

EU-type examination Certificate

Number **T10434** revision 11
Project number 3651470
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Issued by NMi Certin B.V.,
designated and notified by the Netherlands to perform tasks with respect to
conformity modules 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
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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 : enCore FC1

Manufacturer's mark or name : Elster

Conversion principle : PT or PTZ

Ambient temperature range : -10 °C / +55 °C

Designed for : non-condensing humidity

Environment classes : M1 / E2

The intended location for the instrument is closed.

Further properties are described in the annexes:

- Description T10434 revision 11;
- Documentation folder T10434-9.

Valid until 25 June 2032

Initially issued 25 June 2012

Remark This revision replaces the previous versions, including its documentation
folder.

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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.

1.1 Essential parts

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

Part	Document	Remarks
CPU base	10434/0-04; 10434/0-05	-
CPU core	10434/0-06; 10434/0-07	-
ExMFE5 input board	10434/0-08; 10434/0-09; 10434/10-03; 10434/10-04	Optional
MFE7 input board	10434/0-10; 10434/0-11	Optional
Display module	10434/0-12; 10434/0-13	-

1.2 Essential characteristics

1.2.1 Software specification (refer to WELMEC guide 7.2):

- Software type P;
 - Risk Class C;
 - Extension T, S and I;
- while the extensions O, L and D are not applicable or excluded.

Software part	Version	Checksum
ExMFE5 input board - firmware	2.0.7	E4289B65
	2.0.8	749786F4
	3.0.0	472C2776
MFE7 input board - firmware	1.0.7	2D311E1F
	1.0.8	81B50CFE
	1.0.9	6A251F79
	1.2.0	6D456065
	1.2.1	0A0DC244
MSER4 serial communication board - firmware	1.0.3	49F5E5EA
	1.0.4	C6A536B0
ESER4 communication board	1.0.4	D7DE3088
Basic system	01-00-C	2670647A
	02-02-B	75881213
	02-11-B	81D0356E
	03-02-A	3CA9EDA0
	03-22-A	84060E4D
	03-28-A	FEB06D27
	03-39-A	F001BA90
	03-39-D	E1AB8430
	03-41-A	466C9BD7
	03-41-C	ED21F840

Software part	Version	Checksum
Gas Quality Application Function Block	01-00-C	620D285C
	02-00-E	F65E6ED5
	02-06-B	77A2051C
	03-00-C	B9CADD5D
	03-08-A	DCEAC7C0
	03-12-B	2A8E492E
	03-15-D	B615E905
	03-16-A	E76395C8
	03-16-B	6FEABA17
Table Z Application Function Block	03-00-A	FF48B3BB
	03-03-A	70406B20
	03-06-B	3C966F95
	03-07-B	2C770C4C
	03-07-C	0AB935CF
Flow Conversion Application Function Block	01-00-C	05D6A298
	02-01-C	DF5B7846
	02-05-D	848E39FD
	03-00-C	7F8AEA5F
	03-07-A	F706E911
	03-10-C	E80B09B2
	03-13-B	F02A75DF
	03-14-A	86E32A1A
	03-14-C	E6BAD15D

The software versions and checksums can be read on the information display by activating the "i"-button in the device's home display, followed by the "Software status" hyperlink.

1.2.2 Conversion

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

$$V_b = V_{(m \text{ or } c)} \times \frac{p_{abs}}{p_b} \times \frac{273,15 + t_b}{273,15 + t} \times \frac{Z_b}{Z}$$

Symbol	Represented quantity	Unit
V_b	volume at base conditions	m ³
V_m	volume at measurement conditions	m ³
V_c	volume at measurement conditions meter error corrected (optional)	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	-

1.2.3 Compression

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

- SGERG88 (mol%CO₂, mol%H₂, H_s and rd or ρ_b);
- AGA8 DC92 (detailed composition)
- AGA-NX19 (mol%N₂, mol%CO₂, H_s and rd or ρ_b);
- AGA 8 part 1: edition 2017 (detailed composition)
- SGERG-mod-H2¹ (mol%CO₂, mol%H₂, H_s and rd or ρ_b) for the calculation of gas mixtures with H₂ contents up to 30 mol%

The required gas properties are programmed in the EVCD as fixed parameters or they come as actual values from a Gas chromatograph or CVDD (see paragraph 5.4.3 of the documentation no. 10434/10-01 or 10434/11-01).

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

1.2.4 Presentation of legal data

The legal data is presented in the fiscal display.

The menu structure, keyboard, display and (alarm) indicators are described in paragraph 5 of the documentation no. 10434/10-01 or 10434/11-01.

1.2.5 Meter error curve correction

Meter error curve correction (see paragraph 6.3 of the documentation no.

10434/10-01 or 10434/11-01) 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 maximum of 20 points.

Besides the corrected volume V_c , also the uncorrected volume V_m can be read via the display.

1.2.6 Accountable alarms

The EVCD has to be programmed such that accountable alarms will be generated (only) if extreme values are measured by the EVCD or if otherwise a defect arises (see paragraph 5.3 of documentation no. 10434/10-01 or 10434/11-01).

Accountable alarms cause that the registration of the volume at base conditions in the main totalizer V_b is stopped, while the registration is continued in an alarm totalizer V_{be} .

The alarm indication (status LED – see paragraph 5.2.2 of documentation no. 10434/10-01 or 10434/11-01) can be reset by the error list menu, which can be activated via the device's home display.

It is not possible to clear an alarm as long as the cause of the alarm still is present.

¹ SGERG-mod-H2 is applicable with the following restriction:

- Pressure range: 0,4 to 30 bar absolute;
- Gas temperature range: -10 to 65 °C.

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. T10434;
 - manufacturer's name, registered trade name or registered trade mark;
 - manufacturer's postal address;
 - serial number of the device and year of manufacture;
 - the ambient temperature range.

The following information is mentioned on the nameplate or on the display:

- the gas temperature range;
- the gas pressure range;
- the base pressure;
- the base temperature;
- the compression algorithm; (if applicable)
- the gas properties; (if applicable)
- the parameters for gas meter error correction curve (if applicable).

The following information is mentioned in the manual:

- mechanical environment class;
- electromagnetic environment class.

An example of the markings is shown in document no. 10434/10-02 or 10434/11-02.

- 1.3.2 Sealing: see chapter 2.

1.4 Conditional parts

- 1.4.1 Housing
The EVCD has a metal housing, which has sufficient tensile strength. Different housing designs are available. For examples of the housing see documentation no. 10434/5-03. Metrological important parts are only accessible after breaking one or more seals.
- 1.4.2 Power supply
The EVCD is powered by an external 24 V DC (+/- 20%) power supply.
- 1.4.3 Printed circuit boards
Besides the essential PCB's (see 1.1) the EVCD can be equipped with the following conditional printed circuit boards:
- MSER4 communication board (optional) – see documentation no. 10434/0-14;
 - ESER4 communication board (optional) – see documentation no. 10434/2-02;
 - MFA8 output board (optional) – see documentation no. 10434/0-15.
- 1.4.4 Communication interface(s)
The EVCD is equipped with in- or outputs for serial communication (RS232 / RS422 / RS485) and Ethernet. Use of the serial communication may not influence the working of the EVCD. In the normal situation (also see paragraph 1.5.3) the essential parameters needed for the conversion cannot be changed via the communication ports.

1.4.5 Pressure transducer

Any absolute pressure transducer may be used provided the following conditions are met:

- there is a respective Parts Certificate issued under WELMEC 8.8 by a Notified Body that acts under module B of the Directive 2014/32/EU for ANNEX IV (MI-002);
- the output signal has to be according to the HART-protocol or it has to be a standard 4-20 mA signal;
- the pressure range is according to the concerning Parts Certificate, besides the following restrictions are valid:
 - maximum measuring range is 1:20 for 4-20 mA transducers;
 - the pressure range has to be within the working range of the used algorithm for correcting the deviation from the ideal gas law.

1.4.6 Temperature transducer

Any temperature transducer may be used provided the following conditions are met:

- when the output signal is 4...20 mA or according to the HART-protocol there is a respective Parts Certificate issued under WELMEC 8.8 by a Notified Body that acts under module B of the Directive 2014/32/EU for ANNEX IV (MI-002) or by an Approved Body that acts under module B of Measuring Instruments Regulations 2016 as amended for Schedule 1D;
- when the output signal is a resistance (PT100) the transducer is in accordance with the requirements of EN 60751 class A or better;
- the temperature range is according to the concerning Parts Certificate, however the temperature t may not exceed: $-30\text{ °C} \leq t \leq +80\text{ °C}$;
- the temperature range has to be within the working range of the used algorithm for correcting the deviation from the ideal gas law.

1.4.7 Gas chromatograph or CVDD (optionally)

Any Gas chromatograph or CVDD may be used provided the following conditions are met:

- there is a respective Parts certificate issued for the Gas chromatograph or CVDD by a Notified Body responsible for type examination;
- the communication between the EVCD and the Gas chromatograph or CVDD takes place through a serial (RS485, RS422, RS232) - or TCP/IP (Ethernet 10/100 MBit) interface, different communication protocols can be used, for example Modbus and DSfG ;
- if the connection between the EVCD and Gas chromatograph or CVDD is broken or if the Gas quality measurement device is defective, this will cause an accountable alarm.

1.5 Conditional characteristics

1.5.1 Impulse input gas meter

The volume impulses generated by the pulser belonging to the gas meter can have two different types:

1.5.1.1 LF-impulses

The maximum frequency may not exceed 2 Hz (board ExMFE5) or 8 Hz (board MFE7) if the gas meter is running at $Q_{\max}$.

The minimum pulse length is 200 ms (board ExMFE5) or 50 ms (board MFE7).

1.5.1.2 HF-impulses

The maximum frequency is not higher than 5 kHz, if the gas meter is running at $Q_{\max}$.

1.5.2 Gas meter with encoder interface

The EVCD can be connected to gas meters equipped with an Encoder interface. If the communication between the EVCD and the gas meter is broken, this will cause an accountable alarm.

1.5.3 Ultrasonic gas meter

The EVCD is equipped with drivers to communicate with Ultrasonic gas meters as specified by the manufacturer. The communication takes place through a RS232, RS485 or Ethernet interface. If the communication between the EVCD and the gas meter is broken or if the Ultrasonic gas meter is defective, this will cause an accountable alarm.

1.5.4 Programming

The parameters which are essential for the conversion can only be changed if the sealable security switch is open or if the changes are recorded by the Fiscal audit trail (see paragraphs 5.1.3 and 5.4.7 of the documentation 10434/10-01 or 10434/11-01).

A complete overview of legally relevant parameters can be found in the documentation 10434/7-02.

During normal operation the security switch has to be in the closed position.

2 Seals

The following items are sealed:

- the nameplate with the housing; *)
- the front and rear panel of the EVCD;
- the security switch;
- the connectors of legally relevant process boards must be sealed, see chapter 4 of marking and sealings document.

*) 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 drawing no. 10434/10-02 or 10434/11-02.