

Number **TC7445** revision 13
Project number 3813931
Page 1 of 1

Issued by

NMi Certin B.V.

In accordance with

- OIML R85, 2008: Automatic level gauges for measuring the level of liquid in stationary storage tanks
- WELMEC 7.2, issue 5: Software Guide

Producer

Endress+Hauser SE+Co. KG
Hauptstrasse 1
79689 Maulburg
Germany

Part

A **calculating and indicating device**, intended for use as part of an automatic level gauge for liquid level measurements.

Manufacturer's mark or name : Endress+Hauser SE+Co. KG

Type designation : Tankvision

Further properties are described in the annexes:

- Description TC7445 revision 13;
- Documentation folder TC7445-6.

Initially issued

21 October 2008

Remarks

This revision replaces the previous revision(s), including its documentation folder.

Issuing Authority

The Designated Body, NMI Certin B.V.
6 December 2024

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1 General information about the calculating and indicating device

Properties of the calculating and indicating device, whether mentioned or not, shall not be in conflict with the legislation.

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

1.1 Essential parts

See document number 7445/4-01 for a photograph of the calculating and indicating device housing.

1.1.1 Devices

- Tank Scanner, make Endress+Hauser, type NXA820, with V1 interface
- Tank Scanner, make Endress+Hauser, type NXA820, with MODBUS interface;
- Data Concentrator, make Endress+Hauser, type NXA821.

1.1.2 Electronic parts

The devices in paragraph 1.1.1 are composed of the following parts (not all need to be present):

Part	Documentation	Remarks
CPU board, version 1	7445/4-02, -04	-
CPU board, version 2	7445/4-03, -04	-
CPU board, version 3	7445/5-01, -02, -03	-
IO board	7445/4-05, -06	-
Memory expansion board	7445/4-07, -08	-
Link board	7445/4-09, -10	-
V1 board, version 1	7445/4-11, -12	-
V1 board, version 2	7445/4-13, -14	-
RS485 board, version 1	7445/4-15, -16 7445/12-01, -02, -03	-
RS485 board, version 2	7445/4-17, -18	-
Power supply AC	7445/4-19, -20	-
Power supply DC	7445/13-01, -02, -03	

1.2 Essential characteristics

1.2.1 Temperature range ambient: -40 °C / +55 °C

1.2.2 Indication

The indication is presented in read-only mode on a personal computer screen; the data is transported from the Tankvision system to the personal computer with an Ethernet connection and using the TCP / IP protocol. The settings of the protocol parameters are such that the data on the personal computer cannot be altered.

- Indication of the measured level in m, in units of 0,001 m or 0,0001 m;
- Optional indication of the corrected level in m, in units of 0,001 m or 0,0001 m;
- Optional temperature indication, in °C;

- Optional volume at measurement conditions;
- Optional volume at reference conditions;
- Indication of status messages, error messages and alarms.

1.2.3 Conversions

Tankvision can perform conversion calculations according to the following methods:

- API Manual of Petroleum Measurements Standards, Chapter 11.1 (2004), tables 53A and 54A (Crude Oil), tables 53B and 54B (Refined Petroleum Products), tables 53D and 54D (lube oils).
- API Manual of Petroleum Measurements Standards, Chapter 11, section 2, part 4, (2007), tables 53 E, 54E, 59E and 60E.
- API Manual of Petroleum Measurements Standards, Chapter 11.1; calculation of compressibility.
- API Manual of Petroleum Measurements Standards, Chapter 11.2; calculation of compressibility.

Remark: the following tables, which are not within the scope of this Test certificate, were also confirmed to be in line with their specified reference documents:

- API Manual of Petroleum Measurements Standards, Chapter 11.1 (2004), tables 5A and 6A (Crude Oil), tables 5B and 6B (Refined Petroleum Products), tables 23A and 24A (Crude Oil), tables 23B and 24B (Refined Petroleum Products).

1.2.4 Software specification (refer to WELMEC 7.2):

- Software type P;
- Risk Class C;
- Extension T and S while extensions L and D are not applicable.

Remark: the following communication hardware fulfils the demands from WELMEC 7.2, as the protocol guarantees the demands are fulfilled.

- V1 communication
- Modbus communication

Software version	Checksum	Remarks
V01.01.00; V01.01.01; V01.02; V01.04; V01.05	Not applicable	Checksum is not presented.
V02.00	8c1468be	-
V02.01	53fd8157	-
V02.02	2360e7bb	-
V02.03 – Build 0309	ae3bcdcd	-
V02.03 – Build 0310	c3818ce8	-
V02.03.01 – Build 0328	972cb1a0	-

Software versions can be viewed as following:

1. On the local display of the NXA82x device, the user must press the "Info" button. The local display will show the order code, serial number, software version and checksum of the firmware.
2. On the web interface. The user must click on the "About" link on the upper right-hand corner. A new window will appear which will show the software version of the firmware. The software checksum of the firmware can be displayed at "System Administration" - "Global Settings" - "W&M Seal" - "W&M Information".

Before sealing the user can and will input user configured data that is protected by the seal. The software is built such that as a result of the configuration procedure different applications will have different checksums. After sealing the Tankvision module the checksum will be durably inscribed on the module on a sealed plate or sticker, in such a way that it is easily visible.

1.3 Essential shapes

1.3.1 Markings

The main nameplate is bearing at least, good legible, the following information:

- Test certificate number TC7445;
- Name or trademark of the manufacturer;
- Serial number and year of manufacture;
- An explanation of the symbols as used on the indication, or a reference to where this explanation may be found.

1.3.2 Connections

- V1;
- Modbus;
- Ethernet.

1.3.3 Checksum at the time of sealing, indicated with a time stamp.

1.3.4 W&M Approved values are indicated with "WM".

1.3.5 System clean-up and factory reset are not possible when the W&M switch is closed.

1.4 Conditional parts

1.4.1 Power supply

The calculating and indicating device is powered in the range of 90 - 250VAC (-15% / +10%) at 50/60Hz or 10,5 – 32VDC.

1.5 Conditional characteristics

1.5.1 Printing of a report using the Printer Agent; only a one-to-one print of a tank detail report is considered as being Weights & Measures approved.

1.5.2 Error messages

During error conditions on the indication is shown that the measured value is not W&M approved.

1.5.3 Programming

For detailed information see the Endress+Hauser manual BA00339G/00/EN/19.20 71505010. Remark: Prior to verification a parameters list, an explanation of the chosen settings shall be handed to the verification officer.

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

- Menu: Tank details – General details
 - Tank name
 - Tank type
 - Gauge model
 - Gauge reference height
 - Position of lowest temperature sensor (if any)
 - Temperature status when level is too low
- Menu: Tank details – Capacity details
Remark: TCT Tables can be visualized with the web browser.

Most of the information is part of the TCT XML file, i.e. Tank Calibration Table, Level type, Volume method, Units, Floating roof information, etc.
When a tank is sealed a TCT XML file cannot be downloaded.
- Menu: Tank details – Shell details:
 - Tank shell correction enabled
 - Tank shell calibration temperature (see the applying certificate)
 - Thermal expansion coefficients
 - Temperature status propagation
 - Tank shell isolation type and factor
 - Vessel radius
 - Menu: Tank details – Floating roof (if any)
- Menu: Tank details – Water content:
Parameters shall be chosen such that water content is a non-legal value.
- Menu: Tank details – Calibrated status:
Each item that can be considered as a Weights & Measures item should be checked.
At least the Tank and the Product level shall be checked. Only after checking the Weights & Measures switch the selected items are approved.
- Menu: Product – General
 - Product type
- Menu: Product – Volume correction factor (VCF):
 - Range checking: enable
 - Input rounding: disable
 - Output rounding: select no rounding
 - API / ASTM table: select appropriate table
- Menu: Product – Reference density calculation (RDC):
 - Range checking: enable
 - Input rounding: disable
 - Output rounding: select no rounding
 - Density in air or vacuum: depending on the density determination method
 - API / ASTM table: select appropriate table
- Menu: Product – Advanced (Weights & Measures):
 - Product configuration protected by W&M switch: enable
 - Manual VCF propagates to Standard Volume: disable
 - Propagation of temperature, water, density values: specified and motivated by the user

- Propagation of manual density: specified and motivated by the user
- Menu: System – Customer settings:
 - Units: correct settings
 - Leading digits, decimals, thousands separator and decimal separator: decimal separator is a comma; thousands separator is disabled
 - Date and time: correct settings
 - Printer agent: correct address
- Menu: System – Network settings
Correct settings: specified and motivated by the manufacturer and / or the user
- Menu: System – Environment settings:
One or more of these settings may or may not be a Weights & Measures parameter. Therefore the use of these parameters is specified and motivated by the manufacturer and / or the user.
- Weights & Measures parameters for the V1 settings:
 - Protocol Variant
 - Pulse Period
 - Pulse Amplitude
 - Tank Name
 - Enabled
 - Gauge Slave Address (DEC)
 - Gauge Type
 - V1 Map File

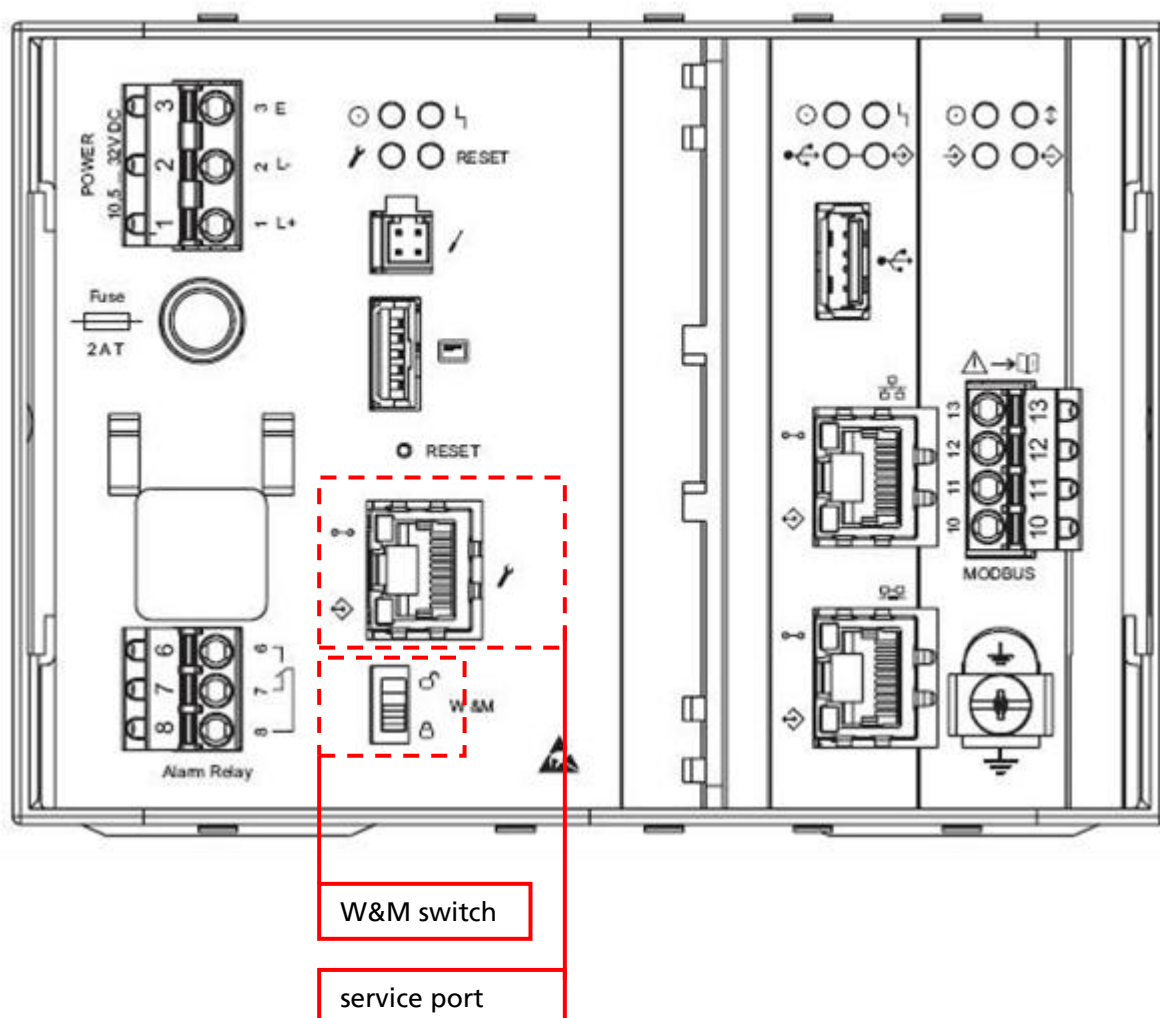
None of these parameters can be changed while the W&M switch is closed and thus the system is sealed.
- Weights & Measures parameters for the MODBUS settings:
 - Baud Rate
 - Parity
 - EIA485 Termination Resistor
 - Tank Name
 - Enabled
 - Gauge Slave Address
 - Gauge Type
 - Modbus Register Map

None of these parameters can be changed while the W&M switch is closed and thus the system is sealed.

2 Seals

The following seals are applied:

- The Weights and Measures key switch. A seal or sealing sticker has to be placed over the switch after the system is configured and sealed and switch is closed;
- The data plate is fixed to the calculating and indicating device and secured against removal by seal or it will be destroyed when removed;
- The Service port. A seal or sealing sticker has to be placed over the port.
- The housing is sealed against opening.



3 Conditions for conformity assessment

- The calculating and indicating device shall be constructed in conformity with the description and documentation folder that belong to this Test certificate;
- The seals shall be applied as described in chapter 2;
- Other parties may use this Test certificate only with the written permission of the producer.

4 Reports

An overview of the performed tests is given in Evaluation Report ER7445 revision 13 issued together with this Test Certificate