Evaluation Certificate

Number **TC12890** revision 1
Project number 3939292

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 R117, 2019: Dynamic measuring systems for liquids other than water

Producer:
Endress+Hauser SICK GmbH+Co.KG
Bergener Ring 27
01458 Ottendorf-Okrilla
Germany

Part: A **measuring device** (ultrasonic flow meter) intended to be used as part of an interruptible or non- interruptible dynamic measuring system for liquids other than water.

Producer's mark or name	:	Endress+Hauser
Type designation	:	FLOWSIC900 F9**L**-XXX**Y** [1]
Accuracy class	:	0,3; 0;5; 1,0; 1,5
Destined for the measurement of	:	Liquified Natural Gas (LNG); Liquid petroleum and related products, liquids food, chemical products and any other liquids other than water in liquid state with maximum kinematic viscosity of 2 cSt.

Further properties and test results are described in:
- Description TC12890 revision 1.
- Documentation folder TC12890-2.

Initially issued: 6 December 2024

Remark:
- This revision replaces the earlier version(s), including its documentation folder.
- The measuring device is approved for measuring volume.

[1] Where Y = D for 8-path and C for 4-path meter.
L = Large scale flow meter type.

Issuing Authority: **NMi Certin B.V.**
28 April 2025

Certification Board

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Description

1 General information about the measuring device

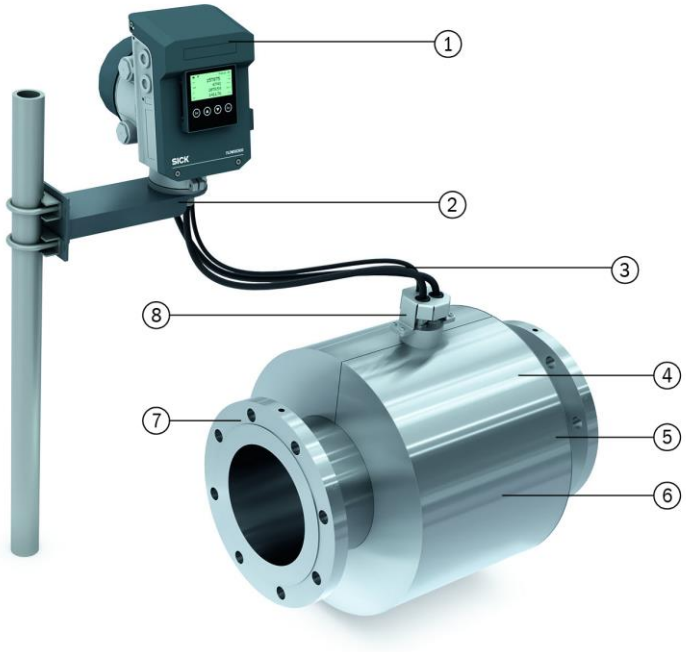
All properties of the measuring device, whether mentioned or not, shall not be in conflict with the legislation.

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.

The FLOWSIC900 F9**L**-XXX**Y** is an ultrasonic flow meter for measuring the volume of liquified natural gas (LNG) and low viscosity oil. It is based on the measurement of the runtimes of ultrasonic pulses along several measuring paths. The meter consists of the following assemblies:

- One meter body with a straight pipe section with 4 or 8 ultrasonic measuring paths.
- Two ultrasonic transducers per measuring path, where the two transducers both serve as transmitters and receivers,
- The signal processing unit (SPU) separated from the meter body with the measurement electronics for excitation and processing of the transducer signals, the interface electronic and the display.



1 SPU (Signal Processing Unit)
2 SPU holder
3 Connection cable (for ultrasonic transducers and temperature sensor)
4 Thermal factory pre-insulation (ultrasonic transducers under the insulation)
5 Jacketing
6 Meter body
7 Meter body flange (flange)
8 Meter body neck (neck)

Example of the measuring device

1.1 Essential parts

The measuring device can be composed of the following parts:

Description	Documentation	Remarks
Measurement Sensor		
Meter Body	12890/0-02	The meter body consists of: - the cylindrical spool piece, with 8 distinct path locations in X- configuration with 4 transducers in one plane and 4 in the other plane. - For a 4-path meter, transducers in only one plane (A-A) are available.
Transducer Type: large scale 1,5 MHz	12890/0-03	Technical drawing
	12890/0-04	Technical specifications
Signal Processing Unit (SPU) (Transmitter)		
HMI Board EK-CID1-HMI1	12890/0-06; 12890/0-07	• Display controller • Control of LCD • Evaluation of Touch events • Connection to system controller
Terminal Board Sensor FPE1-TB_S Board	12890/0-08; 12890/0-09	• Terminals for internal sensors • Ultrasonic • Temperature • ADC for temperature sensor (PT1000)
Sideboard FPE1-SB board	12890/0-10; 12890/0-11	• Connection board
Terminal Board Ex D FPE1-TB_D Board	12890/0-12; 12890/0-13	• Customer terminals • Real time clock + backup battery
Digital board FPE1-DIGI Board	12890/0-14; 12890/0-15	• Measuring processor • Conversion and processing measured values ADC for receive signals (ultrasonic) • DAC for transmit signal (ultrasonic) • System processor • Data processing customer interface • Data conversion of internal temperature sensor • Display control • Memory – parameter • Power supply

Description	Documentation	Remarks
Analogboard FPE1-ANAB Board	12890/0-16; 12890/0-17	• Analog frontend end for ultrasonic transducer • Amplification of transmit signal • Amplification of receive signal • Control of ultrasonic channels
LCD Display	-	Make: LCD Mikroelektronik GmbH Part number: 2132170
Power supply unit	12890/0-18	Make: Phoenix Contact Type: STEP-CAP/24VDC/2/0.4KJ Part Number: 1519633
	12890/0-19	Make: FEAS Type: SSESSE24-M Part Number: 622406

The placement of electronic boards in the Signal Processing Unit (SPU) is shown in documentation number 12890/0-05.

1.2 Essential characteristics

1.2.1 Measuring range
The measuring device has the following characteristics:

Meter size		Q_{min}	Q_{max}	Minimum measured quantity	Minimum Reynolds Number
[DN]	[Inch]	[m³/h]	[m³/h]	[m³]	[-]
200	8	60	1500	2	50000
250	10	90	2300	2	50000
300	12	130	3300	5	50000
350	14	160	4100	5	50000

1.2.3 Product range (density and/or viscosity)
- Liquified Natural Gas (LNG);
- Liquid petroleum and related products, liquids food, chemical products any other Liquids other than water in liquid state with maximum kinematic viscosity of 2 cSt.

1.2.4 Maximum operating pressure
- 20 bar(g)

1.2.5 Temperature range liquid
- -200 °C / 60 °C

1.2.6 Temperature range ambient
- -40 °C / +55 °C for pulse output and Modbus as the metrologically relevant output signal.
- -25 °C / +55 °C for local display on the SPU as the metrologically relevant display.

1.2.7 Environment classes
- M3 / E2
- Humidity class H3: condensing, open location.

1.2.8 Power supply
The measuring device is powered in the range 23 to 29 VDC.
The measuring device should always be powered using a power supply unit as mentioned in chapter 1.1.

1.2.9 Software specification (refer to WELMEC 7.2)
- Software type P.
- Risk Class C.
- Extension T and S, while extensions O, L and D are not applicable.

The validated software versions and checksums are:

Software versions	CRC Checksum	Remarks
1.1.0	EFC304FA	…

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 checksum, which can be displayed:
- by the electronic calculating/indicating device connected to the measuring device, or
- via the serial communication line and a computer temporarily connected to the measuring device.

1.2.10 Temperature correction
In the flow transmitter a temperature correction is applied depending on the connected sensor type.
Temperature correction for the sensor behaviour due to process temperature variations takes automatically place by default, based on the integral temperature sensor and the configured temperature coefficients in the electronics.

1.2.11 Data communication
The measuring device is capable of indicating several quantities. Use for legally relevant purposes is allowed for the following quantities:
- Volume at flowing conditions.

The following outputs can be used for legally relevant data:
- Display;
- Frequency output (maximum frequency is 10 kHz);
- Modbus RS485 serial communication.

1.3 Essential shapes

Inscriptions
On the measuring device, clearly visible, at least the following is inscribed:
- Evaluation Certificate number TC12890.
- Name or trade mark of the producer.
- Type designation.
- Serial number and year of manufacture.

See documentation number 12890/1-01 for an example of the markings.

This measuring device was previously placed on the market under the name “Sick Engineering GmbH”.

The markings must be clearly visible without removing any covers.

1.3.1 Indication
The meter is equipped with an electronic display.
The indicating device is separate and connected to the flow meter by cable (remote version).

1.3.2 Construction
The measuring device has the following characteristics:
8 path configuration:
- Number of sound paths: 8 (4 + 4, X- Configuration)
- Sound frequency: 1,5 MHz;
- Path angle: 52,5° ± 10°

4 path configuration:
- Number of sound paths: 4
- Sound frequency: 1,5 MHz;
- Path angle: 52,5° ± 10°

Refer documentation 12890/0-03 and 12890/0-04 for further details.

1.4 Conditional parts

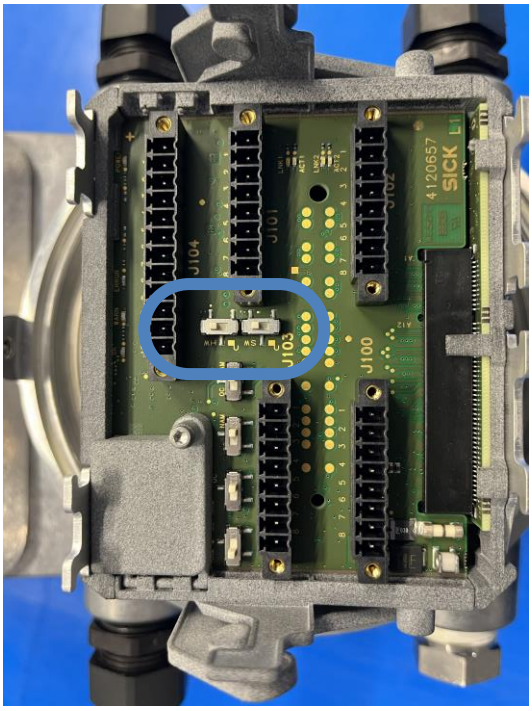
1.4.1 Housing
The housing of the signal processing unit is made of aluminium or stainless steel.

1.4.2 Electro-Magnetic Interference (EMI) protection measures
The following measures are taken for EMI protection:
- All cables between the meter body and the remote signal processing unit cannot be longer than 6 meters.
- Serial RS485 communication cable should be a shielded cable.
- The measuring device should always be powered using a power supply unit as mentioned in chapter 1.1.

1.5 Conditional characteristics

1.5.1 Programming
The value and the integrity of the metrological relevant parameter settings can be checked by an additional checksum.

Metrological relevant parameters are secured by metrological lock switches placed on the connection board. Changes are only possible when the metrological lock switch is open. In normal operation, the metrological lock switch is closed. It is not possible to change the position of the metrological lock switch without breaking a seal.



The metrological hardware lock status of the meter could be verified on the local display. When the meter switch is locked a close padlock symbol (🔒) is displayed on the top left of the local display.

1.5.2 Parameter settings

The change of parameters requires a user login (username and password) and the setting of a special device mode. Any change of legally parameters requires additionally the opening of a sealable hardware lock switch inside the housing.

Any changes of parameters are traced with logbooks. The logbooks store the old value, new value, timestamp, and user identification. The change of legally parameters is recorded with the legally logbook. This logbook can only be reset after opening the sealable hardware lock switch inside the housing.

The legally relevant settings, which cannot be altered anymore after putting the device into Custody Transfer Mode are given in documentation number 12890/0-01.

- All parameter settings may be read out and displayed:
  - by the electronic calculating/indicating device connected to the measuring device, or
  - via the serial communication line and a computer temporarily connected to the measuring device.
- The software version and belonging checksum of the measuring device shall be displayed:
  - by the electronic calculating/indicating device connected to the measuring device, or
  - via the serial communication line and a computer temporarily connected to the measuring device.

1.5.3 Alarm handling

Under the following conditions the measuring device generates an alarm:
- If the flow measurement has failed;
- If the calibration mode is activated on the meter;
- If the system test mode is activated on the meter;
- Failure of display module;
- The legally logbook is full and in blocking mode;
- Any firmware checksum error;
- Firmware mismatch;
- Totalizer checksum error;
- Checksum or range error of parameters;
- Checksum error of the legally logbook;
- Invalid date and time.

A path is considered as not working properly under the following conditions:
- if the measurements of this path differ too much from the other path (velocity of sound, gain, signal to noise ratio etc.).

During an alarm the following actions are taken:
- An overall status flag is set and registered in the legally logbook;
- The status LED is red;
- The reaction of the measurement value output on alarm is configurable;
- The totalizer for the undisturbed volume stops upon alarm.

The measuring device itself doesn't give a visible or audible alarm; however, the alarm handling, including the raise of a visible and audible alarm with the acknowledgement, has to be arranged in the attached indicating device / flow computer.
For the method of alarm handling used by the particular flow computer, see the applicable Evaluation certificate.

1.6 Conditional shapes

The cylindrical pipe is constructed such that the combination of material and wall thickness is such that the influence due to changing liquid pressure is negligible.

2 Seals

The following seals are applied:
- The inscriptions are fixed to the measuring device and secured against removal by seal or it will be destroyed when removed.
- The housing of the remote signal processing unit is sealed against opening after the measuring device is set to Custody Transfer mode.

- The ultrasonic transducers are sealed on the outside of the metallic jacketing after insulation of the measuring device. Alternatively, without insulation the ultrasonic transducers are sealed at their covers.

See below for an example of the sealing positions.

Figure 1 Sealing positions for remote signal processing unit

Sticker seal

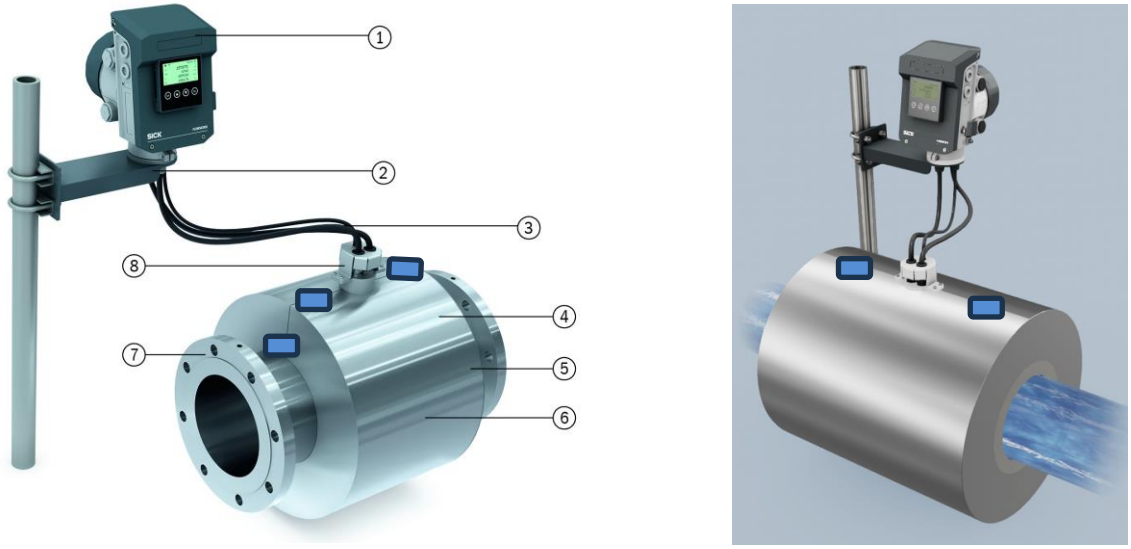


Figure 2 Sealing positions for meter body with metal jacket (L); and with insulation (R).

3 Conditions for conformity assessment

- Other parties may use this Evaluation Certificate only with the written permission of the producer.
- Before taken into use the measuring device shall be calibrated on the product it is going to measure or on a product with similar properties (density and viscosity) to cover a sufficient Reynolds-number range taking into account the operating range of the measurement system in which the measuring device is used.

- If the measuring device is intended to be used with multiple liquids without adjustments, the measuring device shall be calibrated on all applicable liquids without changing the parameters or it has to be calibrated in a Reynolds-number range covering all these fluids
- It is up to the Notified Body or authorized body to decide if the calibration with a single or multiple liquid(s) covers the process range on which the measuring device is going to be used.
- If a flow computer is used with a correction curve for multiple product applications, the accuracy requirements only have to be met for all products individually.
- The calibration can be performed on site or at a test laboratory. In the latter case the relevant parameter settings have to be registered and checked at the initial verification on site.
- In case the measuring device is used bi-directional, the measurement accuracy shall be determined in both directions.

4 Reports

An overview of the performed tests is given in Evaluation Report ER12890 revision 1 issued together with this Evaluation Certificate.