



# Thermal Mass Flow Meter (Analog) Model 111 Precision Fluidics



ENGINEERING YOUR SUCCESS.

# Model 111 Thermal Mass Flow Meters

Traditional Analog Flow Meter



Parker Model 111 Thermal Mass Flow Meters provide reliable analog flow measurements configured for your process conditions. Each meter offers a linear flow signal output proportional to a calibrated flow rate and is available with a D-connector.

## Typical Applications

- Burner Ratio Control for Ceramics and Metals

## Features

- Cleaned for Analytical Service Use
- RoHS and REACH compliant



## Product Specifications

### Physical Properties

#### Sensor Technology:

Thermal Sensor, Bypass Method

#### Media:

Air, Nitrogen, Helium, Argon, Hydrogen, Oxygen, Krypton, Neon, Xenon and other non-corrosive primary and blended gases

#### Width:

See Dimensional Drawing

#### Length:

See Dimensional Drawing

#### Height:

See Dimensional Drawing

#### Weight:

See weights provided on each Dimensions page

#### Mounting Orientation:

Attitude sensitive

#### Porting:

1/8", 1/4", 3/8", 1/2", 3/4", 6mm and 10mm compression; 1/4", 3/8", 1/2" CPI; 1/4", 3/8", 1/2", 3/4" A-Lok; 1/4" MMGFS\*

\*Male Metal Gasket Face Seal

### Electrical

#### Power Supply:

+12 (±5%) or +15 (±10%) VDC

#### Input Control Signal:

0-5 VDC, 0-10 VDC, 4-20 mA

#### Monitor Output Voltage:

0-5 VDC, 0-10 VDC, 4-20 mA

#### Max Current Requirement:

< 400 mA

#### Power Supply Requirement:

(Current consumption <45 mA)

#### Voltage output models:

+12 (±5%) (0-5 VDC flow signal outputs only) or +15 (±10%) VDC

#### Current loop models:

+15 (±5%) or +24 (±15%) VDC

#### Setpoint/Flow Signal I/O:

0-5, 0-10 VDC; 4-20 mA

#### External Electrical Connector:

Nine (9)-pin D-connector

### Wetted Materials

**Body:** 316 Stainless Steel

**Sensor Assembly:** 316L Stainless Steel

**O-Rings and Valve Seat:**

Buna-N, EPDM, FFKM, Neoprene, FKM

**Process Connections:**

316 Stainless Steel

### Performance Ratings

#### Ratings:

Max operating pressure:

1,500 psig (103 barg)

Max working temperature:

158°F (70°C)

#### Pressure Coefficient:

± 0.1% / atmosphere typical using nitrogen (N<sub>2</sub>)

#### Minimum Pressure Drop:

2 psid (0.14 bard)

### Performance Characteristics

#### Accuracy and Linearity:

±1% Full Scale

Model 114 ±1.5% Full Scale;

#### Repeatability:

Within ±0.2% Full Scale at any constant temperature within operating temperature range

#### Response Time: 2-4 sec

#### Rangeability:

50:1 (2-100% Full Scale)

#### Temperature Coefficient:

±0.05% Full Scale / °C of zero;

±0.05% of reading / °C of span

#### Warm-Up Time: 10 minutes

#### Flow Control Range:

See flow control ranges provided on each model catalog page



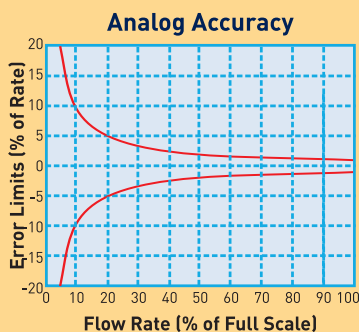
For more information call +1 603 595 1500 or email [ppinfo@parker.com](mailto:ppinfo@parker.com)  
Visit [www.porterinstrument.com](http://www.porterinstrument.com)

## Model 111 Thermal Mass Flow Meters

### Principle of Operation

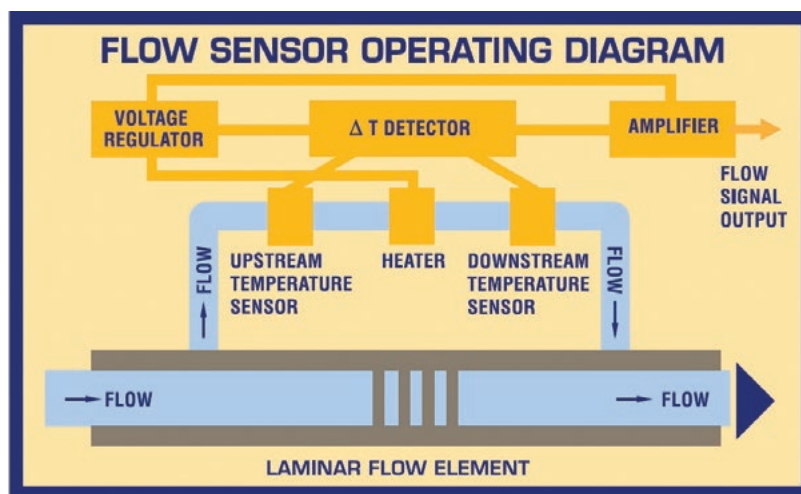
#### Accuracy

Parker mass flow meters and controllers offer standard  $\pm 1.0\%$  and  $\pm 2.0\%$  full scale accuracy of calibrated span referenced to nitrogen at  $21.1^\circ\text{C}$  and  $14.7\text{ PSIA}$ . Gas correction factors may be used to determine the equivalent flow rate of your process gas or, for an additional cost, live gas calibrations at a different reference temperature and pressure are also available.



Parker Model 111 Mass Flow Meters (MFM) incorporate an operating principle based on the thermodynamic properties of the process gas being measured.

Mass flow measurement relates to the amount of heat absorbed by the process gas. The amount of heat the gas absorbs is determined by the gas molecular structure. Specific heat, the amount of heat required to raise the temperature of one gram of a given gas one degree centigrade quantitatively describes this “thermal absorbency”.



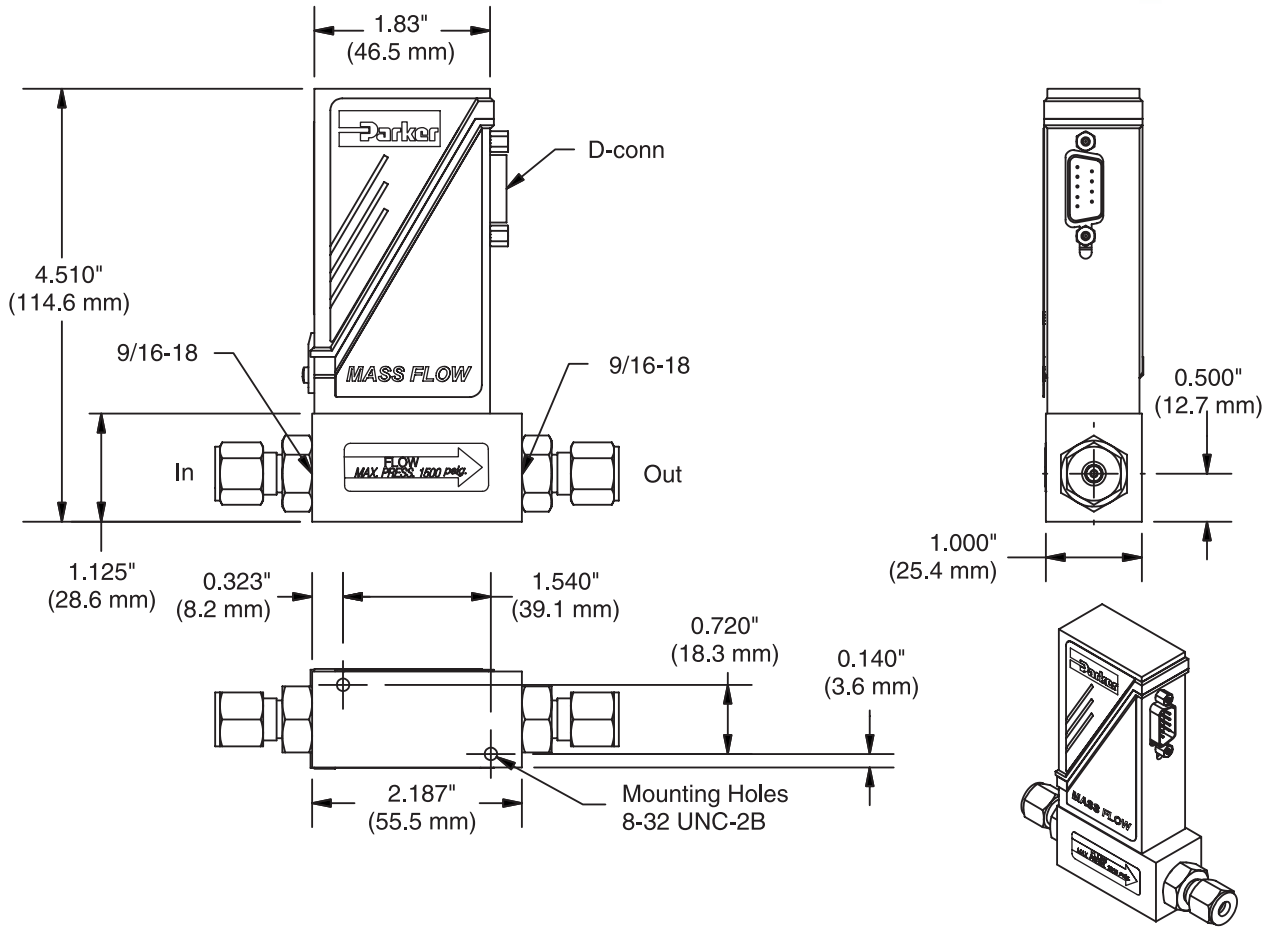
Mass flow measurement consists of a bypass sensing tube with a heater wound around the center of the sensing tube and precision resistance type temperature sensors located equidistant upstream and downstream of the heater. A laminar flow element package, located in the main flow stream, acts as an appropriate restriction creating a pressure drop forcing a fixed percentage of the total flow, approximately 10 sccm, through the bypass sensing tube for temperature differential detection. As gas flows through the sensing tube, heat is displaced to the downstream temperature sensor creating a temperature differential between the upstream and downstream temperature sensors. The upstream and downstream temperature sensors form two legs of a bridge network at the sensor assembly inputs to the PCB. The resulting temperature differential is amplified on the PCB assembly to a 0-5 VDC output signal directly proportional to the gas mass flow rate. To ensure an accurate flow measurement, flow disturbances must be eliminated or greatly reduced. Accordingly, both the sensor tube and the laminar flow element package are designed for laminar flow. Actual gas or gas factors are used in calibration to account for the specific heat of the measured gas.

# Model 111 Thermal Mass Flow Meters

## Mechanical Integration

### Dimensions

Basic Dimensions Model 111



Model 111	
Weight	0.9 lbs (0.4 kg)

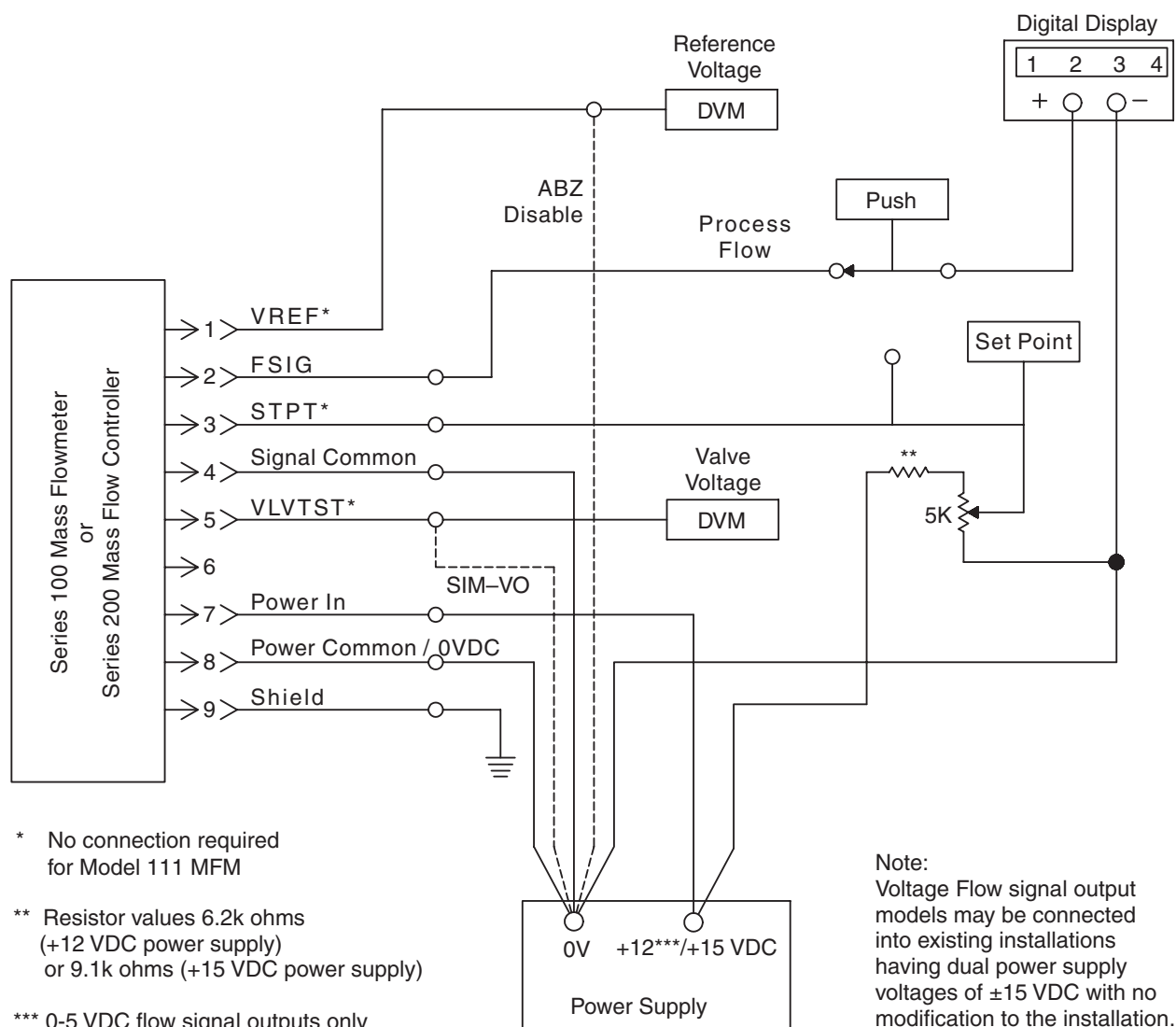
Units
In (mm)



For more information call +1 603 595 1500 or email [ppinfo@parker.com](mailto:ppinfo@parker.com)  
 Visit [www.porterinstrument.com](http://www.porterinstrument.com)

## Model 111 Thermal Mass Flow Meters

### Electrical Integration and Recommendation

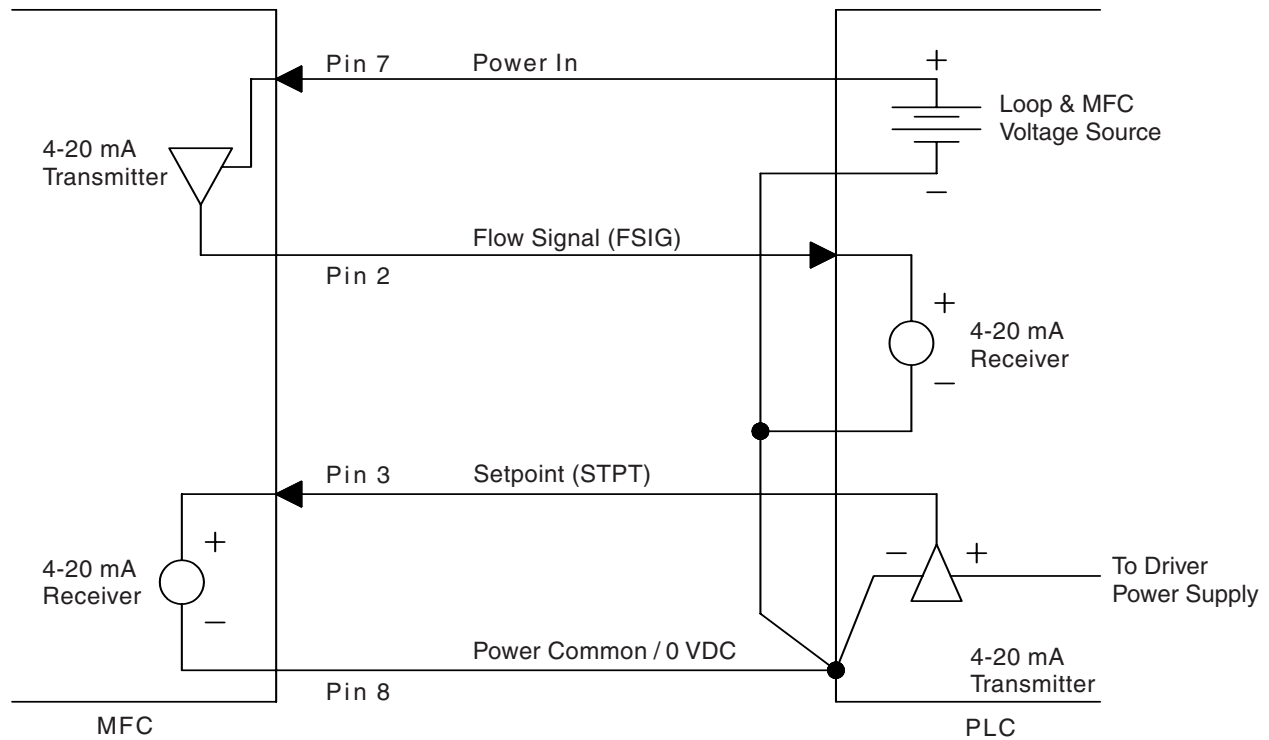


Parker-Supplied Cable Assembly Color Codes		
Signal	Connector Pin	
	No.	Insulation Color
Voltage Reference	1	Brown
Flow Signal	2	Red
Setpoint	3	Yellow
Signal Common	4	Green
Valve Test	5	Blue
Open	6	Violet or White
Power In	7	Orange
Power Common / 0 VDC	8	Black
Shield (Drain Wire)	9	Shield (Drain Wire)

Note: Cable color codes are for reference only and are subject to change without notice

## Model 111 Thermal Mass Flow Meters

### Electrical Integration and Recommendation



#### Notes:

1. Setpoint: 4-20 mA
2. For input/output designations (i.e., individual pin functions) for pin numbers not shown, refer to electrical integration drawing on previous page.

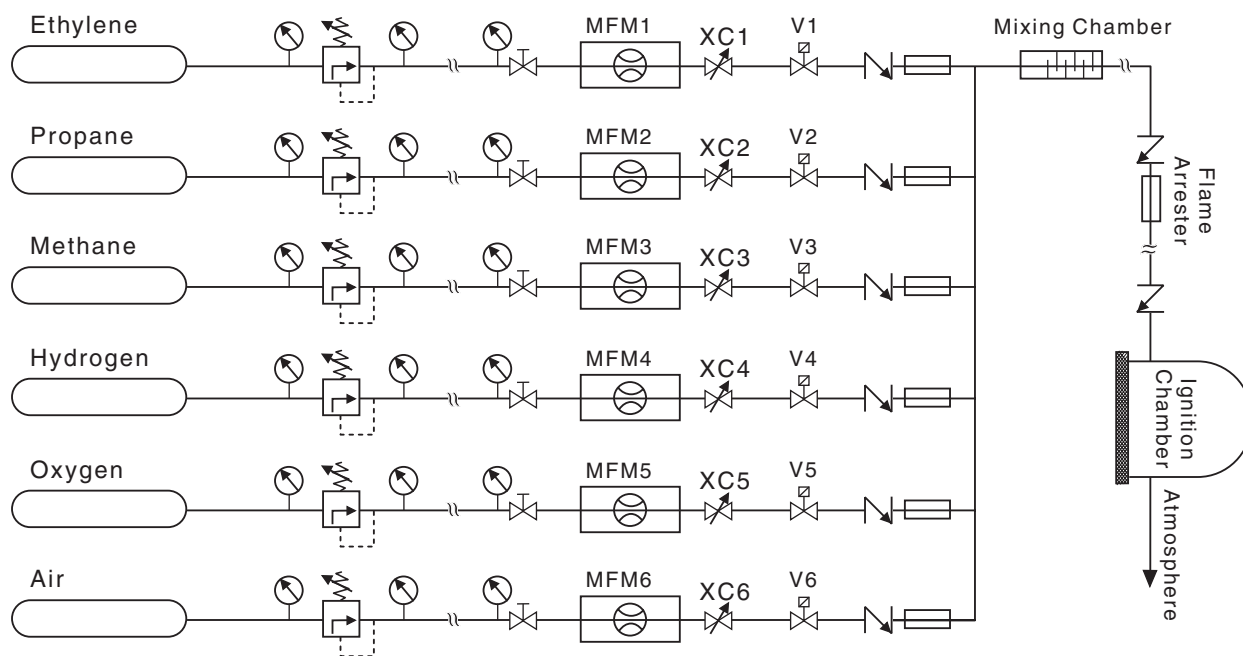
Parker-Supplied Cable Assembly Color Codes		
Signal	Connector Pin	
	No.	Insulation Color
Voltage Reference	1	Brown
Flow Signal	2	Red
Setpoint	3	Yellow
Signal Common	4	Green
Valve Test	5	Blue
Open	6	Violet or White
Power In	7	Orange
Power Common / 0 VDC	8	Black
Shield (Drain Wire)	9	Shield (Drain Wire)

Note: Cable color codes are for reference only and are subject to change without notice



## Model 111 Thermal Mass Flow Meters

### Typical Flow Diagram



## Model 111 Thermal Mass Flow Meters

### Installation Guide

- Clean dry area with adequate space
- Indoor use only
- Follow process connection manufacturer guidelines and leak check all connections
- Purge all gas lines with nitrogen before installation
- Remove all loose particulate or debris from system

### Key Things to Remember:

- Standard Flow Sizing Specifications
  1. Gas Type
  2. Flow Rate
  3. Inlet Pressure
  4. Outlet Pressure
  5. Operating Temperature
  6. Standard Calibration Condition\*
  7. Connection Fitting Size and Type
  8. Set point/Output signal
- CM-400 4-channel Power Supply/Control
- Power Cables
- PN: C-700-002, Interface cable with flying leads on one end
- PN: C-1666-010, CABLE ASSY, MFC, CM-400

\* Default standard calibration conditions = 21.1C and 14.7 PSIA. Consult Applications for support to specify other common calibration standards such as: 0C, 20C, 25C.



## Model 111 Thermal Mass Flow Meters

### Ordering Information

Model Number Example:

111-	F	K	A	S	V	X	AA
------	---	---	---	---	---	---	----

#### Nominal Range - Nitrogen Equivalent\*

Model	Rev	Description
111-	F	±1% FS, 5 sccm to 10 slpm

\* **Note:** The flow ranges listed are minimum and maximum nitrogen (N<sub>2</sub>) flow ranges available for each given model. Intermediate flow ranges are available. For correct sizing when operating parameters are questionable, please consult the factory.

#### PC -Board Electrical Connector

Code	Description
K	Nine (9)-Pin "D"
W <sup>1)</sup>	Nine (9)-Pin "D" CE Approved Design

#### Setpoint Signal / Output Signal

Code	Description
A	0-5 VDC / 0-5 VDC
E	0-10 VDC / 0-10 VDC
H	4-20 mA <sub>dc</sub> (sourcing)

#### Body Material

Code	Description
S	Stainless Steel
J	Stainless Steel / Silconert <sup>2)</sup>

<sup>1)</sup> NX CE Approved Design Assembly/Calibration feature must be selected in tandem with W 9-Pin CE approved design PC-board.

<sup>2)</sup> Consult factory for information pertaining to the Silconert process and estimated additional lead times.

#### Assembly / Calibration Features

Code	Description
AA	Standard, Calibrated Horizontally
CP	Environmental Chamber Calibration
EY	Calibrated Vertically (Inlet Down)
NX <sup>1)</sup>	CE Approved Design

#### Fitting Size and Type

Code	Description
X	Without Fitting
B	Compression - 1/8"
C	Compression - 1/4"
D	Compression - 3/8"
E	Compression - 1/2"
G	Compression - 3/4"
P	Male Metal Gasket Face Seal - 1/4"
Q	Male Metal Gasket Face Seal - 3/8"
S	Male Metal Gasket Face Seal - 1/2"

**Note:** Fitting Size Restricted by Model Size.

**Note:** Additional Fitting Types Available. Consult Factory for Availability & Restrictions.

#### Elastomers (Valve Seat / O-Rings)

Code	Description
V	FKM
B	Buna N
E	EPDM
N	Neoprene
K	FFKM

**NOTE:** In order to provide the best possible solution for your application, please provide the following requirements when contacting Applications Engineering:

- Media, Inlet & Outlet Pressures
- Minimum Required Flow Rate.

For more detailed information, visit us on the web or call Applications Engineering.



Parker Hannifin Precision Fluidics Division reserves the right to make changes. Drawings are for reference only.

For more information call +1 603 595 1500 or email [ppinfo@parker.com](mailto:ppinfo@parker.com)  
Visit [www.porterinstrument.com](http://www.porterinstrument.com)



## Series 100 Thermal Mass Flow Meters

# Portfolio Review

## Customization

Contact Division Applications at (603) 595 1500 or [ppfinfo@parker.com](mailto:ppfinfo@parker.com).

### Model 111



### Model 112



### Model 113



### Model 114



### Model 2211



Type	Model	Min. Flow (sccm)	Min. Flow (slpm)	Max. Flow <sup>1</sup> (slpm)	Max. Pressure <sup>2</sup> (psig)	Min. Delta <sup>3</sup> (psig)
Analog Flow Meters	111	5	—	10	1500	2
	112	—	10	100	1500	2
	113	—	100	500	1000	2
	114	—	500	1000	1000	2
	2211	40	—	10	200	2

<sup>1</sup> The maximum full scale flow rate available.

<sup>2</sup> The maximum operating inlet pressure available.

<sup>3</sup> The minimum required pressure differential for maximum full scale

