

Product Data Sheet

PS-001039, Rev. K

May 2013

Micro Motion[®] 7835 Series Density and Concentration Meters

Micro Motion density and concentration meters are built to tackle the most demanding process and fiscal applications. They are rugged and reliable straight-tube meters, requiring minimal maintenance, and are the industry standard for online density measurement.



Best precision density measurement

- Ni-Span-C[®] tube for wide-ranging precision measurement
- On-site ISO/IEC17025-accredited laboratory for guaranteed performance

Industry standard for fiscal hydrocarbon measurement

- Market leader with largest installed base
- Compliant with fiscal measurement standards
- Meets OIML R117-1 for usage in installations requiring MID approval

Superior reliability and safety

- Cleanable, straight-through sensor with low pressure drop
- Optimized design – insensitive to vibration, flow, temperature and pressure variations

7835

Peak performance
density meter

7845

High performance
general purpose
density meter

7847

High performance
hygienic density
meter

7826/28

Direct insertion
density meter

3098

Gas specific gravity
meter

7812

Fiscal gas density
meter



Micro Motion 7835 density and concentration meters

The 7835 density meter is designed for the fiscal metering of crude oil, refined hydrocarbons, and non-aggressive process liquids. It offers the highest accuracy with excellent repeatability under pipeline operating conditions. The vibrating element is manufactured from Ni-Span-C® for excellent long-term stability and low temperature coefficient. All other wetted parts are ANSI 316L stainless steel.

Available in both explosion-proof (Ex d) and intrinsically safe (Ex ia) versions, the 7835 series offers a full range of ATEX and CSA approved units.

The 7835 density meter is designed to operate with one of two electronic configurations:

- as a meter giving a frequency output to a signal converter (such as the Micro Motion 7950 and 7951 signal converters) or flow computer.
- as a transmitter with up to three integral analog outputs and Modbus RS-485 communications. (HART protocol communications and a remote display are also available as options).

Advantages

- Continuous measurement
- Explosion proof and intrinsically safe versions
- ATEX and CSA approvals
- MID evaluation certificate available
- IP66 Weatherproof
- Straight-through flow path
- Pipeline quality – all welded construction
- Hermetically sealed construction
- Insensitive to mounting position, plant vibration, flow rate and pressure
- Modular electronics design
- Direct analog and digital communications outputs
- Multi-drop capability
- Remote display and HART communications options
- PC configuration tool for diagnostics and data logging
- Zero maintenance

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Principle of operation

The 7835 liquid density meters use a vibrating tube to measure density. As the liquid density changes, it affects the vibrating mass of the density meter. The change in vibrating mass then affects the resonant frequency, which is inversely proportional to the density of the process fluid. By monitoring the resonant frequency and applying well-known conversions, the 7835 can provide highly accurate inline density data.

Features

The 7835 density meters are factory-calibrated and no field calibration is required. The calibration is traceable to UK National Standards through the onsite ISO/IEC17025-accredited density laboratory.

The meters measure line density and temperature, and calculate referred density using API tables or a matrix referral. Parameters such as °API and specific gravity are also available. Calculations are performed in conjunction with a signal converter (for the frequency output version) or by the integral transmitter electronics. Any of the parameters can be used to drive analog outputs (from either the signal converter or the transmitter).

The design of the 7835 density meter ensures highly accurate and reliable results with minimal maintenance and lower overall operating costs.

Measuring Instrument Directive (MID) Compliance

The 7835 density meter has been evaluated against OIML R117-1:2007 and WELMEC guide 8.8 for use in measuring systems for the continuous and dynamic measurement of quantities of liquids other than water. This evaluation was completed in compliance with the European Measuring Instrument Directive (2004/22/EC) Annex MI-005. The evaluation certificate for the 7835 meter may be used, with written permission of Mobrey Limited – a division of Emerson Process Management, to assist in obtaining an EC-type examination certificate for the complete measuring system.

System capabilities

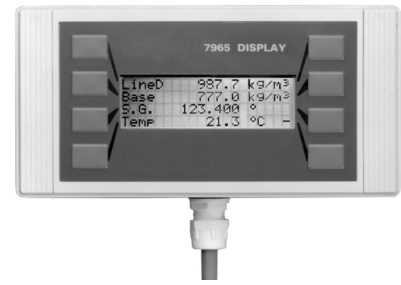
Depending on the functionality required, the 7835 density meters are available in any of the following configurations:

- Frequency Output version (requires external signal converter / flow computer)
 - Explosion proof (Ex d) or intrinsically safe (Ex ia)
- Transmitter version with integral communications (Modbus RS-485 and two 4–20 mA outputs)
 - Intrinsically safe (Ex ia) version only
 - HART / 3rd analog output board (optional)
 - Remote display (optional)

Remote display features

The remote display is designed for use with the 7835 intrinsically safe (Ex ia) transmitter version only. It provides the following functionality:

- Keypad configuration
- Four-line parameter display
- Hand or wall-mount operation up to 328 ft (100 m) away from the transmitter
- Hazardous-area operation



A single remote display can communicate with up to 24 7835 Ex ia density meters in a multi-drop transmitter environment. Each 7835 meter must have a unique slave address in the range of 0 to 200. The remote display interrogates one meter at a time, and each meter is configured by setting the address and re-polling.

7950/7951 Signal Converter features

Inputs from 7835:

- Line density (frequency)
- Temperature (RTD)

Typical 7950 and 7951 calculations:

- Line density
- Referred density
- % Concentration
- Specific gravity

7950 and 7951 outputs:

- Status
- 4–20 mA output
- RS-232C/485 Modbus



ProLink II software features

The ProLink II software can be used with the 7835 liquid density meters. ProLink II runs on a Microsoft Windows platform, communicates with the 7835 through a standard serial port or USB port, and provides the following functionality:

- Configuring the 7835 transmitter
- Viewing and logging process parameters
- Viewing meter diagnostics.

ADView software features

ADView is a PC-based configuration and diagnostics tool available with the 7835 transmitter version. ADView runs on a Microsoft® Windows® platform, communicates with the 7835 through a standard communications port, and provides the following functionality:

- Configuring the 7835 meter
- Viewing data real-time and saving data as a graph
- Logging data files
- Verifying system operation and diagnosing system faults
- Loading and storing Modbus register values
- Read/write to individual Modbus registers.

The ADView diagnostic tool is available for download at www.micromotion.com on the 7835 density meter products page.

Density performance

Accuracy	±0.0001 g/cc ±0.00015 g/cc	±0.1 kg/m ³ ±0.15 kg/m ³	(Enhanced calibration) ⁽¹⁾ (Standard calibration) ⁽²⁾
Operating Range	Up to 3 g/cc	Up to 3000 kg/m ³	
Repeatability	±0.00002 g/cc	±0.02 kg/m ³	
Stability	±0.00015 g/cc	0.15 kg/m ³	(Per year)
Process Temperature Effect (Corrected) ⁽³⁾	±0.000005 g/cc ±0.000278 g/cc	±0.005 kg/m ³ ±0.278 kg/m ³	(Per °C) (Per 100 °F)
Process Pressure Effect (Corrected) ⁽⁴⁾	±0.000003 g/cc ±0.000021 g/cc	±0.003 kg/m ³ ±0.021 kg/m ³	(Per bar) (Per 100 psi)

(1) Accuracy is dependent upon the calibrator option chosen. Density range for which this accuracy applies depends on the calibration option chosen.

(2) Stated accuracy is for operating density range of 0.3 to 1.1 g/cc (300 - 1100 kg/m³).

(3) Temperature effect is the maximum measurement offset due to process fluid temperature changing away from the density calibration temperature.

(4) Pressure effect is defined as the change in sensor density sensitivity due to process pressure changing away from the calibration pressure. To determine factory calibration pressure, refer to calibration document shipped with the 7835. If data is unavailable, contact the factory.

Temperature specification

Operating Range	-58 °F to +230 °F (-50 °C to +110 °C)
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Integral temperature sensor:

Technology	100 Ohms RTD (4 wire)
Accuracy	BS 1904 Class, DIN 43760 Class A.

Pressure ratings

Maximum operating pressure	Intrinsically safe (Ex ia) 2175 psi (150 bar) Explosion proof (Ex d) 1450 psi (100 bar)
Test pressure	Tested to 1.5 times the maximum operating pressure
PED compliance	Complies with European directive 97/23/EC on Pressure Equipment.

Hazardous area classifications

ATEX Intrinsically Safe

ATEX-approved I.S. 7835: Certification to EN 60079-0: 2006 and EN 60079-11: 2007 for use in Europe

7835 (Frequency Output):	(7835****AJ****)	ATEX II1G, Ex ia IIC T6 (Ta -40 °C...+40 °C) T4 (Ta -40 °C...+70 °C)
7835 (Transmitter):	(7835****DJ****) (7835****BJ****)	ATEX II1G, Ex ia IIB T4 (Ta -40 °C...+60 °C) ATEX II1G, Ex ia IIC T4 (Ta -40 °C... +60 °C)
Remote Display (Optional)		ATEX II 1 G, Ex ia IIC, T4 (Ta -40 °C...+60 °C)

ATEX Explosion Proof

ATEX-approved Ex d 7835: Certification for use in Europe

7835 (Frequency Output):	(7835****AK****)	ATEX II2G Ex d IIB T6 (Ta -40 °C...+70 °C)
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CSA Intrinsically Safe

CSA-approved I.S. 7835: Certification to CSA C22-2 No 142, CSA C22-2 No 175, UL 508 and UL 913 for use in Canada and USA

7835 (Frequency Output):	(7835****AL****)	Class I, Division 1 Groups C & D, T3C
7835 (Transmitter) and optional Remote Display:	(7835****BL****) (7835****DL****)	Class I, Division 1, Groups A, B, C & D, T4 (Single instrument) Class I, Division 1, Groups C & D, T4 (Hart Multi-drop)

CSA Explosion Proof

CSA-approved Ex d 7835: Certification for use in Canada and USA

7835 (Frequency Output):	(7835****AM****)	Class I, Division 1 Groups C & D, T3C
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OIML R117-1 classifications

Evaluation to OIML R117-1 Edition 2007 (E) and Measuring Instrument Directive (2004/22/EC) Annex MI-005

Viscosity range	0.75 cP to 50 cP (0.75 mPa·s to 50 mPa·s)
Density range	0.7 g/cc to 1.2 g/cc (700 kg/m ³ to 1200 kg/m ³)
Temperature range ambient	-40 °F to +158 °F (-40 °C to +70 °C)

Environmental class
Mechanical: M2
Electromagnetic: E2

Maximum pressure	Fluid temperature range	Accuracy Class
• 928.2 psi (64 bar)	• +23 °F to +131 °F (-5 °C to +55 °C)	• 0.3
• 1450.4 psi (100 bar)	• +32 °F to +104 °F (0 °C to 40 °C)	• 0.3
• 1450.4 psi (100 bar)	• +23 °F to +131 °F (-5 °C to +55 °C)	• 1.0

Electromagnetic compatibility

All versions conform to the latest international standards for EMC, and are compliant with EN 61326/IEC 61326.

Materials of construction

Wetted parts	Ni-Span-C [®] and 316L Stainless steel
Case finish	316L Stainless steel
Flange	316L Stainless steel

Fluid containment

Recognizing the increased emphasis on safety by chemical, hydrocarbon, and process markets alike, these Micro Motion density meters have been enhanced by the introduction of an optional outer 725 psi (50 bar) or secondary 1450 psi (100 bar) pressure retaining capability. In the unlikely event of an instrument failure, the meter safely contains any leakage. As a further safety feature, all welds are qualified to ASME 9/EN ISO 15614–1 standards and can undergo dye penetration testing to ASME standards, if required. Furthermore, the flange welds may be x-rayed to most recognized international standards.

	Standard Containment	Optional Outer Containment	Optional Second Containment
Case pressure	Limited by the Case failure pressure specification below	725 psi (50 bar) Standard engineering practice	1450 psi (100 bar) designed to B31.3
Case failure pressure	Fitted with burst disc which will fail between 290–435 psi (20–30 bar)	2900 psi (200 bar)	5727 psi (395 bar) Glass to metal seal failure

Weight

Weight	Intrinsically safe (Ex ia)	48 lb (22 kg)
	Explosion proof (Ex d)	77 lb (35 kg)

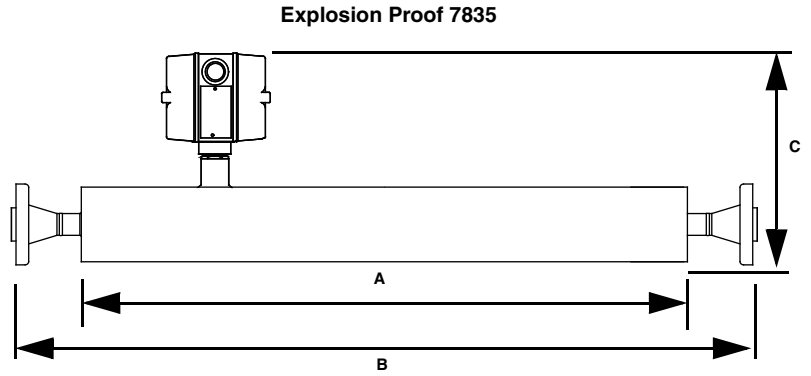
Electrical

Power supply (Frequency Output version)	16 to 28 VDC at 17 mA maximum	
Power supply (Transmitter version)	18 to 28 VDC at 80 mA	
Outputs (Frequency Output version)	Current modulation on power supply line	
Outputs (Transmitter version)	Analog	2 (+1 with HART option board)
	Accuracy	0.1% of reading plus 0.5% of full scale
	Repeatability	±0.025%
	Out-of-range	2 to 20 mA on 4–20 mA (Programmable alarm state)
	Pulse output (Ex ia transmitter only)	Open collector output. Alarm status or frequency.
	Communications (Ex ia transmitter only)	RS-485, Modbus (standard), HART (optional)

Dimensions

Dimensions for the Explosion Proof 7835

Model	Dimensions			
	A	B	C	
Ex d 7835	inches	34	40.4	12.6
	mm	863±1	1027±3	320



Dimensions for the Intrinsically Safe 7835

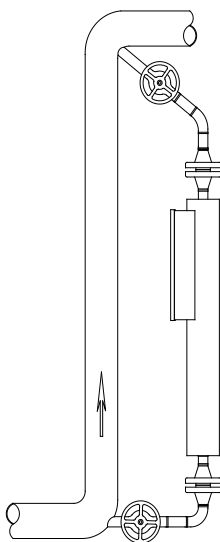
Model	Dimensions			
	A	B	C	
Ex ia 7835	inches	34	40.4	6.2
	mm	863±1	1027±3	156.6



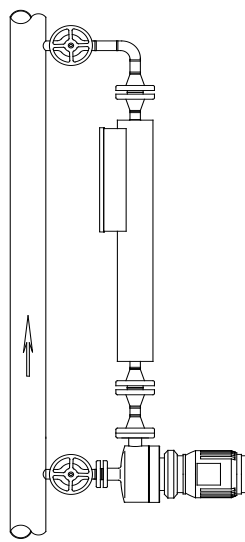
Installation

You can mount the 7835 density meter at any angle. However, at low flow rates [such as 2.7 gallons/minute (750 liters/hour)], we highly recommend you mount the meter vertically or at an incline with the liquid flowing in an upwards direction. For continuous typical flow rates [such as 7.4 to 11.1 gallons/minute (2000 to 3000 liters/hour)], you can select the mounting position based on the need to simplify the associated pipework and minimize the pressure and temperature losses. The maximum flow rate for the 7835 meter is 60 gallons/minute (15,000 liters/hour).

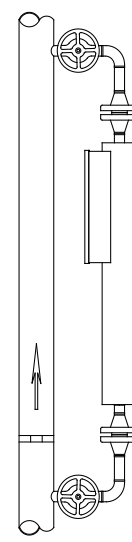
Installation examples



'S' Bend Method



Pump Method



Orifice Plate Method

Ordering information

Model	Product description
7835	Ni-Span-C Liquid Density meter
Code	Process connection
Available with all Safety Approval Codes	
B	1-inch ANSI 600 lb weld neck raised face (RF) flange
D	1-inch ANSI 600 lb weld neck ring joint (RTJ) flange
F	1-inch ANSI 600 lb weld neck raised face (RF) 125-250 Ra finish face flange
H	DN25/PN40 weld neck flange; DIN 2635 type C face
J	DN25/PN40 weld neck flange; DIN 2635 type N grooved flange
L	DN25/PN100 weld neck flange; DIN 2637 type E face
Z	Special
Available only with Safety Approval Codes J and L	
A	1-inch ANSI 900 lb weld neck raised face (RF) flange
E	1-inch ANSI 900 lb weld neck ring joint (RTJ) flange
Code	Material options
A	Wetted parts: Ni-Span tube, SS Bellows and input, SS outer case
Z	Special
Code	Meter outer containment
Available only with Amplifier Enclosure F	
A	Standard stainless steel, for tube mounted amplifiers
B	Outer containment (1/4-inch NPT), for tube mounted amplifiers (up to 725 PSI or 50 Bar)
C	Secondary containment B31.3 (1/2-inch NPT), for tube mounted amplifiers (up to 1450 PSI or 100 Bar)
Available only with Amplifier Enclosure B	
D	Ex d, for amplifier enclosure with stand off
Code	Amplifier enclosure
Available only with Safety Approval Codes K and M	
B	Alloy stand off (Ex d 7835 Only)
Available only with Safety Approval Codes J and L	
F	Tube mounted flat box in stainless steel (Ex ia 7835 Only)
Code	On-board electronics
Available with all Amplifier Enclosure codes	
A	Standard base board, giving 1 x Frequency Output
Available only with Amplifier Enclosure F	
B	Advanced base board, giving 2 x 4-20mA outputs (Ex ia 7835 only)
D	Advanced base board and HART board, giving 3x 4-20mA outputs (Ex ia 7835 only)
J	MID Advanced base board (two 4-20 mA outputs)
K	MID Advanced base board and HART board (three 4-20 mA outputs)
Code	Safety approval and label
Available with all On-board Electronics codes	
J	ATEX Intrinsically Safe - Ex ia IIC T6 or T4 or Ex ia IIB T4
Available only with On-board Electronics code A	
K	ATEX Explosion Proof - Ex d IIB T6 and T3
M	CSA Explosion Proof - Class 1 Div 1 Groups C and D (Canada and USA)
Available only with On-board Electronics codes A, B, and D	
L	CSA intrinsically safe, Class 1 Div 1 Groups C and D (Canada and USA)
Continued on next page	

Ordering information *continued*

Code Default software configuration	
Available only with On-board Electronics Codes B, D, J, and K	
C	Line density only
Available only with On-board Electronics Codes B and D	
A	API Degrees (Americas)
B	Base density to API tables (metric configuration)
D	General Process including Matrix
Z	Special
Available only with On-board Electronics Code A	
T	Frequency version - no software - <i>Frequency board only</i>
Code Calibration	
Available only with On-board Electronics Codes A, B, and D	
A	Instrument standard
D	ISO/IEC 17025 (UKAS) calibration — Water
E	ISO/IEC 17025 (UKAS) calibration — 3 liquids
L	LNE calibration
Z	Special
Available only with On-board Electronics Codes A, J, and K	
M ⁽¹⁾	MID evaluated component calibration
Code Dye Penetrant and Radiographic Examination (ASME IX)	
A	None
B	Dye penetration (internal welds)
C	Dye penetration (all welds)
D	Radiography of flange welds + B above
E	Radiography of flange welds + C above
F	Radiography of flange welds
Code Traceability	
A	None
X	Certificates of material traceability (per single order)
Typical model number: 7835 B A A F A J T A A A	

(1) Not available with Safety Approval code M and L.

Micro Motion—The undisputed leader in flow and density measurement



World-leading Micro Motion measurement solutions from Emerson Process Management deliver what you need most:

Technology leadership

Micro Motion introduced the first reliable Coriolis meter in 1977. Since that time, our ongoing product development has enabled us to provide the highest performing measurement devices available.

Product breadth

From compact, drainable process control to high flow rate fiscal transfer—look no further than Micro Motion for the widest range of measurement solutions.

Unparalleled value

Benefit from expert phone, field, and application service and support made possible by more than 750,000 meters installed worldwide and over 30 years of flow and density measurement experience.

 www.micromotion.com

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