

Data Sheet

DS-TMF-AN-Eng
June, 2003

Models 5850E/5863E

Industrial/High Performance Mass Flow Meters and Mass Flow Controllers

DESIGN FEATURES

- Accurate measurement and control
- Wide flow- & pressure range
- Fast response to command changes
- Corrosion resistant normally closed-, or normally opened control valve
- Subminiature D-connector electrical interface for RFI immunity
- CE certified

OPTIONS:

- Ultra clean technology, all metal sealed. Please ask for PDS: 5964 or 5850EM
- Fast response or soft start
- Normally opened-, or closed control valve
- Mechanically and electrically interchangeable with other mass flow controllers
- (Optionally) certified for use in zone 2 environment according to NEN 3410, NEN-EN 50014, DIN 57165 and VDE 0165

DESCRIPTION

The Brooks models 5850E-5863E mass flow meters and mass flow controllers accurately measure and control gas flows.

The heart of the system is a very stable flow sensor which produces an electric output signal linear with flow rate used for indicating and/or recording.

The Brooks mass flow controllers accurately measure and control gasflows fast to command changes, virtually without overshoot. These mass flow controllers provide an exclusive PID control loop, which has been balanced to match unique sensor/valve characteristics.

The computer designed control valves allow stable operation over a wide variety of flow and pressure conditions.

The actual flow dynamics are controlled, resulting in a much smoother transition to steady-state flow in the shortest period of time.



Mass Flow Controller Model 5850E



Mass Flow Controller Model 5851E



Mass Flow Sensor Model 5863E

SPECIFICATIONS

Certification CE certified

Performance

Accuracy ± 1% full scale including linearity measured at calibrated conditions

Repeatability ± 0,25% of rate

Rangeability 50 to 1

Flow ranges Any full scale range from 3 ml_n/min to 1000 l_n/min. (Nitrogen equivalent.)

Mounting attitude from sensitivity ± 0,5% full scale max. deviation specified accuracy after rezeroing

Temperature scale/°C sensitivity Zero : less than ± 0,075% full scale shift from original calibration over 10-50 °C range

Ratings

Max. operating pressure

- 100 bar
- Model 5860E 300 bar
- Model 5850E, 5861E optional 300 bar

Differential pressure

- Models 5850E and 5851E typical 1 bar
- Model 5853 0,5 bar to 20 bar
- Models 5860E, 5861E and 5863 50 mbar at max full scale

Temperature Ambient/gas 0-65°C

Leak integrity Outboard: 1 x 10⁻⁹ mbar.l/s Helium

Electrical Specifications

MASS FLOW CONTROLLERS

| MODELS | POWER SUPPLY REQUIREMENTS | SETPOINT INPUT | OUTPUT SIGNALS |
|-------------------------|---|--------------------------------------|---------------------------------|
| 5850E and 5853E | +15 Vdc, 35 mA and -15 Vdc, 180 mA | 0-5 Vdc 2000 Ohm input resist. | 0-5 Vdc min load 2000 Ohm |
| 5851E and 5850E 300 bar | +15 Vdc, 350 mA and -15 Vdc, 350 mA | 0-5 Vdc 2000 Ohm input resist. | 0-5 Vdc min load 2000 Ohm |

MASS FLOW METERS

| MODEL | POWER SUPPLY | OUTPUT SIGNALS |
|------------------------|---|--|
| 5860E, 5861E and 5863E | +15 Vdc @ 25mA and -15 Vdc @ 15mA | 0-5 Vdc into 2000 Ohm (or greater) load 0-5 Vdc into 2000 Ohm (or greater) load |

NOTE: Tolerance to the above requirements: ± 5%

Materials of construction Wetted parts stainless steel with Viton[®], Buna-N[®] or PTFE/Kalrez[®]

Mechanical connections

- 1/4", 1/2", 1", 1 1/2" NPT(F)
- 1/4", 1/2" - 3/4" or 1" Tube compression
- 1/4", 1/2", 3/4" VCO or 1/2" VCR

Option: Flanged DIN- or ANSI type available; please refer to ordering information

Electrical connections

- 15-pins D-type connector (gold-plated contacts) with 3 m, 6 m or 12 m cable

MASS FLOW CONTROLLER FAST RESPONSE PERFORMANCE

The curves in figure 1 displays the M.F.C. output signal and actual transitional flow to steady-state when gas flow enters into a process chamber, under a step response command condition.

LOW COMMAND VALVE INHIBIT

A variety of process control systems do not always provide a true "zero" command value.

This results in the mass flow controller trying to match its output signal to its commanded value, which opens the M.F.C. and permits undesired gas flow.

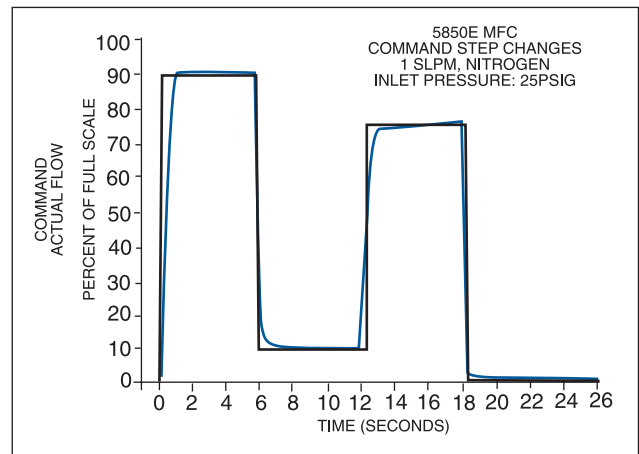


Figure 1: Response performance

The Brooks mass flow controller eliminates this undesired flow condition through its unique LOW COMMAND VALVE INHIBIT, which provides superior process stability.

With Low Command Valve Inhibit the valve is automatically driven to the full closed position when the command value is less than 1% of full scale.

INTERNAL COMMAND RESET

The Brooks mass flow controller provides the exclusive feature of INTERNAL COMMAND RESET.

It eliminates overshoot and undershoot oscillations and reaches commanded steady-state flow control very rapidly.

The result is a decreased gas settling time and vastly improved set point control (see figure 2).

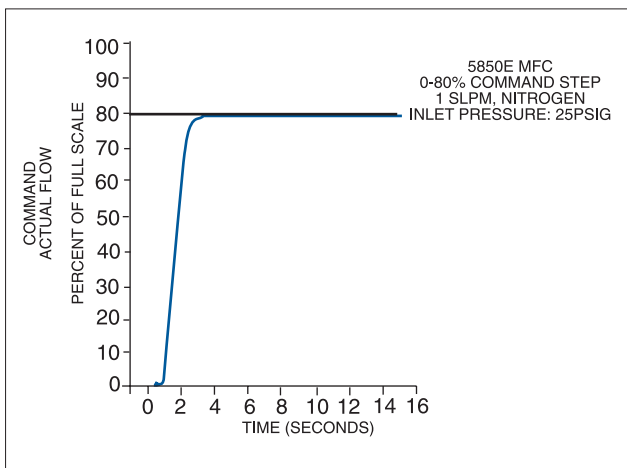


Figure 2: The M.F.C valve closed to normal operation

SELECTABLE SOFT START

Processes requiring injection of gases can be adversely affected by excessive initial gas flow.

This overshoot can result in process damage from explosion or initial pressure impact.

These problems are virtually eliminated with the SOFT START feature (see figure 3)

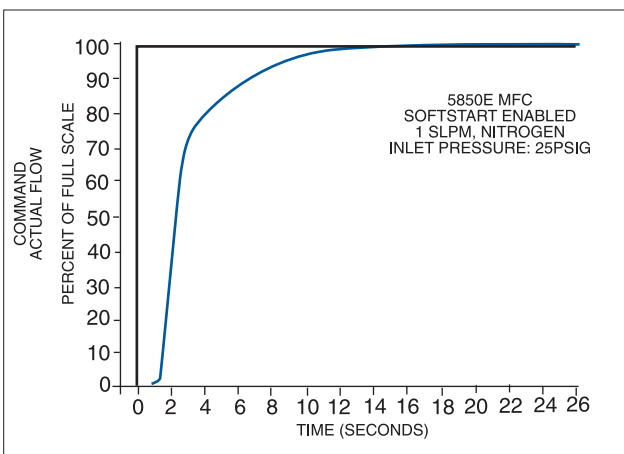


Figure 3: Soft-start enabled

SELECTABLE VALVE OVERRIDE

Gas handling safety practices must be given consideration in many processes.

Since M.F.C.'s are an integral part of the gas system, it was mandatory to take these practices into our design standards.

Independent of command setpoint values the control valve can be fully opened or closed via the VALVE OVERRIDE FEATURE by simply providing a voltage signal through the interconnection wiring. This is useful for shutdown or system purge requirements.

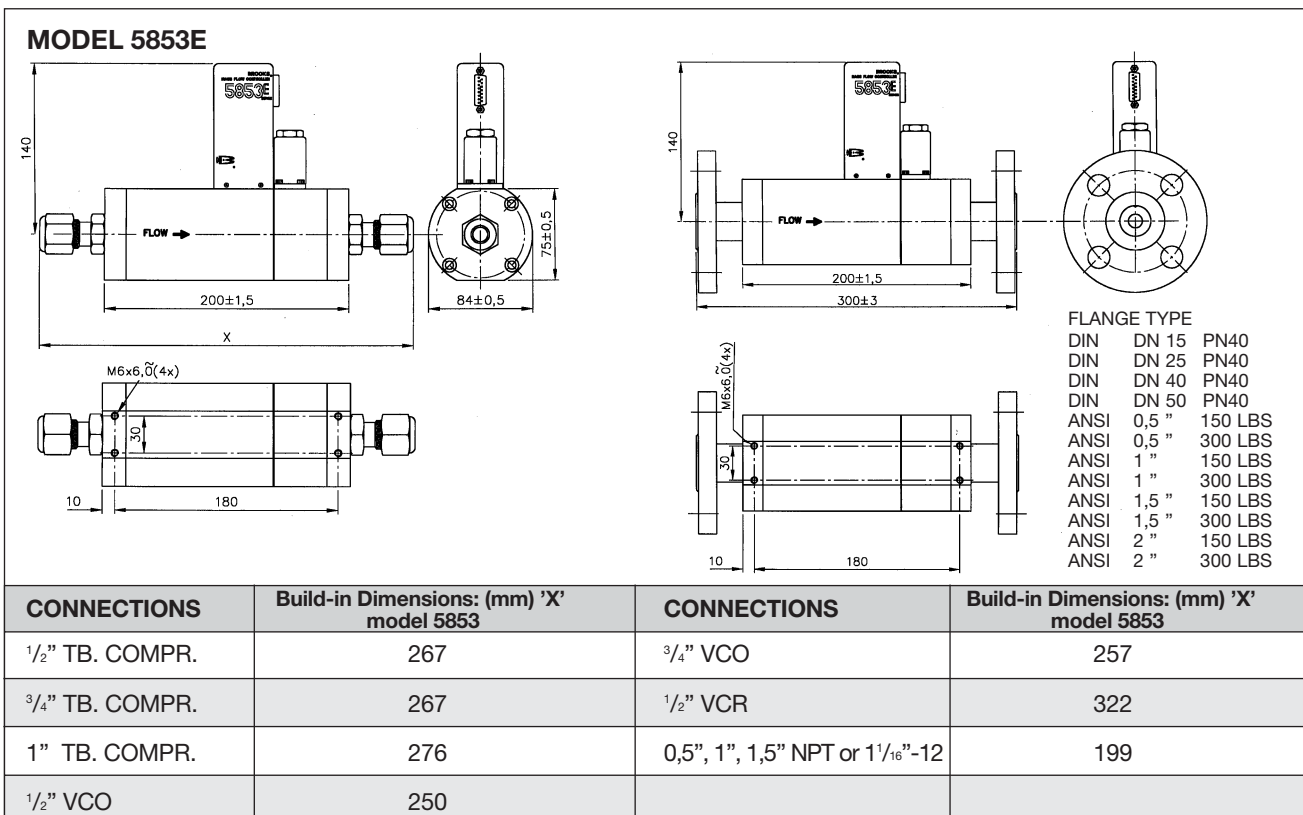
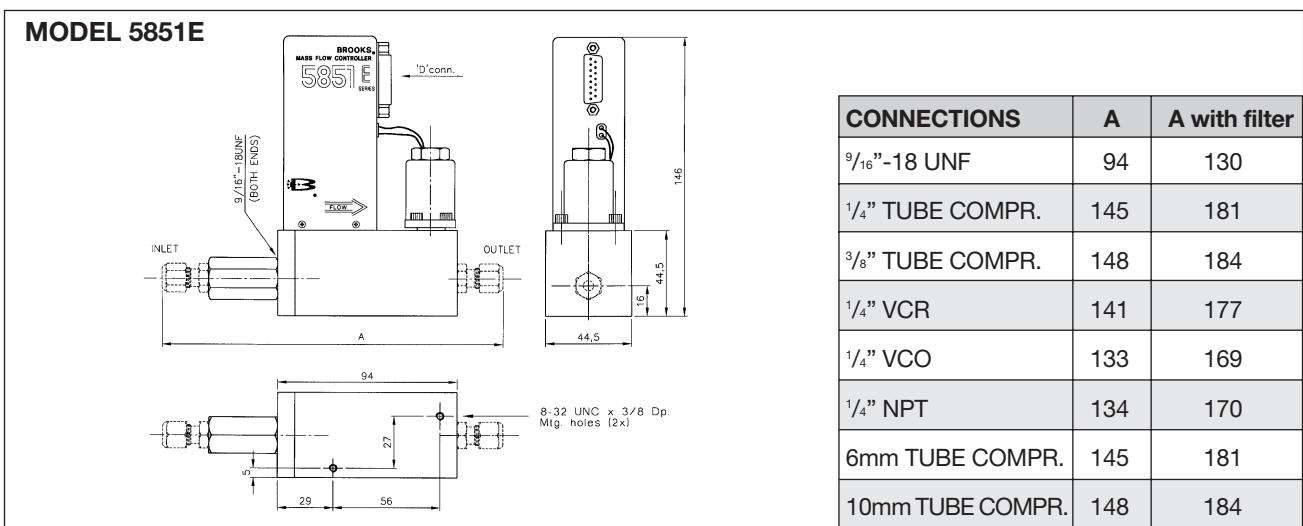
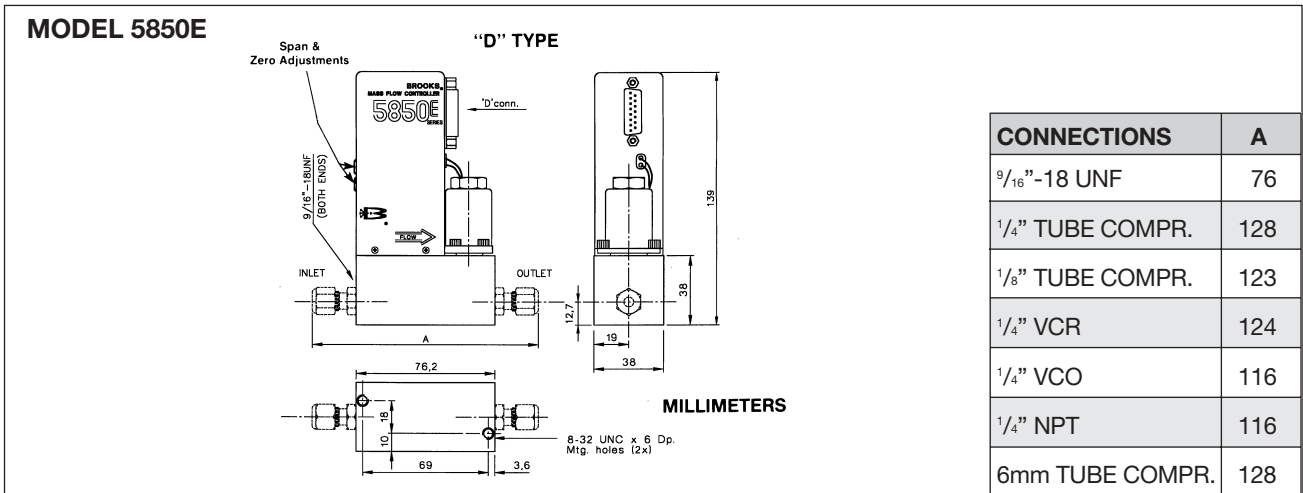
ACCESSORIES

- For Microprocessor based Read Out and Control electronics, please refer to the PDS 0152/0154.
- Standard signal cables are available. Please refer to the ordering information at page 6/7.

Reference to figures: 1, 2 and 3

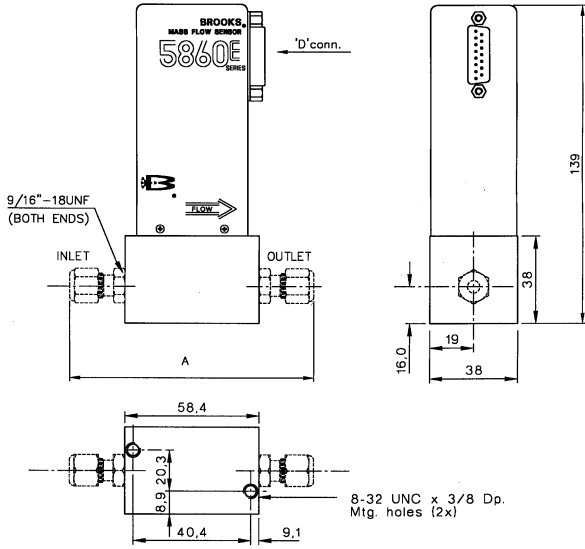
- The black curve represents an (external) command setpoint change
- The blue curve represents the flowrate output signal of the mass flow sensor/controller

DIMENSIONS



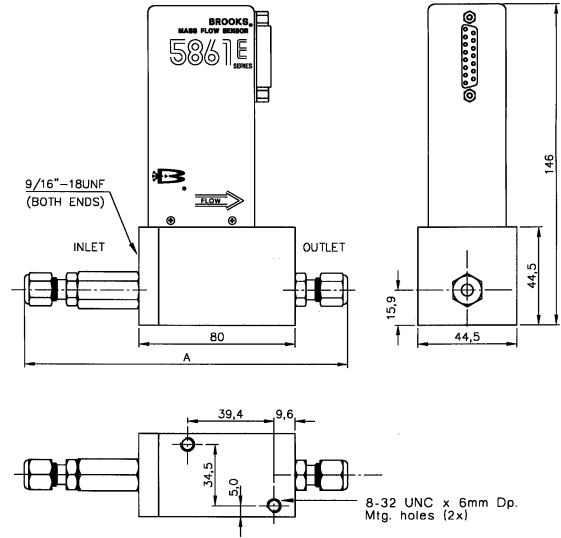
DIMENSIONS

MODEL 5860E



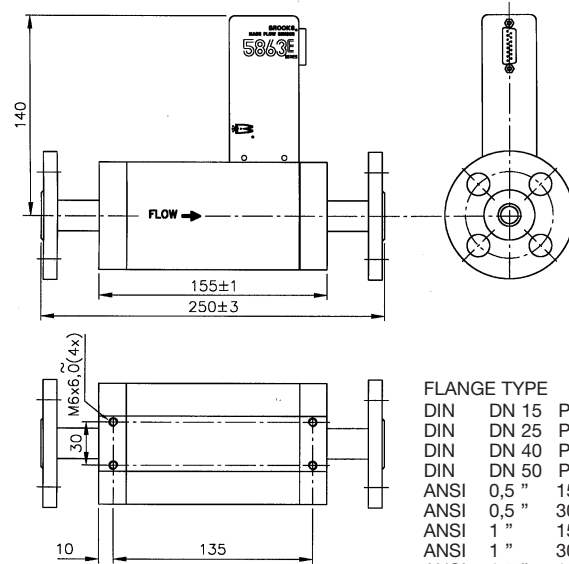
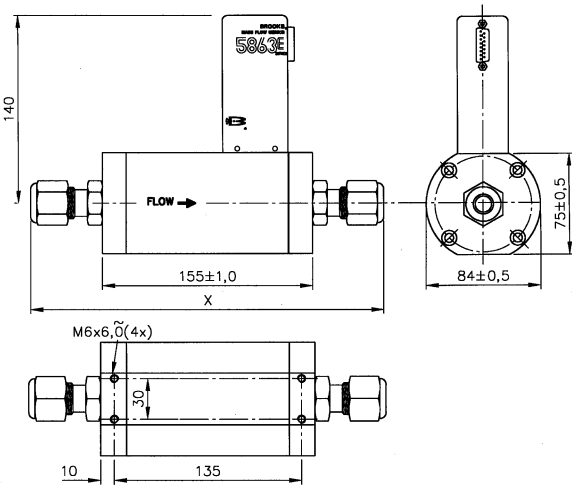
| CONNECTIONS | A | CONNECTIONS | A |
|------------------|-----|-----------------|-----|
| 9/16" -18 UNF | 59 | 1/4" VCO | 98 |
| 1/4" TUBE COMPR. | 110 | 1/4" NPT | 99 |
| 1/8" TUBE COMPR. | 105 | 6mm TUBE COMPR. | 110 |
| 1/4" VCR | 106 | | |

MODEL 5861E



| CONNECTIONS | "A" dim in mm | "A" dim in mm |
|------------------|---------------|---------------|
| 9/16" -18 UNF | 80 | 116 |
| 1/4" TUBE COMPR. | 131 | 167 |
| 3/8" TUBE COMPR. | 134 | 170 |
| 1/4" VCR | 128 | 164 |
| 1/4" VCO | 120 | 156 |

MODEL 5863E



FLANGE TYPE

| | | |
|------|-------|---------|
| DIN | DN 15 | PN40 |
| DIN | DN 25 | PN40 |
| DIN | DN 40 | PN40 |
| DIN | DN 50 | PN40 |
| ANSI | 0,5" | 150 LBS |
| ANSI | 0,5" | 300 LBS |
| ANSI | 1" | 150 LBS |
| ANSI | 1" | 300 LBS |
| ANSI | 1,5" | 150 LBS |
| ANSI | 1,5" | 300 LBS |
| ANSI | 2" | 150 LBS |
| ANSI | 2" | 300 LBS |

| CONNECTIONS | Build-in Dimensions: (mm) 'X' model 5863 | CONNECTIONS | Build-in Dimensions: (mm) 'X' model 5863 |
|------------------|--|----------------------------------|--|
| 1/2" TB. COMPR.. | 223 | 3/4" VCO | 213 |
| 3/4" TB. COMPR. | 223 | 1/2" VCR | 210 |
| 1" TB. COMPR. | 232 | 0,5", 1", 1,5" NPT or 1 1/16"-12 | 155 |
| 1/2" VCO | 206 | | |

| THERMAL MASS "E" SERIES | |
|--|---|
| 5850/5851 | |
| BASE MODEL NUMBER | DESCRIPTION |
| 5850E/B1 | MASS FLOW CONTROLLER, MAX. 100 BAR FULL SCALE RANGES FROM 10mln/min* UPTO 30 ln/min N2 |
| 5851E/B1 | MASS FLOW CONTROLLER, MAX 100 BAR FULL SCALE RANGES FROM 10mln/min UPTO 100ln/min N2 |
| O-RING/VALVE SEAT MATERIAL | |
| A | VITON |
| B | BUNA |
| C | TEFLON/KALREZ (KALREZ ONLY FOR SENSOR O-RINGS AND VALVE SEAT) |
| D | KALREZ |
| Z | SPECIFY |
| VALVE TYPE | |
| 1 | NORMALLY CLOSED |
| 2 | NORMALLY OPENED (ONLY 5850E) |
| ELECTRICAL CONNECTIONS | |
| A | CARD EDGE |
| B | 15-PINS SUB "D" CONNECTOR |
| J | ZONE II CERTIFIED |
| Z | SPECIFY |
| MECHANICAL CONNECTIONS | |
| 1 | WITHOUT ADAPTERS (9/16"-18" UNF) |
| 2 | 1/4" TUBE COMPRESSION FITTINGS |
| 3 | 1/8" TUBE COMPRESSION FITTINGS (ONLY FOR 5850E) |
| | 3/8" TUBE COMPRESSION FITTINGS (ONLY FOR 5851E) |
| 4 | 1/4" VCR |
| 5 | 1/4" VC0 |
| 6 | 1/4" NPT |
| 7 | 6 mm TUBE COMPRESSION FITTINGS |
| 8 | 10 mm TUBE COMPRESSION FITTINGS (ONLY FOR 5850/51E) |
| 9 | SPECIFY |
| INTERCONNECTION CABLE | |
| 0 | NO CABLE |
| A | MOUNTING C.E. BRACKET |
| B | MATING CONNECTOR ONLY |
| C | 1,5m. FLAT CABLE WITH C.E. CONNECTOR AT ONE SIDE |
| D | 3m. ROUND CABLE WITH MATING "D" CONNECTOR |
| E | 6m. ROUND CABLE WITH MATING "D" CONNECTOR |
| F | 12m. ROUND CABLE WITH MATING "D" CONNECTOR |
| Z | SPECIFY |
| 5850E/B1 A 1 B 3 E = TYPICAL MODEL NUMBER | |

| ACCESSOIRES & OPTIONS |
|--|
| * FOR FLOWRANGES > 3 mln/min. 10 mln/min. N2, ADD: |
| - FOR GASES WICH CLOG AND CONTAMINATE THE MFC EASILY, AN ANTI-CLOG LAMINAR FLOW ELEMENT MUST BE ORDERED, FOR FLOWRANGES UPTO 3460 mln/min N2 ADD.: |
| - HEATING PAD |
| - INTERCONNECTION CABLE; ADD PER METER |

| THERMAL MASS "E" SERIES | |
|--------------------------------|--|
| 5853 | |
| BASE MODEL NUMBER | DESCRIPTION |
| 5853E/- | MASS FLOW CONTROLLER, MAX 100 BAR |
| | MAX. F.S. FLOW RANGE |
| 1 | 100 lN/min. |
| 2 | UP TO 200 lN/min. |
| 3 | UP TO 300 lN/min. |
| 4 | UP TO 400 lN/min. |
| 5 | UP TO 500 lN/min. |
| 6 | UP TO 600 lN/min. |
| 7 | UP TO 700 lN/min. |
| 8 | UP TO 800 lN/min. |
| 9 | UP TO 900 lN/min. |
| 0 | UP TO 1000 lN/min. |
| | O-RING MATERIAL |
| A | VITON |
| B | PTFE/BUNA |
| C | PTFE/KALREZ |
| | CONTROL VALVE TYPE |
| 1 | NORMALLY CLOSED MIN. DIFF. 2 BAR, MAX. DIFF. 20 BAR |
| 2 | NORMALLY CLOSED MIN. DIFF. 0,5 BAR, MAX. DIFF. 2 BAR |
| | ELECTRICAL CONNECTIONS |
| | 0-5Vdc 0-5Vdc CE-CONN. E-SERIES |
| A | 0-5Vdc 0-5Vdc "D"-CONN. E-SERIES |
| B | |
| | MECHANICAL CONNECTIONS |
| 1A | 9/16" - 18UNF. (100 lN/min max.) |
| 1B | 1 1/16" - 12SAE/MS |
| 1C | 9/16" TO 1/2" TUBE COMPRESSION FITTINGS |
| 1D | 1 1/16" TO 1/2" TUBE COMPRESSION FITTINGS |
| 1E | 3/4" TUBE COMPRESSION FITTINGS |
| 1F | 1" TUBE COMPRESSION FITTINGS |
| 1G | 1/2" NPT (F) |
| 1H | 1" NPT (F) |
| 1J | 1 1/2" NPT (F) |
| 1K | 1/2" VCO (100 lN/min max.) |
| 1L | 3/4" VCO |
| 1M | 1/2" VCR (100 lN/min max.) |
| 1N | 1/2" BSP (F) |
| 1O | 1" BSP (F) |
| 2A | DIN DN 15 PN40 |
| 2B | DIN DN 25 PN40 |
| 2C | DIN DN 40 PN40 |
| 2D | DIN DN 50 PN40 |
| 3A | ANSI 1/2" 150 LBS |
| 3B | ANSI 1/2" 300 LBS |
| 3C | ANSI 1" 150 LBS |
| 3D | ANSI 1" 300 LBS |
| 3E | ANSI 1 1/2" 150 LBS |
| 3F | ANSI 1 1/2" 300 LBS |
| 3G | ANSI 2" 150 LBS |
| 3H | ANSI 2" 300 LBS |
| 9Z | SPECIFY |
| | INTERCONNECTION CABLE |
| O0 | WITHOUT MATING CONNECTOR |
| A0 | C.E. BRACKET |
| B0 | WITH MATING CONNECTOR |
| C0 | C.E. CONNECTOR WITH 1.5m. FLAT CABLE |
| D0 | 3M. SIGNAL CABLE WITH 15-PINS SUB "D" CONNECTOR |
| E0 | 6M. SIGNAL CABLE WITH 15-PINS SUB "D" CONNECTOR |
| F0 | 12M. SIGNAL CABLE WITH 15-PINS SUB "D" CONNECTOR |
| Z0 | SPECIFY |
| 5853E/- 5 A1 B 1F D0 = | TYPICAL MODEL NUMBER |

| ACCESSOIRES & OPTIONS |
|---|
| * CERTIFIED FOR USE IN ZONE 2, HAZARDOUS AREA |
| ** STANDARD CABLE; ADD PER METER |

| THERMAL MASS "E" SERIES | |
|--|---|
| 5860/5861 | |
| BASE MODEL NUMBER | DESCRIPTION |
| 5860E/-1 | MASS FLOW METER (VOLTAGE), F.S. RANGES FROM 10 mln/min* UPTO 30 ln/min (N2 EQUIVALENT) MAXIMUM OPERATING PRESSURE 300 BAR |
| 5861E/-1 | MASS FLOW METER (VOLTAGE), F.S. RANGES FROM 20 ln./min UPTO 100 ln/min (N2 EQUIVALENT) MAXIMUM OPERATING PRESSURE 100 BAR* |
| O-RING MATERIAL | |
| A | VITON |
| B | BUNA |
| C | TEFLON (KALREZ O-RINGS FOR THE SENSOR ASSEMBLY) |
| D | KALREZ |
| Z | SPECIFY |
| ELECTRICAL CONNECTIONS | |
| A | CARD EDGE 0-5Vdc |
| B | 15-PINS SUB "D" 0-5Vdc |
| J | ZONE 2 CERTIFIED |
| Z | SPECIFY |
| MECHANICAL CONNECTIONS | |
| 1 | WITHOUT ADAPTERS (9/16-18 UNF) |
| 2 | 1/4" TUBE COMPRESSION FITTINGS |
| 3 | 1/8" TUBE COMPRESSION FITTINGS ONLY FOR 5860 |
| | 3/8" TUBE COMPRESSION FITTINGS ONLY FOR 5861 |
| 4 | 1/4" VCR |
| 5 | 1/4" VCO |
| 6 | 1/4" NPT |
| 7 | 6 mm TUBE COMPRESSION FITTINGS |
| 8 | 10 mm TUBE COMPRESSION FITTINGS (ONLY FOR 5860/61E) |
| 9 | SPECIFY |
| INTERCONNECTION CABLE | |
| 0 | NO CABLE |
| A | C.E. Bracket |
| B | MATING CONNECTOR ONLY |
| D | 3m. ROUND CABLE WITH MATING "D" CONNECTOR |
| E | 6m. ROUND CABLE WITH MATING "D" CONNECTOR |
| F | 12m. ROUND CABLE WITH MATING "D" CONNECTOR |
| Z | SPECIFY |
| 5860E/-1 A B 7 D = TYPICAL MODEL NUMBER | |

| ACCESSOIRES & OPTIONS | |
|---|--|
| * FOR FLOWRANGES > 3 mln/min. 10 mln/min. N2, ADD: | |
| - FOR LOW-LINE PRESSURES AND FOR GASES WICH CLOG AND CONTAMINATE THE MFM EASILY, AN ANTI-CLOG LAMINAR FLOW ELEMENT MUST BE ORDERED. FOR FLOWRANGES UPTO 3460 mln/min N2 ADD | |
| - HIGH PRESSURE RATING: 300 BAR FOR MODEL 5861 | |
| - STANDARD CABLE: ADD PER METER | |
| - HEATING PAD | |

| THERMAL MASS "E" SERIES | |
|---|--|
| 5863E | |
| BASE MODEL NUMBER | DESCRIPTION |
| 5863E/- | MASS FLOW SENSOR, MAX 100 BAR |
| MAX. F.S. FLOW RANGE | |
| 1 | 100 l/min. |
| 2 | UP TO 200 l/min. |
| 3 | UP TO 300 l/min. |
| 4 | UP TO 400 l/min. |
| 5 | UP TO 500 l/min. |
| 6 | UP TO 600 l/min. |
| 7 | UP TO 700 l/min. |
| 8 | UP TO 800 l/min. |
| 9 | UP TO 900 l/min. |
| 0 | UP TO 1000 l/min. |
| O-RING MATERIAL | |
| A0 | VITON |
| B0 | PTFE/BUNA |
| C0 | PTFE/KALREZ |
| ELECTRICAL OUTPUT | |
| A | 0-5Vdc CE-conn |
| B | 0-5Vdc "D"-conn |
| MECHANICAL CONNECTIONS | |
| 1A | 9/16" - 18UNF. (100 l/min max.) |
| 1B | 1 1/16" - 12SAE/MS |
| 1C | 9/16" TO 1/2" TUBE COMPRESSION FITTINGS |
| 1D | 1 1/16" TO 1/2" TUBE COMPRESSION FITTINGS |
| 1E | 3/4" TUBE COMPRESSION FITTINGS |
| 1F | 1" TUBE COMPRESSION FITTINGS |
| 1G | 1/2" NPT (F) |
| 1H | 1" NPT (F) |
| 1J | 1 1/2" NPT (F) |
| 1K | 1/2" VCO (100 l/min max.) |
| 1L | 3/4" VCO |
| 1M | 1/2" VCR (100 l/min max.) |
| 1N | 1/2" BSP (F) |
| 1O | 1" BSP (F) |
| 2A | DIN DN 15 PN40 |
| 2B | DIN DN 25 PN40 |
| 2C | DIN DN 40 PN40 |
| 2D | DIN DN 50 PN40 |
| 3A | ANSI 1/2" 150 LBS |
| 3B | ANSI 1/2" 300 LBS |
| 3C | ANSI 1" 150 LBS |
| 3D | ANSI 1" 300 LBS |
| 3E | ANSI 1 1/2" 150 LBS |
| 3F | ANSI 1 1/2" 300 LBS |
| 3G | ANSI 2" 150 LBS |
| 3H | ANSI 2" 300 LBS |
| 9Z | SPECIFY |
| INTERCONNECTION CABLE | |
| 0 | WITHOUT MATING CONNECTOR |
| A | C.E. BRACKET |
| B | WITH MATING CONNECTOR |
| C | C.E. CONNECTOR WITH 1.5m. FLAT CABLE |
| D | 3M. SIGNAL CABLE WITH 15-PINS SUB "D" CONNECTOR |
| E | 6M. SIGNAL CABLE WITH 15-PINS SUB "D" CONNECTOR |
| F | 12M. SIGNAL CABLE WITH 15-PINS SUB "D" CONNECTOR |
| Z | SPECIFY |
| 5853E/- 5 A1 B 1F D0 = TYPICAL MODEL NUMBER | |

| ACCESSOIRES & OPTIONS |
|---|
| * STANDARD CABLE; ADD PER METER |
| * CERTIFIED FOR USE IN ZONE 2, HAZARDOUS AREA |

BROOKS LOCAL AND WORLDWIDE SUPPORT

Brooks Instrument provides sales and service facilities around the world, ensuring quick delivery from local stock, timely repairs, and local based sales and service facilities.

Our dedication to customer service and support extends to our direct sales force, who are well trained, experienced and equipped. These flow specialists provide consultation and support, assuring successful applications of the Brooks flow measurement and control products.

Calibration facilities are available in local sales and service offices. The primary standard calibration equipment to calibrate the mass flow products is certified by our local Weights and Measures Authorities and traceable to the relevant international standards.

START-UP SERVICE AND IN-SITU CALIBRATION

Brooks Instrument can provide start-up service prior to operation when required.

For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the mass flow products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

CUSTOMER SEMINARS AND TRAINING

Brooks Instrument can provide customer seminars and dedicated training to engineers, end users and maintenance persons. Please contact your nearest sales representative for more details.

HELP DESK

In case you need technical assistance, our Helpdesk for Europe, ☎ + (31) 318 549265, or for North America, ☎ 1-888-554-FLOW, is available to support you.

TRADEMARKS

Brooks Brooks Instrument Division, Emerson Electric Co.
Kalrez DuPont Dow Elastomers.
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VCO Cajon Co.
VCR Cajon Co.
Viton DuPont Dow Elastomers

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