

Test certificate

Number **TC3464** Revision 4
Projectnumber: **607857**
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Issued by NMI Certin B.V.
Hugo de Grootplein 1
3314 EG Dordrecht
The Netherlands

In accordance with the applicable articles stated in the regulations on gas meters

Applicant Elster-Instromet B.V.
Munstermanstraat 6
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The Netherlands

Submitted **An indicating device / electronic gas-volume conversion device (EVCD)**

Manufacturer : Instromet or Elster-Instromet
Type : model 2000

Characteristics Destined for gas volume conversion as a part of a gasmeter

Severity class : B (enclosed locations, having only low levels of vibration and shock, ambient temperature between -10 °C and +40 °C)

In the Description TC3464 Revision 4 the remaining characteristics are stated.

Description and documentation The EVCD is described in the Description no. TC3464 Revision 4 and recorded in the Documentation folder no. T3463-3, appertaining to this Test certificate.

Remarks This version replaces the earlier version, including its documentation folder.

Dordrecht, X September 2006
NMI Certin B.V.

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Description

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1 General information of the electronic gas volume conversion device

All features, mentioned or not mentioned, may not be in conflict with the legislation.
 This revision has been issued due to changes made to printed circuit boards and a software change.

1.1 Essential parts

Part	Document	Remarks
microprocessor board	3464-005 or 3464/2-001; 3464-006 or 3464/2-002	-
input board input 2 board	3464-007 3464-008 3464/4-002 up to and including 3464/4-004	-
Software		<p>The following software version numbers are valid: "V1.x", "V2.x", "V3.x", "V4.x" and "V5.x".</p> <p>Software changes which have no accountable influence may be implemented freely. These changes cause an increase of the number "x". Software changes, which do have accountable influence, may not be implemented freely. The software version is indicated via the software menu "General Info".</p> <p>General comment: Only the part of the software which is within the scope of this Test certificate was tested.</p>

1.2 Essential characteristics

1.2.1 Conversion

The conversion is performed according to the following formula as stated below, when using an absolute pressure transmitter:

$$V_n = V_b \times \frac{p_{abs}}{p_n} \times \frac{273,15 + t_n}{273,15 + t} \times \frac{Z_n}{Z}$$

When using a gauge transmitter the conversion is performed according to the formula:

$$V_n = V_b \times \frac{B + p}{p_n} \times \frac{273,15 + t_n}{273,15 + t} \times \frac{Z_n}{Z}$$

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Symbol	Represented quantity	Unity
V_n	volume at base conditions	m^3
V_b or V_{bc}	volume at measurement conditions (meter error corrected)	m^3
p_{abs}	absolute pressure at measurement conditions	bar
p	gauge pressure at measurement conditions	bar
B	atmospheric pressure	bar
p_n	absolute pressure at base conditions	bar
t	gas temperature at measurement conditions	$^{\circ}C$
t_n	temperature at base conditions	$^{\circ}C$
Z_n	compression factor at base conditions	-
Z	compression factor at measurement conditions	-

1.2.2 Compressibility

The compression factor Z_n/Z :

- can be programmed in the EVCD as a fixed factor or;
- can be calculated by interpolation from a table or;
- can be calculated on the basis of the algorithm SGERG (mol%CO₂, H₂ and d), AGA8 or AGA NX19I.

The required gas properties are programmed in the EVCD as fixed parameters or they come via a RS232 or RS485 serial data communication (as actual values from a gaschromatograph).

When using a fixed compression factor the pressure and temperature range is limited such, that the resulting error remains within 0,3%.

1.2.3 Meter error correction

Meter error correction (see paragraph 2.5 from manual 3464-001, resp. 3464/4-001) can only be applied if the gasmeter produces at least 10 pulses per second at Q_{min} .

The correction for the error is performed while using:

- a 10 points correction at turbine gasmeters;
- a 20 points correction at ultrasonic gasmeters;
- (optionally) a correction for expansion of the spoolpiece as a function of pressure and/or temperature at ultrasonic gasmeters, see par. 2.5.2.2 of documentation no. 3464-001, resp. no. 3464/4-001.

Besides the corrected volume V_b-c , also the uncorrected volume V_b can be read via the display.

1.2.4 Presentation of legal data

The menu structure, keyboard, display and (alarm) indicators are described in paragraph 2.2 en 2.3 of document no. 3464-001, resp. no. 3464/4-001.

1.2.5 Accountable alarms

General:

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 2.7 of documentation no. 3464-001, resp. no. 3464/4-001 and documentation no. 3464-009).

Accountable alarms cause that the registration of the volume at measurement conditions and the volume at base conditions in the main totalizers will be stopped, while the registration is continued in alarm totalizers.

The alarm indication can be reset by the alarm menu; however it is not possible to clear an alarm as long as the cause of the alarm still is present.

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With application of ultrasonic gasmeters under the following circumstances an accountable alarm is generated by the EVCD:

- with a 5 path meter: if 1 swirl path fails; or
if 3 axial paths fail;
- with a 4 path meter: if 1 swirl path fails; or
if 2 axial path fails;
- with a 3 path meter: if 1 swirl path fails; or
if the axial path fails.

The minimum percentage for approval of the results per path is 20%.

- disturbance of the communication with the control electronics of the ultrasonic meter;
- wrong programmed number of measuring paths;
- active status bit in the RS485 signal of the ultrasonic gasmeter, which indicates that the meter is placed into the programming mode.

1.3 Essential shapes

- 1.3.1 The name plate contains at least, clearly legible, the information as mentioned in the regulations on gas meters. An example of the markings is shown in drawing no. 3464-003. A second plate (with the serial number) can optionally be placed on the side of the EVCD (see 3464-004, drawing RE4410).

Also in the infopages is stated that energy totalizers may not be used for legal purposes.

If the EVCD is the primary indicating device of an ultrasonic gas meter, the serial number and the number of the Dispensation of the ultrasonic gas meter are also stated.

- 1.3.2 Sealing: see chapter 2.

1.3.3 Mandatory devices

The entire EVCD consists of the following mandatory devices:

- pressure transmitter; see paragraph 1.4 Conditional parts;
- temperature transmitter; see paragraph 1.4 Conditional parts.

1.4 Conditional parts

1.4.1 Housing

The EVCD has a metal housing, which has sufficient tensile strength. For an example of the housing see documentation no. 3464-002.

Metrological important parts only are accessible after breaking one or more seals (see documentation no. 3464-004).

The meter is also built in a moisture tight housing.

1.4.2 Power supply

The EVCD is powered by an external 24 V DC power supply.

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1.4.3 Printed circuit boards

Besides the essential PCB's (see 1.1) the EVCD is equipped with the following conditional printed circuit boards:

- DC-DC convertor board;
- display board;
- Comms board or Comms 2 board.

1.4.4 Serial communication

The EVCD may be equipped with a communication board for serial communication. Use of the serial communication may not influence the working of the EVCD (when no gaschromatograph is connected). In the normal situation the essential parameters needed for the conversion cannot be changed via this communication link.

1.4.5 Pressure transmitter

The pressure transmitter has to meet the following requirements:

- the pressure transmitter is approved according to the regulations on gas meters and described in a Test certificate;
- the output signal has to be according to the standard 4-20 mA signal or according to the HART-protocol.
- The pressure range is according to the concerning Test certificate; besides the following restrictions are valid:
 - the maximum absolute pressure is limited to 120 bar;
 - the maximum measuring range is 1:20 for 4-20 mA transmitters.
- If a gauge pressure transmitter is used the constant value for the atmospheric pressure is stated on the nameplate of the EVCD.

It is also allowed to make use of the following pressure transmitters, as described in the Type approval certificate no. T1092:

- Transamerica type BHL 4206-53
- CEC type type BHL 4208-58

1.4.6 Temperature transmitter

The temperature transmitter has to meet the following requirements:

- the temperature transmitter is approved according to the regulations on gas meters and described in a Test certificate.
- the output signal has to be a standard 4 – 20 mA signal, RTD or HART-protocol.
- The temperature range is according to the concerning Test certificate; besides the following restrictions are valid:
 - the temperature range is within: $-30\text{ °C} \leq t \leq +80\text{ °C}$.
 - for legal purposes, according to art. 75 sub h of the regulations on gas meters, the range $t_{\min} \dots t_{\max}$ may not exceed 50 °C.

It is also allowed to make use of the temperature transmitter described in the Type approval certificate no. T1092, which is manufactured by Heraeus, type WGC 1810.

1.4.7 Gaschromatograph

The (optionally) used gaschromatograph is approved according to the regulations on gas meters and described in a Test certificate.

The communication between the EVCD and the gaschromatograph takes place through a RS232 or RS485 serial interface.

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When the connection between the EVCD and gaschromatograph is broken or when the gaschromatograph is defective, this will cause an accountable alarm.

1.5 Conditional characteristics

1.5.1 The maximum frequency is 5 kHz. Also LF pulses can be handled, with a pulse width of 10 ms minimally.

1.5.2 Programming

The parameters which are essential for the conversion can be changed only after the security switches 1 and 2 are set in the "on" position, which are only accessible after breaking the seals (see document no. 3464-004).

In the normal situation the security switches have to be in the "partly secure" or "fully secure" position.

1.6 Not-essential parts

1.6.1 Output board or Output 2 board;

1.6.2 Infrared interface board;

1.6.3 USB port;

1.6.4 Network board or Network 2 board.

2 Verification marks and seals

2.1 Verification mark

The name plate is sealed with a verification mark (sticker sealing).

However, if the EVCD is used as a primary indicating device of an ultrasonic gas meter, the name plate is sealed with a protection mark (see for an example documentation no. 3464-003).

2.2 Protection marks

Also the following items are sealed with a protection mark:

- the access to the microprocessor board, inclusive the security switches;
- the access to the input board;
- the (optionally) second plate on the side of the EVCD.

See documentation no. 3464-004 for an example of the sealing.