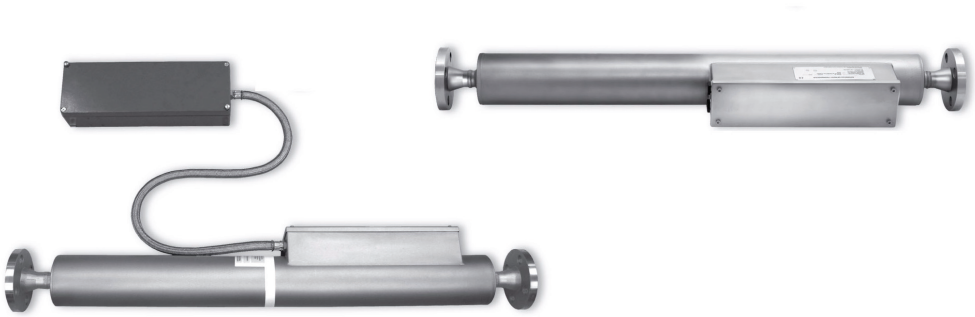
Product Data Sheet
PS-001116, Rev. G
April 2009

Micro Motion® 7845/7847 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.



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

Superior precision density measurement

- Unique design delivers unparalleled measurement sensitivity and stability
- Onsite accredited density laboratory for guaranteed performance

Broadest range of density measurement

- Compliant with fiscal measurement standards
- Guarantee consistent, reliable performance over the widest density range

Superior reliability

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

Micro Motion®

EMERSON™
Process Management

Micro Motion 7845/7847 density and concentration meters

The 7845 and 7847 density meters are designed to tackle the most demanding of applications found in modern processing plants.

The 7845 is a flexible, stainless steel, high accuracy meter that is designed for general process applications. This meter is capable of market-leading density and concentration measurements in challenging applications, ranging from custody transfer and interface detection to concentration control. Building on the proven design of the 7845, the 7847 is designed for hygienic applications that require high performance process control. With the inherent advantages of its low pressure drop, straight-through, and easily cleanable design, the 7847 is ideal for the food and beverage industries.

Both the 7845 and 7847 density meters are 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)
- as a transmitter with up to three integral analog outputs and Modbus RS485 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
- IP66 Weatherproof
- 7845 is NACE compatible
- 7847 has 3A approval for use in hygienic applications
- 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

Contents

Principle of operation

The 7845/7847 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 7845/7847 can provide highly accurate inline density data.

Features

The 7845/47 density meters are factory-calibrated and no field calibration is required. The calibration is traceable to UK National Standards through the onsite Micro Motion 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 7845 and 7847 density meters ensures highly accurate and reliable results with minimal maintenance and lower overall operating costs. The entrained gas versions of these meters also allow accurate density measurements in aerated liquids. The 7847 with 3A approval provides a highly accurate density meter for use in the food and beverage industry and other hygienic applications.

System capabilities

Depending on the functionality required, the 7845 and 7847 density meters are available in any of the following configurations:

- Frequency Output version (requires external signal converter / flow computer)
  - Intrinsically safe (Ex ia) 7845 or 7847
- Transmitter version with integral communications (Modbus RS485 and two 4–20 mA outputs)
  - Intrinsically safe (Ex ia) 7845 or 7847
  - HART / 3rd analog output board (optional)
  - Remote display (optional)
- Entrained gas version with frequency or digital communications outputs
  - Frequency Output version 7845 or 7847 for non-hazardous (safe) area only
  - Transmitter version of intrinsically safe (Ex ia) 7845 or 7847

Remote display features

The remote display is designed for use with the 7845/7847 transmitter version only. It provides the following functionality:

- Keypad configuration
- Four-line parameter display
- Hand or wall-mount operation up to 100 meters away from the transmitter
- Hazardous-area operation (intrinsically safe 7845/7847 version only).

A single remote display can communicate with up to 24 7845/7847 density meters in a multi-drop transmitter environment. Each 7845/7847 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.

ADView diagnostic tool features

ADView is a PC-based configuration and diagnostics tool available with the 7845/7847 transmitter version only. ADView runs on a Microsoft® Windows® platform, communicates with the 7845/7847 through a standard communications port, and provides the following functionality:

- Configuring the 7845/7847 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 7845/7847 density meters products page.

7950/7951 Signal Converter features

Inputs from 7845 and 7847:

- Line density (frequency)
- Temperature (PT100)

Typical 7950 and 7951 calculations:

- Line density
- Referred density
- Specific gravity

7950 and 7951 outputs:

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

Density performance

Accuracy	±0,1 kg/m^3	(Option) [1]
	±0,35 kg/m^3	(Standard) [2]
	±0,5 kg/m^3	(Standard) [3]
	±5,0 kg/m^3	(Entrained Gas Option) [4]
Operating Range	Up to 3000 kg/m^3	
Repeatability	±0,05 kg/m^3	
	±1,0 kg/m^3	(Entrained Gas Option) [4]
Stability	0,35 kg/m^3	(Per year)
Process Temperature Effect (Corrected) [5]	±0,05 kg/m^3	(Per °C)
	±2,7778 kg/m^3	(Per 100 °F)
Process Pressure Effect (Corrected) [6]	±0,006 kg/m^3	(Per bar)
	±0,041 kg/m^3	(Per 100 psi)

(1) Accuracy is for optional calibration in water – contact the sales office for further details. With the transmitter electronics option, there are additional uncertainties attributable to time period measurement and 4–20 mA output.

(2) Stated accuracy is for operating density range of 600 – 1200 kg/m^3. With the transmitter electronics option, there are additional uncertainties attributable to time period measurement and 4–20 mA output.

(3) Stated accuracy is for operating density range of 600 – 1600 kg/m^3. With the transmitter electronics option, there are additional uncertainties attributable to time period measurement and 4–20 mA output.

(4) Percentage of entrained gas range 0 to 100%.

(5) This is the maximum measurement offset due to process fluid temperature changing away from the density calibration temperature.

(6) 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 7845/47. If data is unavailable, contact the factory.

Temperature specification

Operating Range [1]	–50 °C to +110 °C

(1) –50 °C to +160 °C with high temperature kit option.

Integral temperature sensor:

Technology	PT100 – 4 wire
Measurement Range	–200 °C to +300 °C
Accuracy	BS 1904 Class, DIN 43760 Class A.

Pressure ratings

Maximum operating pressure	7845	100 bar or flange limit
	7847	20 bar or flange limit
Test pressure	Tested to 1,5 x 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. 7845/47: Certification to EN 60079-0: 2006 and EN 60079-11: 2007 for use in Europe

7845/47 (Frequency Output) (1)	(784x****AJ****)	ATEX II1G, Ex ia IIC T6 (Ta –40 °C...+40 °C) T4 (Ta –40°C...+70°C)
7845/47 (Transmitter) (1)	(784x****(D/H)J****)	ATEX II1G, Ex ia IIB T4 (Ta –40°C...+60°C)
	(784x****(B/F)J****)	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)

(1) Entrained gas 7845/7847 (Frequency Output) approved for use in non-hazardous areas only – See "7845 Ordering information" on page 10.

CSA Intrinsically Safe

CSA-approved I.S. 7845/47: Certification to CSA C22-2 No 142, CSA C22-2 No 175, UL 508 and UL 913 for use in Canada/USA

7845/47 (Frequency Output) (1)	(784x****AL****)	Class I, Division 1 Groups C & D, T3C
7845/47 (Transmitter) and optional Remote Display (1)	(784x****(B/F)L****)	Class I, Division 1, Groups A, B, C & D, T4 (Single instrument)
	(784x****(D/H)L****)	Class I, Division 1, Groups C & D, T4 (Hart Multi-drop)

(1) Entrained gas 7845/7847 (Frequency Output) approved for use in non-hazardous areas only – See "7845 Ordering information" on page 10.

General classifications

Electromagnetic compatibility

All versions conform to the latest international standards for EMC, and are certified compliant with:

- Emissions: EN 61326 – 1997 (Heavy Industrial Environment)
- Radiated emissions in the range 30 MHz to 100 MHz, and conducted emissions in the range 0,15 MHz to 30 MHz complying with standard EN 61000-4
- Immunity: BS EN 61000-6.2

Materials of construction

Wetted parts	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 50 bar or secondary 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/BS/EN288 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 [1]
Design pressure		50 bar Standard engineering practice	100 bar designed to B31.3
Yield pressure	Fitted with burst disc which will fail between 20–30 bar	100 bar	N/A
Failure pressure		200 bar	395 bar Glass to metal seal failure

(1) Available for 7845 only – See "7845 Ordering information" on page 10.

Weight

Weight (7845/47):	22 kg

Electrical

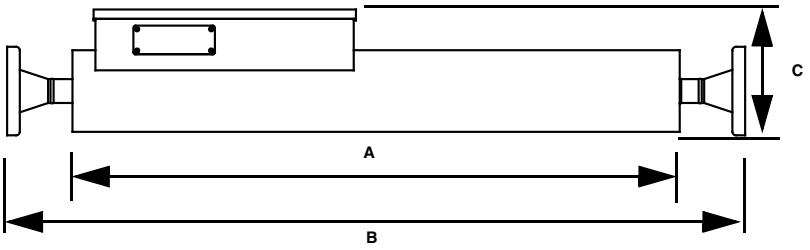
Power supply (Frequency Output version)	16 to 28 VDC at 17 mA maximum	
Power supply (Transmitter version)	18 to 28 VDC at 80 mA	
Outputs (Frequency Output version)	Current modulation on power supply line	
Outputs (Transmitter version)	Analog	2 (+1 with HART option board)
	Accuracy	0,1% of reading plus 0,5% of full scale
	Repeatability	±0,025%
	Out-of-range	2 to 20 mA on 4–20 mA (Programmable alarm state)
	Pulse output (on Ex ia transmitter)	Open collector output. Alarm status or frequency.
	Communications (on Ex ia transmitter)	RS485, Modbus (standard), HART (optional).

Dimensions

Dimensions for the Intrinsically Safe 7845/7847

	Dimensions (mm)		
Model	**A**	**B**	**C**
7845/7847 Ex ia	863±1	1027±3	156.6

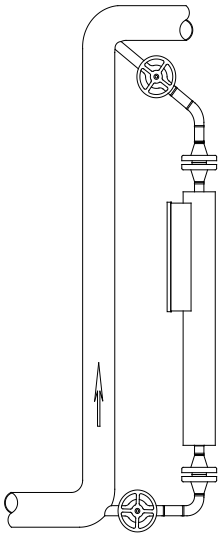
Ex ia 7845/47



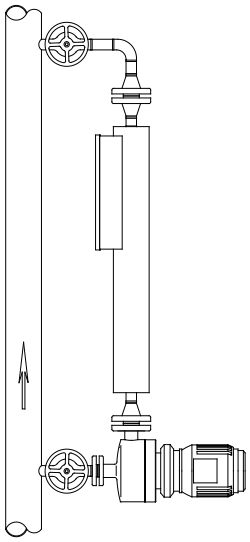
Installation

You can mount the 7845/7847 density meter at any angle. However, at low flow rates (such as 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 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 7845/7847 meter is 15000 liters/hour.

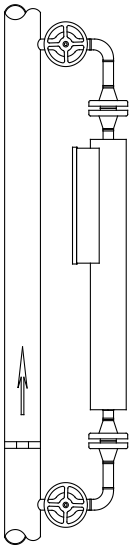
Installation examples



'S' Bend Method



Pump Method



Orifice Plate Method

7845 Ordering information

Model	Product description
7845	316L Stainless Steel Liquid Density Meter
Code	**Process connection**
C	1-inch ANSI 300 lb weld neck raised face (RF) flange
K	1-inch ANSI 600 lb weld neck raised face (RF) flange
H	DN25/PN40 weld neck flange; DIN 2635 type C face
J	DN25/PN40 weld neck flange; DIN 2635 type N grooved face
L	DN25/PN100 weld neck; DIN 2637 type E face
Z	Special
Code	**Material Options**
B	Wetted parts: 316L Stainless Steel, 316L Stainless Steel outer case
D(1)	Wetted parts: Hastelloy® bellows, 316L Stainless Steel tube, flanges and outer case. NACE
Code	**Meter outer containment**
A	Standard stainless steel, for tube mounted amplifiers or remote amplifier
B	Outer containment (1/4-inch NPT), for tube mounted amplifiers or remote amplifier
C	Secondary containment B31.3 (1/2-inch NPT), for tube mounted amplifiers or remote amplifier (up to 100 bar)
Code	**Amplifier enclosure**
F	Tube mounted flat box in stainless steel
Code	**On-board electronics**
A	Standard frequency output
B	Advanced base board (two 4–20 mA outputs)
D	Advanced base board and HART board (three 4–20 mA outputs)
E	Entrained gas option – Frequency Output (safe area only)
F	Entrained gas option – Advanced base board (two 4–20 mA outputs)
H	Entrained gas option – Advanced base board and HART® (three 4–20 mA outputs)
Code	**Safety approval label**
J	ATEX intrinsically safe
L	CSA (US and Canada) intrinsically safe
S	Safe area only (entrained gas option)
Code	**Default software configuration**
	Available for on-board electronics codes B, D, F, or H
A	API degrees
B	Base density to API tables (metric configuration)
C	Line density only
D	General Process including matrix (user data required)
	Available for on-board electronics codes A or E
T	Frequency version – no software
Code	**Calibration**
A	Instrument standard
D	UKAS calibration (Water)
E	UKAS calibration (3 liquids)
Z	Special

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(1) NACE–Incorporates Hastelloy bellows instead of Stainless Steel

7845 Ordering information *continued*

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 and dye penetration (internal welds)
E	Radiography of flange welds and dye penetration (all welds)
F	Radiography of flange welds
Code	**Traceability**
A	None
X	Certificates of material traceability (per single order)
Typical model number: 7845 C B A F A J T A A A	

7847 Ordering information

Model	Product description
7847	316L Stainless Steel Liquid Density Meter (Hygienic)
Code	**Process connection**
C	1-inch ANSI 300 lb weld neck raised face (RF) flange
H	DN25/PN40 weld neck flange; DIN 2635 type C face
J	DN25/PN40 weld neck flange; DIN 2635 type N grooved face
P	1” sanitary fitting (Tri-Clamp compatible)
R	DN25 IDF (ISO 2853) female aseptic coupling
S	DN25 DIN 11851 female aseptic coupling
Z	Special
Code	**Material Options**
B	Wetted parts: 316L Stainless Steel, 316L Stainless Steel outer case
Code	**Meter outer containment**
A	Standard stainless steel, for tube-mounted amplifiers or remote amplifier
B	Outer containment (1/4-inch NPT), for tube mounted amplifiers or remote amplifier
Code	**Amplifier enclosure**
F(3)	Tube mounted flat box in stainless steel
Code	**On-board electronics**
A	Standard frequency output
B	Advanced base board (two 4–20 mA outputs)
D	Advanced base board and HART board (three 4–20 mA outputs)
E(1)	Entrained gas option – Frequency Output (safe area only)
F	Entrained gas option – Advanced base board (two 4–20 mA outputs)
H	Entrained gas option – Advanced base board and HART® (three 4–20 mA outputs)
Code	**Safety approval label**
J	ATEX intrinsically safe
L	CSA (US and Canada) intrinsically safe
S(2)	Safe area only (entrained gas option)
T	Safe area only (3A approval label)
Code	**Default configuration**
	Available for on-board electronics codes B, D, F, or H
A	API degrees
B	Base density to API tables (metric configuration)
C	Line density only
D	General process including matrix (user data required)
	Available for on-board electronics codes A or E
T	Frequency version – no software
Code	**Calibration**
A	Instrument standard
D	UKAS calibration (water)
E	UKAS calibration (3 liquids)
Z	Special

Continued on next page

(1) Only available with safety approval and label option S.

(2) Only available with on-board electronics option E.

(3) 3A approval is not available with the remote amplifier kit.

7847 Ordering information *continued*

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 and dye penetration (internal welds)
E	Radiography of flange welds and dye penetration (all welds)
F	Radiography of flange welds
Code	**Traceability**
A	None
X	Certificates of material traceability (per single order)
Typical model number: 7847 P B A F B J C A A A	

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 600000 meters installed worldwide and over 30 years of flow and density measurement experience.

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