Issued by	NMi Certin B.V.
In accordance with	- WELMEC 8.8, 2017 "General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments under the MID". - OIML R117-1 Edition 2019 (E) "Dynamic measuring systems for liquids other than water".
Producer	Newflow Ltd. George House Derwent Road YO17 6YB Malton, North Yorkshire United Kingdom
Part	An **electronic calculating device** intended to be used as a part of a dynamic measuring system for liquids other than water.

Producer's mark or name	:	Newflow Ltd.
Type designation	:	NÅNO or NÅNO flow Computer
Accuracy class	:	0,3

Further properties and test results are described in the annexes:
– Description TC11943 revision 1;
– Documentation folder TC11943-1.

Remarks	– This revision replaces the previous revision; – The documentation folder is not changed.

Issuing Authority	**NMi Certin B.V., Notified Body number 0122** 19 July 2021 Certification Board

1   General information on the electronic calculating device

Properties of the electronic calculating device, whether mentioned or not, shall not conflict with the legislation.

This Evaluation 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.

Example of the electronic calculating device   P578 Energy Store

1.1   Essential parts

The electronic calculating device can be composed of the following parts:

Description	Documentation	Remarks
Printed Circuit Boards		
P513 Main board with Power supply	11943/0-01; 02; 03	-
P514 CPU board	11943/0-04; 05; 06	-
P511 Analog board	11943/0-07; 08; 09	-
P578 Energy Store	11943/0-10; 11; 12	-

1.2 Essential characteristics

1.2.1 Temperature range ambient
- -25 °C / +55 °C, Non-condensing Humidity

1.2.2 Environment classes
- M1 / E2 / H1

1.2.3 Power supply
The electronic calculating device is powered in the range 24 – 32 DC.
The device needs to be powered using the P578 Energy Store.
If the P578 Energy Store is not used to power the NÅNO flow computer, a redundant or backup power supply should be used.

1.2.4 Software specification (refer to WELMEC 7.2)
- Software type P;
- Risk Class C;
- Extension S, L, D, T and I-5 are applicable.

The software is composed of calculation blocks, see documentation no. 11943/0-14 for a schematic overview of the calculation blocks. The approved modules are as follows:

Software versions	CRC Checksum	Remarks
Totaliser	281ee714633b1e8d5d6623bb61936774	Totaliser block takes the calculated increments from the Liquid Flow Handler block and integrates these into check-summed totals and remainders, maintaining very high resolution over a wide number range.
Liquid Flow Handler	ecd270d90c5863c3e1c7589fc72d8ba8	Liquid Flow Handler generates the high-resolution increments once corrections are applied to the pulse input stream. The block also calculate instantaneous corrected flow rate values for indication purposes.
KF Linearisation	31802dcd1dc23e23af6345effcbbdde1	Multi point K-factor linearisation code block, that performs straight line interpolation between the points with clamped start and end values

Software versions	CRC Checksum	Remarks
API_Ch11-1_2012	d22d623940f6cd3d386a3f97f304310a	**API Ch11.1 (2012)** incorporating **API Ch11.2.5** Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils
API_Ch11-2-5_2007	b93fe392eacc567d368bfbea9aab40fe	**API Ch11.2.5, GPA TP-15 (2007)** Simplified Vapor Pressure Correlation for Commercial NGLs
API_Ch11-2-4_2019	ed8159c9433b793c16fc1a40b5372ef0	**API Ch11.2.4, GPA 8217 (2019) (**formally **TP-27)** incorporating **API Ch11.2.2M** Temperature Correction for the Volume of NGL and LPG Tables, 53E, 54E, 59E and 60E Pressure correction provided by API Ch11.2.2M
API_Ch11-2-2M_2017	39d2ff37492343e213c2cccf40d82a65	**API Ch11.2.2M (R2017)** Compressibility Factors for Hydrocarbons: 350-637 Kilograms per Cubic Meter Density (15°C) and -46°C to 60°C Metering Temperature
OIML_R022	00794f1ee95633a66005927cb10ee9dd	**OIML R022** International Alcoholometric Tables including the Bettin Spiewick ITS90 calculation

The validity of the program and the parameters are continuously checked. If these checks fail, an alarm is generated.
The metrological software is identified by the software version and/or checksum, which can be checked on the "System information page" of the build-in webserver.

1.2.5   Legal software functions
The Weights and Measures part of the program that contains the test routines for memory, transmissions and calculation.
Other functions are for optional valve management, monitoring the nozzle-switches, managing and protection of the pump motors, monitoring and protection of the volume / mass impulses / data, registering of volume(s), check on communication between calculator and hydraulic controller, calibration procedure and setting of prices per unit.

1.2.6   Data communication
The following inputs of the electronic calculating device can be used for legally relevant data:
- 2 frequency input (maximum frequency is 10 kHz, configurable as dual pulse input with 90° phase shift);
- 2 temperature inputs (4 wire RTD);
- 6 analog inputs, configurable for:
  - 4…20 mA analog current input;
  - 1…5 V analog voltage input.

  The analog inputs can be configured for the input of density, pressure or temperature.
- Ethernet;
- Modbus RS232, RS422 or RS485 serial communication.

The following outputs can be used for legally relevant data:
- Ethernet;
- Modbus RS232, RS422 or RS485 serial communication.

The following outputs are present on electronic calculating device but **cannot** be used for legally relevant data:
- Period signal for density input;
- 2 Analog outputs (4…20 mA);
- 9 digital inputs;
- 6 digital outputs;
- 1 Alarm Relay;
- 2 pulse outputs;
- 1 bi-directional pulse bus;
- USB port;
- SD card port.

1.2.7   Density input
Density can be entered in the electronic calculating device through the approved legally relevant inputs mentioned in chapter 1.2.6.
When the analog signal is used for density input, the density input range can be scaled for a maximum span of 2000 kg/m^3 over the 4…20 mA or 1…5 V range.
When the density input is used for legally relevant conversion calculations, the density input should be through a density meter covered by an Evaluation / Parts Certificate.

1.2.8   Temperature input
Temperature can be entered in the electronic calculating device through the approved legally relevant inputs mentioned in chapter 1.2.6.
When the analog signal is used for temperature input, the temperature input range can be scaled for a maximum span of 600 °C over the 4…20 mA or 1…5 V range.
When the temperature input is used for legally relevant conversion calculations, the temperature input should be through a temperature transmitter covered by an Evaluation / Parts Certificate.
This requirement is not applicable if the temperature input for the legally relevant conversion is through a 4 wire RTD.

1.2.9 Pressure input

Pressure can be entered in the electronic calculating device through the approved legally relevant inputs mentioned in chapter 1.2.6.

When the pressure input is used for legally relevant conversion calculations, the pressure input should be through a pressure transmitter covered by an Evaluation / Parts Certificate.

1.2.10 Conversions

The electronic calculating device can perform conversion calculations according to the following standards:

- API Manual of Petroleum Measurements Standards, Chapter 11, Physical Properties Data, Section 1 (also known as ASTM D1250-07) at reference conditions (0 kPa, 15 °C)
  - tables 53A and/or 54A (crude oil);
  - tables 53B and/or 54B (refined petroleum products);
  - table 54C (Special products);
  - tables 53D and/or 54D (lube oils).
- API Manual of Petroleum Measurements Standards, Chapter 11, Physical Properties Data, Section 1 (also known as ASTM D1250-07) at reference conditions (0 kPa, 20 °C)
  - tables 59A and/or 60A (crude oil);
  - tables 59B and/or 60B (refined petroleum products);
  - table 60C (Special products);
  - tables 59D and/or 60D (lube oils).
- API Manual of Petroleum Measurements Standards, Chapter 11, Physical Properties Data, Section 2 Part 4 (also known as ASTM/GPA TP-27)
  - tables 53E and/or 54E (NGL and LPG);
- API Manual of Petroleum Measurements Standards, Chapter 11.2.2M (pressure correction).
- GPA TP-15:2003 (Calculation of Vapour Pressure for NGL).
- OIML R22 International Alcoholometric tables (Alcohol concentration density calculations).

1.3 Essential shapes

1.3.1 Inscriptions

On the electronic calculating device, clearly visible, at least the following is inscribed:

- Evaluation Certificate number TC11943;
- Name or trade mark of the producer;
- Type designation;
- Serial number and year of manufacture.

See below for an example of the markings:

NMi Certificate:	TC11943
Producer:	Newflow Ltd
Type:	NÅNO Flow Computer
YOM:	2021

S/N	

Example of markings

1.4 Conditional parts

1.4.1 Housing
The housing of the electronic calculating device is made of plastic with a stainless-steel lid. The electronic calculating device can be installed in any cabinet or protective enclosure.

1.4.2 Display
The electronic calculating device has no display therefore an external display must be used for indications. All displays screens are web browser based. The basic browser display indicates a single meter. The system can be configured for indication of multiple meters.

1.4.3 EMC measures
The following measure prevent significant EMC influence on the electronic calculating device:
- The length of the RS232 cable is should not exceed to 10 meters;
- The ethernet, RS232 and RS422 cables are shielded cables;
- The device must be protected from ESD contact discharge. This can be achieved by a protective cover or clearly visible indication of ESD sensitivity fixed on the device.

1.5 Conditional characteristics

1.5.1 Programming
The legal metrological changes can be done via the ethernet interface. For putting the device in the secure mode "read-only", the W&M switch on the CPU board shall be enabled.

1.5.2 Parameter settings
The below mentioned parameters shall be set to the belonging values and in the secure mode "read only".
The parameters are fixed in the application blocks by the manufacturer per site configuration.

2 Seals

The following seals are applied:
- The inscriptions are fixed to the electronic calculating device and secured against removal by seal or it will be destroyed when removed.
- The top cover of the electronic calculating device is secured against opening by seal.

See documentation no. 11943/0-13 for an example of the sealing positions.

3 Conditions for conformity assessment

- Other parties may use this Evaluation Certificate only with the written permission of the producer.

4 Reports

An overview of performed tests is given in the reports:
- No. NMi-2502312-01;
- No. NMi-2502312-02;
- No. NMi-2607496-01.

A report can be a test report, an evaluation report, a type evaluation report and/or a pattern evaluation report.