

Number **TC9039** revision 2
Project number 3611444
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Issued by

NMi Certin B.V.

In accordance with

- WELMEC 8.8, 2017: Guide on the General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments
- OIML R85, 2008: Automatic level gauges for measuring the level of liquid in stationary storage tanks
- WELMEC 7.2, 2023: Software Guide
- API Manual of Petroleum Measurement Standards Chapter 7.3 - Temperature Determination-Fixed Automatic Tank Temperature Systems – edition 2021.

Producer

Endress+Hauser Yamanashi Co., Ltd.
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Fuefuki-shi Yamanashi
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Part

An **automatic tank thermometer (ATT)**, with liquid level sensor, intended for use as part of a tank measuring system.

Producer mark or name : Endress+Hauser Yamanashi Co., Ltd.
Type designation : NMT81

Further properties and test results are described in the annexes:

- Description TC9039 revision 2.
- Documentation folder TC9039-1.

Initially issued

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Remark

This revision replaces the previous versions, except its documentation folder.

Issuing Authority

The Designated Body, NMi Certin B.V.

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Certification Board

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1 General information on the ATT

All properties of the ATT, whether mentioned or not, shall not be in conflict with the legislation.

This Test Certificate is the positive result of the applied voluntary, modular approach, for a component of a measuring instrument, as described in WELMEC 8.8, 2017.

The complete measuring instrument must be covered by relevant metrological certification that is valid in the country where the instrument is put into use.

The NMT81 Automatic Tank Thermometer is intended to measure liquid and vapour temperature at different levels inside a storage tank and transmits these temperatures via the HART protocol to a connected to an automatic level (ALG). The ATT receive the tank level from the connected ALG to calculate an average liquid and vapour temperature. The ALG receives the calculated average temperatures and individual element temperatures. Additionally, the NMT81 can be equipped with a water bottom probe to determine the water/oil interface (water level) by itself.



Example of the ATT

1.1 Essential parts

See documentation number 9039/0-15 for assembly drawing of the ATT housing.

1.1.1 Electronics parts

The ATT can be composed of the following parts:

Part	Documentation	Remarks
Main unit	9039/0-01, 0-02, 0-03	
Display	9039/0-04, 0-05, 0-06	
Terminal	9039/0-07, 0-08, 0-09	
SEHT	9039/0-10, 0-11, 0-12	Temperature probe

Part	Documentation	Remarks
SEHW	9039/0-13, 0-14	Water bottom probe

- 1.1.2 Temperature probe
The temperature probe is used to measure the temperature inside the storage tanks at different levels. The probe consists of:
– Pt-100 elements with characteristics according to EN IEC 60751.
- 1.1.3 Water bottom probe (optional)
For determination of the water/oil interface (water level) at the bottom,
See documentation number 9039/0-15.

1.2 Essential characteristics

- 1.2.1 Liquid temperature range: -50 °C ... +120 °C
- 1.2.2 Temperature range ambient: -40 °C ... +70 °C
- 1.2.3 Measuring range water level (optional): 0 mm ... 2000 mm
- 1.2.4 Electromagnetic environment classes: E2
- 1.2.5 Power supply
The ATT is powered in the range 14 ... 35 VDC.
- 1.2.6 Indication
- Scale interval of the indication, in m or mm, shall not be greater than 1 mm.
- Indication of status messages, error messages and alarm messages.
- 1.2.7 Software specification (refer to WELMEC guide 7.2)
- Software type P.
- Risk Class C.
- Extension T, while extensions L, S and D are not applicable.

The validated software versions and checksums are:

Software versions	CRC checksum	Remarks
01.01.00	0xdc3573e3	
01.01.01	0xAC06F71F	

Software version can be viewed by the display as stated in paragraph 1.5.1.

Parameter Dip-Switch	Description, Value	Write access level
Element type	Pt100, IEC60751	Service
Temperature coeff. A, B, C, D, R0	Coefficients to describe the relationship between resistance (R) and temperature (T). Only relevant for custom element type.	Maintenance
Wire compensation	Enabled	Production
Wire compensation coeffP, coeffQ	Coefficient for wire compensation between sensor element 2 wire connection and 4-wire cable.	Production
Element (1 - 24) to end of probe	Shows the position of each element measured from the end of probe. Element 1 is the closest element to the end of probe. According to customer specifications	Service
Element temperature offset enable	Function to activate individual temperature offsets added to each element.	Maintenance
Element (1 - 24) temperature offset	-100...100	Maintenance
Filter coefficient	In general this value should not be changed from the preset value. Use this value to adjust the low pass filter of the measurement. Smaller values will reduce the filter and thus increase reaction speed of the measured value. Bigger filter values will reduce fluctuation of the measured value and will reduce reaction speed. Recommendation is to use values between 0.8 and 0.98.	Service
Filter threshold	-3.0e+38...3.0e+38	Production
Calibration coeff1 (element 1 - 24)	Result of calibration.	Production
Calibration coeff2 (element 1 - 24)	Result of calibration.	Production
Calibration coeff3 (element 1 - 24)	Result of calibration.	Production

1.2.8 Data communication

The ATT is capable of indicating several quantities. Use for Weights and Measures related purposes is allowed for the following quantities:

- Level.
- Temperature.

The following input(s) can be used for legally relevant data:

- HART superimposed on the current input.

The following output(s) can be used for legally relevant data:

- HART superimposed on the current output.

1.3 Essential shapes

1.3.1 Inscriptions

On the ATT, clearly visible, at least the following is inscribed:

- Test Certificate number **TC9039**.
- Name or trademark of the manufacturer.
- Serial number and year of manufacture.
- Identification of the measuring tank on which the connected level gauge is mounted.
- Product temperature range.
- Measurement length of the temperature probe and if applicable level sensor.

1.4 Conditional parts

1.4.1 Housing

The housing of the ATT is made of aluminium or stainless steel.

1.4.2 EMI protection measures

The following measures are taken for EMI protection:

- Shielded cables of the I/O cables.

1.5 Conditional characteristics

1.5.1 Programming

There are no settings inside the ATT that can be changed without breaking the hardware sealing. As addition, a special tool (CDI interface) and service program is required to make any changes.

The device can be locked by switching the DIP-switch as stated in documentation number 9039/0-16.

Below an overview is given of the parameters that are important from a legal point of view, with the correct setting:

Parameter	Setting	Remarks
Firmware version	See chapter 1.2.7	Shows the device firmware version installed on display at start up and available via service programs e.g. DeviceCare and FieldCare via navigation menu as followed: System → Information → Firmware version
Firmware CRC	See chapter 1.2.7	Shows the checksum of the firmware version via service programs e.g. DeviceCare and FieldCare via navigation menu as followed: System → Information → Firmware CRC. Display is optional and used indicator only, not a W&M-complaint display and software revision is shown with start-up. However, the display of the level gauge NMx8x can show all required W&M information related to the NMT81.

1.5.2 Error messages

On the indication or indications, a message is presented if the measured value is not legal and/or a technical problem occurs.

2 Seals

The following items are sealed:

- The inscriptions are fixed to the ATT and secured against removal by seal or it will be destroyed when removed.
- The housing is sealed against opening.

See below / documentation number 9039/0-17 for an example of the sealing positions.

3 Conditions for conformity assessment

- Other parties may use this Test Certificate only with the written permission of the producer.
- The seals shall be applied as described in chapter 2.
- The placement of the temperature sensors shall comply with API Manual of Petroleum Measurement Standards Chapter 7.3 edition 2021, paragraph 5.1.3.
- Characteristics of Pt 100 according to EN IEC 60751.
- The ATT is calibrated in the factory:
 - The complete ATT over its measuring range with a maximum permissible error (MPE) of $\pm 0,25$ °C.
 - The water level probe is calibrated with the water tank setup in the factory according to client specification with a maximum permissible error (MPE) of:
 - ♦ $\pm 5,0$ mm for 2000 mm probe;
 - ♦ $\pm 2,0$ mm of 1000 mm probe;
 - ♦ $\pm 1,5$ mm of 500 mm probe.

The result of this investigation is a calibration report, which states the results and of the calibrations.

4 Reports

An overview of the performed tests is given in Evaluation Report ER9039 revision 2 issued together with this Test Certificate.