## Mass Flow Controller \& Meter Models 5853E/5863E

## Features \& Benefits

- Easy maintenance
- Fast flow response to command changes
- Negligible flow overshoot/undershoot
- Removable sensor
- Insensitive to mounting attitude
- Wide flow range (up to 1000 slpm $\mathrm{N}_{2}$ )
- End accessible zero and span potentiometers


## Model 5853E:

- Jumper selectable external valve control
- Electrically activated valve override
- Low command flow cutoff
- Normally closed valve
- Meriam ${ }^{\circledR}$ LFE restrictor
- Bellows sealed high stability valve
- Wide range of pressures and pressure drops


## Description

The Brooks ${ }^{\circledR}$ Models 5853E/5863E Mass Flow Controller and Meter accurately measure and control gas flow (5863E Meter only). The heart of the system is its removable, attitude-insensitive sensor which produces an electrical output signal linear with flow rate used for indicating, recording, and/or control purposes. It eliminates the need for continuous monitoring and readjustment of gas pressures to provide a stable gas flow.

## Principle of Operation

The operating principle of the Brooks mass flow controller and meter is thermodynamic. A wire wound heating element directs heat to the midpoint of the bypass sensor tube. A predetermined portion of the total flow is diverted through the bypass sensor tube. On the same tube, equidistant upstream and downstream of the heat input, are resistance temperature measuring elements.

With no flow, the heat reaching each temperature element is equal. With increasing flow, the flow stream carries heat away from the upstream element, T1, and an increasing amount towards the downstream element, T2. An increasing temperature difference develops between the two elements and this difference is proportional to the amount of gas flowing or the mass flow rate. A bridge circuit interprets the temperature difference and an amplifier provides a 0-5 Vdc output signal.


The control circuitry compares the command setpoint to the flow signal and positions the precision solenoid control valve (Model 5853E) to maintain the desired flow rate. When the command signal is below $2 \%$ of full scale, the control valve is positioned to fully closed. The control valve can be latched fully open or closed by activating the valve override circuit (Model 5853E).

## Specifications

## Performance:

## Flow Ranges

Any full scale flow from 0-100 slpm* to 0-1,000 slpm (Nitrogen equivalent).
*Standard pressure and temperature in accordance with SEMI (Semiconductor Equipment and Materials Institute) standard: $0^{\circ} \mathrm{C}$ and 101 kPa ( 760 Torr). The mass flow controller can be calibrated to other reference standard conditions. Specify at time of ordering.

## Control I Usable Range

50 to 1

## Accuracy

$\pm 1 \%$ full scale including linearity at calibrated conditions.


Figure 1 Principle of Operation

## Specifications (continued)

## Settling Time

Less than 3 seconds to within $2 \%$ full scale of final value for a 0-100\% command change.

## Repeatability

0.25\% of rate

## Sensitivity to Mounting Attitude

$\pm 0.5 \%$ full scale maximum deviation from specified accuracy after re-zeroing

## Temperature Sensitivity

Zero: Less than $\pm 0.075 \%$ F.S. per degree C
Span: Less than $\pm 1.0 \%$ F.S. shift from original calibration over $50^{\circ} \mathrm{F}$ to $122^{\circ} \mathrm{F}$ range $\left(10^{\circ} \mathrm{C}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$
Pressure Sensitivity (Model 5853E)
$\pm 0.03 \%$ per psi up to 200 psig $\left(\mathrm{N}_{2}\right)$

## Ratings:

Operating pressure
1500 psig (100 bar) maximum

## Differential Pressure (Model 5853E)

Standard: High differential valve 30 to 290 psid Optional: Low differential valve 7.5 to 30 psid (<500 slpm)

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11.8 \text { to } 30 \text { psid (>500 slpm) }
$$

## Temperature Ambient/Gas

$41^{\circ} \mathrm{F}$ to $149^{\circ} \mathrm{F}\left(5^{\circ} \mathrm{C}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$

## Leak Integrity, Outboard

$1 \times 10^{-9} \mathrm{~atm} \mathrm{cc} / \mathrm{sec}$. Helium (excluding permeation)
Materials of Construction
Wetted Parts - 316 Stainless Steel with Viton ${ }^{\circledR}$ fluoroelastomers, Buna-N or PTFE/Kalrez ${ }^{\circledR}$

## Mechanical Connections

| Type | Sizes Available | Standard or Optional |
| :---: | :---: | :---: |
| UNF | 9/16"-18, 1-1/16"-12 | Standard |
| NPT | 1/2", 1", 1-1/2" | Standard |
| Compression | 1/2", 3/4", 1" | Optional |
| VCO ${ }^{\text {™ }}$ | 3/8", 1/2" | Optional |
| VCR ${ }^{\text {TM }}$ | 3/8", 1/2" | Optional |
| 150\# ANSI Flange | 1/2", 1", 1-1/2", 2" | Optional |
| 300\# ANSI Flange | 1/2", 1", 1-1/2", 2" | Optional |
| DIN Flange | DN 15, 25, 40, 50 | Optional |



## Electrical Specifications

|  | 5853E | 5863 E |
| :--- | :---: | :---: |
| $+15 \mathrm{Vdc}( \pm 5 \%)$ | 35 mAdc | 35 mAdc |
| $-15 \mathrm{Vdc}( \pm 5 \%)$ | 180 mAdc | 35 mAdc |
| Power | 3.5 Watts | 1.05 Watts |
| D-connector <br> (DA-15P) | Standard | Standard |
| Card Edge Connector <br> 30 microinch gold over low- <br> stress Nickel | Standard | N/A |
| Output Signal into <br> 2k ohm minimum | $0-5 \mathrm{~V}$ | $0-5 \mathrm{~V}$ |
| Command Input Voltage <br> 200 k ohm input resistance | $0-5 \mathrm{~V}$ | $\mathrm{~N} / \mathrm{A}$ |

## Ordering Information

To order, specify: 5853E/5863E

1. Model number
2. Complete gas data

Type of gas to be metered
Operating temperature
Inlet pressure
Outlet pressure
Flow range
Process connections
Additional application information:
Reference Temp.: $0^{\circ} \mathrm{C}$ (STD), $20^{\circ} \mathrm{C}$, $70^{\circ} \mathrm{F}$ or other
Mounting Attitude: Describe mounting position
Soft Start __Yes __No
(It is often helpful to know the equipment the 5853E/ 5863 E will be used in, and/or the type of flow controller it will be replacing)
3. Additional accessories (if any):

Power supply
Secondary electronics
Command potentiometer
Cable assembly
Approximate shipping weight: $15 \mathrm{lb} .(7 \mathrm{~kg}) \mathrm{w} /$ fittings $29 \mathrm{lb}(13 \mathrm{~kg}) \mathrm{w} /$ flanges

TRADEMARKS


Figure 2 Typical Model 5853E Performance Curve

Data Sheet
DS-TMF-5853E-5863E-MFC-eng
October, 2008
Model 5853E \& 5863E


Figure 3 Model 5853E Dimensions

| PCB No. | Pin No. | Function | Color Code ${ }^{(5)}$ |
| :---: | :---: | :---: | :---: |
| 1 | 1 | Chassis Ground | Brown |
| A | 2 | Command Input (Cmd Post "S") | Red |
| 2 | 3 | 0-5 V Signal Common | Orange |
| B | 4 | Command Common (Cmd Pot "CCW") | Yellow |
| 3 | 5 | 0-5 V Signal Output | Green |
| C | 6 | Supply Voltage Common | Blue |
| 4 | 7 | +15 Vdc Supply | Violet |
| D | 8 | Valve Test Point/Purge | Gray |
| 5 | 9 | Remote Transducer Input** | White |
| E | 10 | Not Used | Black |
| 6 | 11 | Not Used | Brown |
| F | 12 | -15 Vdc Input | Red |
| 7 | 13 | Slot | Orange |
| H | 14 | Slot | Yellow |
| 8 | 15 | Not Used | Green |
| J | 16 | Not Used | Blue |
| 9 | 17 | Valve Override | Violet |
| K | 18 | Not Used | Gray |
| 10 | 19 | +5 V Reference Output (Cmd Pot "CW")* or Valve Return* | White |
| L | 20 | Valve Off | Black |

Figure 4 Model 5853E Card Edge Hook-Up Diagram

| PIN OUT - TOP VIEW |  |  |
| :---: | :---: | :---: |
| PIN NO. | FUNCTION | COLOR CODE ${ }^{(6)}$ |
| 1 | Cmd. Common (Command Pot "CCW") | Black |
| 2 | 0-5 Volt Signal Output | White |
| 3 | Supply Common or Ext. Valve Return(See Note 3)* | Red |
| 4 | Valve Off | Green |
| 5 | +15 Vdc Supply | Orange |
| 6 | -15 Vdc Supply | Blue |
| 7 | Valve Test Point/Purge | Wht/Blk |
| 8 | Cmd. Input or Cmd. Pot "S" | Red/Blk |
| 9 | Supply Voltage Common (Note 4) | Grn/Blk |
| 10 | 0-5 Volt Signal Common | Org/Blk |
| 11 | +5 Volt Reference Output (Command Pot "CW") | Blu/Blk |
| 12 | Valve Override | Blk/Wht |
| 13 | Not Used | Red/Wht |
| 14 | Chassis Ground | Grn/Wht |
| 15 | Remote Transducer Input** | Blu/Wht |
| ${ }^{*}$ Jumper Selectable ${ }^{* *}$ Factory Activated Option <br> Notes: <br> 1. Cable shield tied to chassis ground in meter connector. Make no connection on customer end. <br> 2. All power leads must be connected to power supply. <br> 3. To use pin 3 for external valve return, jumper J1 must be moved to the B-D position and pin 3 must be grounded at the customers system. <br> 4. Pin 9 is normally used for external valve return and can be used for cables up to 10 feet in length. <br> 5. Reference Brooks Cable Assy S124Z495AAA. <br> 6. Reference Brooks Cable Assy S124Z575AAA. |  |  |
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|  |  |  |
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|  |  |  |

Figure 5 Model 5853E D-Type Connector Hook-Up Diagram


Model 5863E
with Flanges


| Flange <br> Type | Flange OD, "D" |  |
| :---: | :---: | :---: |
|  | inch | mm |
| ANSI 1/2" 150 lb | $3-1 / 2$ | 89 |
| ANSI 1/2" 300 lb | $3-3 / 4$ | 95 |
| ANSI 1.0" 150 lb | $4-1 / 4$ | 108 |
| ANSI 1.0" 300lb | $4-7 / 8$ | 124 |
| ANSI 1.5" 150 lb | 5 | 127 |
| ANSI 1.5" 300 lb | $6-1 / 8$ | 156 |
| ANSI 2.0" 150 lb | 6 | 152 |
| ANSI 2.0" 300 lb | $6-1 / 2$ | 165 |
| DIN DN15 PN40 | 3.74 | 95 |
| DIN DN25 PN40 | 4.53 | 115 |
| DIN DN40 PN40 | 5.90 | 150 |
| DIN DN50 PN40 | 6.50 | 165 |

Figure 6 Model 5863E Dimensions

| PIN NO. | FUNCTION | COLOR CODE |
| :---: | :--- | :---: |
| 1 | Not Used | Black |
| 2 | 0-5 Volt Signal Output | White |
| 3 | Supply Common | Red |
| 4 | Not Used | Green |
| 5 | +15 Vdc Supply | Orange |
| 6 | -15 Vdc Supply | Blue |
| 7 | Not Used | Wht/Blk |
| 8 | Not Used | Red/Blk |
| 9 | Supply Voltage Common | Grn/Blk |
| 10 | 0-5 Volt Signal Common | Org/Blk |
| 11 | +5 Volt Reference Output (Command Pot "CW") | Blu/Blk |
| 12 | Not Used | Blk/Wht |
| 13 | Not Used | Red/Wht |
| 14 | Chassis Ground | Grn/Wht |
| 15 | Not Used | Blu/Wht |

## PIN OUT - TOP VIEW

## Note:

1. Cable shield tied to chassis ground in meter connector. Make no connection on customer end.
2. All power leads must be connected to power supply.

Figure 7 Model 5863E Pin Out

| Brooks Instrument | Brooks Instrument |
| :--- | :--- |
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Specifications Subject to Change Without Notice

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