

Micro Motion[®] Compact Density Meters (CDM)

Measuring Instruments Directive (MID) Applications Supplement



Safety messages

Safety messages are provided throughout this manual to protect personnel and equipment. Read each safety message carefully before proceeding to the next step.

Emerson Flow customer service

Email:

- Worldwide: flow.support@emerson.com
- Asia-Pacific: APflow.support@emerson.com

Telephone:

North and South America		Europe and Middle East		Asia Pacific	
United States	800-522-6277	U.K.	0870 240 1978	Australia	800 158 727
Canada	+1 303-527-5200	The Netherlands	+31 (0) 704 136 666	New Zealand	099 128 804
Mexico	+41 (0) 41 7686 111	France	0800 917 901	India	800 440 1468
Argentina	+54 11 4837 7000	Germany	0800 182 5347	Pakistan	888 550 2682
Brazil	+55 15 3413 8000	Italy	8008 77334	China	+86 21 2892 9000
Venezuela	+58 26 1731 3446	Central & Eastern	+41 (0) 41 7686 111	Japan	+81 3 5769 6803
		Russia/CIS	+7 495 981 9811	South Korea	+82 2 3438 4600
		Egypt	0800 000 0015	Singapore	+65 6 777 8211
		Oman	800 70101	Thailand	001 800 441 6426
		Qatar	431 0044	Malaysia	800 814 008
		Kuwait	663 299 01		
		South Africa	800 991 390		
		Saudi Arabia	800 844 9564		
		UAE	800 0444 0684		

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1 MID applications

The Measuring Instruments Directive (MID) is a European Union directive (2004/22/EC) that standardizes 10 types of measuring instruments. For example, MID standardizes the instruments used for the continuous and dynamic measurement of liquid quantities other than clean water (Annex MI-005).

TPS connections

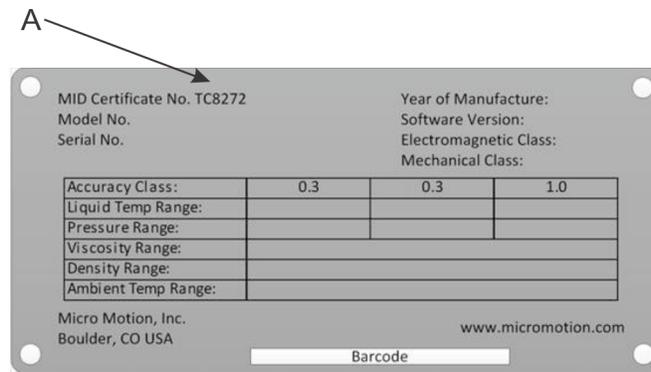
The CDM meter provides the raw density information in a time period value over the Time Period Signal (TPS) output. The TPS output is the “MID”-approved output.

2 Certification

An assessor uses the voluntary Welmecc 8.8 guide to test the essential parts of an MID liquid measuring system. If the tests pass, the assessor issues an evaluation certificate or parts certificate.

The CDM has been tested by NMI Certin BV based on Welmecc 8.8. OIML R117 was used as the normative document. The evaluation certificate number is TC8272.

Figure 2-1: MID label



A. *Certificate number*

As a result of this test and certification, the CDM can be used in an MID liquid measurement system.

3 MID flow computer and power supply requirements

Approved flow computers

When using the CDM in an MID application, the CDM must use an approved flow computer, such as a FloBoss S600 (TC7379, TC7470, TC8218), or an OMNI 3000/6000 (TC7375).

An approved flow computer is a flow computer which has either:

- An EC-type examination certificate for annex MI-005
- An evaluation certificate or parts certificate issued by a notified body under the Welmeq 8.8 guideline

Power supply requirements

When not powered by a flow computer, the CDM must be powered by one of the following power-supply types:

- DC/DC Phoenix QUINT PS/24VCD/24VDC/5
- AC/DC Phoenix QUINT PS/1AC/24VDC/3.5

4 Flow computer density calculations

If you want to calculate temperature-corrected and pressure-corrected densities, you will need external temperature and external pressure inputs.

You must use MID-approved pressure and temperature transmitters for the external temperature and pressure inputs. For example, Rosemount pressure transmitter type 3051S (TC7457) and Rosemount temperature transmitter type 3144P (TC7458) are both MID-approved.

In addition, you will need to program the following equations into the flow computer to calculate:

- Density (ρ)
- Temperature-corrected density (ρ_t)
- Temperature-corrected and pressure-corrected density (ρ_{tp})

For 7835/45 and legacy density meters

Use the following formula when:

- Replacing a 7835/45 density and concentration meter with a CDM
- Using legacy density calculations

Figure 4-1: Formula for 7835/45 and legacy density meters

$$\rho = K_0 + K_1 \times \tau + K_2 \times \tau^2$$

$$\rho_t = \rho(1 + K_{18}(t - 20)) + K_{19}(t - 20)$$

$$\rho_{tp} = \rho_t(1 + (K_{20}A + K_{20}B(P - 1))(P - 1)) + (K_{21}A + K_{21}B(P - 1))(P - 1)$$

where :

τ = time period from the CDM

t = external temperature in °C

P = external pressure in BarA

K_0 , K_1 , K_2 , K_{18} , K_{19} , $K_{20}A$, $K_{20}B$, $K_{21}A$, and $K_{21}B$ are coefficients provided by Micro Motion and determined during factory calibration.

For new CDM applications

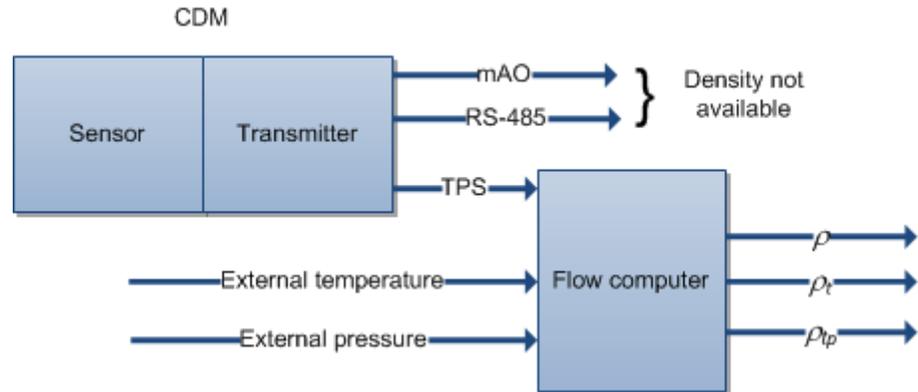
Use the following formula when using a new application with a CDM.

Figure 4-2: Formula for new CDM applications

$$\begin{aligned}\rho &= K_0 + K_2 \times \tau^2 \\ \rho_t &= \rho(1 + K_{18}(t - 20)) + K_{19}(t - 20) \\ \rho_{tp} &= \rho_t + K_{21}A(P - 1)\end{aligned}$$

5 TPS and external input connections to the flow computer

The following diagram shows the TPS, external temperature, and external pressure inputs to the flow computer.



6 MID support

When the meter is secured, process data meets MID requirements for custody transfer applications.

The meter is always either *secured* or *unsecured*.

The meter leaves the factory in unsecured mode, with Status Alert A027: Security Breach active. Process data cannot be used for custody transfer until the meter is secured. The alert will clear when the meter is secured.

When the meter is unsecured, all features and functions are available. When the meter is secured, configuration and calibration functions are not available, but basic operator functions are available. See the following table.

Table 6-1: MID security and functions

Function	Meter is unsecured	Meter is secured
Meter configuration	✓	
Meter calibration	✓	
Sensor zero	✓	
Sensor simulation	✓	
mA output trim	✓	
Connecting to the device from ProLink III	✓	✓
Connecting to the device from the Field Communicator	✓	✓
Reading process data, configuration data, calibration, and diagnostic data	✓	✓
Viewing and acknowledging alarms	✓	✓

7 Read revision and checksum data

Display	OFF-LINE MAINT > SW REV
ProLink III	Device Tools > Diagnostics > Core Processor Diagnostics > Core Processor Firmware Checksum Device Tools > Device Information > (Transmitter Electronics) Software Revision Device Tools > Device Information > (MID) Software Revision
Field Communicator	To read the transmitter firmware checksum: Overview > Device Information > MID Information > Xmtr Firmware To read the MID software revision: Overview > Device Information > MID Information > MID Software Version To read the transmitter software revision: Overview > Device Information > Revisions > Transmitter Software

Overview

During commissioning, you may need to read the transmitter firmware checksum, the transmitter software revision, and the Weights & Measures MID software revision.

8 Secure the meter

When the meter is secure, process data meets MID requirements for custody transfer applications.

Prerequisites

If necessary for your installation, arrange for a site visit by a certified Weights & Measures inspector, and ensure that the inspector is present for the appropriate portions of this procedure.

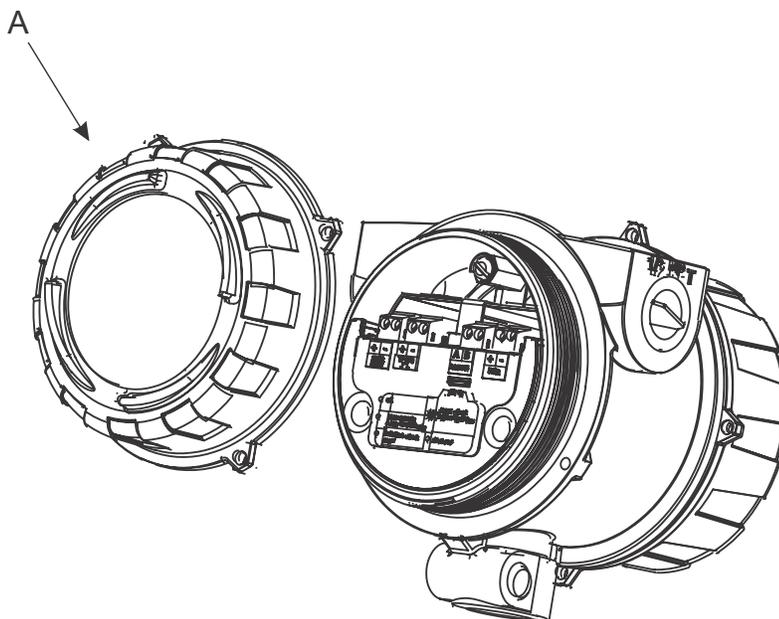
Ensure that the transmitter is ready to be secured, i.e., it is configured as desired and you have performed all appropriate tests and adjustments. After the transmitter is secured, you cannot make any changes to configuration, many maintenance actions are disallowed, and some operator actions are disallowed.

You will need a 3 mm strap wrench and a 3 mm hex key.

Procedure

1. Power down the meter.
2. Remove the transmitter end-cap.

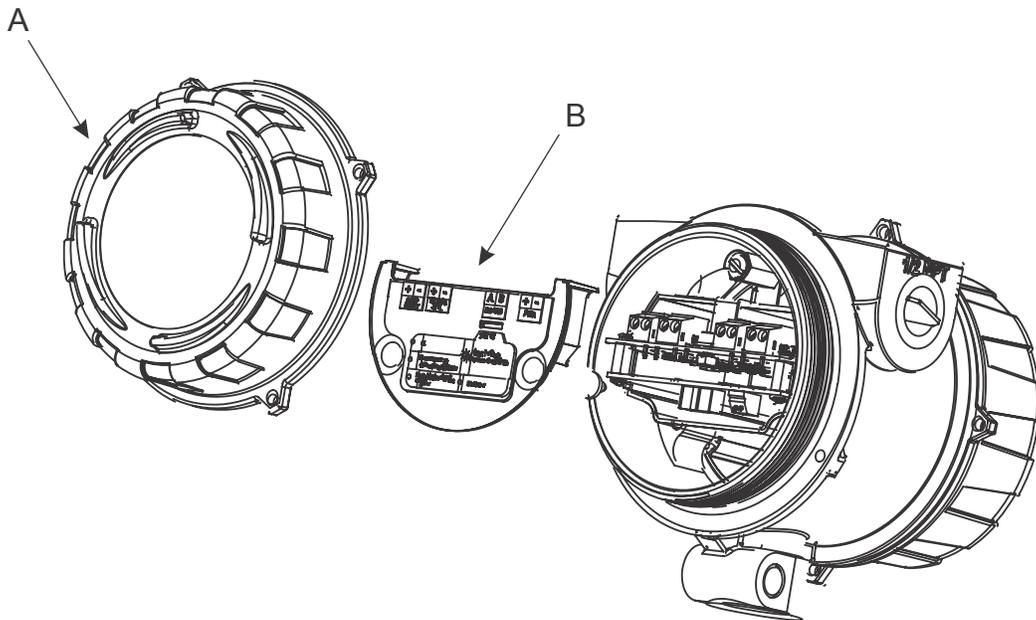
Figure 8-1: Transmitter with end-cap removed



A. Transmitter end-cap

3. Remove the safety spacer.

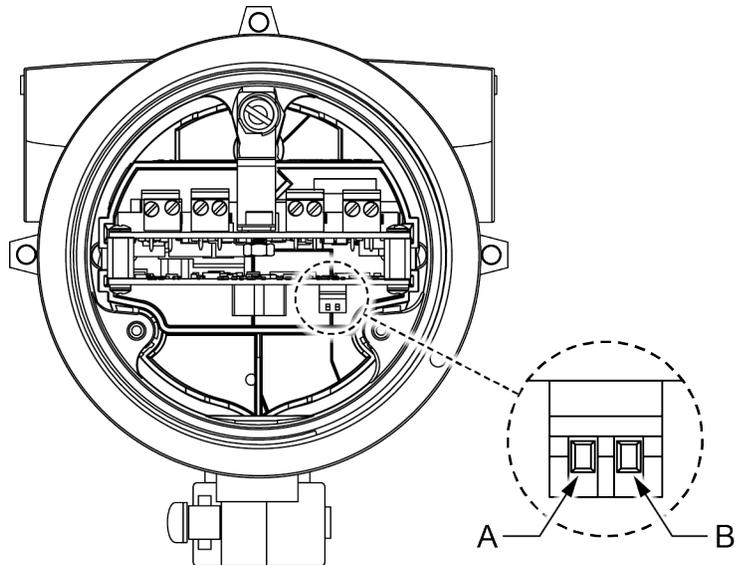
Figure 8-2: Transmitter with end-cap and safety spacer removed



- A. Transmitter end-cap
- B. Safety spacer

4. Move the custody transfer switch to the ON position (down).
The custody transfer switch is the switch on the right.

Figure 8-3: HART security switch and custody transfer switch



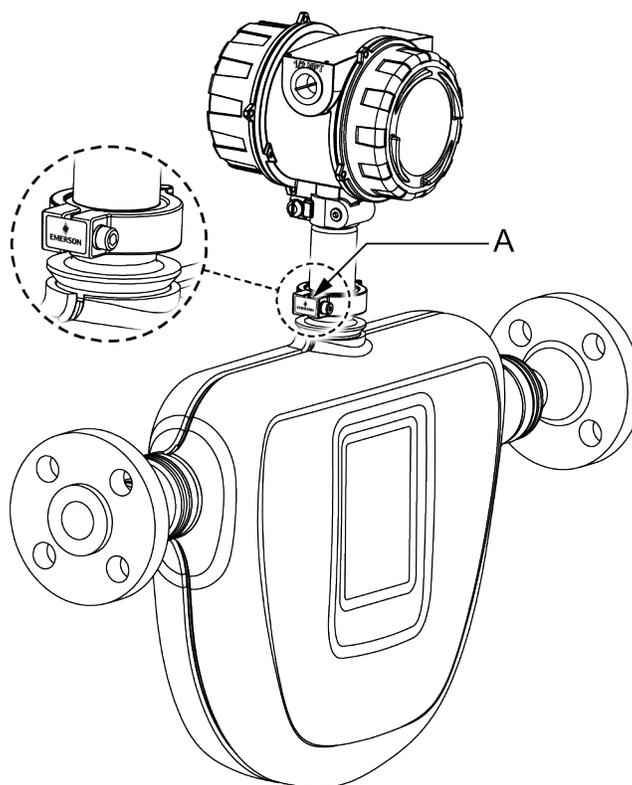
- A. HART security switch
- B. Custody transfer switch

5. Re-install the safety spacer and end-cap.
6. Install the physical seal.

Important

The physical seal is a paper seal that must be installed by a certified Weights & Measures inspector. The seal is provided by the inspector. Place the seal over the bolt between the transmitter and sensor.

Figure 8-4: Custody transfer seal



7. Power up the meter.
During power-up, the meter checks the position of the custody transfer switch, and clears Status Alert A027: Security Breach Active.

9 Switch to unsecured mode

If the meter is secured, you must switch to unsecured mode to change the transmitter configuration or perform many administrative tasks.

Prerequisites

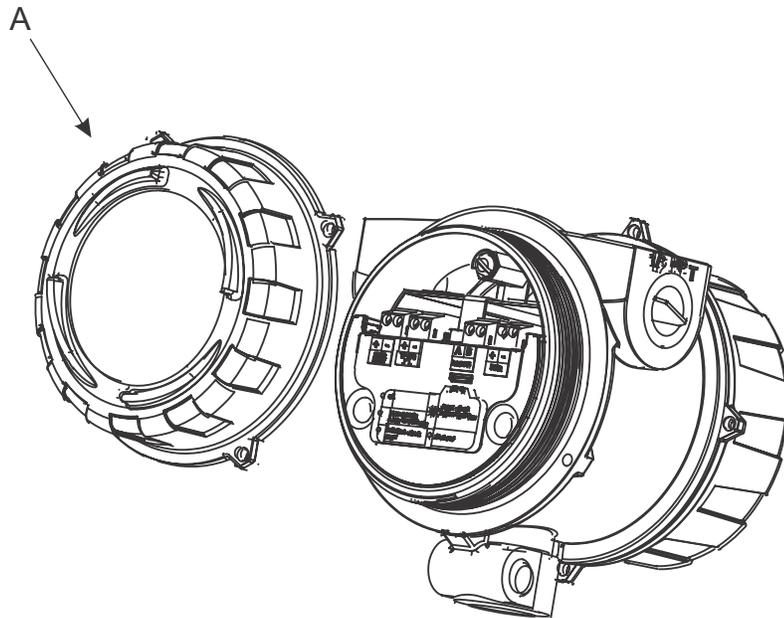
Before switching to unsecured mode, ensure that you will be able to switch back to secured mode. Because switching to unsecured mode requires breaking the physical seal, switching back to secured mode may require a site visit from a certified Weights & Measures inspector and reinstallation of the physical seal.

You will need a 3 mm strap wrench and a 3 mm hex key.

Procedure

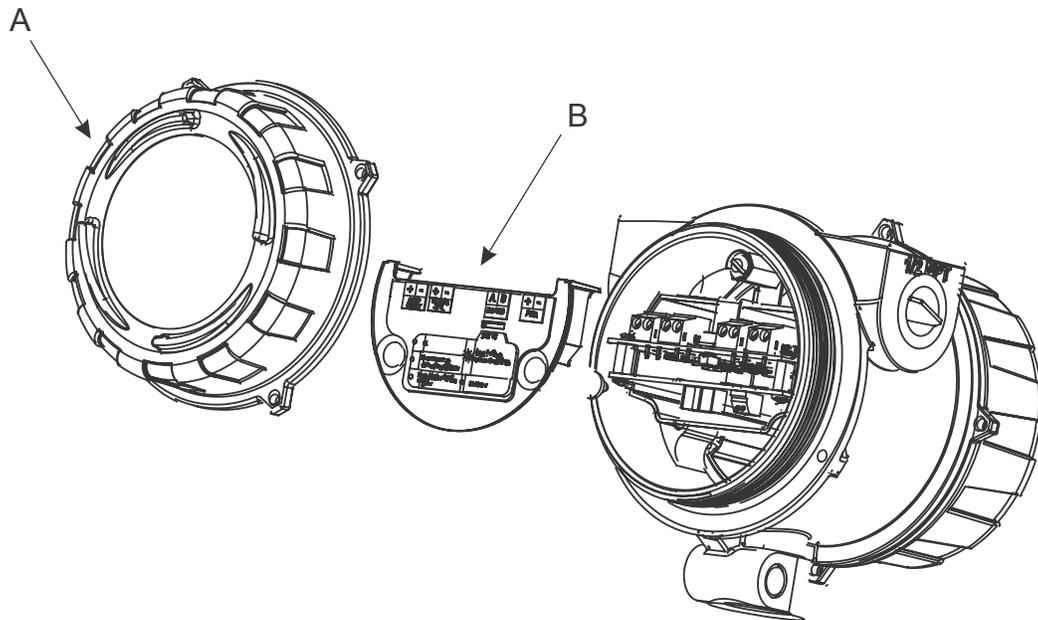
1. Power down the meter.
2. Remove the paper seal on the clamp attaching the transmitter to the sensor.
3. Remove the transmitter end-cap.

Figure 9-1: Transmitter with end-cap removed



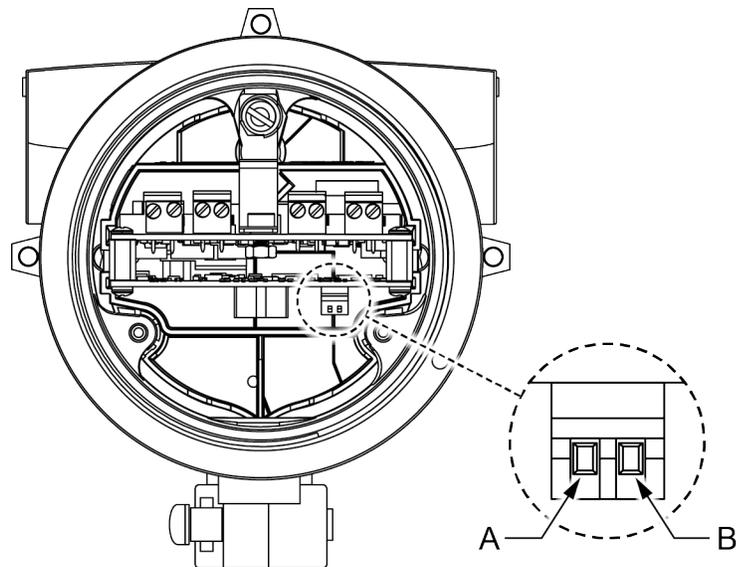
A. Transmitter end-cap

4. Remove the safety spacer.

Figure 9-2: Transmitter with end-cap and safety spacer removed

- A. Transmitter end-cap
- B. Safety spacer

5. Move the custody transfer switch to the OFF position (up).
The custody transfer switch is the switch on the right.

Figure 9-3: HART security switch and custody transfer switch

- A. HART security switch
- B. Custody transfer switch

6. Replace the safety spacer and end-cap.
7. Power up the meter.

During power-up, the meter checks the position of the custody transfer switch, and posts Status Alert A027: Security Breach Active.



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Micro Motion Inc. USA

Worldwide Headquarters
7070 Winchester Circle
Boulder, Colorado 80301
T +1 303-527-5200
T +1 800-522-6277
F +1 303-530-8459
www.micromotion.com

Micro Motion Europe

Emerson Process Management
Neonstraat 1
6718 WX Ede
The Netherlands
T +31 (0) 70 413 6666
F +31 (0) 318 495 556
www.micromotion.nl

Micro Motion Asia

Emerson Process Management
1 Pandan Crescent
Singapore 128461
Republic of Singapore
T +65 6777-8211
F +65 6770-8003

Micro Motion United Kingdom

Emerson Process Management Limited
Horsfield Way
Bredbury Industrial Estate
Stockport SK6 2SU U.K.
T +44 0870 240 1978
F +44 0800 966 181

Micro Motion Japan

Emerson Process Management
1-2-5, Higashi Shinagawa
Shinagawa-ku
Tokyo 140-0002 Japan
T +81 3 5769-6803
F +81 3 5769-6844

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