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2014/32/EU, after having established that the Measuring instrument meets
the applicable requirements of Directive 2014/32/EU, to:

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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
Device type : 1 (complete system)
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 16;
- Documentation folder T10339-8.

Valid until 31 May 2021

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

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1 General information about the electronic gas-volume conversion device

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

The EVCD is a so-called type 1 device, with specific types of transducers for pressure and temperature (PTZ) or for temperature only (T).

The EVCD, type EK-280 (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.



Picture of the device.

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)
Ethernet board	10339/15-01, -02	-01 = Component lay-out (1 page) -02 = Parts list (4 pages)
Pressure transmitter type CT30	10339/10-03 (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 and D;
- while extension S is not applicable or excluded.

Software version: (Read out field 02:190)	Checksum: (Read out field 02:191)
1.00	35354
1.01	61021
1.10	59904
2.00	53441
2.10	41245
2.20	61767
2.23	34248
2.30	53895
2.31	1724
2.32	16186
2.40	62516
2.50	51353
2.51	3268
2.52	44920

Remark: The software version and checksum can be read on the display in the above mentioned fields as described in par. 3.10.4 of documentation 10339/7-02.

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	Unity
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	$^{\circ}C$
t_b	temperature at base conditions	$^{\circ}C$
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%CO₂, H₂, H_s and d);
- AGA8-G1 "Gross characterization method 1" (mol%CO₂, H₂, H_s and d);
- AGA8-G2 "Gross characterization method 2" (mol%N₂, mol%CO₂ and d);
- AGA NX19 Herning & Wolowski (mol%N₂, mol%CO₂ and d);
- AGA NX19 Hbr (mol%N₂, mol%CO₂, H_s and d);
- AGA8-92DC "Detailed characterization equation" *)

*) The algorithm AGA8-92DC can be applied in the pressure and temperature ranges as stated below:

	p_{min} [bar]	p_{max} [bar]	t_{min} [$^{\circ}C$]	t_{max} [$^{\circ}C$]
Range-1	1	80	-5	60
Range-2	1	40	-10	60
Range-3	1	16	-20	60
Range-4	1	11	-25	60
Range-5	1	8	-30	60

When using a fixed compression factor (T and PT conversion), the pressure and temperature range are 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. 10339/13-01) 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	$0,7 \leq p_{abs} \leq 2$
	$0,8 \leq p_{abs} \leq 5$
	$0,8 \leq p_{abs} \leq 6$
	$1,4 \leq p_{abs} \leq 7$
	$2 \leq p_{abs} \leq 10$
	$2,4 \leq p_{abs} \leq 12$
	$4 \leq p_{abs} \leq 20$
	$6 \leq p_{abs} \leq 30$
	$8 \leq p_{abs} \leq 40$
	$14 \leq p_{abs} \leq 70$
	$16 \leq p_{abs} \leq 80$
17002	$0,9 \leq p_{abs} \leq 7$

1.2.6 Gas temperature range
 The temperature range is: $-30^{\circ}\text{C} \leq t \leq +60^{\circ}\text{C}$, 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. 6.3, 6.4 and 8.2 of document no. 10339/7-02.

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 8.2 of documentation 10339/7-02).

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. 3.10.1 of documentation 10339/7-02 and in document 10339/13-01.

- 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

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. Use of the serial 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 communication ports.

1.4.4 Ethernet communication

The EVCD is equipped with an Ethernet port. Use of the Ethernet port 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.

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. 5.3.1.6 of the User manual 10339/7-02.

See paragraph 4.10 of documentation 10339/13-01 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

1.6.1 Alarm outputs

1.6.2 Impulse outputs

1.6.3 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.