Issued by	NMi Certin B.V.
In accordance with	The "Metrologiewet" (Stb. 2006, 137) and the "Meetinstrumentenbesluit II", article 5, point a (Stb. 2009, 494)
Producer	Endress + Hauser GmbH + Co. KG Hauptstrasse 1 79689 Maulburg Germany
Part	A **calculating and indicating device, intended for use as part of a liquid level gauge**

Make	:	Endress + Hauser GmbH + Co. KG
Type	:	Tankvision
Software versions	:	See the description, paragraph 1.2.2.

Further properties and test results are described in the annexes:
- Description TC7445 revision 5;
- Documentation folder TC7445-4.

Remark	This revision replaces the previous versions, including its documentation folder.
Issuing Authority	**The Designated Body, NMi Certin B.V.** 7 October 2014

C. Oosterman
Head Certification Board

Parties concerned can lodge objection against this decision, within six weeks after the date of submission, to the general manager of NMi (see "Regulation objection and appeal against decisions of NMi")

INSPECTION
RvA I 122

1 General information about the calculating and indicating device

Properties of the measuring instrument shall not be in conflict with the legislation, in particular the "Regeling meetreservoirs, vloeistofhoogtemeters en discontinue brandstofmeters (Stcrt. 2008, 069)".

1.1 Essential parts

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

A photograph of the units is shown in the documentation folder, nr. 7445/4-01.

1.1.4 The units consist of the following parts, not all of which need to be present.

Part	Documentation number
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
RS485 board, version 2	7445/4-17, -18
Power supply board	7445/4-19, -20

1.2 Essential characteristics

1.2.1 The characteristics as described on page 1 of this test certificate.

1.2.2 Software versions
1.2.2.1 Tankvision module NXA 820: V01.01.00; V01.01.01; V01.02; V01.04; V01.05
1.2.2.2 Tankvision module NXA 821: V01.01.00; V01.01.01; V01.02; V01.04; V01.05
1.2.2.3 MODBUS interface: V01.01.00; V01.01.01; V01.02; V01.04; V01.05
1.2.2.4 V1 interface: V01.01.00; V01.01.01; V01.02; V01.04; V01.05

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 and software revision,
2 - On the web interface. the user must click on the "About" link on the upper right hand corner. A new windows will apear which will show the software revision of the firmware.

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.
Because of that, after sealing the Tankvision module the checksum will be durably inscripted

on the module on a sealed plate or sticker, in such a way that it is easily visible.

1.2.3 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 can not be altered.

1.2.3.1 indication of the measured level in m, in units of 0,001 m or 0,0001 m;
1.2.3.2 optional indication of the corrected level in m, in units or 0,001 m of 0,0001 m;
1.2.3.3 optional temperature indication, in °C;
1.2.3.4 optional volume at measurement conditions;
1.2.3.5 optional volume at reference conditions;
1.2.3.6 indication of status messages, error messages and alarms.

1.2.4 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).

1.2.5 Software properties
1.2.5.1 The main hardware fulfills the demands from the Welmec guide 7.2 (issue 3), as specified in the chapters P, T and S.
1.2.5.2 The V1 communication hardware fulfills the demands from the Welmec guide 7.2 (issue 3), as specified in the chapters P, T and S; the protocol guarantees that the demands are fulfilled.
1.2.5.3 The Modbus communication hardware fulfills the demands from the Welmec guide 7.2 (issue 3), as specified in the chapters P, T and S; the protocol guarantees that the demands are fulfilled.
1.2.6 Protection of W&M parameters against unauthorized changes.

1.3 **Essential shapes**

1.3.1 V1 connection.
1.3.2 MODBUS connection.
1.3.3 Ethernet connection.
1.3.4 Sealing of the Weights & Measures switch (see chapter 3).

The Weights & Measures switch is situated underneath the indication, and is sealed by sealing the enclosure against unauthorized opening, with a seal.
When the Weights & Measures switch is set to "W&M sealed" W&M parameters cannot be changed.

1.3.5   Inscriptions on the nameplate.
1.3.5.1 Manufacturer's name or logo.
1.3.5.2 The number of this Test certificate TC7445.
1.3.5.3 An explanation of the symbols as used on the indication, or a reference to where this explanation may be found.

1.3.6   Checksum at the time of sealing is now indicated with time stamp.
1.3.7   W&M Approved values are indicated with "WM".
1.3.8   System clean-up and factory reset are not possible when the W&M switch is closed.

1.4   **Conditional characteristics**

1.4.1   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

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

1.4.3   Parameters

For detailed information see the Endress+Hauser manual BA339F/00/en/ - 71030718.
Remark: Prior to verification a parameters list, an explanation of the chosen settings shall be handed to the verification officer.

For each tank the following parameters shall be sealed:
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.

The following parameters shall be sealed:
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.

500

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.

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.

2 Conditions for approval

2.1 The calculating and indicating device shall be constructed in conformity with the description and documentation folder that belong to this Test certificate.

2.2 The seals shall be applied as described in chapter 3.

2.3 Other parties may use this Evaluation Certificate only with the written permission of Endress+Hauser.

3 Seals

3.1 Sealing of the Weights & Measures switch.

A seal or sealing sticker has to be place over the switch after system is configured and sealed and switch is closed.

3.2   Sealing of the service port, just above the Weights & Measures switch.

A seal or sealing sticker has to be place over the service port.

W&M switch

service port
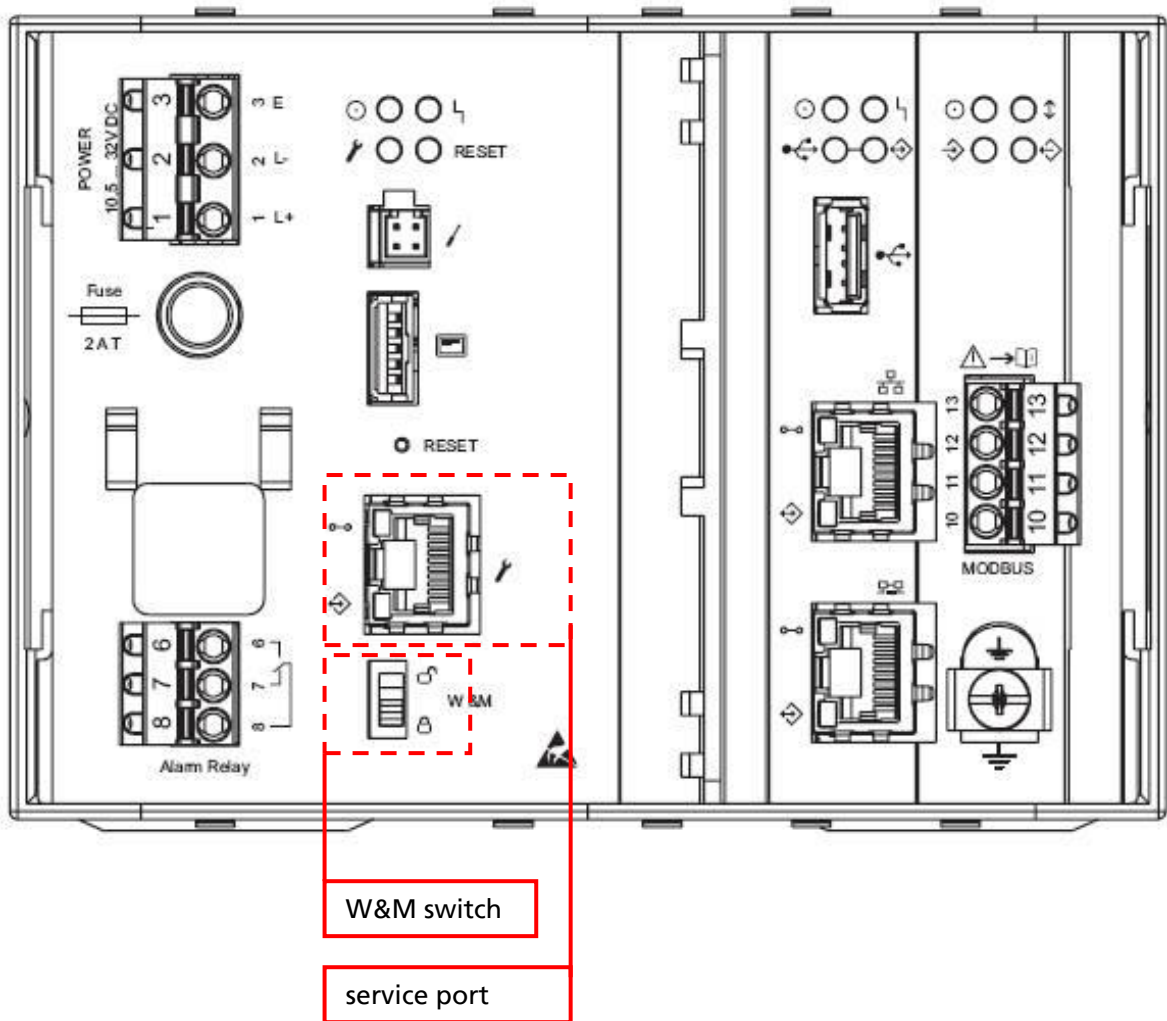
4   Test reports

An overview of the performed tests given in the test reports and test result files:

- CPC-800739-1;
- CPC-800739-2.