

Issued by NMI Certin B.V.

In accordance with – WELMEC guide 8.8 “General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments under the MID”
 – OIML R117-1 Edition 2007(E) “Dynamic measuring systems for liquids other than water”.
 – OIML R137-1 Edition 2012(E) “Gas meters”.

Producer Emerson Process Management Flow B.V.
 Neonstraat 1
 6718 WX Ede
 The Netherlands

Measuring instrument A **flow transmitter** (calculating/indicating device for Micro Motion Inc. Coriolis meters), intended to be used as a part of a measuring instrument.

Producer’s mark or name : Micro Motion Inc.

Designation : 5700*1(2, 3 or 5)A***ZZ*
 with additional feature code OL or OG

Software versions : See essential characteristics, paragraph 1.2.5

Accuracy classes : 0.3; 0.5; 1.0; 1.5

Environment classes : H3, E3 including E2, M3


Temperature range ambient : -25 °C ... +55 °C
 -40 °C ... +55 °C In case the measurement results can be read and / or recorded with a connected approved instrument.

Power supply voltage : See essential characteristics, paragraph 1.2.3

Further properties and test results are described in the annexes:
 – Description TC8519 revision 1;
 – Documentation folder TC8519-1.

Remark This revision replaces the previous versions. The documentation folder is not changed.

Issuing Authority **NMI Certin B.V.**
 4 February 2015



C. Oosterman
 Head Certification Board



Description

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Project number 15200770
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1 General information on the flow transmitter

Properties of this flow transmitter, 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 guide 8.8.

The complete measuring instrument must be covered by an EC type-examination Certificate.

The Evaluation certificate is valid for the flow transmitter 5700 variants as described below, and can be used in combination with MID approved Coriolis measurement sensors, for instance type F sensors and type CMF sensors, manufactured by Micro Motion Inc., that are described in and covered by respectively the Evaluation certificates TC7050 and TC7056.

The flow transmitter is intended for control of a Coriolis sensor and processing of its Custody Transfer output signals into:

- mass flow rate, mass total and mass inventory;
- actual density, actual volume flow rate, actual volume total and actual volume inventory.
- density at defined reference temperature, volume flow rate at defined reference temperature, volume total at defined reference temperature and volume inventory at defined reference temperature;
- net mass flow rate, net mass total, net mass inventory, net volume flow rate, net volume total, net volume inventory, and concentration

Note 1:

Net means at defined reference temperature and 100% concentration.

Note 2:

The Micro Motion Inc. meters are calibrated in such a way to represent the mass in vacuo (and not the weight or mass in air or apparent mass) and density in vacuo (and not density in air or apparent density). Mass and/or density can be presented in vacuo (default setting) or in air. When mass and/or density are/is to be presented in air the Mass meter factor and/or the Density meter factor must be used:

Mass Flow Rate Meter Factor

1,00000

Density Meter Factor

1,00000

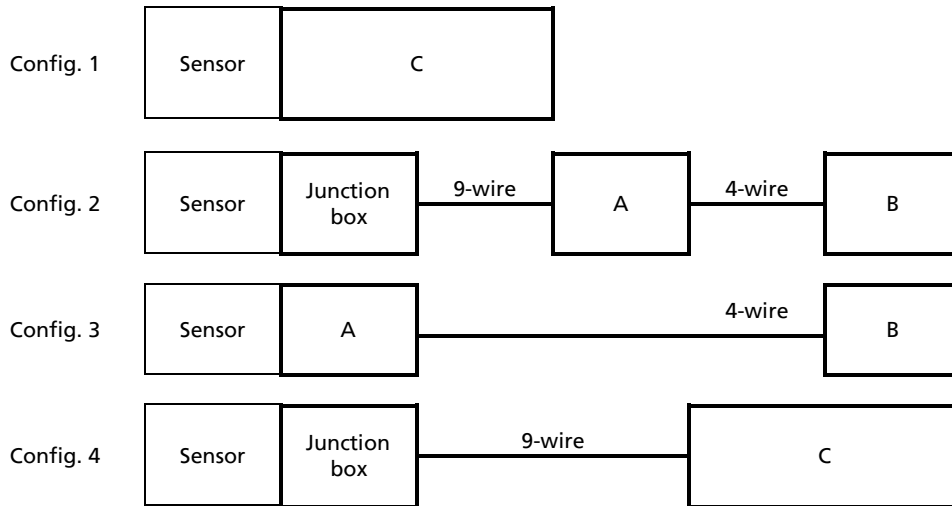
The meter factor depends on the actual fluid density and/or ambient air density and is always <1; therefore these meter factors are application specific.

It shall be made clear on the device when the measurement is presented in air.

Depending on the type, the flow transmitter is equipped with or without a display. It can be considered as an electronic calculating / indicating device or an electronic calculating device.

The Model 5700 can be used in the following configurations.

- Config. 1 = Model type 5700I: Integral mount of the Core processor and 5700 transmitter with the sensor.
- Config. 2 and 3 = Model type 5700R: Remote Core Processor and 5700 transmitter.
- Config. 4 = Model type 5700C: Core processor integrated with remote 5700 transmitter.



A is the Remote Core-Processor MVD700 or MVD800, known from TC7057.
 B is the transmitter.
 C is the transmitter with integral Core-Processor

All measurement calculations of Process Variables are performed in the 5700; the Core Processor only supplies raw signal measurements and basic sensor diagnostics.



One of the functions is LD-optimisation, which is described in detail in the documentation that pertains to the Evaluation Certificates TC7050 and TC7056.

Remark:

Smart Meter Verification (on-line) can be used in Custody Transfer mode, as it has no influence on the measurement accuracy.



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1.1 Essential Parts

The boards included in the Calculating / Indicating device:

part	reference	documentation
Core processor board (config 1 & 4)	EB-20025291	8519/0-01, -02
Core processor pass thru board (config 2 & 3)	EB-20025294	8519/0-03, -04
Config I/O board	EB-20025303	8519/0-05, -06
Analog board	EB-20025300	8519/0-07, -08
Display board	EB-20029907	8519/0-09, -10
Power board	EB-20025312	8519/0-11, -12
Backplane	EB-20025288	8519/0-13, -14
4 – wire terminal board (config 2 & 3)	EB-20025315	8519/0-15, -16
9 - wire terminal board (config 4)	EB-20025318	8519/0-17, -18
Connector board	EB-20025323	8519/0-19, -20

The Core-Processor

Communication to the Core Processor is initially established using RS-485 Modbus RTU mode, 38400 baud, no parity, and one stop bit. Once the revision is validated as supported, the protocol is switched to a proprietary burst protocol which transfers basic, raw sensor information and diagnostics from the Core Processor to the 5700 to be used in Sensor Calculations. All packets contain a CRC value for the data in that packet and also a packet sequence number. The Core Processor may be remotely mounted or integral to the 5700, the interface is the same in each case.

All measurement calculations of Process Variables are performed in the 5700, the Core Processor only supplies raw signal measurements and basic sensor diagnostics.

1.2 Essential Characteristics

1.2.1 Totals / inventories

- 1.2.1.1 Actual mass total / inventory, actual volume total / inventory, standard volume total / inventory or net (Concentration Measurement) volume total / inventory can be used to measure a custody transfer transaction. These totalisers / inventories can be read from the transmitter via the display (if configured as such), via pulse output (double channel, phase shifted) or via digital communication (Modbus) on an approved indicating device or calculating and indicating device.
- 1.2.1.2 Concentration Measurement uses manually configured tables which are stored behind seal, e.g. they cannot be modified when the device is in Custody Transfer Secure Mode. Concentration Measurement requires an approved external temperature probe; it is not allowed to use the temperature probe of the connected sensor. Concentration Measurement feature can be used for density and volume at a defined reference temperature for any liquid for which a traceable database or norm/standard is available. This Evaluation Certificate covers
- FAME calculations, using the formula:
 $\text{Density at } 15\text{ }^{\circ}\text{C} = \text{density at actual temperature} + 0,723 * (\text{product temperature} - 15\text{ }^{\circ}\text{C}).$
 - Methyl-Ester calculations, using the formula:
 $\text{Density at } 15\text{ }^{\circ}\text{C} = \text{density at actual temperature} + 0,71962 * (\text{product temperature} - 15\text{ }^{\circ}\text{C}).$
 - The Concentration Measurement feature is used for measuring alcohol, alcohol percentage and alcohol at 20°C (100% alcohol), based on OIML R22. This Evaluation Certificate covers alcohol percentages from 50% up to and including 100%.
 Remark: For using the Concentration Measurement feature on alcohol, it is always (independent of temperature) necessary to determine the FT and DT values of the individual sensor.

Remarks:

- Before putting into use, when a flow transmitter 5700 is using the Concentration Measurement feature, the correctness of the configured table must be verified, in order to be sure that the conversion does not exceed the limits as defined for the calculations.
- Conversion of measured volumes to volumes at reference conditions using ASTM D1250-04 / -07 calculations (API Manual of Petroleum Measurement Standards, chapter 11, section 1; IP 200/04) and GPA TP-27 calculations (API Manual of Petroleum Measurement Standards, chapter 11, section 2, part 4; ASTM PETROLTBL-TP27) is not within the scope of this Evaluation Certificate.
- The Batch function is not within the scope of this Evaluation Certificate.

1.2.2 Input signals

- 4 ... 20 mA temperature from an external device;
- 4 ... 20 mA pressure from an external device;
- Modbus from the remote Core Processor;
- HART BELL 202 over the current output for reading digitally the pressure and/or temperature. The Hart signals are superimposed on the DC-current of the output.

The user can configure the number of decimal places for each process variable. Temperature has a default of 2 decimal places, all other variables 4, with a maximum of 5 places of precision.

1.2.3 Power supply voltage

100 Vac ... 240 Vac (tested with good results at 85 Vac and at 265 Vac)
 or
 21 Vdc ... 90 Vdc (tested with good results at 18 Vdc and at 100 Vdc).
 For uninterruptible applications an uninterruptible power supply is mandatory.

1.2.4 Software specifications (see the WELMEC 7.2 "Software Guide"):

- Chapter P;
- Risk Class C;
- Extensions T, I-2 and I-5 apply.

Chapter U and the extensions L, S, D, I1, I3, I4 and I6 do not apply.

1.2.5 Software versions

Firmware	Software version	checksum
Transmitter Software	1.20	2DF0D8E9
Remote Core Software	See TC7057.	
Internal Core Software	4.02	8D61C368
	4.14	40860C63
PIC Firmware	8.0	0000DE9C
LCD PIC Firmware	3.0	000081D5
Weights & Measures	1.0 (means W&M is licensed)	-

1.2.6 Minimum measured quantity

The minimum measured quantity is not smaller than the largest of the following values:
 The minimum measured quantity of the connected sensor;
 200 times the unit of indication of the 5700 (being 0.001 ton or kg respectively 0.001 m³ or litres; see paragraph 1.4).

1.2.7 Custody Transfer parameters

The Custody Transfer parameters and the mandatory settings are given in paragraph 1.4 of this Description.

1.2.8 Security mode:

- The 5700 transmitter must have a license installed that enables custody transfer, and the switch on the LOI must be placed into the secure state. See the following picture for the location of the switch.



- The remote Core Processor contains no parameters that affect legally relevant functionality. Therefore, it requires no special locking or sealing mechanism.
- Software passwords are not needed and are not incorporated.
- The wiring compartment must be sealed to prevent tampering with the wiring or access to the USB service port (SP). See the example in chapter 2 of this description. The display cover must be sealed. See the example in chapter 2 of this description.
- When in the secure mode, the host is limited to read commands only. All configuration and calibration data can be read via digital communication while in a secured mode.

The LOI may be additionally protected by password security, which requires the user to enter a 4 digit alphanumeric password to change configuration. The user always has read access to configuration menus. If the user forgets the password, that password must be reset using digital communications. When in secure mode, the operator has only read access.

1.2.9 Non Volatile Memory Data Integrity

Data integrity of the NVM is preserved by keeping two exact copies of NVM parameters and each copy a computed CRC of the data. The 5700 updates the CRC as data is changed in the NVM. At power up the 5700 checks the NVM integrity by comparing calculating a CRC value over the data and comparing it to the stored value. If the CRCs do not match with the stored values an Electronics Failed alert is activated. During runtime, the 5700 completes a CRC validation of NVM every 5 minutes. If CRCs do not match, an Electronics Failed alert is activated.

1.2.10 Parameters that are protected in the secure mode

When in secure mode all output and calibration configuration data is locked (no write privileges).

1.2.11 Process Variable Approval

Process Variables that are approved for MID functionality will be marked on the LOI using the following method. Legal for Trade and the name of the process variable will alternately be displayed on the menu bar at the top of the process variable screen. Variables that are approved for display must be entered by the user when the 5700 is not in secured state. This is accomplished by navigating the LOI menus Configuration -> Weights & Measures -> Approve



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Variables. The appropriate variables can then be selected. This can also be done using digital communications.

1.2.12 Rollover

Setting NTEP – Not allowed to be used.

Setting OIML - Totals and inventories always roll-over. A rollover count is incremented for each total/inventory whenever they roll-over. This is different from previous products where there was no running count, only a rollover flag. If the rollover count for a given total/inventory is greater than 0, a rollover indication is shown on the corresponding process variable screen. The roll-over indication is stored in non-volatile memory.

1.2.13 The 5700 has 7 Totalizers and 7 Inventories, each is independent and configurable. In addition to Process Variable Assignment, behavior with respect to flow direction can be configured. The Process Variables available for configuration depends on what licenses are installed. For details on configuration refer to Configuration Manual, Micro Motion Model 5700 Transmitter. Configuration of the Totalizers and Inventories is not allowed when the 5700 is in Custody Transfer secured mode.

1.3 Essential Shapes

1.3.1 Inscriptions

At least the inscription "TC8519" is placed on the model.

Identification of the measurement sensor.

Close to the display of the 5700 or that of the connected flow computer: the minimum measured quantity.

1.3.2 Status

In case an electronic calculator/indicating device is connected to the 5700 the status is sent to the connected device in one or more of the following ways:

- The status is sent directly to the flow computer using the Modbus connection.
- The status output results in interrupting one of the pulse-channels, thus enabling the flow computer to detect a pulse failure and consequently generate an alarm.
- The status results in a saturated mA output (< 3,6 mA or >21 mA) thus enabling the flow computer to detect failure and consequently generate an alarm.

1.3.3 Sealing.

See chapter 2 of this description.



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1.4 Conditional Characteristics

1.4.1 Parameter settings; all settings are protected by the security switch.

1.4.1.1 Totalizer reset (if allowed)

1.4.1.2 Meter zero calibration

1.4.1.3 The settings of the following parameters must be explained before putting into use of the instrument, either by the user or the manufacturer.

1.4.1.3.1 Configuration / Flow / damping, direction

1.4.1.3.2 Configuration / Flow / mass / flow units, low flow cutoff, decimals on display, meter factor

1.4.1.3.3 Configuration / Flow / volume / flow type, flow units, low flow cutoff, decimals on display, meter factor

1.4.1.3.4 Configuration / Flow / density / units, decimals on display, damping, cut off, meter factor

1.4.1.3.5 Configuration / Flow / temperature / units, decimals on display, damping, external temperature

1.4.1.3.6 Configuration / Flow / pressure / units, flow factor, density factor, calibration pressure

1.4.1.3.7 Configuration / Totalizers/Inventory / mass, volume, source, direction, response time

1.4.1.3.8 Configuration / Totalizer reset / on/of

1.4.2 The indication unit can be set to tons or kg or grams, respectively m³ or litres.

1.4.3 Double impulse, phased shifted, frequency output signal, for the transmission of mass- or volume information.

1.4.4 Current output(s) for density

1.4.5 Modbus RS485 output of the various parameters (for example mass total) to an approved indicating device (flow computer).

1.4.6 Low flow cut off settings.

The low flow cut off for mass flow and the low flow cut off for volume flow shall not be more than one fifth of the minimum flow rate of the connected sensor.

1.4.7 Damping settings

1.4.7.1 Flow: maximum damping time is 1,6 s.

1.4.7.2 Density: maximum damping time is 1,6 s.

1.4.7.3 Temperature: maximum damping time is 4,8 s.

1.4.8 Last measured value fault time out settings

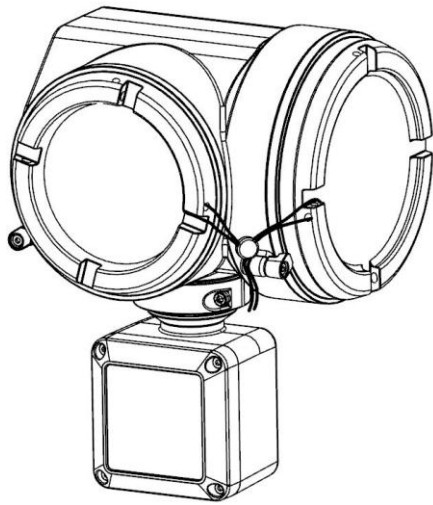
1.4.8.1 The maximum value for "Last measured value fault time out setting" for mA and for pulses (one setting) is 2 s.

1.4.9 The 5700 is equipped with meter factors for density and volume. These factors can be used to adjust the density and volume in case density and/or volume are outside the allowed limits but still are within a band of two times the allowed limits. Using the factors applies a linear shift in the measurement.

2 Seals

After setting the 5700 in Custody Transfer mode, the access to the wiring is sealed to avoid unauthorised changing of the wiring. The display window is sealed against opening for protection of the Weights & Measures switch setting.

See the example below.



The transmitter is sealed against removal from the measurement sensor. This is done either by physically sealing the transmitter to the measurement sensor or by mentioning the measurement sensor's serial number on the type plate of the transmitter.

In case of configuration Config 2 and Config 4: The 9-wire connection between measurement sensor (junction box) and Core Processor resp. transmitter is sealed at both ends against opening.

3 Conditions for Conformity Assessment

Other parties may use this Evaluation Certificate only with the written permission of Emerson Process Management Flow B.V., Neonstraat 1, 6718 WX Ede, the Netherlands.

Cabling has to be in accordance with manufacturer installation instructions.

4 Test reports

An overview of performed tests is given in the test reports:

- No. NMI-14200115-01;
- No. NMI-14200115-02;
- No. NMI-14200115-03;
- No. NMI-15200770-01.