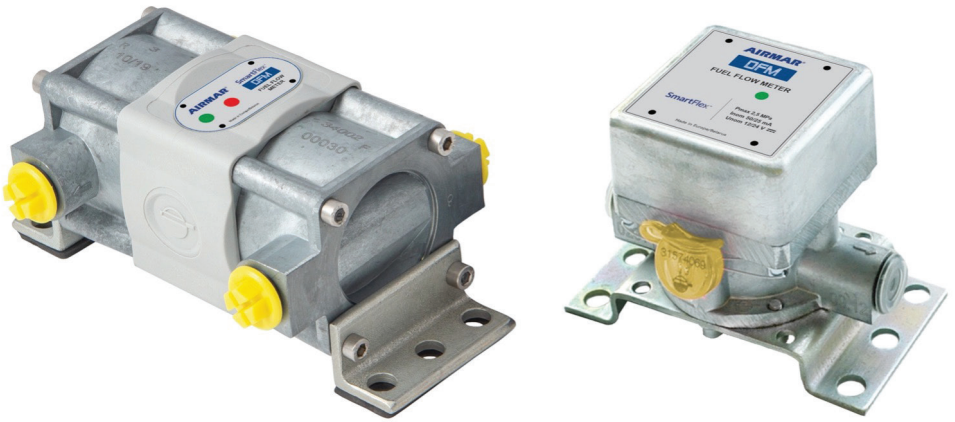


## SmartFlex™ System



# Diesel Flow Meter

## Installation and User Manual

# Airmar Diesel Flow Meter (DFM) Installation Instructions

## Covering models:

DFM-1000-SA-L, DFM-1000-SB-L, DFM-2000-SA-L, DFM-2000-SB-L, DFM-4000-SA-L, DFM-4000-SB-L, DFM-1000F-SA-L, DFM-1000F-SB-L, DFM-2000F-SA-L, DFM-2000F-SB-L, DFM-4000F-SA-L, DFM-4000F-SB-L, DFM-50-SA, DFM-100-SA, DFM-250-SA, DFM-500-SA, DFM-50-SA-L, DFM-100-SA-L, DFM-250-SA-L, DFM-500-SA-L, DFM-100-DA, DFM-120-DA, DFM-250-DA, DFM-300-DA, DFM-500-DA, DFM-600-DA

## Attention:

1. The DFM Sensor **REQUIRES** an Airmar SmartBoat or SmartFlex Module (ASM) to operate
2. All models are configured for Diesel Fuel only
3. It is recommended that after installation all fittings be tested for leaks
4. **ONLY** Liquid Pipe sealant should be used – **NO** Teflon Tape
5. Use of engine rated particulate filters is recommended

## 1.1 Theory of Operation

The Airmar DFM operation is based on the measurement of fuel volume passing through the flow chamber. The fuel pressure passing through the chamber causes the ring slides along the inner wall to rotate, which generates a pulse used to measure volume.

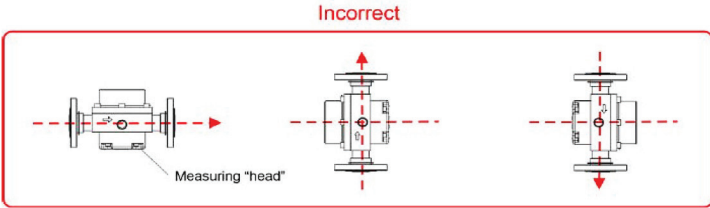
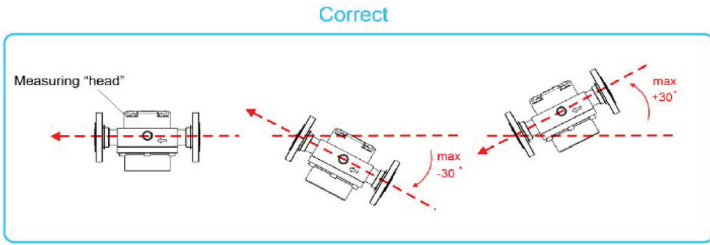


## 1.2 Physical Mounting

The DFM should be installed in an accessible location for service.

The DFM should be installed forward of the fuel pump if possible.

The flow meter can be installed up to 30 degrees of incline (fuel output up)

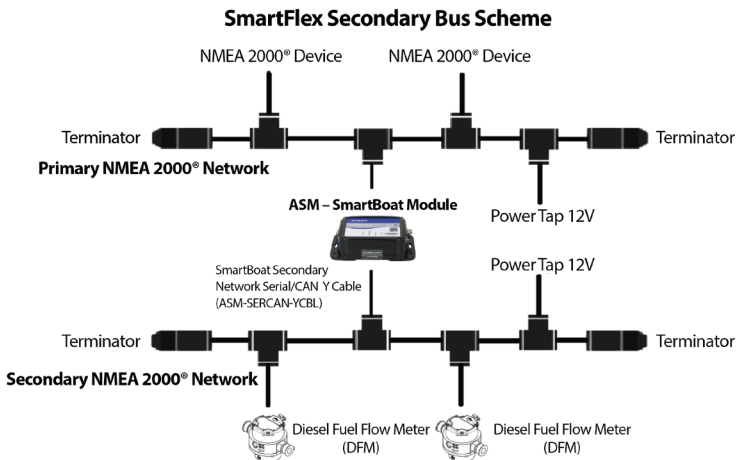


### 1.3 Electrical Connection

The DFM comes equipped with a M12 Device Net connector to aid in a quick and easy connection.

Sensor Connections should be made to the secondary bus of the ASM as dictated by the ASM Installation guide for Digital Sensors.

Up to 10 Fuel Flow sensors can be connected to a single ASM secondary bus input.



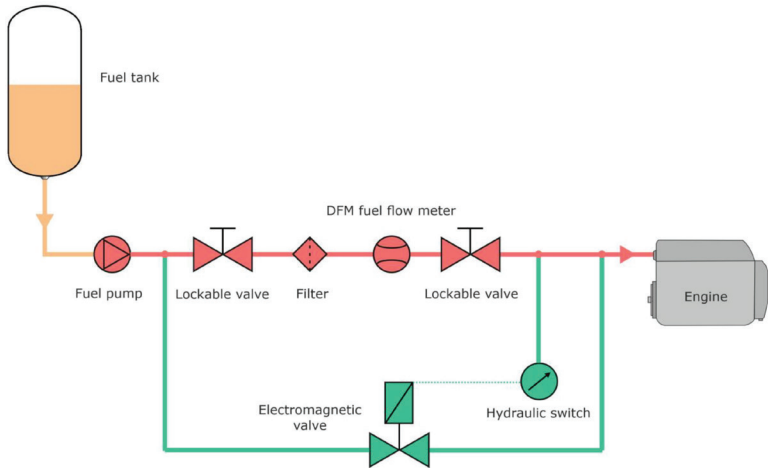
## 1.4 Fuel Line Connection

Refer to the sensor specifications to determine inlet and outlet thread type and diameter.

Sensor Connections should be made to the secondary bus of the ASM as dictated by the ASM Installation guide for Digital Sensors.

Up to 10 Fuel Flow sensors can be connected to a single ASM secondary bus input.

A fuel line bypass with gate valve is recommended to complement servicing of the fuel sensor, as this allow the sensors to be removed from the vessel without disrupting engine operation. An example is provided below:



Fuel line size should be maintained by the engine rating and installation specifications.

To ensure proper operation all air must be bled from the fuel system prior to operation. Follow the engine manufacturer's instructions for doing so.

## 1.5 LCD Operation (if applicable)

Informational screens are switched/advanced when the surface below the display is tapped with a magnetic key (included with LCD sensor variant).



In order to save the charge of the built-in battery, the display goes to sleep mode one minute after the last touch of the cover by the magnetic key. At the same time dots are shown on the display.



Multiple data points are available by continuous tapping of the touch area of the fuel sensor.

Screen No	Displayed data	Digit capacity	Units	
			Metric System of Measures	US System of Measures
1	"Total Fuel Consumption" Counter	0.00001	m <sup>3</sup>	gal
		0.01	l	
2	"Total Fuel Consumption" Counter with higher digit capacity	0.000001	m <sup>3</sup>	gal
		0.001	l	
3	"Engine Operation Time" Counter	0.1	h	h
4	"Engine Operation Time" in "Idle" Mode Counter	0.1	h	h
5	"Engine Operation Time" in "Optimal" Mode Counter	0.1	h	h
6	"Engine Operation Time" in "Overload" Mode Counter	0.1	h	h
7	"Engine Operation Time" in "Tampering" Mode Counter	0.1	h	h
8	"Engine Operation Time" Counter. Clearable	0.1	h	h
9	"Total Fuel Consumption" Counter. Clearable	0.00001	m <sup>3</sup>	gal
		0.01	l	
10	"Total Fuel Consumption" Counter. Tampering Mode	0.00001	m <sup>3</sup>	gal
		0.01	l	
11	"Interference Time" Counter	0.1	h	h
12	"Instant Fuel Consumption"	0.00001	m <sup>3</sup> /h	gal/h
		0.01	l/h	
13*	"Total Differential Fuel Consumption" Counter	0.00001	m <sup>3</sup>	gal
		0.01	l	
14*	"Instant Differential Fuel Consumption"	0.00001	m <sup>3</sup> /h	gal/h
		0.01	l/h	
15	"Battery Charge in Percentage of the Maximum"	1	%	%
16	"Temperature in the Measuring Chamber"	1	°C	°F
17	"Firmware Version"	-	X.X	

Screen 1 displays "Total Fuel Consumption" Counter value accumulated since DFM has been powered.

Screen 2 displays "Total Fuel Consumption value with higher digit capacity" Counter, accumulated since DFM has been powered. Reading accuracy is increased by one decimal.

**Screen 3** displays the Counter readings **“Engine Operation Time”** accumulated as the total time of engine operation in all modes including idle run.

**Screens 4...6** display the Counters readings of **“Engine Operation Time in “Idle”, “Optimal” and in “Overload” Modes”** accumulated by DFM as a total engine operation time in corresponding modes.

**Screen 7** displays the Counters readings of **“Engine Operation Time in “Tampering” Mode”** accumulated by DFM as a total time of engine operation when consumption was higher than maximum possible. Value increase of this counter indicates the incorrect installation of the fuel flow meter or possible fuel theft.

**Screen 8** displays the Counter readings of **“Engine Operation Time. Clearable”**, which was accumulated as a total time of engine operation in all modes, including idling. Counter data could be reset using service software or by applying a magnetic key (3...5) s to a switching zone of DFM's cap when Screen 8 is active.

**Screen 9** displays the Counter readings of **“Total Fuel Consumption. Clearable”**, which was accumulated by DFM since its production. Counter data could be reset using service software or by applying a magnetic key (3...5) s to a switching zone of the DFM's cap when Screen 9 is active.

**Screen 10** displays the Counter readings of **“Total Fuel Consumption. “Tampering” Mode”** accumulated by the DFM, measured as the amount of fuel higher than maximum consumption. Value increase of this counter indicates the incorrect installation of the fuel flow meter or possible fuel theft.

**Screen 11** displays the Counter's **“Interference Time”** accumulated by the DFM as the total time of exposure to external factors (strong magnetic field). Increase of the values of this counter may indicate an installation of the fuel flow meter near a source of strong electromagnetic radiation or deliberate attempts to lock the fuel meter.

**Screen 12 “Instant Fuel Consumption”** displays current value of fuel consumption. It can serve for a visual check of device operability and its correct installation.

**Screen 13** displays **“Total Differential Fuel Consumption”** counter value, accumulated in differential mode.

**Screen 14 “Instant Differential Fuel Consumption”** displays current differential fuel consumption (a difference between fuel consumption in chamber of each flow meter) on display of DFM installed in fuel feed line and operating in pair with DFM installed in fuel reverse line.

Note — If Slave Flow meter is disconnected, current differential fuel consumption will not be displayed. Master Flow meter's display will show screen similar to “Tampering” mode screen.

**Screen 15 “Battery Charge in Percentage of the Maximum”** displays the value of remaining charge of integrated battery.

Note — When the environment temperature is below 10 °C, displayed value of remaining charge can decrease by (10...30) %.

**Screen 16 “Temperature in the Measuring Chamber”** displays current temperature value in the measuring chamber of the fuel flow meter.

**Screen 17 “Firmware Version”** displays the firmware version (X.X) installed on the fuel meter.

## 1.6 Anti-Tamper Modes

- 1) **“Tampering” Mode** is to protect from tampering which has a purpose to increase fuel consumption counters readings (e.g., blowing with air). Tampering usually causes a rapid increase of readings exceeding the maximum flow rate limit. Once this increase is observed the sensor suspends fuel consumption counters. At the same time the “Tampering” Counter is activated, and it records the volume value that passes through the meter at the increased flow rate.

Fuel sensor displays dashes being in “Tampering” Mode



*Display view in “Tampering” Mode*

The meter will automatically exit “Tampering” Mode a few seconds after operation and revert to normal operating conditions.

- 2) **“Interference” Mode** is designed to protect the fuel sensor from magnetic field impact with the purpose to stop fuel counting or to tamper readings of fuel consumption. When exposed to an external magnetic field, it registers an attempt of interference. This results in a stop of fuel measurement and the time of exposure is recorded in a special “Interference Time” Counter.

The unit displays vertical strokes in “Interference” Mode



*Display view in “Interference” Mode*

The meter will automatically exit Interference mode a few seconds after operation and revert to normal operation conditions.

**For full instructions for setting your DFM up in the SmartFlex Software, visit:**

<https://www.airmar.com/uploads/InstallGuide/D-20189.pdf#page=87>