

# MDOT

## Thermal Mass Flow Meter

### Technical Specification:

The MDot is one of the most technically advanced gas flow meters specifically designed for the water and wastewater market. Extensive engineering effort has been invested to deliver advanced features, accurate measurement performance, and outstanding reliability.



#### PERFORMANCE SPECIFICATIONS

<b>Flow Accuracy</b>	Air: $\pm 1\%$ of reading $\pm 0.2\%$ of full scale Other gases: $\pm 1.5\%$ of reading $\pm 0.5\%$ of full scale Accuracy specification applies to customer's selected flow range)
<b>Unobstructed Pipe Requirement:</b>	Insertion: 15 diameters upstream, 5 diameters downstream Inline: 8 diameters upstream, 4 diameters downstream
<b>Flow Repeatability:</b>	$\pm 0.2\%$ of full scale
<b>Flow Response Time:</b>	0.8 seconds (one time constant)
<b>Temperature Accuracy:</b>	$\pm 0.6^\circ\text{C}$ ( $\pm 1^\circ\text{F}$ )
<b>Calibration:</b>	Factory calibration to NIST-traceable standards
<b>MDot Cal</b>	In-situ, operator-initiated calibration validation

#### OPERATING SPECIFICATIONS

<b>Gas Selections:</b>	Air, Methane, or Methane and CO <sub>2</sub> mix (Digester or Bio Gas)
<b>MDot GasSelect:</b>	Allows the user to change gas selection and Methane/CO <sub>2</sub> mixture percentage in the field
<b>Gas Pressure (max):</b>	Insertion: 51 barg (740 psig) Inline, 316SS w/ NPT ends: 34.5 barg (500 psig) Inline, 316SS w/ ANSI150 ends: 16 barg (230 psig) Inline, Carbon Steel w/ NPT ends: 34.5 barg (500 psig) Inline, Carbon Steel w/ ANSI150 ends: 20 barg (285 psig)  NOTE: If Teflon (PTFE) ferrule option ordered, max gas pressure is 4.1 barg (60 psig)
<b>Operating Temperature:</b>	MDot DST Sensor: $-40$ to $121^\circ\text{C}$ ( $-40$ to $250^\circ\text{F}$ ) Enclosure: $-40$ to $70^\circ\text{C}$ ( $-40$ to $158^\circ\text{F}$ )  NOTE: Display dims below $-20^\circ\text{C}$ ( $-4^\circ\text{F}$ ). Function returned once temperature rises again.
<b>Flow Velocity Range:</b>	0.07 to 118 NMPS (15 to 25,000 SFPM) Turndown: Up to 1000:1, 100:1 typical

#### MAXIMUM FLOW RANGES FOR INSERTION FLOW METERS

Pipe Diameter	SCFM	MSCFD	NM <sup>3</sup> /hr
1.5" (40 mm)	0-354	0-510	0-558
2" (50 mm)	0-583	0-840	0-920
2.5" (63 mm)	0-830	0-1,310	0-1,200
3" (80 mm)	0-1,280	0-1,840	0-2,020
4" (100 mm)	0-2,210	0-2,210	0-3,180
6" (150 mm)	0-5,010	0-7,210	0-7,910
8" (200 mm)	0-8,680	0-12,500	0-13,700
10" (250 mm)	0-13,600	0-19,600	0-21,450
12" (300 mm)	0-19,400	0-27,900	0-30,600

## MAXIMUM FLOW RANGES FOR INLINE FLOW METERS

Pipe Diameter	SCFM	MSCFD	NM3/hr
0.75"	0-93	0-134	0-146
1"	0-150	0-216	0-237
1.25"	0-260	0-3741	0-410
1.5"	0-354	0-510	0-558
2"	0-583	0-840	0-920
2.5"	0-830	0-1,310	0-1,200
3"	0-1,280	0-1,840	0-2,020
4"	0-2,210	0-3,180	0-3,480
6"	0-2,500	0-3,600	0-3,950

<b>Relative Humidity:</b>	90% RH maximum; non-condensing NOTE: Condensing liquids contacting the sensor can cause erratic flow readings
<b>Units of Measurement (field selectable):</b>	SCFM, SCFH, NM3/M, NM3/H, NM3/D, NLPS, NLPM, NLPH, MCFD, MSCFD, SCFD, MMSCFD, MMSCFM, SM3/D, SM3/H, SM3/M, LB/S, LB/M, LB/H, LB/D, KG/S, KG/M, KG/H, SLPM, MT/H
<b>Input Power:</b>	12 to 28 VDC, 6 watts Full input power range: 10 to 30 VDC A 20 Watt or greater power supply is recommended Installation (over-voltage) Category II for transient over-voltages
<b>Outputs:</b>	Channel 1: Standard isolated 4-20mA output for flow or temperature; fault indication per NAMUR NE43; optional HART communication Channel 2: Option of pulse output or Serial Communication (Modbus RTU via RS485 Isolated pulse output: 5 to 24VDC, 20mA max., 0 to 100Hz for flow (the pulse output can be used as an isolated solid state output for alarms)
<b>USB Communication:</b>	USB for connecting to a laptop or computer is standard Free PC-based software tool - MDotView - provides complete configuration, remote process monitoring, and data logging functions
<b>4-20mA and Pulse Verification:</b>	Simulation mode used to align 4-20mA output and pulse output (if ordered) with the input to customer's PLC/DCS.

## PHYSICAL SPECIFICATIONS

<b>Probe Diameter:</b>	3/4-inch
<b>Sensor Material:</b>	316 stainless steel
<b>Enclosure:</b>	NEMA 4X, aluminum, dual 3/4-inch FNPT conduit entries.

## SOFTWARE

<b>MDot View:</b>	For easy field setup, and access to all meter configuration and data logging functions
<b>MDot Cal:</b>	To validate meter functions

## INLINE METER AVAILABLE SIZES, MATERIALS, AND PROCESS CONNECTIONS

Nominal Size:	Flow Body Materials (Schedule 40)		Process Fittings	
	316 Stainless Steel	Carbon Steel	NPT	ANSI 150 Flanges
0.75	✓		✓	✓
1	✓		✓	✓
1.25	✓		✓	✓
1.5	✓		✓	✓
2	✓	✓	✓	✓
2.5	✓	✓	✓	✓
3	✓	✓	✓	✓
4	✓	✓		✓
6	✓	✓		✓

## APPROVALS

<b>CE:</b>	Relevant directives and standards applied: EMC Directive: 2014/30/EU Electrical Equipment for Measurement, Control and Lab Use: EN61326-1:2013 Pressure Equipment Directive: 2014/68/EU Article 13 Weld Testing: EN ISO 15614-1 and EN ISO 9606-1, ASME B31.3
<b>FM (FM222US0064X) &amp; FMc (FM22CA0045X):</b>	Class I, Division 1, Groups B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1; T4, Ta = -40 ° to 70 °C; Class I, Zone 1, AEx/Ex db IIB + H2 T4; Gb Ta = -40 °C to 70 °C; Type 4X, IP66/67
<b>ATEX (FM16ATE X0013X):</b>	II 2 G Ex db IIB + H2 T4; Gb Ta = -40 °C to 70 °C; IP66/67 II 2 D Ex tb IIIC T135 °C; Db Ta = -40 °C to 70 °C; IP66/67
<b>IECEx (IECEx FMG 16.0010X):</b>	Ex db IIB + H2 T4; Gb Ta = -40 °C to 70 °C; IP66/67 Ex tb IIIC T135 °C; Db Ta = -40 °C to 70 °C; IP66/67
<b>ATEX and IECEx Standards:</b>	EN IEC 60079-0, IEC 60079-0 EN 60079-1, IEC 60079-1 EN 60079-31, IEC 60079-31 EN 60529 +A1 +A2, IEC 60529