EU-type examination certificate

Number **T10265** revision 14
Project number 2166885

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	Emerson Process Management Flow B.V. Neonstraat 1 6718 WX Ede The Netherlands
Measuring instrument	A non-interruptible **measuring system** intended for delivery/ reception of marine fuel to/ from ships (barges and sea-going vessels). Manufacturer's mark or name : Emerson Type designation : MMI-MID-003 Accuracy class : 0.5 Destined for the measurement of : See § 1.2 of the description Further properties are described in the annexes: – Description T10265 revision 14; – Documentation folder T10265-12.
Valid until	15 June 2020
Remarks	– The measuring system is approved for measuring mass, density at base conditions, volume at metering conditions and volume at base conditions; – The measuring system can be fixed or movable; – This revision replaces the previous revisions; – The documentation folder replaces the previous documentation folder.

Issuing Authority **NMi Certin B.V., Notified Body number 0122**
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INSPECTION RvA I 122

1 General information about the measuring system

Properties of this measuring system, whether mentioned or not, shall not be in conflict with the legislation.
The measuring system is used as:
- Delivery or reception system installed on a barge (bunker boat) or onshore;
- Reception system installed on a vessel (example containership).

1.1 Essential parts

Producer	Type	Evaluation / Parts Certificate	Remarks
Measurement sensor			
Emerson Process Management Flow B.V.	Various types	TC7056	See § 1.2 for further details on which types can be used for a particular application
Core Processor			
Emerson Process Management Flow B.V.	MVD800	TC7057	Equipped with marine bunkering application.
Flow transmitter			
Emerson Process Management Flow B.V.	MVD3500; MVD3700	TC7057	Equipped with marine bunkering software.
Flow computer			
Emerson Process Management Remote Automation Solutions	FloBoss S600; FloBoss S600+	TC7470	Mandatory for systems with parallel meters. Optional in all other cases.
Pressure transducer			
Emerson Process Management GmbH & Co. OHG	3051S	TC7457	Depending on the operating pressure, see TC7056 for details on pressure correction.

1.2 Essential characteristics

In addition to the characteristics as is stated on page 1 of this EU-type examination certificate, the following characteristics apply to the measuring system:

1.2.1 Fuel Oil bunker application (Heavy Fuel Oil (HFO); Normal Fuel inclusive low sulphur):

- Intended for the measurement of bunker fuel with density at 15 °C between 750 and 1050 kg/m^3 and an actual viscosity between 1 and 2400 cSt.
- Emptying of the barge tanks during the delivery is common practice for this application.
- Only the following sensors with their respective flow rate can be used for this application:

Sensor	CMF-HC2	CMF-HC3
Maximum flow rate	680 t/h	1200 t/h
The minimum flow rate is the larger of these two values:	68 t/h	120 t/h
	The flow rate belonging to the minimum Reynolds number of 100 taking into account the actual product viscosity and the actual density.	

  The ratio Qmax:Qmin shall be at least 4:1.
- Temperature range liquid: 0 … +80 °C
- Minimum Measured Quantity (MMQ): Installation specific, the larger value of:
  - 50 ton (CMF-HC2) or 100 ton (CMF-HC3);
  - Value calculated during the "putting into use" by taking into account the connecting volume between the measurement sensor and the transfer point. See NMi procedure C-SP-HW-281 for details on this calculation. This value is rounded up to multiples of 50 ton.

1.2.2 Diesel and other Marine Oil and Lubricant Oil applications:

- Intended for the measurement of:
  - Diesel;
  - Marine Oil such as but not limited to MGO (Marine Gasoil) / MDO (Marine Diesel Oil) / DFO (Diesel Fuel Oil);
  - Lubricants.
- Emptying of the tanks during the delivery is common practice for this application.
- The following sensor types can be used for this application:
  CMF200; CMF300; CMF350; CMF400; CMF-HC2 and CMF-HC3
- Qmax: Shall not be larger than the Qmax stated in Evaluation certificate number TC7056 for the applicable sensor.
- Qmin: Shall not be smaller than the Qmin stated in Evaluation certificate number TC7056 for the applicable sensor.
- The ratio Qmax:Qmin shall be at least 4:1.
- Temperature range liquid: See Evaluation certificate number TC7056 for details.
- Minimum Measured Quantity (MMQ): Installation specific.
  The MMQ is not smaller than the largest value of:
  - The MMQ mentioned in Evaluation certificate number TC7056 of the sensor;
  - 200 times the largest display scale interval;
  - 200 times the largest printed scale interval;
  - Shall be calculated during the "putting into use" by taking into account the connecting volume between the measurement sensor and the transfer point. See NMi procedure C-SP-HW-281 for details on this calculation.

1.2.3 Maximum operating pressure (P_{max})
Shall not exceed the maximum pressure of the measurement sensor.

1.2.4 Temperature range ambient
-25 °C / +55 °C

1.2.5 Environment classes
M3 / E3

1.2.6 Multiple flow meters (optional)
- Flow meters in parallel
  Two or more meters can be mounted parallel.
  Please note that:
  - A meter consists of a measurement sensor, core processor and flow transmitter.
  - It is not mandatory that all meters operate simultaneously.
  - The meter size can be different.
  - Measures shall be taken to ensure that the minimum and maximum flow rate of each individual meter is not exceeded.
  - If the delivered total of the meters is summated and presented by the calculating and indicating device mentioned in paragraph 1.1, the whole installation can be considered as one measuring system and only one nameplate is present. In all other cases, every individual measurement sensor is to be considered an individual measuring instrument, and the appropriate number of nameplates has to be present for each measuring system.
  - When measuring the same product through one transfer point, the delivered amount is the total of all meters.

1.2.7 The LD Optimisation (See Evaluation certificate number TC7057) must be enabled when applicable.

1.2.8 Aeration
Settings are programmed so that the Flow Transmitter can determine if the overall accuracy is not exceeding 0.5% resp. 1.0%. If CMF-HC2 and CMF-HC3 meter is used for both HFO and other marine fuels, then worst-case settings has to be respected.
The settings are to be verified during commissioning (putting into use). The settings cannot be changed without breaking a seal.
- See Evaluation certificate number TC7057 for details on aeration.
- See documentation number T10265–Aeration–1f for details on the settings.
- See documentation number T10265-Aeration-1f for details on the settings for Normal Fuel inclusive low sulphur, corresponding to diesel settings (= worst case).

1.2.9 The bunker procedures for start, during and end of the bunkering are mandatory to be followed.
- See annex 1 for a template of the latest bunker procedures for barges
- See annex 2 for a template of the latest bunker procedures for vessels.

1.2.10 Prevention of unauthorized counting
In order to prevent unauthorized counting (due to a partially filled flow meter), the measuring instrument is equipped with:
- A liquid detector in case of a barge application
- A liquid detector or limit switch in case of a vessel application.

For details, see paragraph 1.4.5 of this description the applicable documentation in the documentation folder.

1.3 Essential shapes

1.3.1 Configuration

Accuracy class	Type of measuring system	Schematic drawing	Remarks
0.5	measuring system installed on a barge	T10265-PID-1c	
	measuring system installed on a vessel	T10265-PID-2d	

- The essential parts stated in paragraph 1.1 can be applied in each desired combination as long as there is no conflict with the concerning Evaluation or Parts Certificates.

1.3.2 Inscriptions

- The following information is clearly visible on the nameplate:
  - 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 number T10265;
  - Manufacturer's name, registered trade name and/or registered trade mark;
  - Manufacturer's postal address;
  - Type designation;
  - Year of manufacture and serial number;
  - Accuracy class;
  - Minimum and maximum flow rate;
  - Maximum pressure;
  - Name(s) or nature(s) of the product(s) to be measured;
  - Mechanical and electromagnetic environment class;
  - Ambient temperature range;
  - Liquid temperature range.

Remarks:
The nameplate must be clearly visible without removing the covers.
An example of the nameplate is given in documentation number T10265-NP-3.

- Further inscriptions:
- The inscription "Minimum Measured Quantity … ton" in the vicinity of the display of the flow computer;
- The inscriptions on the essential parts as mentioned in the applicable Evaluation Certificates or Parts Certificates and/or clause 2 of this description.

1.4 Conditional parts

1.4.1 Thermowell, optional for checking purposes.

1.4.2 Pressure sensors, mechanical ranging from an adequate negative pressure (vacuo) to an adequate upper range.
- If installed on a barge, one pressure sensor is present installed on deck at the bottom of the discharge arm.
- If installed on a vessel, at least two pressure sensors are present.
  They are installed:
  - At the vacuum breaker installation;
  - Closely before downstream valve of the measurement sensor.

1.4.3 Sample point (optional).
Installed upstream or downstream of the measurement sensor. In the latter case, see note on the P&ID drawings.

1.4.4 Vacuum breaker installation.
Mandatory when the MMQ determination of the measuring system without vacuum breaker leads to value that is too big for the application and no other provisions are available to drain the bunker line.
Optional in all other cases.
Note: the vacuum breaker has the function to prevent vacuum (under pressure) in the bunker line to enable draining. A manual valve is placed over the breaker in case the vacuum breaker fails. This valve is sealed in the closed position.

1.4.5 Liquid detector; the following options are possible:
- model 2120; make Rosemount, with relay output; directly connected to flow transmitter; see documentation 10265/10-01;
- model 2120; make Rosemount with Namur output. See documentation number 10265/10-02. This liquid detector can only be used together with isolation barrier:
  - Pepperl + Fuchs, type KCD2-SR.
    See documentation number 10265/10-03;
  - Phoenix, type MACX MCR-EX-SL-NAM-2RO.
    See documentation number 10265/13-01.

  The liquid detector is connected to the barrier; the barrier has two outputs: one for liquid/air detection and one for open/short circuited cable; each output of the barrier is connected to different inputs of flow transmitter to enable detection of broken or short circuit cable;
- model 2130; same as model 2120, however model 2130 includes more diagnostics such as fouling or corrosion of sensor.

For more information on the use of the liquid detector, see paragraph 1.2.10.

1.4.6 Printing device (optional)
A printer is optionally connected to the flow transmitter or to the flow computer and is used for printing the reports (deliveries), events and alarms. The printer can be of any brand and type under the condition that it is equipped with a paper out detection and that the communication with the printer is safeguarded.

1.5 Conditional characteristics

1.5.1 By-pass of a sensor (optional)
See notes on the drawings T10265–PID–1c and T10265–PID–2d, for prescribed conditions for by-passing a sensor.

1.5.2 Alarms
Alarms occurring in the essential parts mentioned in paragraph 1.1 shall be transferred to the flow transmitter and (if present) flow computer. The presence of such an alarm shall be indicated, stored, displayed and/or printed if the delivery data is recalled.
In case of an interruptible measuring system, the flow shall be stopped and the ongoing delivery shall be ended.

1.6 Conditional shapes

- Diameter of the valves and piping.

1.7 Non-essential parts

- Pump, pipe work and connections;
- Block-in Valve(s);
- Vent-off valve(s);
- Filter/strainer;
- Pump;
- Temperature transducers (not for legal metrology);
- Pressure transducers (not for legal metrology).

2 Seals

The following items of the measuring system are sealed:
- Nameplate to the frame of the measurement system. Removal of the nameplate without destroying it or without breaking a seal shall not be possible;
- For sealing of the essential parts, see the applicable Evaluation Certificates or Parts Certificates;
- Vacuum breaker installation (if present)
  The manual valve over the vacuum breaker is sealed in the closed position.
- Liquid detector
  The liquid detector is sealed against opening and removal.
- All connections (tapping's) such as blind flanges, valves, etc. located between meter and transfer point.
  Guidelines for measures to take, such as permanent or temporary seals, are given in NMi procedure CPC–PR–01; see documentation number 10265/9-01.

3 Conditions for conformity assessment

- Verification procedure of the system
  - For the putting into use, the NMi procedure C-SP-HW-281 can be applied. The title of the procedure is "Procedure C-SP-HW-281 for the MID conformity assessment for the Micro Motion Flow meter when used for custody transfer gas application (annex MI-002) and liquid applications (annex MI-005)".
  - NMi procedure CPC–PR–01 (see documentation number 10265/9-01) describes how to handle valves and connections that are situated between meter and transfer point. The title of the procedure is "Integrity requirements for valves/connections between meter and transfer point in an industrial liquid measuring system, equipped with Micro Motion Coriolis meter(s), to comply with the essential requirements out of the MID, annex MI-005".

- Verification procedure of the meter
  For the putting into use, the NMi procedure C-SP-HW-280 can be applied. The title of the procedure is “Procedure C-SP-HW-280 for the MID conformity assessment for the Micro Motion Flow meter when used for custody transfer in gas applications (annex MI-002) and liquid applications (annex MI-005)”.

  The initial verification can be based on:
  - a water calibration, which includes:
    - a zero mass flow setting at the water calibration facility
    - mass flow tests
    - if applicable a density test
  - In the field
    - a zero mass flow setting, if needed
    - a zero mass flow verification
    - if applicable a density verification
    - record of the standard density (at 15 °C) as indicated by Micro Motion and the standard density (at 15 °C) as determined in a lab from a sample in order to assess the stability of the meter during subsequent verifications.

  Note: a zero mass flow verification and a standard density stability verification can be used for subsequent verifications.

  If the measurement sensor is used bi-directional, the verification in one direction is sufficient.

  This procedure is justified because of the fact that tests have proven that the mass accuracy on water is representative for mass accuracy on other liquids.

Bunkering Procedure for Compliance with OIML/MID Accuracy Requirements

Barges with Micro Motion® Certified Marine Bunker Measurement Solution

All standard setup and safety procedures must be followed at all times.
IMPORTANT! Failure to follow the procedures specified in this document may result in a measurement that is not OIML/MID-approved.

This procedure is designed for use with the detailed operational procedure in the *Marine Bunker Transfer Package Application Manual*. Refer to the detailed operational procedure as required.

Before Bunkering

1. Present all relevant documents (procedures, fuel specifications, and estimated quantity) to the purchaser/vessel.
2. Obtain the barge-specific MID compliance document, as delivered by Emerson at the end of the certification process. This document includes the Process & Instrumentation Diagram between meter and transfer point (P&ID), all permanent and temporary sealings, provisions to check for leakage (e.g., sight glasses), operational procedures, and maintenance procedures.
3. Ensure that the pressure gauge at the bottom of the discharge arm reads atmospheric pressure. If it does not, take action to drain the discharge arm (pressure should read atmospheric).
4. Supplier/barge captain and vessel chief engineer must verify the following, as defined in the barge-specific MID compliance document:
   - All permanent seals, as attached by the authorized officer, are intact.
   - All temporary seals (each identified with a unique number) are in place.
   - All sight glasses are clean.

   Proceed to the next step when all conditions are met.
5. If requested by vessel chief engineer, verify compliance with the barge-specific P&ID included in the barge-specific MID compliance document.
6. Supplier/barge captain and vessel chief engineer must verify that both of the following conditions are true at the flowmeter display:
   - The value of the mass totalizer is 0 or the site-specific value defined in the barge-specific MID compliance document.
   - No alarm is active.

   If both conditions are met, the flowmeter is ready for bunker transfer. If the conditions are not met, print a bunker ticket and retain the ticket for traceability. If the alarm remains, or the mass total is not reset to 0 or the site-specific value, consult the manual for troubleshooting information. If you cannot resolve the situation, contact Micro Motion at marinetechsupport@emerson.com.
7. Barge captain should take all appropriate actions to minimize the amount of air passing through the flowmeter before fuel delivery begins. For example, fill all the pipeworks between the barge tanks and the flowmeter (recirculate with no bunker fuel passing through the sensor).
8. Open the main bunker manifold valve of the vessel.
9. Start bunkering as soon as possible. The flowmeter will begin bunker totalizing as soon as fuel oil is pumped through the flowmeter.

During Bunkering

During the bunker transfer, the flowmeter calculates and displays the Aeration Limit diagnostic. Aeration Limit is the measured aeration of the fuel, reported as a percentage of the maximum allowable value. Aeration Limit is not reported until the quantity transferred reaches MMQ (Minimum Measured Quantity). At the beginning of the bunker, Aeration Limit will be high and possibly increase due to air in the pipelines. Once the pipelines are full of liquid, Aeration Limit should decrease and become lower than 100%. During the emptying of the barge tank(s), Aeration Limit will increase.

1. Take all possible measures to reduce/eliminate air entrainment throughout the bunkering process.
2. Monitor the Aeration Limit diagnostic throughout bunkering. If the value of Aeration Limit is 100% or greater at the end of the transfer, the bunker measurement will not meet MID requirements. Depending on system installation, audible/visible alarms may be triggered at predefined threshold values of Aeration Limit (default values are 20% and 75%).

   IMPORTANT! If the value of Aeration Limit is greater than 100% and is not decreasing, increase the back pressure downstream from the flowmeter. If this does not correct the problem, take all available measures to eliminate the aeration source. However, if the heavy fuel in the barge tanks is already aerated before start of the bunkering, Aeration Limit will not decrease and the bunker measurement will not meet MID accuracy requirements.
3. **IMPORTANT!** Close the main bunker manifold valve as soon as the required amount has been delivered. Follow the defined procedure to drain the line, including the discharge arm (blow the line and/or drain the line back to the tanks).

After Bunkering

1. Upon completion of bunker delivery, supplier/barge captain and vessel chief engineer must check the sight glass(es), verify that the pressure gauge near the flowmeter reads atmospheric pressure, verify that all seals are intact, then press the Print button and witness the printing of the bunker ticket from the Marine Bunker Transfer Package. The printed ticket includes the mass of the bunker and the OIML/MID pass/fail result. For a valid measurement, all four of the following must be true: The OIML/MID result on the ticket must be Pass; the sight glasses must be clean; the pressure reading at the bottom of the discharge arm must be atmospheric; and all seals must be intact. If one or more of these conditions is not true, the measurement is not valid.
2. Supplier/barge captain must provide the Bunker Delivery Note (BDN) to the vessel chief engineer. The vessel chief engineer must compare the BDN with the ticket.

Micro Motion

EMERSON
Process Management

Annex 2

Number **T10265** revision 14
Project number 2166885

Bunkering Procedure for Compliance with OIML/MID Accuracy Requirements

Vessels with Micro Motion® Certified Marine Bunker Measurement Solution

All standard setup and safety procedures must be followed at all times.
IMPORTANT! Failure to follow the procedures specified in this document may result in a measurement that is not OIML/MID-approved.

This procedure is designed for use with the detailed operational procedure in the *Marine Bunker Transfer Package Application Manual*. Refer to the detailed operational procedure as required.

Before Bunkering

1. Obtain all relevant documents (procedures, fuel specifications, and estimated quantity) from the supplier/barge.
2. Obtain the vessel-specific MID compliance document, as delivered by Emerson at the end of the certification process. This document includes the Process & Instrumentation Diagram between meter and transfer point (P&ID), all permanent and temporary sealings, provisions to check for leakage (e.g., sight glasses), operational procedures, and maintenance procedures.
3. Do not sign the Bunker Delivery Note (BDN) or any quantity-specific document before the bunker transfer.
4. Ensure that the bunker line between the main bunker manifold and the flowmeter is properly drained and atmospheric. If not, check the vacuum breaker system (if applicable) and take action to ensure atmospheric pressure.
5. Supplier/barge captain and vessel chief engineer must verify the following, as defined in the vessel-specific MID compliance document:
   - All permanent seals, as attached by the authorized officer, are intact.
   - All temporary seals (each identified with a unique number) are in place.
   - All sight glasses are clean.

   Proceed to the next step when all conditions are met.
6. If requested by barge captain, verify compliance with the vessel-specific P&ID included in the vessel-specific MID compliance document.
7. Supplier/barge captain and vessel chief engineer must verify that both of the following conditions are true at the flowmeter display:
   - The value of the mass totalizer is 0 or the site-specific value defined in the vessel-specific MID compliance document.
   - No alarm is active.

   If both conditions are met, the flowmeter is ready for bunker transfer. If the conditions are not met, print a bunker ticket and retain the ticket for traceability. If the alarm remains, or the mass total is not reset to 0 or the site-specific value, consult the manual for troubleshooting information. If you cannot resolve the situation, contact Micro Motion at marinetechsupport@emerson.com.
8. Vessel chief engineer should request the barge captain to take all appropriate actions to minimize the amount of air passing through the flowmeter before fuel delivery begins. For example, fill all the pipeworks between the barge tanks and the flowmeter (recirculate with no bunker fuel passing through the sensor).
9. Open the main bunker manifold valve and start bunkering as soon as possible.

During Bunkering

During bunkering, the flowmeter calculates and displays the Aeration Limit diagnostic. Aeration Limit is the measured aeration of the fuel, reported as a percentage of the maximum allowable value. Aeration Limit is not reported until the mass total reaches MMQ (Minimum Measured Quantity). At the beginning of the bunker, Aeration Limit will be high and possibly increase due to air in the pipelines. Once the pipelines are full of liquid, Aeration Limit should decrease and become lower than 100%. During the emptying of the barge tank(s), Aeration Limit will increase.

1. Take all possible measures to reduce/eliminate air entrainment throughout the bunkering.
2. Monitor Aeration Limit throughout the bunkering. If the value of Aeration Limit is 100% or greater at the end of the bunker, the bunker measurement will not meet MID requirements. Depending on system installation, audible/visible alarms may be triggered at predefined threshold values of Aeration Limit (default values are 20% and 75%).
   IMPORTANT! If the value of Aeration Limit is greater than 100% and is not decreasing, increase the back pressure downstream from the flowmeter. If this does not correct the problem, contact the barge immediately to eliminate the aeration source. However, if the heavy fuel in the barge tanks is already aerated before start of the bunkering, Aeration Limit will not decrease and the bunker measurement will not meet MID accuracy requirements.

   IMPORTANT! Close the main bunker manifold valve as soon as the barge stops pumping. The valve can be opened briefly for blowdown (only if required).

After Bunkering

1. Ensure that the pressure of the pipeline between the bunker manifold and the flowmeter is atmospheric. If it is not, vent the pipeline.
2. Upon completion of bunker delivery, supplier/barge captain and vessel chief engineer must check the sight glass(es), verify that all seals are intact, then press the Print button and witness the printing of the bunker ticket from the Marine Bunker Transfer Package. The printed ticket includes the mass of the bunker and the OIML/MID pass/fail result. For a valid measurement, all three of the following must be true: The OIML/MID result on the ticket must be Pass; the sight glasses must be clean and all seals must be intact. If one or more of these conditions is not true, the measurement is not valid.
2. Supplier/barge captain must provide the Bunker Delivery Note (BDN) to the vessel chief engineer. The vessel chief engineer must compare the BDN with the ticket.

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