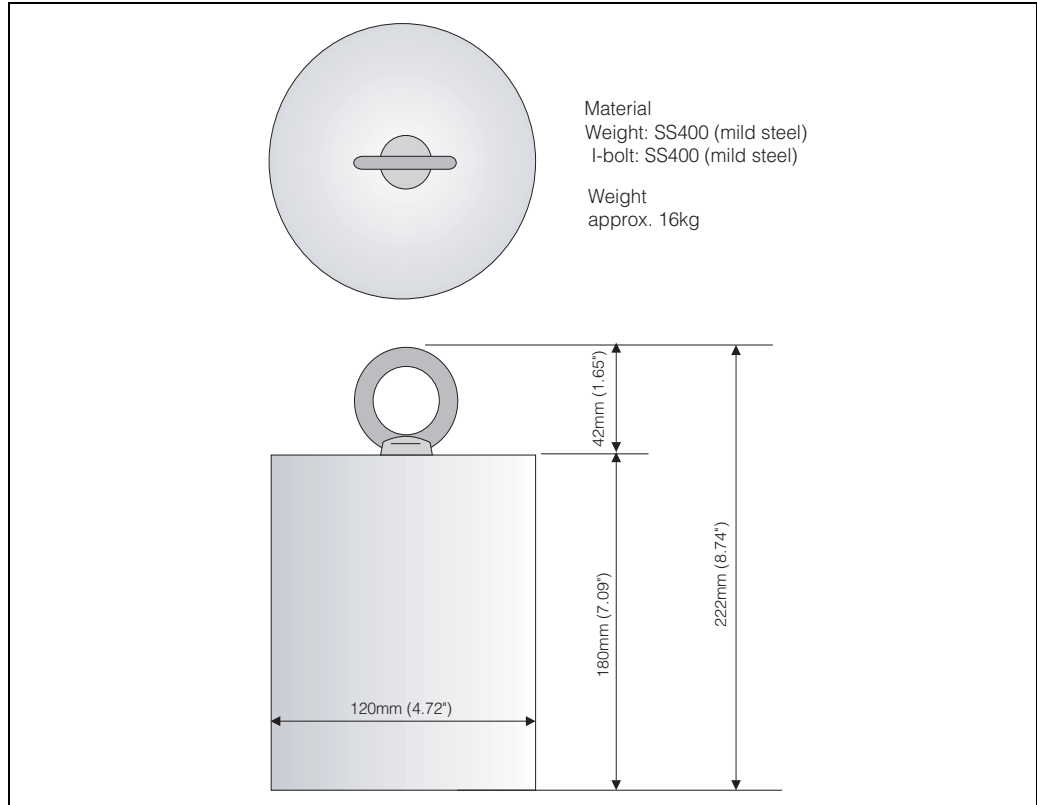
Accessories

Specific anchoring method only designed for converter & temperature probe version.

Anchor weight (Tall profile) Mounting
Attachment option: B

Caution!

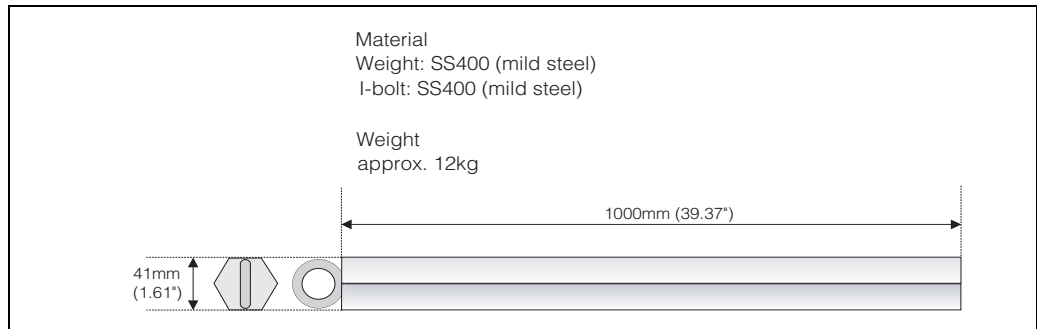
Installation of anchor weight will cause the lowest temperature measurement position to be raised approximately 400mm (16") from the tank floor.



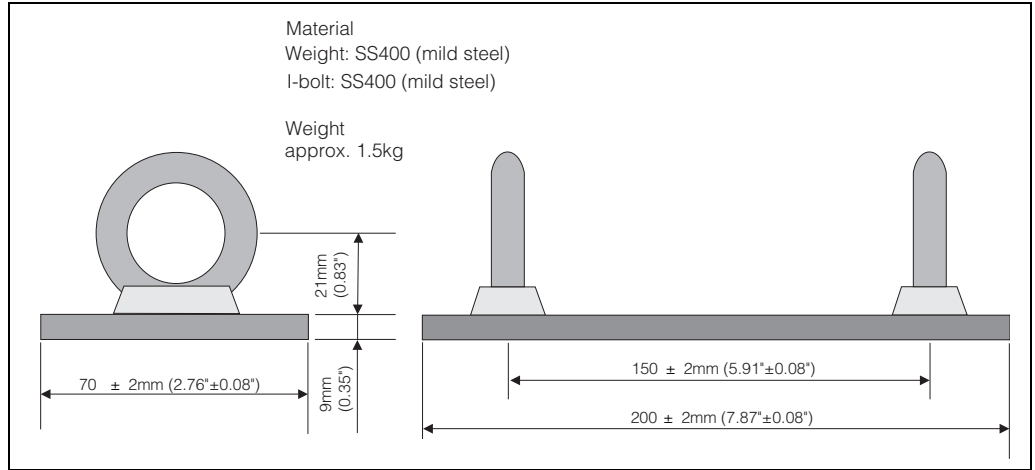
Different dimension, weight, and material anchor weight are also available. Consult your Endress + Hauser representative for further details.

Anchor weight (Low profile) Mounting
Attachment option: C

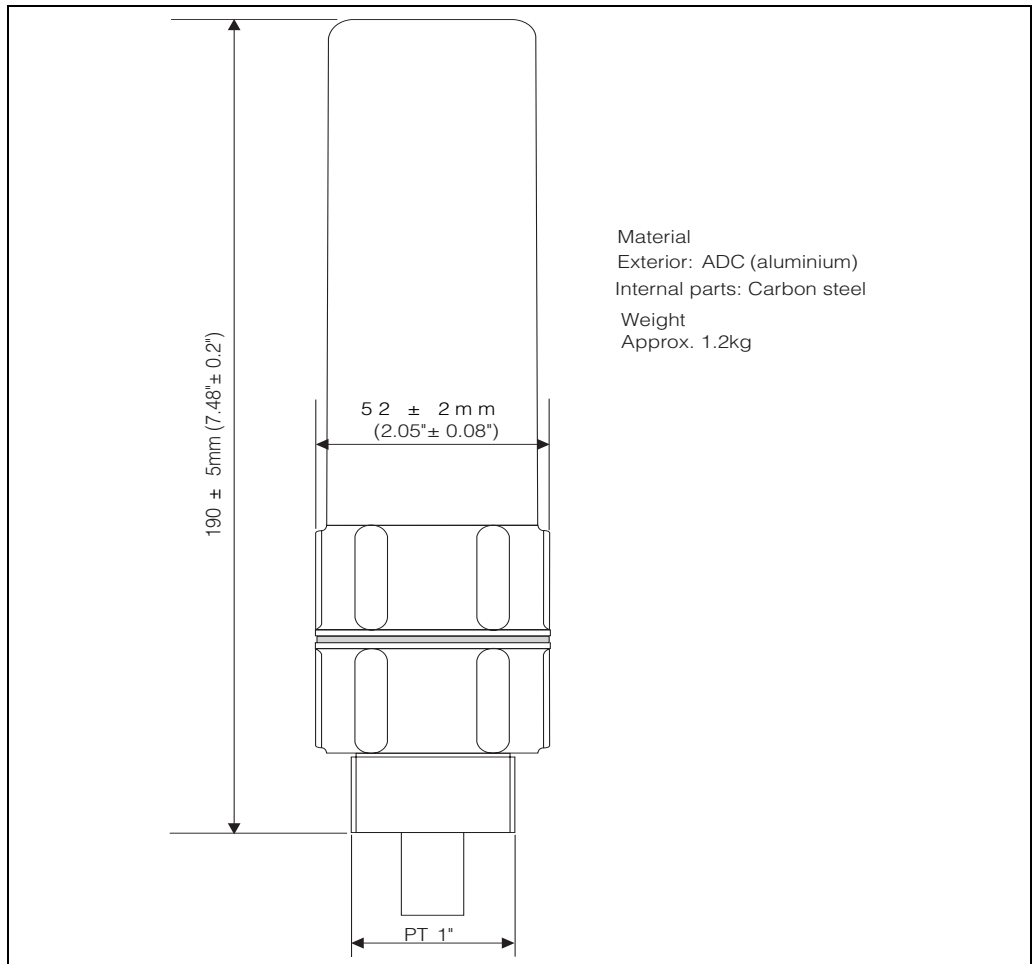
The low profile anchor weight is mainly designed to stabilize the WB sensor, securing it straight up without shortening the WB measuring range. There is also a version for an existing tank installation with a small nozzle opening for converter and temperature version.



**Wire hook, Top anchor
Mounting Attachment
option: D**



Actual tensioning can be completed with SUS316 stranded 3mm diameter tension wire between Wire hook and Top anchor. Based on the application and installation variables, type of wire & size, material, and special coatings are available. Please consult your Endress + Hauser representative for further details.



Note!

The standard process connection of the Top anchor is PT1" threaded connection. Different thread size, material, and specification are available. Flange type connection is also available.

Appendix

Stainless Steel conversion table

The stainless steel material used in products of Endress + Hauser Japan normally have expressions according to Japanese industrial standard, as JIS or TIIS. Each countries or regions may have different expressions place to place. The following conversion table contains the expression of equivalent stainless steel material based on the chemical composition and mechanical properties.

Country	Standard	Expressions			
		SUS304	SUS304L	SUS316	SUS316L
Japan	JIS / TIIS				
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

Note!

Since each standards carry own mechanical and scientific definition, some expressions may not have the straight conversion from the Japanese standard. Consult with local authority or legislature to ensure the proper comparativeness of the applied standard prior to decide specification.

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