Evaluation Certificate

Number **TC13100** revision 0
Project number 3975025

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 - WELMEC 7.2, 2023: Software Guide - OIML R 140, 2007: Measuring systems for gaseous fuel
Producer	Endress+Hauser SICK GmbH+Co. KG Bergener Ring 27 01458 Ottendorf-Okrilla Germany
Part	A model of a **gas chromatograph (GC)**, intended to be used as a part of a measuring system for gaseous fuel

Type	:	ENERSIC600 C6+ ENERSIC600 C6+H2 ENERSIC600 C6+H2-READY
Producer's mark or name	:	Endress+Hauser
Destined for the measurement of	:	calorific value and composition of natural gases
Accuracy class	:	A
Environment classes	:	M2 / E2
Temperature range gas	:	-25 °C / +55 °C
Temperature range ambient	:	-25 °C / +55 °C
Destined for	:	Non-condensing humidity

The intended location for the instrument is closed.

Further properties and test results are described in the annexes:
– Description TC13100 revision 0;
– Documentation folder TC13100-1.

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Issuing Authority

NMi Certin B.V.
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Certification Board

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PRODUCTS RvA C 681

1 General information of the gas chromatograph

All properties of the instrument, whether mentioned or not, shall not be in 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 GC

The measuring principle of the GC is described in documentation number 13100/0-01.

1.1 Essential parts

Description	Documents	Remarks
Construction	13100/0-04	Exploded view
Cartridge	13100/0-05	
Host internal	13100/0-06	
Signal and supply line, with receptacle or cable gland	13100/0-07	
Junction box	13100/0-08	
Main printed circuit board - 51004304 - 51004306	 13100/0-16, 13100/0-17 13100/0-18, 13100/0-19	Assembly and parts list
Pressure control printed circuit board - 51027401	 13100/0-20, 13100/0-21	
Stream valve printed circuit board - 51027600	 13100/0-22, 13100/0-23	

1.2 Essential characteristics

1.2.1 Working range

Natural gas, with a calorific value from 25,9 to 49,2 MJ/m^3 at a base pressure of 1,01325 bar, base temperature of 15 °C and combustion temperature of 15 °C, with the following ranges for the different components:

Component	Range ENERSIC600 C6+ [mol%]	Range ENERSIC600 C6+H2 [mol%]
Methane	60 - 100	60 - 100
Ethane	0,1 - 15	0,1 - 15
Propane	0,1 - 7	0,1 - 7
i-Butane	0,01 - 1,5	0,01 - 1,5
n-Butane	0,01 - 1,5	0,01 - 1,5
neo-Pentane	0,01 - 0,1	0,01 - 0,1
i-Pentane	0,01 - 0,5	0,01 - 0,5
n-Pentane	0,01 - 0,5	0,01 - 0,5
Hexane+	0,01 - 0,35	0,01 - 0,35
Carbon dioxide	0,1 - 12	0,1 - 12
Nitrogen	0,1 - 20	0,1 - 20
Hydrogen		0,1 - 20
Oxygen		0,1 - 3

ENERSIC600 C6+H2-READY is sent with the same host as the ENERSIC600 C6+H2, with the possibility to use 3 GC units. It is sent with a cartridge containing only 2 GC units such that it can only measure C6+. Optionally, it is possible to install a separate cartridge containing 3 GC units to be able to measure C6+ and C6+H2 and fit that on the same host.

1.2.2 Calculations

The calculation of the heating value is performed according to ISO 6976:2016.

The following base conditions can be used:

- Base pressure of 1,01325 bar
- Base temperature of 0, 15 or 20 °C
- Combustion temperature of 0, 15, 20 or 25 °C

The calorific value is displayed in MJ/m^3 or kWh/m^3.

1.2.3 Calibration
The GC can be programmed to be calibrated manually or automatically at variable interval times with a calibration gas. The maximum allowed interval is 1 day. The calibration procedure is described document no. 13100/0-11.

1.2.4 Conditioning
The ENERSIC600 C6+H2 has a conditioning method for cleaning the molecular sieve column. This procedure is described in document no. 13100/0-11.

1.2.5 Accountable alarms
Accountable alarms will be generated if extreme values are measured by the GC or if otherwise a defect arises. See document no. 13100/0-12 and 13100/0-13 for all alarm conditions.

An accountable alarm will be generated if

- A gas pressure or flow rate is outside the programmed limits
- The oven temperature is outside the programmed limits
- One or more peaks of the chromatogram are above the programmed limits
- The analyzing times exceed the recommended times
- During a calibration one of more response factor deviation limits, as programmed, are exceeded
- The energy is outside the programmed limits
- One or more of the analyzed components are outside the programmed limits
- The unnormalized total is outside the programmed limits
- A hardware defect arises

In case of an alarm, the device will show an alarm indication using the LED indication, see document no. 13100/0-14. Depending on the alarm the results will be either presented with an alarm code or will not be processed at all. Also an alarm code will appear on the Modbus registers which will cause an accountable alarm on the EVCD('s) connected with the GC.

1.2.5. Software specification (refer to WELMEC 7.2):

- Software type U;
- Risk Class C;
- Extensions O and T, while extensions L, D and S are not applicable.

Software versions	Checksum	Remarks
1.0.0.3520	728D B1D3 4761 2C71 617C E47D C4D5 17F0 0F41 A8B8 0917 7E90 4EF3 EA0A E974 451F B840 3206 603E FAF7 2F9A 4B21 B530 78C5 8501 3719 CF76 AF43 7E7C F379 D35D 15DC	Firmware FPGA OS kernel OS config
1.0.0.3545	14FB DB33 AB7A EFE6 DF3C FC49 9BA6 0819 BF9E B965 759A 429E 9107 7EAE F44C 065F B840 3206 603E FAF7 2F9A 4B21 B530 78C5 A998 FBB1 652B 341B 11A7 BA28 CA94 7B94	Firmware FPGA OS kernel OS config
1.0.0.3605	FB50 B75A 7106 CA06 943B 4C17 FFF8 195F BF9E B965 759A 429E 9107 7EAE F44C 065F B840 3206 603E FAF7 2F9A 4B21 B530 78C5 A998 FBB1 652B 341B 11A7 BA28 CA94 7B94	Firmware FPGA OS kernel OS config

The software version and checksums can be presented via serial communication at modbus input registers 30044-30077.

1.3 Essential shapes

1.3.1 The name plate on the GC contains at least, clearly legible, the following:

- Producers identification mark, trademark or name
- Parts Certificate number TC13100;
- Type designation;
- Year of manufacture;
- Serial number;
- Ambient temperature range.

An example of the markings is shown in documentation no. 13100/0-09.

1.3.2 Sealing: see chapter 2.

1.4 Conditional parts

1.4.1 Housing
The housing of the GC has sufficient tensile strength. Metrological important parts only are accessible after breaking one or more seals. See drawing no. 13100/0-02 and 13100/0-03 for examples of the housing.

1.4.2 Power supply
The GC needs an external DC power supply: 20 .. 28 V DC.
A non-interruptible power supply must be used.

1.4.3 Carrier gas
The carrier gas for the ENERSIC600 C6+ is Helium with as a minimum 5.0 quality (99,999% purity), with a pressure of 450 ± 50 kPa.
The carrier gases for the ENERSIC600 C6+H2 is Helium and Argon with as a minimum 5.0 quality (99,999% purity), with pressures of 450 ± 50 kPa.

1.4.4 Calibration gas
The applied calibration gas used for recalibration must be traceable to (inter-)national standards and shall have an appropriate uncertainty.
The temperature of the calibration gas must be kept above the minimum storage temperature as mentioned in the Certificate. See document no. 13100/0-11 for the requirements to the calibration gas.

1.4.5 Multi stream measurement
The GC is equipped with a stream selection block where up to four measuring streams can be connected. The stream selection block can automatically switch between streams. Mixing of different process gas streams is prevented by flushing.

1.4.6 Data communication
The GC is equipped with a port for data communication. Use of the data communication may not influence the working of the GC. In the normal situation the essential parameters needed for the legal working of the GC cannot be changed via the data communication.

The following communication output(s) can be used for legally relevant data:
- Modbus RS232
- Modbus RS485
- Ethernet

1.4.7 EMI protection measures
The following measures are taken for EMI protection:
- The signal and supply line is shielded.
- The external ground connection of the GC is directly connected to the ground connection of the junction box. The junction box is connected to protective earth.

1.5 Conditional characteristics

1.4.8 Programming
The parameters which are essential for the legal functioning of the GC can be changed only when Lock mode is disabled. See document no. 13100/0-15.

2 Seals

The following items are sealed:
- the essential components inside the housing of the GC
- the nameplate with the markings

See document no. 13100/0-10 for an example of the sealing.

3 Conditions for conformity assessment

Each gas chromatograph produced is provided with an accompanying document with information about its characteristics.

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

Before taken into use the GC shall be calibrated on the products it is going to measure or on products with similar properties (calorific value and composition) at operating temperature. This calibration should cover the entire calorific value and gas composition range of the measuring system in which the GC is used.

4 Reports

An overview of the performed tests is given in Evaluation Report ER13100 revision 0 issued together with this Evaluation Certificate.