EU-type examination certificate

Number **T10339** revision 26
Project number 3694590

Issued by	NMi Certin B.V., designated and notified by the Netherlands to perform tasks with respect to conformity assessment procedures mentioned in article 17 of Directive 2014/32/EU, after having established that the Measuring instrument meets the applicable requirements of Directive 2014/32/EU, to:
Manufacturer	Elster GmbH Steinernstraβe 19 55252 Mainz-Kastel Germany
Measuring instrument	An **electronic gas-volume conversion device (EVCD),** intended to be used for gas volume conversion as a sub-assembly (according to article 4 of the MID) of a gas meter.

Type	:	EK280
Manufacturer's mark or name	:	Elster
Conversion principle	:	T, PT or PTZ
Ambient temperature range	:	–25 °C / +55 °C
Designed for	:	condensing humidity
Environment classes	:	M2 / E2

The intended location for the instrument is open.

Further properties are described in the annexes:
– Description T10339 revision 26;
– Documentation folder T10339-11.

Initially issued	31 May 2011
Valid until	31 May 2031
Remark	This version replaces the earlier versions; excluding its documentation folder.

Issuing Authority

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PRODUCTS RvA C 681

1 General information about the electronic gas-volume conversion device

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

The EVCD consist of the specific types of transducers for pressure and temperature (PTZ) or for temperature only (T), as described in paragraph 1.1.

The EVCD, type EK280 (T, PT or PTZ) can be connected with any gas meter which has a register and a pulse or encoder output with characteristics as described in paragraph 1.5.1.

Figure 1 Picture of the EVCD.

1.1 Essential parts

The electronic gas volume conversion device is composed of the following parts:

Part	Document	Remarks
CPU board	10339/0-04 (5 pages)	Component lay-out (4 pages) Parts list (1 page)
Pressure transmitter type CT30	10339/25-01 (5 pages)	Built in or external
Pressure transmitter type 17002		
Temperature transmitter Pt100	10339/10-04 (3 pages)	
Temperature transmitter Pt500		

1.2 Characteristics

1.2.1 Software specification (refer to WELMEC 7.2):

- Software type P;
- Risk Class C;
- Extension L, T, D and I;

while extension S is not applicable or excluded.

Software version: (Read out field 02:190)	Checksum: (Read out field 02:191)	Software version: (Read out field 02:190)	Checksum: (Read out field 02:191)
1.00	35354	2.50	51353
1.01	61021	2.51	3268
1.10	59904	2.52	44920
2.00	53441	2.53	1424
2.10	41245	2.54	33682
2.20	61767	2.55	14787
2.23	34248	2.60	8582
2.30	53895	2.61	26065
2.31	1724	2.62	456670CB
2.32	16186	2.64	1F5B3671
2.40	62516		
Remark: The software version and checksum can be read on the display in the above mentioned fields as described in par. 4.12.4 of documentation 10339/25-02.			

Note:
Software principle structure: **X.YZ**
X= changeable, if the hardware is no longer compatible or for special version design.
Y= changeable, if new software functionality with metrological relevant changes is implemented.
Z= changeable, with small non-metrological relevant changes or bug fixing.

1.2.2 Conversion

The conversion is performed according to the following formula as stated below:

$$V_b = V \times \frac{p_{abs}}{p_b} \times \frac{273{,}15 + t_b}{273{,}15 + t} \times \frac{Z_b}{Z}$$

Symbol	Represented quantity	Unit
V_b	volume at base conditions	m^3
V	volume at measurement conditions	m^3
p_{abs}	absolute pressure at measurement conditions	bar
p_b	absolute pressure at base conditions	bar
t	gas temperature at measurement conditions	°C
t_b	temperature at base conditions	°C
Z_b	compression factor at base conditions	-
Z	compression factor at measurement conditions	-

If the conversion principle is only T, for p_{abs}/p_b and Z_b/Z fixed values are programmed.

1.2.3 Compression

The compression factor Z_b/Z can be programmed in the EVCD as a fixed value or it can be calculated on the basis of the following algorithms:

- SGERG 88 (mol%CO_2, H_2, H_s and d);
- AGA8-G1 "Gross characterization method 1" (mol%CO_2, H_2, H_s and d);
- AGA8-G2 "Gross characterization method 2" (mol%N_2, mol%CO_2 and d);
- AGA NX19 Herning & Wolowski (mol%N_2, mol%CO_2 and d);
- AGA NX19 Hbr (mol%N_2, mol%CO_2, H_s and d);
- Detailed characterization method ***)**
- SGERG-Mod-H_2 ****)**

***)** The method "Detailed Characterization" is equivalent to the method AGA8-92DC and uses the same input data as AGA8-DC92 for gas composition.
These components are:
Methane, 11 higher hydrocarbons, nitrogen, carbon monoxide, carbon dioxide, hydrogen, oxygen, helium, argon, water vapour, and hydrogen sulphide.

It is suitable for natural gases and their mixtures with the following restrictions:

	p_{min} [bar]	p_{max} [bar]	t_{min} [°C]	t_{max} [°C]
Range-1	1	80	-5	75
Range-2	1	40	-10	75
Range-3	1	16	-20	75
Range-4	1	11	-25	75
Range-5	1	8	-30	75

For the Range-1 and Range-2:

- The composition of propane xC_3 (in mol%) in a gas mixture, should be within the limits given by the following equation in relationship to composition of ethane xC_2 (in mol%):

$$0{,}3 * xC_2 - 1{,}0 \; < \; xC_3 \; < \; 0.3 * xC_2 + 1{,}0$$

- The total sum of composition of n-butane, isobutane and higher hydrocarbons xC_{4+} (in mol%) in a gas mixture, should be within the limits given by the following equation in relationship to the composition of ethane xC_2 (in mol%):

$$0{,}1 * xC_2 - 0{,}3 \; < \; xC_{4+} \; < \; 0.1 * xC_2 + 0{,}3$$

For other gas compositions, the pressure and temperature range are limited such, that the error of the EVCD remains within the MPE.

**) SGERG-Mod-H_2 is applicable with the following restrictions:
Pressure range: 1 to 30 bar;
Gas temperature range: -10 to 65 °C;
Mol%H_2: 0 to 30%

When using a fixed compression factor (T and PT conversion), the pressure and temperature range have to be limited such, that the error of the EVCD remains within the MPE.

1.2.4 Meter error curve correction

Meter error curve correction (see paragraph 4.2 of document no. 10339/24-01) can be applied if the gas meter produces at least 10 pulses per second at Q_{min}.
The correction is performed by linear interpolation using a minimum of 6 points up to 10 points at maximum, or by a polynomial of up to the 5th degree. The coefficients of the polynomial are determined externally.
Besides the corrected volume V_c, also the uncorrected volume V_m can be read via the display.

1.2.5 Pressure range

The pressure ranges are:

Type	pressure range p [bar]
CT30	0,7 ≤ p_{abs} ≤ 2
	0,8 ≤ p_{abs} ≤ 5
	0,8 ≤ p_{abs} ≤ 6
	1,4 ≤ p_{abs} ≤ 7
	2 ≤ p_{abs} ≤ 10
	2,4 ≤ p_{abs} ≤ 12
	4 ≤ p_{abs} ≤ 20
	6 ≤ p_{abs} ≤ 30
	8 ≤ p_{abs} ≤ 40
	14 ≤ p_{abs} ≤ 70
	16 ≤ p_{abs} ≤ 80
17002	0,9 ≤ p_{abs} ≤ 7
	0,8 ≤ p_{abs} ≤ 10

1.2.6 Gas temperature range
The temperature range is: -30 °C ≤ t ≤ +75 °C, besides the temperature range has to be within the working range of the used algorithm for correcting the deviation from the ideal gas law.

1.2.7 Presentation of legal data
The legal data is presented via a special menu by pressing the arrows keys on the front panel. The menu structure, keyboard, display and (alarm) indicators are further described in par. 7.3, 7.4, 9.2 of document no. 10339/25-02.

1.2.8 Accountable alarms
The EVCD has to be programmed such, that accountable alarms will be generated if extreme values are measured by the EVCD or if otherwise a defect arises. Accountable alarms cause that the registration of the volume at base conditions will be stopped.

During the alarm the volume at measurement conditions will (besides the main totalizer) also be registered in the alarm totalizer.

The alarm indication can be reset by using the keyboard (and the correct password) or the configuration software ("reset alarm" button). However, it is not possible to clear an alarm as long as the cause of the alarm is still present (see paragraph 9.2 of documentation 10339/25-02).

1.3 Essential shapes

1.3.1 The nameplate is bearing at least, good legible, the following information:
- CE marking including the supplementary metrological marking (M + last 2 digits of the year in which the instrument has been put into use);
- Notified Body identification number, following the supplementary metrological marking;
- EU-type examination Certificate no. T10339;
- manufacturer's name, registered trade name or registered trade mark;
- manufacturer's postal address;
- serial number of the meter and year of manufacture;
- ambient temperature range.

The following information is mentioned on the nameplate or on the display:
- gas temperature range;
- gas pressure range;
- base pressure (if applicable);
- base temperature;
- compression algorithm (if applicable);
- gas properties (if applicable);
- parameters for gas meter error correction curve (if applicable);

The following information is mentioned on the display:
- upper and lower limits of the transducers.

The following information is mentioned in the manual:
- mechanical environment class;
- electromagnetic environment class.

An example of the markings is shown par. 4.12.1 of documentation 10339/25-02.

1.3.2 The following text must be published in the user manual.
When the AC Mains powered EK280 is equipped with an Ethernet cable the housing must be connected to ground directly, and not via the ground connection of the mains connection.

1.3.3 Sealing: see chapter 2.

1.4 Conditional parts

1.4.1 The EVCD has a metal housing, which has sufficient tensile strength. For an example of the housing see documentation no. 10339/0-03.
Metrological important parts only are accessible after breaking one or more (software) seals.

1.4.2 Power supply
The EVCD can be equipped with one of the power supplies as mentioned in the paragraphs below:

1.4.2.1 Battery power supply
The EVCD is powered by 2 lithium batteries (3,6 Vdc, 16,5 Ah, D-size). The normal lifetime is 5 years in average conditions. A low battery alarm is generated when 10% or less of the lifetime of the battery is remaining.

1.4.2.2 DC power supply
The EVCD is powered with a built in 8 V (minimum 7,5 V, maximum 8,5 V) dc power supply.

1.4.2.3 Built-in mains power supply
The EVCD is powered from AC mains power supply 230V ±15% at 50Hz.

Part	Document	Remarks
Integrated power supply board	10339/4-01 (3 pages)	Component lay-out (1 page) Parts list (2 pages)

1.4.3 Serial communication
The EVCD is equipped with serial (RS-232, RS-485) and optical communication ports. Serial communication can include IEC 62056-21, IEC 62056-46, DLMS, DSfG and/or Modbus protocol. Use of the serial communication does not influence the working of the EVCD (the calibration lock status has the highest priority above all protocols). In the normal situation the essential parameters needed for the conversion cannot be changed via the communication ports.

1.4.4 Ethernet\Cellular communication
The EVCD is equipped with an Ethernet port or Cellular communication. Use of the Ethernet port or Cellular communication does not influence the working of the EVCD. In the normal situation the essential parameters needed for the conversion cannot be changed via the Ethernet port or Cellular Communication.

Part	Document	Remarks
Ethernet board	10339/15-01 10339/15-02	10339/15-01 = Component lay-out (1 page) 10339/15-02 = Parts list (4 pages)
4G board	10339/22-01 10339/22-02	10339/22-01 = Component lay-out 10339/22-02 = Parts list

1.5 Conditional characteristics

1.5.1 The gas meter can be equipped with the outputs as stated below:

input	1	2	3	4	5	6
Maximum Low frequency [Hz]	8	8	6	8	8	8
Maximum High frequency [kHz]	2,5	2,5	-	-	-	-

Minimum impulse length of the LF input signal: 62,5 ms

If the gas meter is equipped with both an HF and a LF pulse output, in case of a DC or mains power failure the pulse registration will be continued with the LF pulse output.

1.5.2 Programming
Metrological parameters are protected by a programming switch and/or password identification.
If the programming switch is set in the "off" position, parameters declared as protected can be changed only after password identification.
Parameter changes are registered in the event logger, including date and time and a specific element to identify the parameter change.
In the normal situation the programming switch always has to be set in the "off" position.

However, for synchronization purposes the V_m and V_b totalizers can be changed only once after installing the device, while using password identification. The changed totalizing values are stored in the measurement period archive which is accessible using the keyboard. Later changes of the totalizers are not possible without breaking a seal and putting the programming switch in the "on" position. See further par. 6.3.1.6 of the User manual 10339/25-02.

See paragraph 4.10 of documentation 10339/24-01 for a full description of the programming and data protection.

1.6 Conditional shapes

The internal wiring between the two parts of the housing must be as short as possible.

1.7 Non-essential parts

1.7.1 Alarm outputs

1.7.2 Impulse outputs

1.7.3 A built-in modem

2 Seals

The following items are sealed:
- the nameplate with the housing; *)
- the CPU covering plate;
- the plate covering the access to the programming switch and the terminals of the (if applicable) pressure- and temperature transmitter.

*) Removal without destroying the nameplate shall not be possible, otherwise the nameplate shall be sealed to the housing.

An example of the sealing is presented in the document no. 10339/0-07.