

Brooks® Model 5850TR

TR series MFC



Model 5850 TR

Essential Instructions

Read this page before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using and maintaining Brooks Products.

- Read all instructions prior to installing, operating and servicing the product. If this instruction manual is not the correct manual, please see back cover for local sales office contact information. Save this instruction manual for future reference.
- If you do not understand any of the instructions, contact your Brooks Instrument representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation and maintenance of the product.
- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Brooks Instrument. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

Pressure Equipment Directive (PED)

All pressure equipment with an internal pressure greater than 0,5 bar (g) and a size larger than 25mm or 1" (inch) falls under the Pressure Equipment Directive (PED). The Directive is applicable within the European Economic Area (EU plus Norway, Iceland and Liechtenstein).

Pressure equipment can be traded freely within this area once the PED has been complied with.

- ** Section 8 of this manual contains important safety and operating instructions related to the PED directive
- ** Meters described in this manual are in compliance with EN directive 97/23/EC module H *Conformity Assessment*.
- ** All Brooks Instrument flowmeters fall under Fluid-group I
- ** Meters larger than 25mm or 1" (inch) are in compliance with category I, II or III of the PED.
- ** Meters of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

CAUTION

This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling: procedures must be observed during the removal, installation or other handling of internal circuit boards or devices.

Handling procedure

1. Power to unit must be removed.
2. Personnel must be grounded, via a wrist strap or other safe, suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit cards must be transported in a conductive bag or other conductive container. Boards must not be removed from protective enclosure until immediately before installation. Removed boards must immediately be placed in protective container for transport, storage or return to factory.

Comments

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, CMOS, etc.). Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, exhibit early failure.

Model 5850TR

Dear Customer,

We appreciate this opportunity to service your flow measurement and control requirements with a Brooks Instrument device. Every day, flow customers all over the world turn to Brooks Instrument for solutions to their gas and liquid low-flow applications. Brooks provides an array of flow measurement and control products for various industries from biopharmaceuticals, oil and gas, fuel cell research and chemicals, to medical devices, analytical instrumentation, semiconductor manufacturing, and more.

The Brooks product you have just received is of the highest quality available, offering superior performance, reliability and value to the user. It is designed with the ever changing process conditions, accuracy requirements and hostile process environments in mind to provide you with a lifetime of dependable service.

We recommend that you read this manual in its entirety. Should you require any additional information concerning Brooks products and services, please contact your local Brooks Sales and Service Office listed on the back cover of this manual or visit www.BrooksInstrument.com

Yours sincerely,
Brooks Instrument

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1-1 Purpose

The Brooks Model 5850TR mass flowmeter / mass flow controller is a mass flow measuring device, designed for accurately measuring and rapidly controlling flows of gases.

1-2 Description

The Brooks Model 5850TR mass flow controller (MFC) provides "state-of-the-art" mass flow measurement and Proportional and Integral Control. The Brooks Model 5850TR MFC is used widely in the semiconductor industry as well as many others, where manual, electronic or computer controlled gas handling occurs. The Model 5850TR consists of three basic units: a flow sensor, a control valve and an integrated electronic control system. This combination produces a stable gas flow and eliminates the need for continuous monitoring and re-adjustment.

1-2-1 Standard user selectable features includes:

- * **Setpoint** permits the user to control the mass flow controller with an external 0-5 Vdc, 0-10 Vdc or 4-20 mA command in lieu of the command potentiometer. Refer to Section 2-4-1.
- * **Valve override** permits the user to fully open and close the control valve independent of the command setting. Refer to Section 2-4-2.

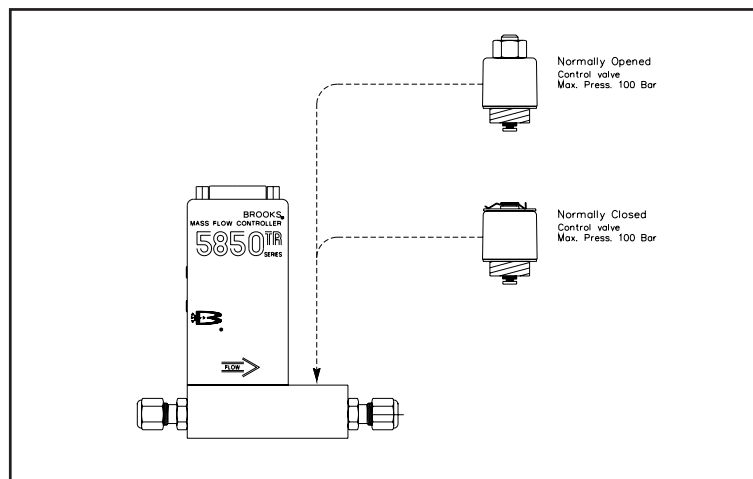


Figure 1-1. Control Valve Types

- The 5850TR MFC can be supplied with two different type control valves:
- Normally opened, max. 100 Bar operating pressure.
 - Normally closed, max. 100 Bar operating pressure (std).

Model 5850TR**1-3 Specifications****▲ WARNING**

Section 1 Introduction
Do not operate this instrument in excess of the specifications listed below. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.

Certification

EMC directive (89/336/EEC)

EN 61326-1:1997+ A1:1998

Certified for Zone II environment according to:

KEMA 03ATEX1531 X per EN 60079-15:2003



II 3 G EEx nA II T4

The flowmeter/controller shall be installed in a suitable enclosed panel or rack providing a degree of ingress protection of at least IP54 according to EN 60529, taking into account the environmental conditions under which the equipment will be used.

Performance*Accuracy*

± 1% full scale including linearity measured at calibrated conditions

Repeatability

± 0.25% full scale

Rangeability

50 to 1

Temperature coefficient

0.1% full scale/°C

Mounting attitude sensitivity

± 0.5% full scale maximum deviation from specified accuracy

*Flow ranges*Any full scale range from 10 ml_n/min. to 20l_n/min. Based on Nitrogen equivalent.*Flow output/setpoint input*0-5 Vdc, min. load: 1000 Ohm
(0)4-20 mA min. load: 350 Ohm**Ratings***Max. operating pressure*

100 bar versions

Temperature

Ambient/gas 0-65/°C (32-149°F)

*Leak integrity*Outboard: 1 x 10⁻⁶ mbar.l/s Helium*Power requirements*

+15 Vdc or + 24 Vdc (max. 250 mA)

Materials of construction

Wetted parts stainless steel with Viton®, PTFE, Buna-N® or Kalrez®

Mechanical connections

Standard fittings: 1/4" VCR, 1/4" VCO, 1/4" NPT, 1/8" or 1/4" tube compression, 9/16 - 18 unf, 6mm tube compression, 1/4" Rc (BSPT)

Electrical connection

Sub-D-type connector or Card Edge

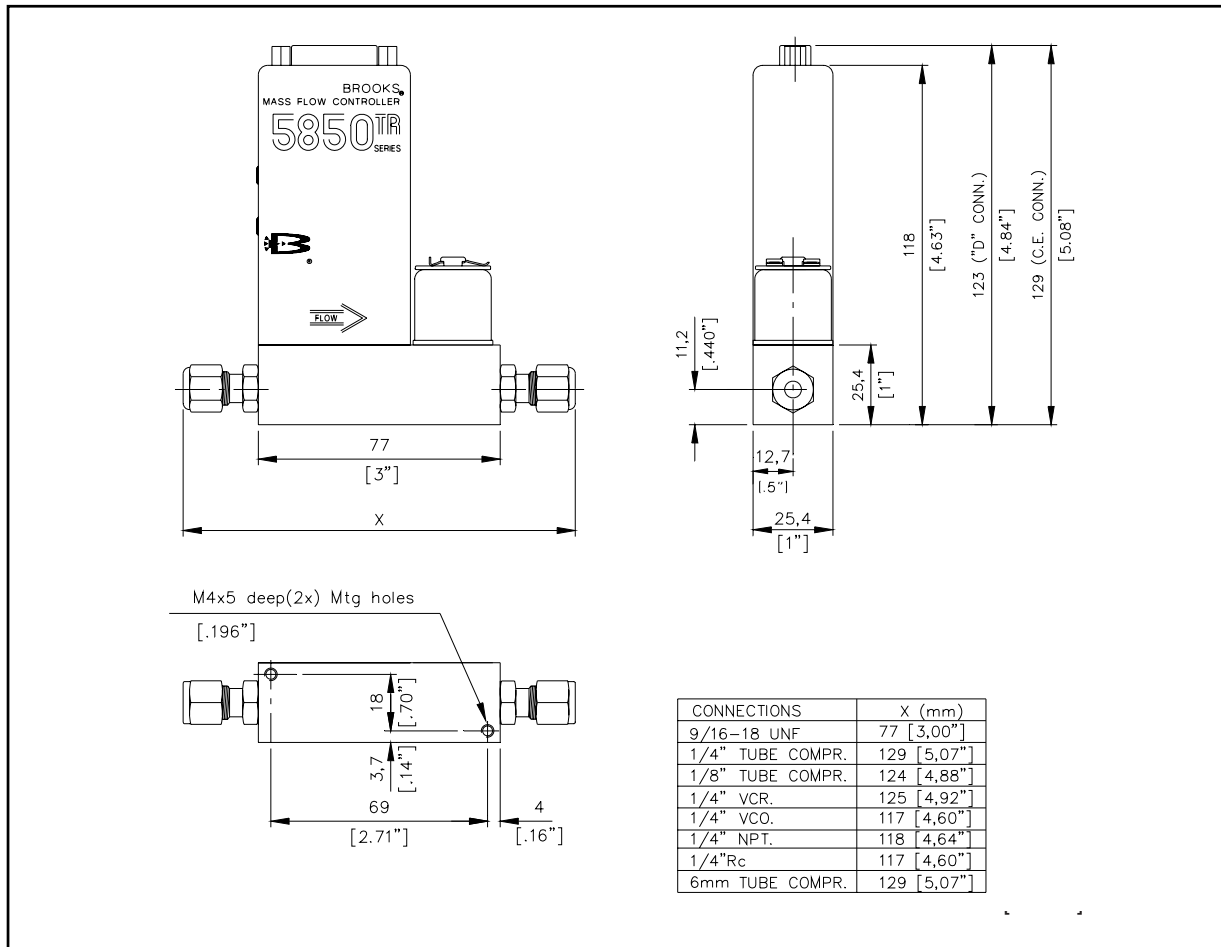


Figure 1-2

1-4 Standard Manufacturing Procedures

Brooks Instrument warrants the supply of very high quality flow measurement and control equipment. Upon receipt of incoming materials, until shipment of instruments, fabrication of the BROOKS MASS FLOW CONTROLLERS are monitored at every production stage.

Pressure test, each mass flow controller is pressure tested at 1.5 times the maximum working pressure.

Burn-in test, each instrument undergoes a temperature burn-in test for 16 hours. In this time the instruments are continuously tested under severe conditions.

Calibration, in our calibration department the instruments are calibrated in accordance with the customers requirements. Brooks Instrument uses their patented VOL-U-METER®, calibration equipment, which are used as a **primary standard**, certified by the National Bureau of Standards.

Helium leak-test, when the mass flow controllers have been calibrated, the instruments are subject to a leak test, using a Helium leak detector. Brooks warrants an inboard outboard leak integrity: 1 x 10⁻⁶ mbar.l/s of Helium.

Final inspection, The instruments are visually inspected, identified for serial control and completed with a calibration certificate.

Model 5850TR**2-1 General**

This section contains the procedures for the receipt and installation of the instrument. See Section 1 for dimensional and connection requirements. Do not attempt to start the system until the instrument has been permanently installed. It is important that the start-up procedures be followed in the exact sequence presented.

2-2 Receipt of Equipment

When the instrument is received, the outside packing case should be checked for damage incurred during shipment. If the packing case is damaged, the local carrier should be notified at once regarding his liability. A report should be submitted to your nearest Product Service Department.

Brooks Instrument

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 P.O. Box 903
 Hatfield, PA 19440 USA
 Toll Free (888) 554-FLOW (3569)
 Tel (215) 362-3700
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 Tokyo, 136-0073 Japan
 Tel 011-81-3-5633-7100
 Fax 011-81-3-5633-7101
 Email: BrooksAs@EmersonProcess.com

Remove the envelope containing the packing list. Carefully remove the instrument from the packing case. Make sure spare parts are not discarded with the packing materials. Inspect for damaged or missing parts.

2-3 Recommended Storage Practice

If intermediate or long-term storage of equipment is required, it is recommended that the equipment be stored in accordance with the following:

- a. Within the original shipping container.
- b. Stored in a sheltered area, preferably a warm, dry, heated warehouse.
- c. Ambient temperature of 70° F (21° C) nominal, 109° F (43° C) maximum, 45° F (7° C) minimum.
- d. Relative humidity 45% nominal, 60% maximum, 25% minimum.

Upon removal from storage a visual inspection should be conducted to verify the condition of equipment is "as received".

2-4 Return Shipment

Prior to returning any instrument to the factory visit the Brooks website www.BrooksInstrument.com for a Return Materials Authorization Number (RMA#), or contact one of the following locations:

Brooks Instrument
 407 W. Vine Street
 P.O. Box 903
 Hatfield, PA 19440 USA
 Toll Free (888) 554-FLOW (3569)
 Tel (215) 362-3700
 Fax (215) 362-3745
 E-mail: BrooksAm@EmersonProcess.com
www.BrooksInstrument.com

Brooks Instrument
 Neonstraat 3
 6718 WX Ede, Netherlands
 P.O. Box 428
 6710 BK Ede, Netherlands
 Tel 31-318-549-300
 Fax 31-318-549-309
 E-mail: BrooksEu@EmersonProcess.com

Brooks Instrument
 1-4-4 Kitasuna Koto-Ku
 Tokyo, 136-0073 Japan
 Tel 011-81-3-5633-7100
 Fax 011-81-3-5633-7101
 Email: BrooksAs@EmersonProcess.com

Instrument must have been purged in accordance with the following:

 WARNING
<p>Before returning the device purge thoroughly with a dry inert gas such as Nitrogen before disconnecting gas connections. Failure to correctly purge the instrument could result in fire, explosion or death. Corrosion or contamination may occur upon exposure to air.</p>

All flow instruments returned to Brooks requires completion of Form RPR003-1, Brooks Instrument Decontamination Statement, along with a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument. Failure to provide this information will delay processing by Brooks personnel. Copies of these forms can be downloaded from the Brooks website www.BrooksInstrument.com or are available from any Brooks Instrument location listed above.

2-5 Transit Precautions

To safeguard the instrument against transportation damage, it is recommended to keep the instrument in its factory container until ready for installation.

2-6 Removal from Storage

Upon removal of the instrument from storage, a visual inspection should be conducted to verify its "as-received" condition. If the instrument has been subject to storage conditions in excess of those recommended (See Section 2-3), it should be subjected to a pneumatic pressure test in accordance with applicable vessel codes.

Model 5850TR

2-7 Gas Connections

The following connections are available:

- * 1/4" tube compression
- * 1/8" tube compression
- * 1/4" VCR / VCO
- * 1/4" NPT
- * 1/4" Rc (BSPT)
- * 3/8" tube compression

Prior to installation, make certain all piping is clean and free of obstruction. Install the piping in such a manner that permits easy removal if the instrument has to be removed for cleaning, or recalibration.

2-8 In-Line Filter

It is recommended that an in-line filter is installed upstream and sometimes downstream from the flow sensor to prevent the possibility of any foreign material entering the mass flow sensor or controller. The filter element should be periodically replaced or may be ultrasonically cleaned.

Refer to Table: 2-1.

Maximum Flow Rate	Recommended Filter Size
100 ml _n /min.	1 micron
500 ml _n /min.	2 micron
5 l _n /min.	7 micron
20 l _n /min.	15 micron

Table 2-1 Recommended Filter Size

2-9 Installation

⚠ CAUTION:

When installing the controller, care should be taken that no foreign materials enter the inlet or outlet of the instrument. Do not remove the protective end caps until installation.

Recommended installation procedures:

- A. The Model 5850TR should be located in a clean dry atmosphere relatively free from shock and vibration.
- B. Leave sufficient room for access to the electrical components.
- C. Install in such a manner that permits easy removal if the instrument requires cleaning.

⚠ CAUTION:

When used with a reactive (sometimes toxic) gas, contamination or corrosion may occur as a result of plumbing leaks or improper purging. Plumbing should be checked carefully for leaks and the controller purged with dry Nitrogen before use.

- D. The Model 5850TR mass flow controller can be installed in any position. However, mounting orientations other than the original factory calibration (see data sheet) will result in a ± 0.5% maximum full scale shift.

⚠ CAUTION:

Since the Model 5850TR control valve is not a positive shut-off, a separate solenoid valve may have been installed for that purpose. It should be noted that a small amount of gas may be trapped between the downstream side of the mass flowcontroller and the solenoid resulting in a surge upon actuation of the controller. This surge can be reduced in magnitude by locating the controller and solenoid valve close to gether or by moving the solenoid valve upstream of the controller.

2-10 Electrical Connection “D” Connector

(Refer to figures 2-1, 2-2 and 2-3)

The 5850TR can be supplied with a 15-pins “D”-connector suitable for round cable connections.

The Brooks (electrical/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (EMC directive 89/336/EEC). Special attention however is required when selecting the signal cable to be used with CE marked equipment.

Quality of the signal cable and cable connectors:

- Brooks standard supplies high quality cable(s) which meets the specifications for CE certification.
- If you provide your own signal cable you should use a cable which is overall completely screened with at least an 80% shield.

Cable connectors used should be made from metal and cable glands should either be metal or metal shielded. The cable screen should be connected to the metal connector or gland and shielded at both ends over 360 degrees.

For pin configuration; please refer to figures 2-2 and 2-3.

2-10-1 Setpoint

This input allows the user to establish a controlled flow rate. The 5850TR supports two types of I/O control signals; 0-5 Vdc and (0) 4-20 mA. Refer to Figure 2-1 for the I/O signal wiring diagram.

For 0-5 VDC I/O

- connect setpoint (+) to pin #8
- connect setpoint return to pin #1

For (0) 4-20 mA I/O

- connect setpoint (+) to pin #7
- connect setpoint return to pin #1

2-10-2 Valve Override

To open or close the control valve independently of the setpoint signal (e.g. for safety reasons pin 12 is available to carry a valve override signal.

Leave floating (i.e. not connected) to allow for normal control operation.

\geq 5 Vdc Valve Open (for both NO and NC valves)

\leq 0 Vdc Valve Closed (for both NO and NC valves)

Refer to figures 2-1:

- Valve override open: apply power supply voltage to pin #12
- Valve override close: apply power supply common to pin #12
- Normal control: no connection on pin #12

Model 5850TR

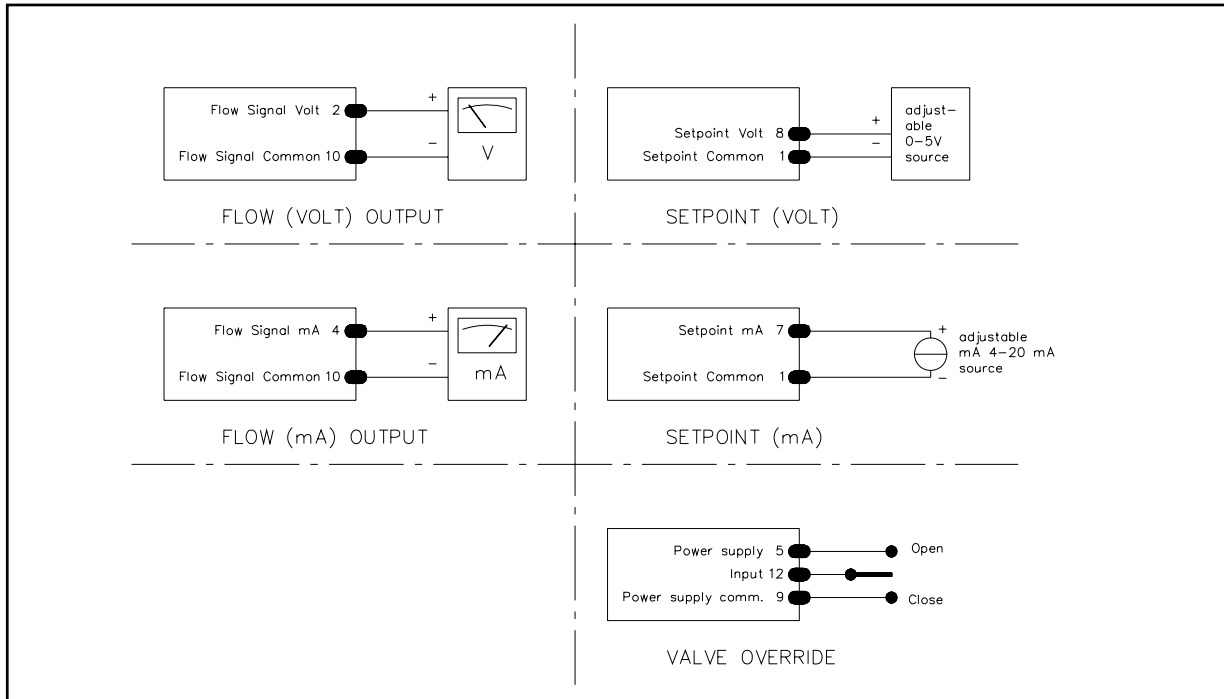


Figure 2-1 5850TR Hook-up Diagrams 15 Pins Sub "D"-Connector

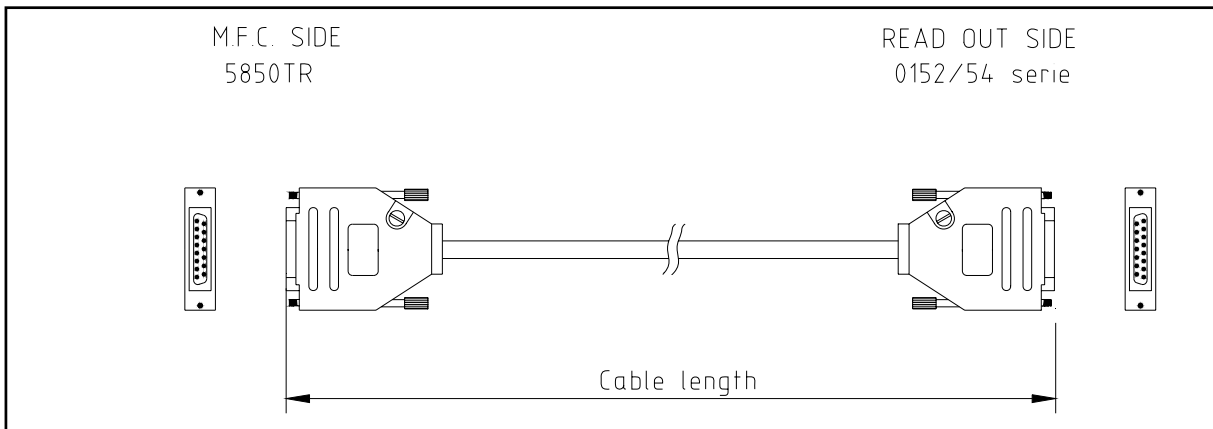


Figure 2-2 5850TR Connections Diagram "D"-Connector

PIN Numbers	Color	Function
1	Brown	Input, setpoint common (-)
2	White	Output, flow signal Volt, 0(1) - 5 (+)
3	Grey / Pink	No function
4	Red / Blue	Output, flow signal mA, 0(4) - 20 (+)
5	Red	Power supply + 15 Vdc or 24 Vdc
6	Blue	No function
7	Violet	Input, setpoint mA, 0(4) - 20 (+)
8	Grey	Input, setpoint Volt, 0(1) - 5 (+)
9	Black	Power supply common (-)
10	Pink	Output, Flow signal common (-)
11	Yellow	Output, +5 Vdc reference (+)
12	Green	Input, valve override
13	Not connected	No function
14	White / Yellow	No function
15	Brown / Green	No function
Housing	Shield	Shielding

Figure 2-3 5850TR Pin Lay-out "D"-Connector

2-11 Electrical Connection Card Edge Connector

(Refer to figures 2-4, 2-5)

The 5850TR can be supplied with a Card Edge connector suitable for flat cable. The Brooks (electrical/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (EMC directive 89/336/EEC).

Special attention however is required when selecting the signal cable to be used with CE marked equipment.

Quality of the signal cable and cable connectors:

- Brooks standard supplies high quality cable(s) which meets the specifications for CE certification.
- If you provide your own signal cable you should use a cable which is overall completely screened with at least an 80% shield.

Cable connectors used should be made from metal and cable glands should either be metal or metal shielded. The cable screen should be connected to the metal connector or gland and shielded at both ends over 360 degrees.

For wiring configuration; please refer to figure 2-4 and 2-5.

2-11-1 Setpoint

This input allows the user to establish a controlled flow rate. The 5850TR supports two types of I/O control signals; 0-5 Vdc and (0) 4-20 mA. Refer to Figure 2-4 for the I/O signal wiring diagram.

For 0-5 VDC I/O

- connect setpoint (+) to contact #A
- connect setpoint return to contact #B

For (0) 4-20 mA I/O

- connect setpoint (+) to contact #D
- connect setpoint return to contact #B

2-11-2 Valve Override

Valve override connections are changed: To open or close the control valve independently of the Set point signal (e.g. for safety reasons) contact 9 is available to carry a valve override signal.

Leave floating (i.e. not connected) to allow for normal control operation.

≥ 5 Vdc Valve Open (for both NO and NC valves)

≤ 0 Vdc Valve Closed (for both NO and NC valves)

Refer to figures 2-4:

- Valve override open: apply power supply voltage to contact #9 (PCB)
- Valve override close: apply power supply common to contact #9 (PCB)
- Normal control: no connection on contact #9 (PCB)

Model 5850TR

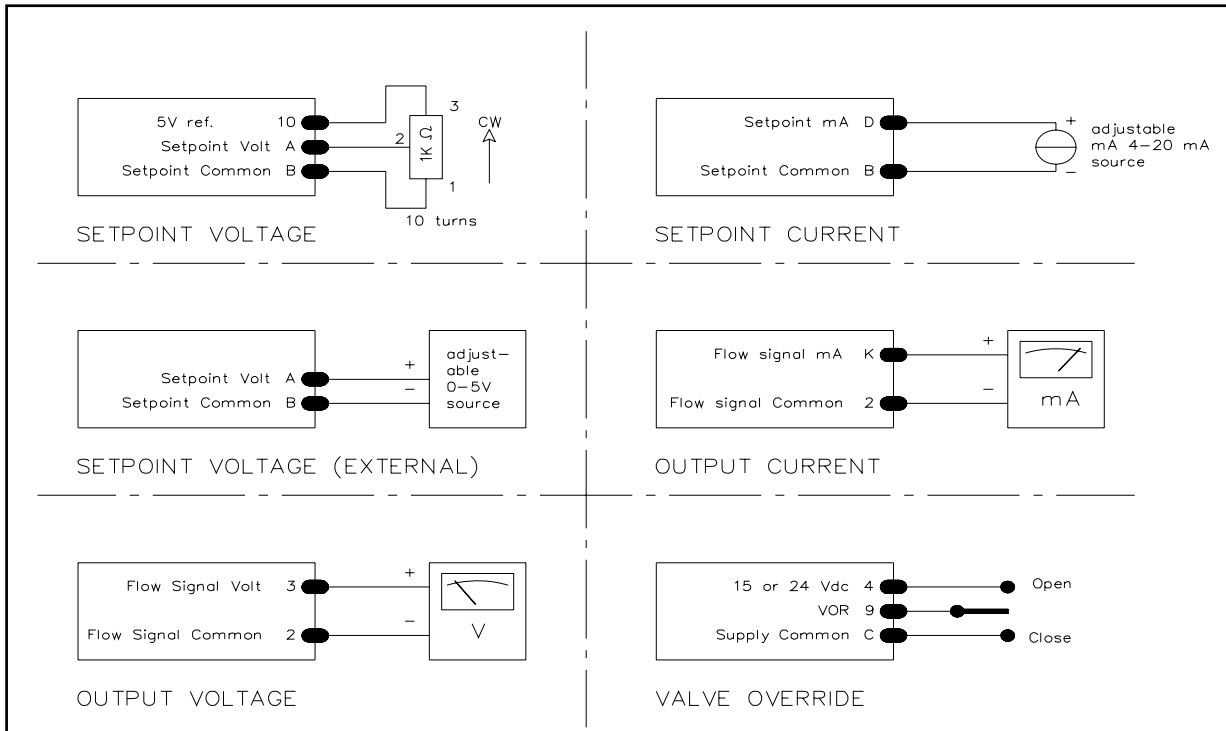


Figure 2-4 5850TR Hook-up Diagrams Card Edge

PCB CONTACT NO	NO	CLR	DESCRIPTION
L	20	BLK	N.C.
10	19	WHT	Output, + 5 Vdc reference (+)
K	18	GRY	Output, flowsignal mA, 4-20 (+)
9	17	VIOL	Input, valve override
J	16	BLU	N.C.
8	15	GRN	N.C.
H	14	YEL	SLOT
7	13	ORG	SLOT
F	12	RED	N.C.
6	11	BWN	N.C.
E	10	BLK	N.C.
5	9	WHT	N.C.
D	8	GRY	Input, setpoint mA, 4-20 (+)
4	7	VIOL	Power supply, + 15 or 24 Vdc (+)
C	6	BLU	Power supply, common (-)
3	5	GRN	Output, Flowsignal volt, 0-5 (+)
B	4	YEL	Input, setpoint common (-)
2	3	ORG	Output, Flowsignal common (-)
A	2	RED	Input, setpoint volt, 0-5 (+)
1	1	BWN	N.C.

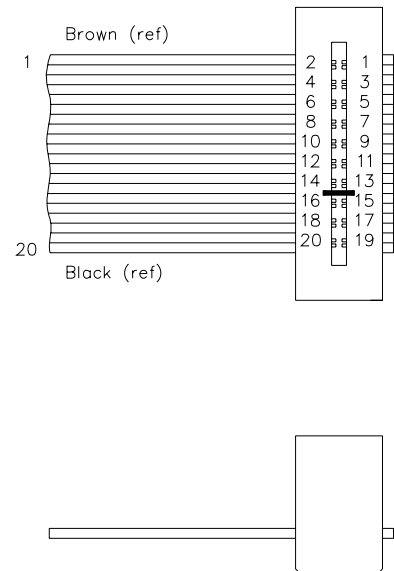


Figure 2-5 5850 TR Connections Diagram Card Edge

3-1 Theory of Operation

The thermal mass flow sensing technique used in the 5850TR works as follows: A precision power supply provides a constant power heat input (P) at the heater, which is located at the midpoint of the sensor tube. Refer to figure 3-1. At zero, or no flow conditions the heat reaching each temperature sensor is equal. Therefore the temperatures T1 and T2 are equal. When gas flows through the tube the upstream sensor is cooled and the downstream sensor is heated, producing a temperature difference. The temperature difference T2-T1, is directly proportional to the gas mass flow. The equation is: $\Delta T = A * P * Cp * m$

Where:

ΔT = Temperature difference T2-T1 (K)

Cp = Specific heat of the gas at constant pressure (kJ/kg.K)

P = Heater power (kJ/s)

m = Mass Flow (kg/s)

A = Constant of proportionality (S²-K²/kJ²)

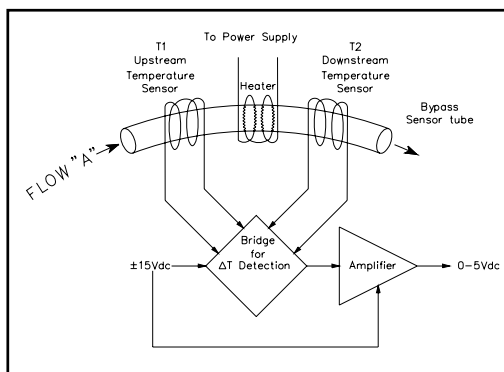


Figure 3-1 Flow Sensor Operational Diagram

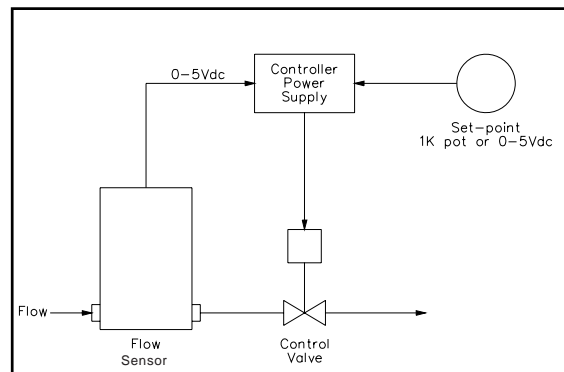


Figure 3-2 Control System Block Diagram

A bridge circuit interprets the temperature difference and a differential amplifier generates a linear 0-5 Vdc signal directly proportional to the gas **mass flow rate**. A flow restrictor performs a ranging function similar to a shunt resistor. This restrictor provides a pressure drop that is linear with flow rate. The sensor tube has the same linear pressure drop/flow relationship. The ratio of the restrictor flow to the sensor tube flow remains constant over the range of the meter. Different restrictors have different pressure drops and produce meters with different full scale flow rates. The span adjustment in the electronics affects the fine adjustment of the meters full scale flow. In addition to the mass flow sensor the model 5850TR mass flow controller has an integral control valve and control circuit. The control circuit senses any difference between the flow sensor signal and adjusts the current in the modulating solenoid valve in increase of decrease the flow.

The printed control board offers you the following features:

- valve override and a setpoint input for 0-5Vdc or (0)4-20 mA
- precision reference voltage is provided to drive the command potentiometer.

Model 5850TR**3-2 Operating Procedure**

(refer to figures 2-1 to 2-5 customer hook-up diagram)

- A. Apply power to the M.F.C. and allow approximately 45 minutes for the instrument to warm up and stabilize.
- B. Turn on gas supply.
- C. Command 0% flow and observe the controller's output signal.
The output should be slightly positive: + 15 mVdc for the N.C. Valve and +100 mVdc for the N.O. Valve.
- D. Set command signal for desired flowrate to assume normal operation.

3-3 Zero Adjustment

Each 5850TR is factory adjusted to provide a + 15 mVdc signal at zero flow. The adjustment is made in our calibration laboratory which is temperature controlled. After initial installation and warm-up in the gas system the zero flow indication may be other than the factory setting. This is primarily caused by changes in temperature between our calibration laboratory and the final installation. The zero flow reading can also be affected to a small degree by changes in line pressure and mounting attitude. To check zero always mount the controller in its final configuration and allow a minimum of 20 minutes for the temperature of the controller and its environment to stabilize. Using a suitable voltmeter check the controller output signal. If it differs from the factory setting adjust it by removing the lower pot hold plug, which is located closest to the controller body. Adjust the zero potentiometer (refer to figure 3-3 or 3-5) until the desired output signal is obtained.

3-4 Calibration Procedure

(refer to figures 3-3 through 3-7)

NOTE:

Calibration of the 5850TR mass flow controller requires the use of a digital voltmeter (DVM) and a primary flow standard calibrator such as the Brooks Vol-U-meter[®].

It is recommended that the calibration be performed only by trained and qualified service personnel.

If the mass flow controller is to be used on a gas other than the calibration gas, apply the appropriate sensor conversion factor. Size the orifice for actual operating conditions.

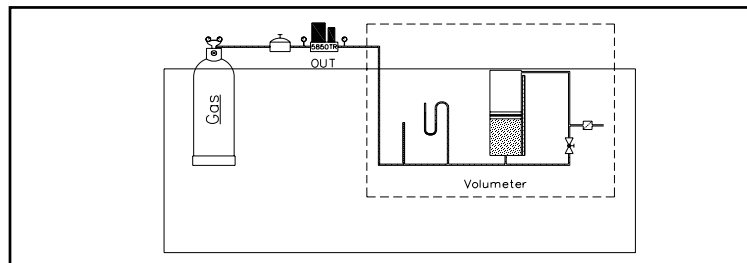


Figure 3-7 Typical Calibration Installation

The calibration procedure is written for all M.F.C. models, please refer only to those chapters which are applicable. With the meter installed in an unpressurized gas line, apply power and allow approximately 45 minutes for warm up. During the warm-up, adjustment, and calibration check procedures, do not allow the control valve to open when gas flow is not present. This situation is not a normal operating mode, it will cause the control valve to heat up abnormally. A meter with an abnormally warm valve will be difficult to calibrate. This situation can be prevented by switching the valve override "closed" when there is no gas flow. Also avoid unnecessary periods with the valve override "open".

The calibration procedure is written for all M.F.C. models, please refer only to those chapters which are applicable. With the meter installed in an unpressurized gas line, apply power and allow approximately 45 minutes for warm up. During the warm-up, adjustment, and calibration check procedures, do not allow the control valve to open when gas flow is not present. This situation is not a normal operating mode, it will cause the control valve to heat up abnormally. A meter with an abnormally warm valve will be difficult to calibrate. This situation can be prevented by switching the valve override "closed" when there is no gas flow. Also avoid unnecessary periods with the valve override "open".

There are 6 adjustment potentiometers on the 5850TR. These are the Zero, Span, 5V Reference, Linearity, Alignment, and 4-20 mA Output adjustments. Adjustment of the Zero and Span potentiometers can be performed by removing the small protection plugs in the side of the electronics cover. Adjustment of the remaining potentiometers necessitates removal of the electronics cover, which can seriously affect the performance of the mass flow controller and should only be performed by properly trained and qualified personnel.

Zero Adjustment, P1

The zero potentiometer is used to balance the thermal sensor during a no flow condition. This potentiometer is adjusted at the time of calibration and minor adjustments may be done in the field. See the "Zero Adjustment" section 3-3 for details.

Span Adjustment, P2

The span potentiometer is used to adjust the full scale flow rate setting of the mass flow controller. Adjusting this potentiometer will alter the calibration and is therefore not recommended at any time unless calibrating the device. The span must be adjusted using suitable volumetric calibration equipment with the input setpoint signal set to 100%.

Linearity Adjustment, P3

The linearity potentiometer is used to linearize the flow calibration due to subtle non-linearities in various bypass elements. Adjusting this potentiometer will alter the calibration and is therefore not recommended unless calibrating the device. See section 3-4-1 for linearity procedure during calibration.

(Note for section 3-4-1, use the existing sections 9, 10, 11, and 12 for linearization instructions).

Alignment Adjustment, P5

The alignment potentiometer is used to adjust for slight tolerances in the input setpoint signal. Adjusting this potentiometer affects the flow control setpoint and is not recommended unless calibrating the device. To adjust the alignment, send a 10% setpoint to MFC. Measure and record output signal. The difference between the input and output signal is alignment error. Adjust alignment potentiometer to one half of error value.

For example, input setpoint is 10.00%, output reads 10.10%. Adjust alignment potentiometer until output reads 10.05%.

5V Reference, P6

The 5V Reference potentiometer is used to adjust the 5Vdc output that is available on pin# 11 (15 pin d-connector) or contact# 10 (card edge) of the device.

When adjusting this reference for a 15 pin d-connector device, connect the DVM positive lead to pin# 11 and the negative lead to pin#1. For a card edge version device, connect the DVM positive lead to contact# 10 and the negative lead to contact# B. Reference Figure 2-5 for details.

Model 5850TR**4-20 mA Adjustment, P7**

The 4-20 mA potentiometer is used to adjust for slight variations in the 4-20 mA output signal. Adjusting this potentiometer affects the flow control output signal and is not recommended unless calibrating the device. To adjust the alignment, send a 100% setpoint (20 mA) to MFC. Measure output signal and adjust 4-20 mA potentiometer until output signal is exactly 20.0 mA.

3-5 Sizing of Control Valve

When a change of the flow conditions is required, it may be necessary to change the flowrestrictor (refer to Section 4-4) and orifice size.

When calculating the Kv-value following information is required.

Upstream pressure	P1 (Abs) Bar
Downstream pressure	P2 (Abs) Bar
Gas temperature	T (Kelvin)
Maximum flow	Q (m ³ /h)
Gas density	φ (kg/m ³)

Depending on the ratio between P1 and P2, we have to make different calculations:

- Over critical, when $\frac{P2}{P1} > 0,5$

$$Kv = \frac{Q \text{ max.}}{514} \times \sqrt{\frac{\varphi \times T}{(P1-P2) \times P2}}$$

- Under critical, when $\frac{P2}{P1} \leq 0,5$

$$Kv = \frac{Q \text{ max.}}{257 \times P1} \times \sqrt{\varphi \times T}$$

Table 3-5-1 refers to the Kv-values and appropriate orifice sizes. The next largest orifice size should be selected in case of interpolation.

Table 3-5-1 Kv-Values and max. Acceptable Pressure Drop over the Valve

Kv value	Orifice diameter (inch)	Maximum ΔP(Bar)	Partnumber
5 x 10 ⁻⁶	0,0013"	100	577-Z-363-BMT
2 x 10 ⁻⁵	0,002"	100	577-Z-364-BMT
5 x 10 ⁻⁵	0,003"	100	577-Z-365-BMT
11 x 10 ⁻⁵	0,004"	100	577-Z-366-BMT
18 x 10 ⁻⁵	0,005"	100	577-Z-367-BMT
4 x 10 ⁻⁴	0,007"	100	577-Z-368-BMT
9 x 10 ⁻⁴	0,01"	60	577-Z-369-BMT
2 x 10 ⁻³	0,014"	36	577-Z-401-BMT
4,7 x 10 ⁻³	0,020"	22	577-Z-370-BMT
1,05 x 10 ⁻²	0,028"	13	577-Z-371-BMT
1,4 x 10 ⁻²	0,032"	11	577-Z-372-BMT
3,3 x 10 ⁻²	0,046"	6	577-Z-373-BMT
4x10 ⁻²	0,052"	4	577-Z-138-BMT
6,1x10 ⁻²	0,067"	2	577-Z-139-BMT

Model 5850TR

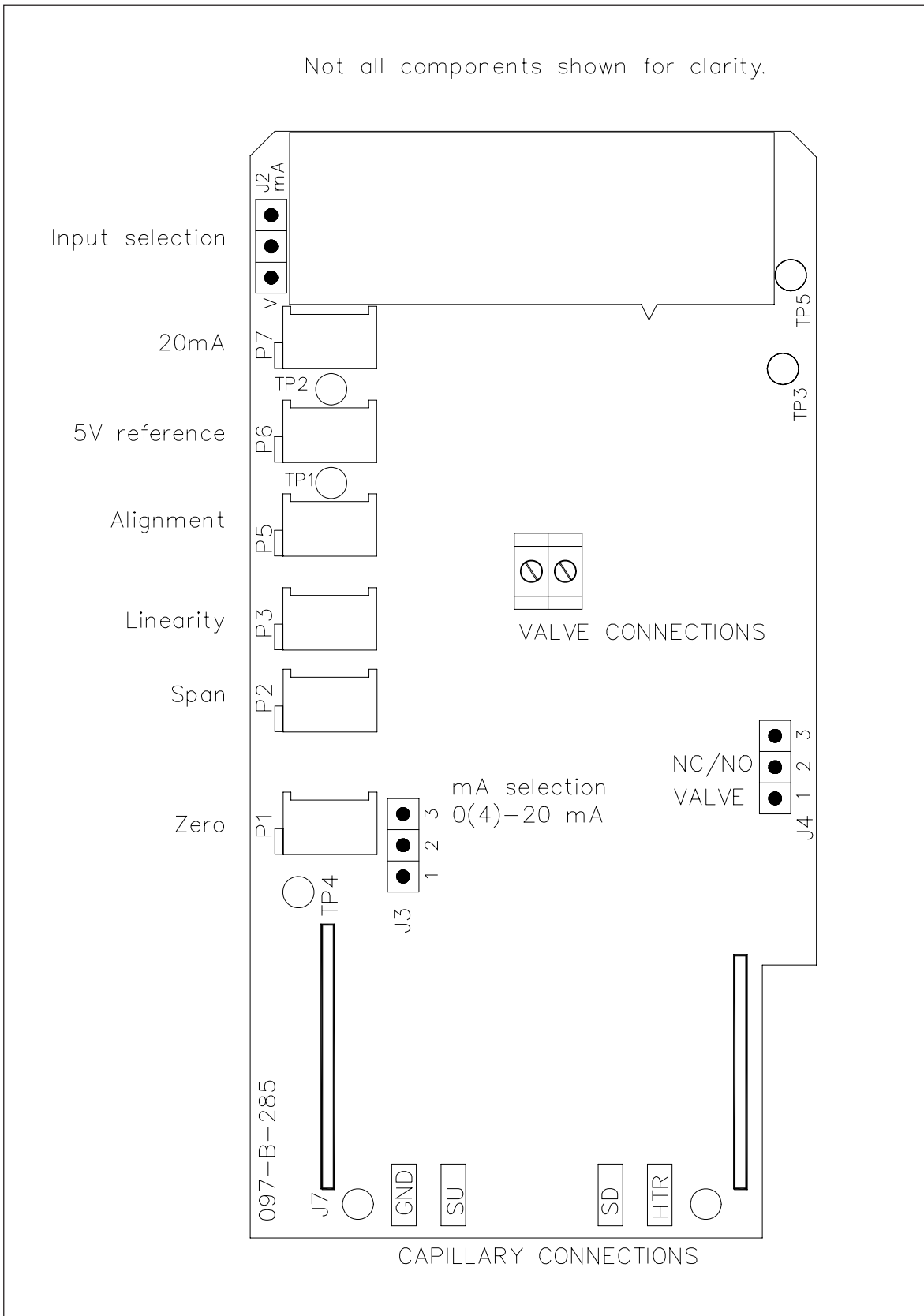


Figure 3-3. Printed Circuit Board Assembly "D"-Connector

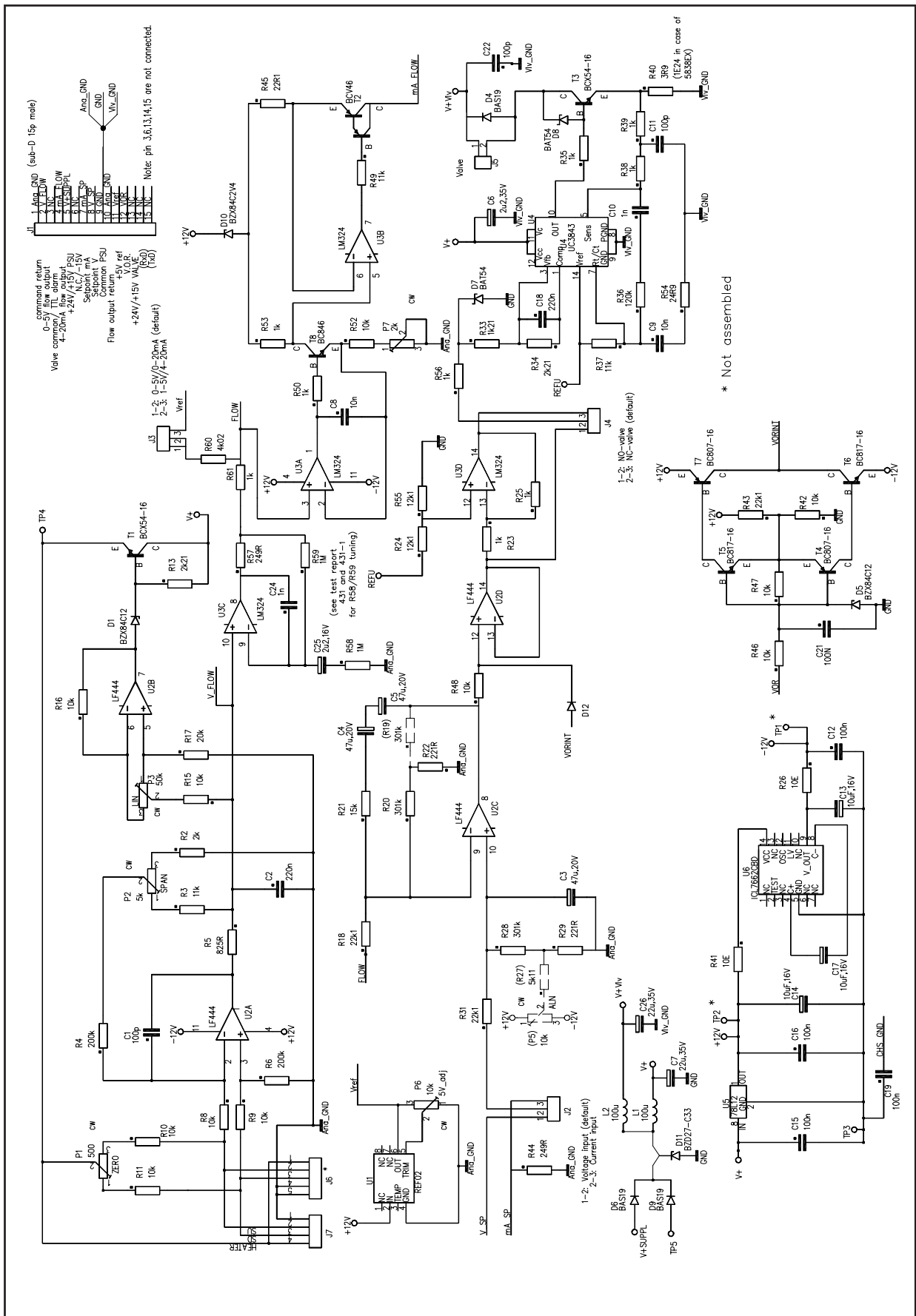


Figure 3-4. Schematic Diagram 5850TR Electronics With "D"-Connector

Model 5850TR

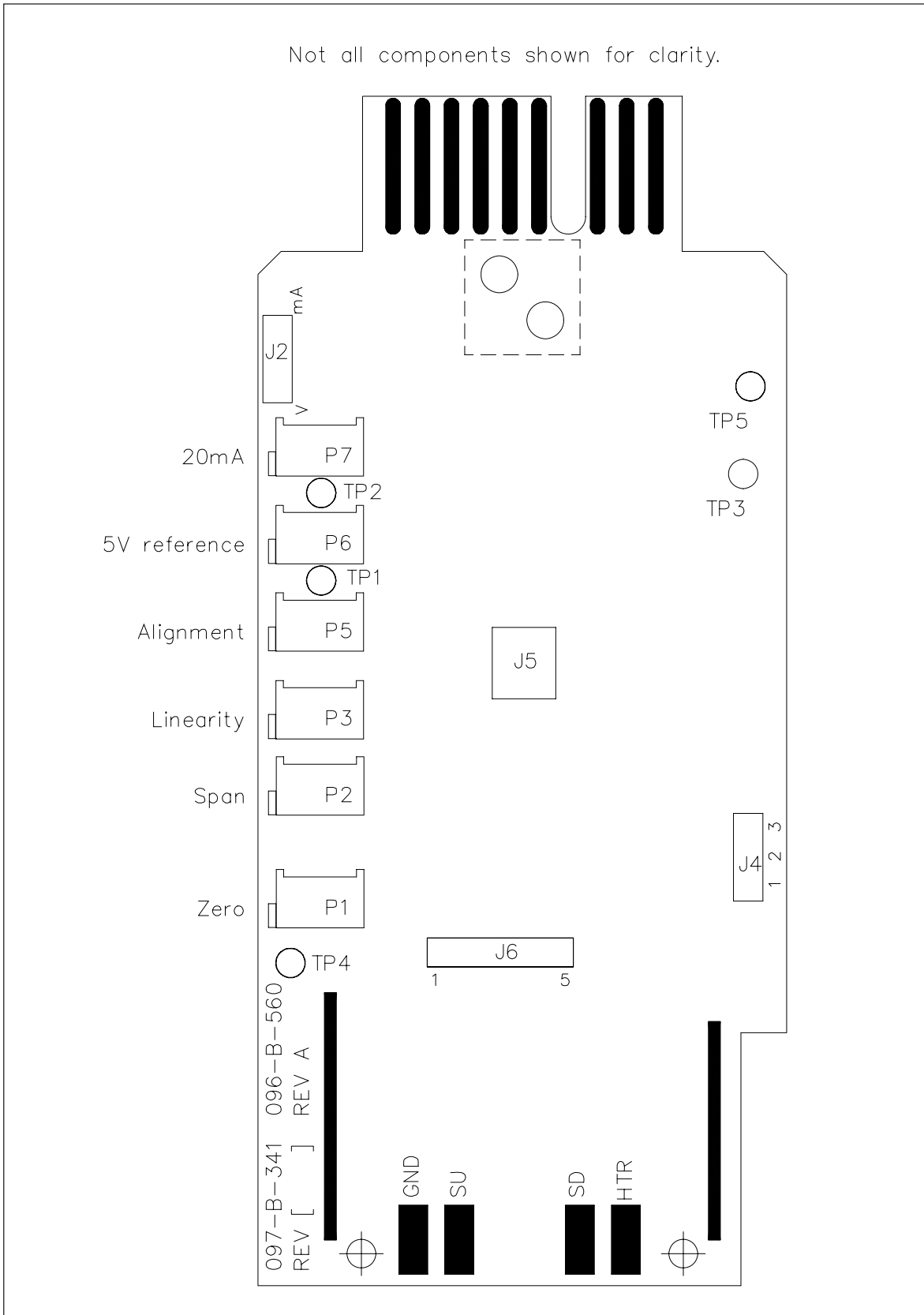


Figure 3-5 Printed Circuit Board 5850TR Assembly Card Edge Connector

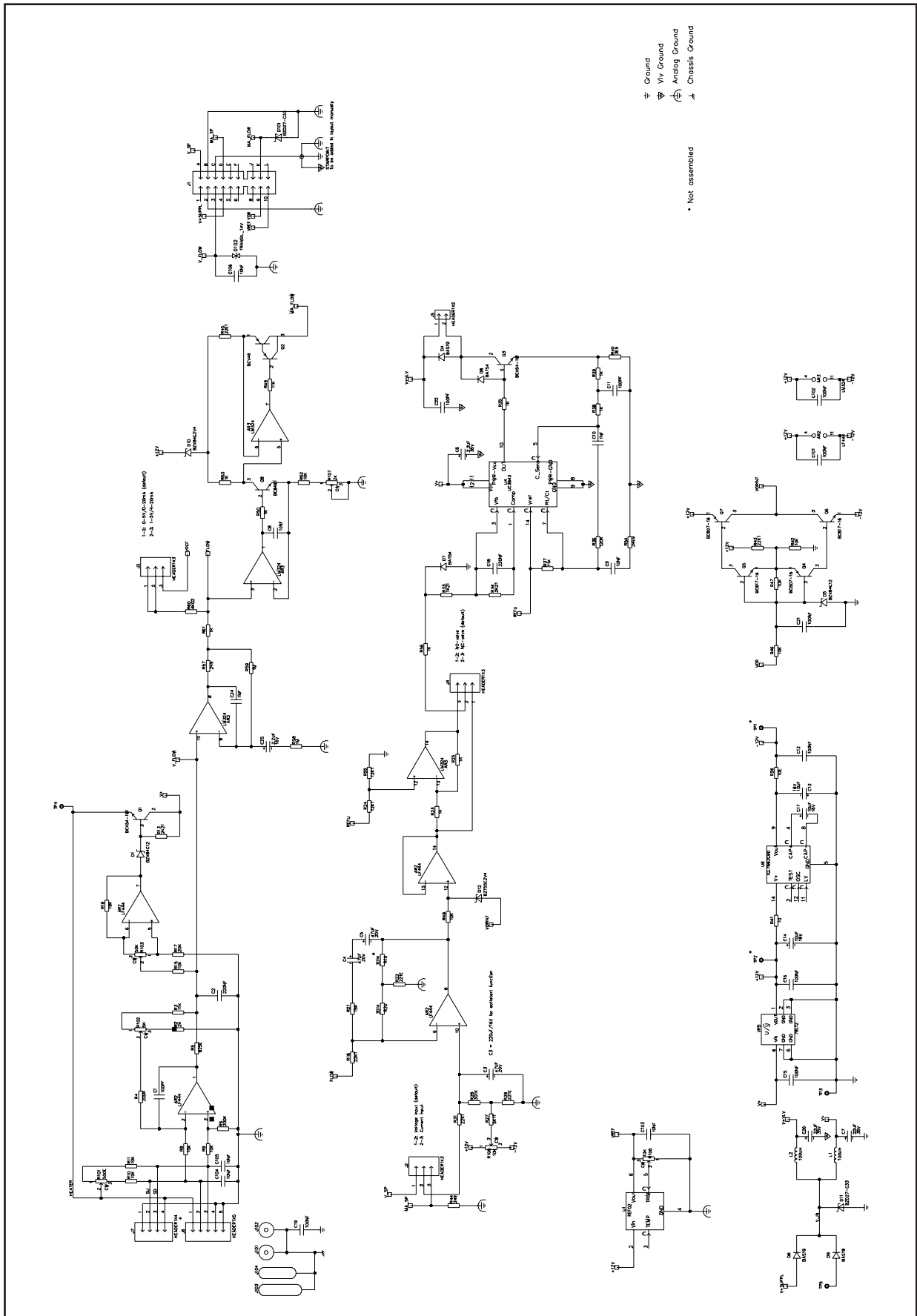


Figure 3-6. Schematic Diagram 5850TR Electronics With Card Edge Connector

Model 5850TR**4-1 General**

No routine maintenance is required on the model 5850 TR other than an occasional cleaning. If an in-line filter is used, the filtering element should periodically be replaced or ultrasonically cleaned.

4-2 Control Valve

(refer to figure 4-2)

The control valve may be disassembled in the field by the user for cleaning or servicing. Disassemble the valve as follows:

1. remove the jam nut (14) on top of the valve assembly.
2. remove the screw (5) and cover (3) of the controller.
3. remove the coil housing (13), (including item 12 and 32).
4. carefully remove the stem assembly (35) as not to bend the lower guide spring (9).
5. remove plunger assembly (16).
6. remove orifice (19).

Clean the parts and carefully assemble in reverse of the above procedure. O-ring seals should be inspected and may need to be replaced during the maintenance procedure.

O-ring seals must be lubricated with HALO-CARBON 25-10M grease prior to installation.

Note: No lubrication substitute is recommended.

4-3 Troubleshooting

Trouble	Possible cause	Check corrective action
No output	No power in	1. Check for power supply
	Obstruction in sensor	1. Flush sensor in both directions with non-residuous solvent. Air dry thoroughly. Do not attempt to service or disassemble sensor. 2. Return to factory *
	P.C. Board failure	1. Return to factory *
Will not zero	Gas leak	1. Check downstream gas connection 2. Return to factory *
	P.C. Board failure	1. Return to factory *
	Gas leak	1. Check all gas connections
Out of calibration	Dirty sensor	1. Flush with non-residuous solvent Air dry thoroughly. Do not attempt to service or disassemble sensor 2. Return to factory *
	Change in composition of metered gas	1. Refer to table 4-4-1 for conversion factor 2. Return to factory *
	P.C. Board failure	1. Return to factory *
	Clogged restrictor	1. Ultrasonically clean 2. Replace restrictor *

Figure 4-1 Troubleshooting Matrix

* If the above services are performed, it is recommended that calibration of the unit be verified using suitable volumetric calibration equipment.

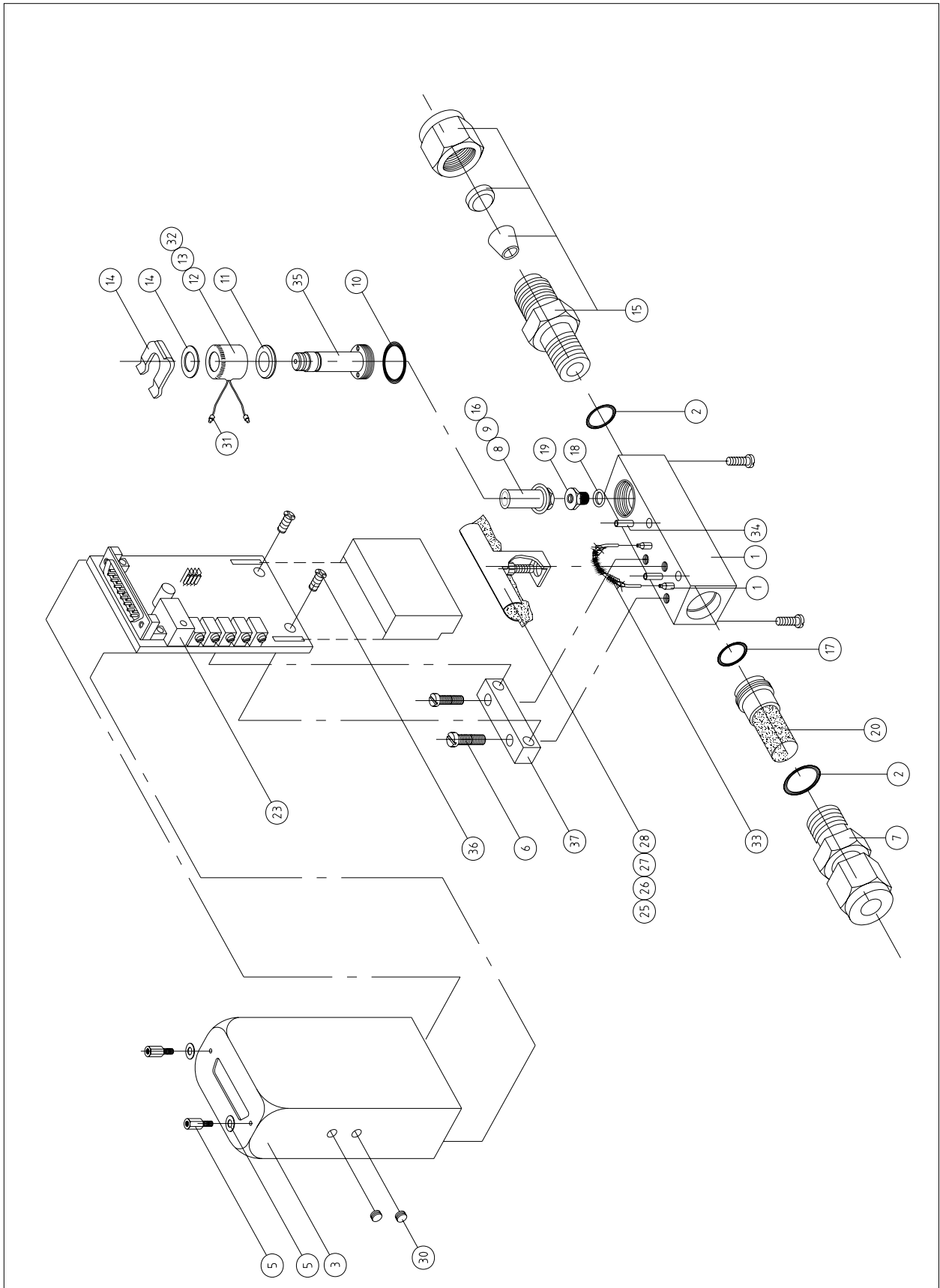


Figure 4-2 Exploded View 5850TR (not to scale)

Model 5850TR

⚠ CAUTION:

It is important that this instrument be serviced only by properly trained and qualified personnel.

System Checks

The 5850TR is generally used as a component in gas handling systems which can be quite complex. This can make the task of isolating a malfunction in the system a difficult one. An incorrectly diagnosed malfunction can cause many hours of unnecessary downtime. If possible, make the following system checks before removing a suspected defective mass flow controller for bench troubleshooting or return, especially if the system is new:

1. Verify that the process gas fittings have been correctly connected and leak checked.
2. If the mass flow controller appears to be functioning but cannot achieve set-point, verify that sufficient inlet pressure and pressure drop are available at the controller to provide the required flow.

⚠ WARNING:

If it becomes necessary to remove the controller from the system after exposure to toxic, pyrophoric, flammable, or corrosive gas, purge the controller thoroughly with dry inert gas such as Nitrogen, before disconnecting the gas connections. Failure to correctly purge the controller could result in fire, explosion, or death. Corrosion or contamination of the mass flow controller upon exposure to air may also occur.

4-4 Use of Conversion Tables

If a Mass Flow Meter or Controller is operated on a gas other than the gas it was calibrated with, a scale shift will occur in the relationship between the output signal and the mass flowrate as a result of the difference in heat capacities between the two gases.

This scale shift can be calculated by using the ratio of the molar specific heat of the two gases, or the sensor conversion factor.

The gas conversion table is available at Brooks Instrument under document no.: J-836-D-508.

USE OF A MFC/MFM FOR A GAS OTHER THAN THE CALIBRATED GAS:

For use with a different gas type, multiply the output reading by the ratio of the gas factor of the desired gas and the gas factor of the calibrated gas.

$$\text{Actual gas Flow rate} = \text{Output Reading} \times \frac{\text{factor of the new gas}}{\text{factor of the calibrated gas}}$$

Example:

The controller is calibrated for nitrogen: 1000 ml_n/min full scale.

The desired gas is carbon dioxide.

Multiply the output reading by 0.740 to calculate the flow of carbon dioxide.

When the output reading is 750 ml_n/min., the flow rate for carbon dioxide is 750 x 0.740 = 555 ml_n/min.

CALCULATE GAS FACTOR FOR MIX GASSES:

In order to calculate the conversion factor for a gas mixture the following formula should be used:

$$\text{Sensor conversion factor for Mixture} = \frac{100}{\left(\frac{P1}{\text{sensor conversion factor 1}}\right) + \left(\frac{P2}{\text{sensor conversion factor 2}}\right) + \left(\frac{Pn}{\text{sensor conversion factor n}}\right)}$$

Where P1 = percentage (%) of gas 1 (by volume)

P2 = percentage (%) of gas 2 (by volume)

Pn = percentage (%) of gas n (by volume)

Example:

The desired gas is 20% Helium (He) and 80% Chlorine (Cl₂) by volume. The desired full-scale flow rate of the mixture is 20 l_n/min.

Sensor conversion factor for the mixture is:

$$\text{Mixture Factor} = \frac{100}{\left(\frac{20}{1.386}\right) + \left(\frac{80}{0.876}\right)} = 0.946$$

N₂ equivalent flow = 20/0.946 = 21.14 l_n/min .

NOTE:

It is generally accepted that the mass flow rate derived from this equation is only accurate to ± 5%. The table below lists the conversion factors for various gases with respect to nitrogen. The conversion table is used to determine the flow rate for gases other than the pre-selected gas. The flow meter is factory set to a pre-selected gas, pressure and flow range.

Model 5850TR**Table: Gas Conversion List (Source J-836-D-508 Rev. 14)**

Gasname	Formula	Gasfactor	Orifice factor	Density (kg/m3)
Acetylene (Ethyne)	C2H2	0,615	0,970	1,173
Air	Mixture	0,998	1,018	1,293
Allene	C3H4	0,478	1,199	1,787
Ammonia	NH3	0,786	0,781	0,771
Argon	Ar	1,395	1,195	1,784
Arsine	AsH3	0,754	1,661	3,478
Boron Trichloride	BCL3	0,443	2,044	5,227
Boron Trifluoride	BF3	0,579	1,569	3,025
Bromine Pentafluoride	BrF5	0,287	2,502	7,806
Bromine Trifluoride	BrF3	0,439	2,214	6,108
Bromotrifluoroethylene	C2BrF3	0,326	2,397	7,165
Bromotrifluoromethane (f-13B1)	CBrF3	0,412	2,303	6,615
1,3-Butadiene	C4H6	0,354	1,413	2,491
Butane	C4H10	0,257	1,467	2,593
1-Butene	C4H8	0,294	1,435	2,503
CIS-2-Butene	C4H8	0,320	1,435	2,503
Trans-2-Butene	C4H8	0,291	1,435	2,503
Carbon Dioxide	CO2	0,740	1,255	1,977
Carbon Disulfide	CS2	0,638	1,650	3,393
Carbon Monoxide	CO	0,995	1,000	1,250
Carbon Tetrachloride	CCL4	0,344	2,345	6,860
Carbon Tetrafluoride (f-14)	CF4	0,440	1,770	3,926
Carbonyl Fluoride	COF2	0,567	1,555	2,045
Carbonyl Sulfide	COS	0,680	1,463	2,680
Chlorine	CL2	0,876	1,598	3,214
Chlorine Dioxide	CLO2	0,693	1,554	3,011
Chlorine Trifluoride	CLF3	0,433	1,812	4,125
Chlorodifluoromethane (f-22)	CHCLF2	0,505	1,770	3,906
Chloroform (Trichloromethane)	CHCL3	0,442	2,066	5,340
Chloropentafluoroethane (f-115)	C2CLF5	0,243	2,397	7,165
Chlorotrifluoroethylene	C2CLF3	0,337	2,044	5,208
Chlorotrifluoromethane (f-13)	CCLF3	0,430	1,985	4,912
2-Chlorobutane	C4H9CL	0,234	1,818	4,134
Cyanogen	(CN)2	0,498	1,366	2,322
Cyanogen Chloride	CLCN	0,618	1,480	2,730
Cyclobutane	C4H8	0,387	1,413	2,491
Cyclopropane	C3H6	0,505	1,224	1,877
Deuterium	D2	0,995	0,379	0,177
Diborane	B2H6	0,448	1,000	1,235
Diboromodifluoromethane (f-12B2)	CBr2F2	0,363	2,652	8,768
1,2-Dibromotetrafluoroethane (f-114B2)	C2Br2F4	0,215	2,905	10,530
Dichlorodifluoromethane (f-12)	CCL2F2	0,390	2,099	5,492
Dichlorofluoromethane (f-21)	CHCL2F	0,456	1,985	4,912
Dichlorosilane	SiH2CL2	0,442	1,897	4,506
Diedthylsilane	C4H12Si	0,183	1,775	3,940
2,2 Dichloro- 1,1,1- Trifluoroethane	C2HCL2F3	0,259	2,336	6,829
1,2-Dichloroethane (Ethylene dichloride)	C2H4CL2	0,382	1,879	4,419
1,2-Dichlorotetrafluoroethane (f-114)	C2CL2F4	0,231	2,449	7,479
1,1-Difluoro-1-Chloroethane	C2H3CLF2	0,341	1,957	4,776
1,1-Difluoroethane	CH3CHF2	0,415	1,536	2,940
1,1-Difluoroethylene	CH2:CF2	0,458	1,512	2,860
Difluoromethane (f-32)	CF2H2	0,627	1,360	2,411
Dimethylamine	(CH3)2NH	0,370	1,269	2,013
Dimethylether	(CH3)2O	0,392	1,281	2,055
2,2-Dimethylpropane	C(CH3)4	0,247	1,613	3,244
Disilane	Si2H6	0,332	1,493	2,779
Ethane	C2H6	0,490	1,038	1,357
Ethanol	C2H6O	0,394	1,282	2,057
Ethylacetylene	C4H6	0,365	1,384	2,388
Ethyl Chloride	C2H5CL	0,408	1,516	2,879
Ethylene	C2H4	0,619	1,000	1,261
Ethylene Oxide	C2H4O	0,589	1,254	1,965
Fluorine	F2	0,924	1,163	1,695
Fluoroform (f-23)	CHF3	0,529	1,584	3,127
Germane	GeH4	0,649	1,653	3,418
Germanium Tetrachloride	GeCL4	0,268	2,766	9,574
Halothane	C2HBrCLF3	0,257	2,654	8,814
Helium	He	1,386	0,378	0,178

Gasname	Formula	Gasfactor	Orifice factor	Density (kg/m3)
Hexafluoroacetone	C3F6O	0,219	2,434	7,414
Hexafluorobenzene	C6F6	0,632	2,577	8,309
Hexafluoroethane (f-116)	C2F6	0,255	2,219	6,139
Hexafluoropropylene (HFP)	C3F6	0,249	2,312	6,663
Hexamethyldisilane (HMDS)	(CH2)6Si2	0,139	2,404	7,208
Hexane	C6H14	0,204	1,757	3,847
Hydrogen	H2	1,008	0,269	0,090
Hydrogen Bromide	HBr	0,987	1,695	3,645
Hydrogen Chloride	HCL	0,983	1,141	1,639
Hydrogen Cyanide	HCN	0,744	0,973	1,179
Hydrogen Fluoride	HF	0,998	0,845	0,893
Hydrogen Iodide	HI	0,953	2,144	5,789
Hydrogen Selenide	H2Se	0,837	1,695	3,613
Hydrogen Sulfide	H2S	0,850	1,108	1,539
Iodine Pentafluoride	IF5	0,283	2,819	9,907
Isobutane	C4H10	0,260	1,440	2,596
Isobutene	C4H8	0,289	1,435	2,503
Isopentane	C5H12	0,211	1,605	3,222
Krypton	Kr	1,382	1,729	3,708
Methane	CH4	0,763	0,763	0,717
Methylacetylene	C3H4	0,473	1,196	1,782
Methyl Bromide	CH3Br	0,646	1,834	4,236
3-Methyl-1-butene	C5H10	0,252	1,584	3,127
Methyl Chloride	CH3CL	0,687	1,347	2,308
Methyl Fluoride	CH3F	0,761	1,102	1,518
Methyl Mercaptan	CH4S	0,588	1,313	2,146
Methyl Silane	CH6Si	0,393	1,283	2,061
Methyl Trichlorosilane	CH3CL3Si	0,267	2,310	6,675
Methyl Vinyl Ether	C3H6O	0,377	1,435	2,567
Monoethanolamine	C2H7NO	0,305	1,477	2,728
Monoethylamine (CH3CH2NH2)	C2H7	0,359	1,269	2,013
Monomethylamine	CH3NH2	0,565	1,067	1,420
Neon	Ne	1,398	0,847	0,902
Nickel Carbonyl	Ni(CO)4	0,212	2,371	7,008
Nitric Oxide	NO	0,995	1,030	1,339
Nitrogen	N2	1,000	1,000	1,251
Nitrogen Dioxide	NO2	0,758	1,713	2,052
Nitrogen Trifluoride	NF3	0,501	1,598	3,168
Nitrogen Trioxide	N2O3	0,443	1,649	3,389
Nitrosyl Chloride	NOCL	0,644	1,529	2,913
Nitrous Oxide	N2O	0,752	1,259	1,964
Octofluorocyclobutane	C4F8	0,169	2,672	8,933
Oxygen	O2	0,988	1,067	1,429
Oxygen Difluoride	OF2	0,672	1,388	2,402
Ozone	O3	0,738	1,310	2,138
Perchloryl Fluoride	ClO3F	0,448	1,905	4,571
Perfluorobutane	C4F10	0,738	2,918	10,610
Perfluoro-2-Butene	C4F8	0,268	2,672	8,933
Perfluoromethyl-vinylether (PMVE)	PMVE	0,296	2,029	5,131
Perfluoropropane	C3F8	0,179	2,591	8,396
Pentane (n-Pentane)	C5H12	0,212	1,605	3,222
Pentafluoroethane	C2HF5	0,287	2,070	5,360
Phosgene	COCL2	0,504	1,881	4,418
Phosphine	PH3	0,783	1,100	1,517
Phosphorous Pentafluoride	PF5	0,346	2,109	5,620
Phosphorous Trifluoridide	PF3	0,495	1,770	3,906
Propane (same as CH3CH2CH3)	C3H8	0,343	1,274	2,008
Propylene (Propene)*	C3H6	0,401	1,234	1,875
Rhenium Hexafluoride	ReF6	0,230	3,279	13,410
Silane	SiH4	0,625	1,070	1,440
Silicon Tetrachloride	SiCL4	0,310	2,462	7,579
Silicon Tetrafluoride	SiF4	0,395	1,931	4,648
Sulfur Dioxide	SO2	0,728	1,529	2,858
Sulfur Hexafluoride	SF6	0,270	2,348	6,516
Sulfur Tetrafluoride	SF4	0,353	1,957	4,776
Sulfur Trioxide	SO3	0,535	1,691	3,575
Sulfuryl Fluoride	SO2F2	0,423	1,931	4,648
Tetrachloromethane	CCL4	0,344	2,345	6,858
Tetrafluoroethylene (TFE)	C2F4	0,361	1,905	4,526
Tetrafluorohydrazine	N2F4	0,367	1,926	4,624
Trichlorofluoromethane (f-11)	CCL3F	0,374	2,244	6,281
Trichlorosilane	SiHCL3	0,329	2,201	6,038

Model 5850TR

Gasname	Formula	Gasfactor	Orifice factor	Density (kg/m3)
Trimethoxyborane (TMB)	B(OCH ₃) ₃	0,300	1,929	4,638
1,1,2-Trichloro-1,1,2-Trifluoroet (f-113)	C ₂ Cl ₃ F ₃	0,231	2,520	7,920
Trimethylamine	(CH ₃) ₃ N	0,316	1,467	2,639
Tungsten Hexafluoride	WF ₆	0,227	3,264	13,280
Uranium Hexafluoride	UF ₆	0,220	3,548	15,700
Vinyl Bromide	C ₂ H ₃ Br	0,524	1,985	4,772
Vinyl Chloride	C ₂ H ₃ Cl	0,542	1,492	2,788
Vinyl Fluoride	C ₂ H ₃ F	0,576	1,281	2,046
Water Vapor	H ₂ O	0,861	0,802	0,804
Xenon	Xe	1,383	2,180	5,851

BASE MODEL NUMBER		DESCRIPTION
5850TR/G		MASS FLOW METER & CONTROLLER FULL SCALE RANGES FROM 10 mln/min UPTO 20 ln/min N2
O-RING/VALVE SEAT MATERIAL		
A		VITON
B		BUNA
C		TEFLON/KALREZ (KALREZ ONLY FOR THE VALVE SEAT)
D		KALREZ (INCLUDING ADAPTERS)
E		TEFLON
VALVE TYPE		
0		NONE (METER ONLY) (300 BAR RATING)
1		NORMALLY CLOSED (100 BAR RATING)
2		NORMALLY OPENED (100 BAR RATING) ONLY IN COMBINATION WITH 24VDC
3		NORMALLY CLOSED (300 BAR RATING) ONLY IN COMBINATION WITH 24VDC (see remark)
ELECTRICAL INPUT/OUTPUT		
C		0-5 VDC I/O (15 pin Sub D connector)
D		4-20 mA I/O (15 pin Sub D connector)
E		0-20 mA I/O (15 pin Sub D connector)
F		0-5 VDC I/O (Card Edge connector)
G		4-20 mA I/O (Card Edge connector)
H		0-20 mA I/O (Card Edge connector)
MECHANICAL CONNECTIONS		
1		WITHOUT ADAPTORS (9/16"-18" UNF)
2		1/4" TUBE COMPRESSION FITTINGS
3		1/8" TUBE COMPRESSION FITTINGS
4		1/4" VCR (100 BAR)
5		1/4" VCO (100 BAR)
6		1/4" NPT (MAX. 300 BAR)
7		6mm TUBE COMPRESSION FITTINGS
8		1/4" BSP (F)
INTERCONNECTION CABLE		
0		NO CABLE
B		MATING CONNECTOR ONLY (For "D" connector)
D		3m ROUND CABLE WITH MATING "D" CONNECTORS
E		6m ROUND CABLE WITH MATING "D" CONNECTORS
F		12m ROUND CABLE WITH MATING "D" CONNECTORS
POWER SUPPLY INPUT		
1		± 15 Vdc
2		+ 24 Vdc (standard)
3		+ 15 Vdc only
APPROVALS		
A		NONE
B		ZONE 2
OEM CODE		
A		NONE
5850TR/G A 1 C 2 E 2 A A = TYPICAL MODEL NUMBER		

Model 5850TR**Dansk**

Brooks Instrument har gennemført CE mærkning af elektronisk udstyr med succes, i henhold til regulativet om elektrisk støj (EMC direktivet 89/336/EEC).

Der skal dog gøres opmærksom på benyttelsen af signalkabler i forbindelse med CE mærkede udstyr.

Kvaliteten af signal kabler og stik:

Brooks lever kabler af høj kvalitet, der imødekommer specifikationerne til CE mærkning.

Hvis der anvendes andre kabel typer skal der benyttes et skærmet kabel med hel skærm med 80% dækning.

Forbindelses stikket type "D" eller "cirkulære", skal være skærmet med metalhus og eventuelle PG-forskrninger skal enten være af metal eller metal skærmet.

Skærmen skal forbindes, i begge ender, til stikkets metalhus eller PG-forskrningen og have forbindelse over 360 grader.

Skærmen bør være forbundet til jord.

"Card Edge" stik er standard ikke af metal, der skal derfor ligeledes benyttes et skærmet kabel med hel skærm med 80% dækning.

Skærmen bør være forbundet til jord.

Deutsch

Nach erfolgreichen Tests entsprechend den Vorschriften der Elektromagnetischen Verträglichkeit (EMC Richtlinie 89/336/EEC) erhalten die Brooks-Geräte (elektrische/elektronische Komponenten) das CE-Zeichen.

Bei der Auswahl der Verbindungskabel für CE-zertifizierte Geräte sind spezielle Anforderungen zu beachten.

Qualität der Verbindungskabel, Anschlußstecker und der Kabeldurchführungen

Die hochwertigen Qualitätskabel von Brooks entsprechen der Spezifikation der CE-Zertifizierung.

Bei Verwendung eigener Verbindungskabel sollten Sie darauf achten, daß eine

80 %igen Schirmabdeckung des Kabels gewährleistet ist.

„D“ oder „Rund“ -Verbindungsstecker sollten eine Abschirmung aus Metall besitzen.

Wenn möglich, sollten Kabeldurchführungen mit Anschlußmöglichkeiten für die Kabelabschirmung verwendet werden.

Die Abschirmung des Kabels ist auf beiden Seiten des Steckers oder der Kabeldurchführungen über den vollen Umfang von 360 ° anzuschließen.

Die Abschirmung ist mit dem Erdpotential zu verbinden.

Platinen-Steckverbindungen sind standardmäßige keine metallgeschirmten Verbindungen. Um die Anforderungen der CE-Zertifizierung zu erfüllen, sind Kabel mit einer 80 %igen Schirmabdeckung zu verwenden.

Die Abschirmung ist mit dem Erdpotential zu verbinden.

English

All Brooks (electrical/electronic) equipment bearing the CE mark has been successfully tested in accordance with the Electromagnetic Compatibility regulations (EMC directive 89/336/EEC).

However, special care is required when selecting signal cables to be used with equipment bearing the CE mark.

Quality of signal cables, cable glands and connectors:

Brooks supplies high quality cabling that meets the specifications for CE certification.

However, if you wish to use your own signal cable, you should select one that is fully screened with at least 80% shielding.

Any 'D' or 'Circular' type connectors used should be screened with a metal shield. If applicable, metal cable glands must be used to clamp the cable shielding. The cable shielding should be connected to the metal shell or gland, and have 360° shielding at both ends.

The shielding should be connected to an earth terminal.

Card Edge Connectors are non-metallic, as standard. The cables used must be screened with 80% shielding to comply with CE certification.

The shielding should be connected to an earth terminal.

Español

Los equipos de Brooks (eléctricos/electrónicos) en relación con la marca CE han pasado satisfactoriamente las pruebas referentes a las regulaciones de Compatibilidad Electro magnetica (EMC directiva 89/336/EEC). Sin embargo se requiere una atención especial en el momento de seleccionar el cable de señal cuando se va a utilizar un equipo con marca CE

Calidad del cable de señal, prensaestopas y conectores:

Brooks suministra cable(s) de alta calidad, que cumple las especificaciones de la certificación CE . Si usted adquiere su propio cable de señal, debería usar un cable que esté completamente protegido en su conjunto con un apantallamiento del 80%.

Cuando utilice conectores del tipo «D» ó «Circular» deberían estar protegidos con una pantalla metálica. Cuando sea posible, se deberán utilizar prensaestopas metálicos provistos de abrazadera para la pantalla del cable.

La pantalla del cable deberá ser conectada al casquillo metálico ó prensa y protegida en ambos extremos completamente en los 360 Grados.

La pantalla deberá conectarse a tierra.

Los conectores estandar de tipo tarjeta (Card Edge) no son metálicos, los cables utilizados deberán ser protegidos con un apantallamiento del 80% para cumplir con la certificación CE.

La pantalla deberá conectarse a tierra.

Français

Les équipements Brooks (électriques/électroniques) portant le label CE ont été testés avec succès selon les règles de la Compatibilité Electromagnétique (directive CEM 89/336/EEC). Cependant, la plus grande attention doit être apportée en ce qui concerne la sélection du câble utilisé pour véhiculer le signal d'un appareil portant le label CE.

Qualité du câble, des presse-étoupes et des connecteurs:

Brooks fournit des câbles de haute qualité répondant aux spécifications de la certification CE.

Si vous approvisionnez vous-même ce câble, vous devez utiliser un câble blindé à 80 %.

Les connecteurs « D » ou de type « circulaire » doivent être reliés à la terre.

Si des presse-étoupes sont nécessaires, ceux ci doivent être métalliques avec mise à la terre.

Le blindage doit être raccordé aux connecteurs métalliques ou aux presse-étoupes sur le pourtour complet du câble, et à chacune de ses extrémités.

Tous les blindages doivent être reliés à la terre.

Les connecteurs de type « card edge » sont non métalliques. Les câbles utilisés doivent être blindés à 80% pour satisfaire à la réglementation CE.

Tous les blindages doivent être reliés à la terre.

Model 5850TR**Greek**

Τα όργανα (ηλεκτρικά/ηλεκτρονικά) της Brooks τα οποία φέρουν το σήμα CE έχουν επιτυχώς ελεγχθεί σύμφωνα με τους κανονισμούς της Ηλεκτρο-Μαγνητικής Συμβατότητας (EMC ντιρεκτίβα 89/336/EEC).

Οπωσδήποτε χρειάζεται ειδική προσοχή κατά την επιλογή του καλωδίου μεταφοράς του σήματος το οποίο (καλώδιο) πρόκειται να χρησιμοποιηθεί με όργανα που φέρουν το σήμα CE.

Ποιότητα του καλωδίου σήματος των στυπιοθλιπτών και των συνδέσμων .

Η Brooks κατά κανόνα προμηθεύει υψηλής ποιότητας καλώδια τα οποία πληρούν τις προδιαγραφές για πιστοποίηση CE.

Εάν η επιλογή του καλωδίου σήματος γίνει από σας πρέπει να χρησιμοποιήσετε καλώδιο το οποίο να φέρει εξωτερικά πλήρες πλέγμα και να παρέχει θωράκιση 80% .

Οι σύνδεσμοι τύπου "D" ή "Κυκλικοί" των καλωδίων, πρέπει να θωρακίζονται με μεταλλική θωράκιση. Εάν είναι εφαρμόσιμο, πρέπει να χρησιμοποιούνται μεταλλικοί στυπιοθλίπτες καλωδίων που να διαθέτουν ακροδέκτη σύνδεσης του πλέγματος του καλωδίου.

Το πλέγμα του καλωδίου πρέπει να συνδέεται στο μεταλλικό περίβλημα ή στον στυπιοθλίπτη και να θωρακίζεται και στα δύο άκρα κατά 360 μοίρες.

Η θωράκιση πρέπει να καταλήγει σε κάποιο ακροδέκτη γείωσης.

Οι σύνδεσμοι καρτών είναι μη-μεταλλικοί, τα καλώδια που χρησιμοποιούνται πρέπει να φέρουν πλέγμα θωράκισης 80% για να υπακούουν στην πιστοποίηση CE.

Η θωράκιση πρέπει να καταλήγει σε κάποιο ακροδέκτη γείωσης.

Italiano

Questa strumentazione (elettrica ed elettronica) prodotta da Brooks Instrument, soggetta a marcatura CE, ha superato con successo le prove richieste dalla direttiva per la Compatibilità Elettromagnetica (Direttiva EMC 89/336/EEC).

E' richiesta comunque una speciale attenzione nella scelta dei cavi di segnale da usarsi con la strumentazione soggetta a marchio CE.

Qualità dei cavi di segnale e dei relativi connettori:

Brooks fornisce cavi di elevata qualità che soddisfano le specifiche richieste dalla certificazione CE. Se l'utente intende usare propri cavi, questi devono possedere una schermatura del 80%.

I connettori sia di tipo "D" che circolari devono possedere un guscio metallico. Se esiste un passacavo esso deve essere metallico e fornito di fissaggio per lo schermo del cavo.

Lo schermo del cavo deve essere collegato al guscio metallico in modo da schermarlo a 360° e questo vale per entrambe le estemità. Lo schermo deve essere collegato ad un terminale di terra.

I connettori "Card Edge" sono normalmente non metallici. Il cavo impiegato deve comunque avere una schermatura del 80% per soddisfare la certificazione CE.

Lo schermo deve essere collegato ad un terminale di terra.

Nederlands

Alle CE gemarkeerde elektrische en elektronische producten van Brooks Instrument zijn met succes getest en voldoen aan de wetgeving voor Electro Magnetische Compatibiliteit (EMC wetgeving volgens 89/336/EEC).

Speciale aandacht is echter vereist wanneer de signaalkabel gekozen wordt voor gebruik met CE gemarkeerde producten.

Kwaliteit van de signaalkabel en kabelaansluitingen:

Brooks levert standaard kabels met een hoge kwaliteit, welke voldoen aan de specificaties voor CE certificering.

Indien men voorziet in een eigen signaalkabel, moet er gebruik gemaakt worden van een kabel die volledig is afgeschermd met een bedekkingsgraad van 80%.

“D” of “ronde” kabelconnectoren moeten afgeschermd zijn met een metalen connector kap. Indien kabelwartels worden toegepast, moeten metalen kabelwartels worden gebruikt die het mogelijk maken het kabelscherp in te klemmen.

Het kabelscherp moet aan beide zijden over 360° met de metalen connectorkap, of wartel verbonden worden.

Het scherm moet worden verbonden met aarde.

“Card-edge” connectors zijn standaard niet-metallisch. De gebruikte kabels moeten volledig afgeschermd zijn met een bedekkingsgraad van 80% om te voldoen aan de CE certificering.

Het scherm moet worden verbonden met aarde.

Norsk

Til den det angår

Brooks Instrument elektrisk og elektronisk utstyr påført CE-merket har gjennomgått og bestått prøver som beskrevet i EMC forskrift om elektromagnetisk immunitet, direktiv 89/336/EEC.

For å opprettholde denne klassifisering er det av stor viktighet at riktig kabel velges for tilkobling av det måletekniske utstyret.

Utførelse av signalkabel og tilhørende plugger:

Brooks Instrument tilbyr levert med utstyret egnet kabel som møter de krav som stilles til CE-sertifisering.

Dersom kunden selv velger kabel, må kabel med fullstendig, 80% skjerming av lederene benyttes.

“D” type og runde plugger og forbindelser må være utført med kappe i metall og kabelnipler må være utført i metall for jordet innfesting av skjermen. Skjermen i kablen må tilknyttes metallet i pluggen eller nippelen i begge ender over 360°, tilkoblet elektrisk jord.

Kort-kantkontakter er normalt utført i kunststoff. De tilhørende flatkabler må være utført med fullstendig, 80% skjerming som kobles til elektrisk jord på riktig pinne i pluggen, for å møte CE sertifiseringskrav.

Português

O equipamento (eléctrico/electrónico) Brooks com a marca CE foi testado com êxito nos termos do regulamento da Compatibilidade Electromagnética (directiva CEM 89/336/EEC).

Atualmente, ao seleccionar-se o cabo de sinal a utilizar com equipamento contendo a marca CE, será necessário ter uma atenção especial.

Qualidade do cabo de sinal, buchas de cabo e conectores:

A Brooks fornece cabo(s) de qualidade superior que cumprem os requisitos da certificação CE.

Se fornecerem o vosso próprio cabo de sinal, devem utilizar um cabo que, na sua totalidade, seja isolado com uma blindagem de 80%.

Os conectores tipo “D” ou “Circulares” devem ser blindados com uma blindagem metálica. Se tal for necessário, deve utilizar-se buchas metálicas de cabo para o isolamento do aperto do cabo.

O isolamento do cabo deve ser ligado à blindagem ou bucha metálica em ambas as extremidades em 360°.

A blindagem deve terminar com a ligação à massa.

Os conectores “Card Edge” não são, em geral, metálicos e os cabos utilizados devem ter um isolamento com blindagem a 80% nos termos da Certificação CE..

A blindagem deve terminar com ligação à massa.

Model 5850TR

ENGLISH

IMPORTANT SAFETY INSTRUCTIONS

This appendix contains important safety and operating instructions for use with the Thermal Mass Flow Meter / Controller Series. The instrument complies to the (PED) PRESSURE EQUIPMENT CE DIRECTIVE 97/23/EC. Consult local authorities as to national and/or local safety codes and any additional installation requirements.

SAFETY INSTRUCTIONS

1. Please read all instructions and cautionary markings on (1) the flowmeter and (2) all appropriate sections of the Instruction and Operating Manual before using this product.
2. **WARNING:** Do not operate this instrument in excess of the specifications, listed in the Instruction and Operating Manual. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.
3. Please make sure that the instrument is properly connected to electrical and pressure sources.
4. **OPERATION:** (a) Slowly initiate flow into the system. Open process valves slowly to avoid flow surges. (b) Check for leaks around the meter inlet and outlet connections. If no leaks are present, bring the system up to operating pressure.
5. **WARNING:** If this equipment is not properly serviced, serious personal injury and/or damage to the equipment can result from potentially high operating pressures. Please make sure that the process line pressure is removed prior to service.
6. Please make sure that original parts of Brooks are used when the device requires servicing. Note however that look-alike substitutions and procedures can affect the product's performance and place the safe operation of your process at risk. It furthermore may result in fire, electrical hazards or improper operation.

DANISH

VIGTIGE SIKKERHEDSINSTRUKTIONER

Denne instruktion indeholder vigtige oplysninger om sikkerhed og anvendelse af Brooks Thermal Mass Flow Meter / Controller Series. Instrumentet opfylder (PED) trykudstyrs CE direktivet 97/23/EC. Kontakt de lokale myndigheder for oplysning om nationale og/eller lokale sikkerhedskrav og yderligere krav i forbindelse med installationen.

SIKKERHEDSINSTRUKTIONER

1. Læs alle instruktioner samt faremarkeringer på (1) flowmeteret og (2) i alle relevante sektioner af instruktions- og brugervejledningen før instrumentet tages i brug.
2. **ADVARSEL:** Anvend ikke dette instrument udover de specifikationer, som er angivet i instruktions- og brugervejledningen. Manglende opmærksomhed på denne advarsel kan resultere i alvorlige personskader og/eller skader på udstyret.
3. Vær sikker på at instrumentet er korrekt tilsluttet elektrisk og mekanisk.
4. **ANVENDELSE:** (a) Luk langsomt flow ind i systemet. For at undgå trykstød åbnes afspærringsventilen langsomt. (b) Kontroller ind- og udgangstilslutningerne for lækager. Hvis ingen lækager findes, kan systemet bringes op på normalt procestryk.
5. **ADVARSEL:** Hvis vedligehold af instrumentet ikke sker som anbefalet, er der - i tilfælde af høje tryk - risiko for alvorlige skader på såvel personer som på instrumentet. Sørg derfor for at instrumentet er trykløst, før det afmonteres for service.
6. Vær opmærksom på kun at anvende originale Brooks reservedele, når instrumentet skal vedligeholdes. Bemærk at anvendelse af uoriginale reservedele kan forringe instrumentets specifikationer og dermed øge risikoen for skader. Desuden kan anvendelse af uoriginale reservedele medføre risiko for brand, elektrisk stød eller forringet virkemåde.

DUTCH

BELANGRIJKE VEILIGHEIDSINSTRUCTIES!

Deze appendix bevat belangrijke veiligheidsinstructies voor het gebruik van de Thermal Mass Flow Meter/ Controller Series. Deze instrumenten voldoen aan de (PED) Pressure Equipment CE Directive 97/23/EC (wet op het vervaardigen en distribueren van drukvaten binnen de Europese lidstaten). De lokale autoriteiten kunnen u op de hoogte stellen van de daar geldende additionele en/of lokale eisen voor installatie en gebruik.

VEILIGHEIDS INSTRUCTIES

1. Lees voor het in gebruiknemen alle instructies en waarschuwingen op de flowmeter en in de gebruikshandleiding.
2. **WAARSCHUWING:** Gebruik dit instrument niet buiten de in de gebruikshandleiding vastgelegde MAXIMALE GEBRUIKS DRUKKEN. Het niet in acht nemen van deze waarschuwingen kunnen leiden tot persoonlijke verwondingen en/of beschadiging van de meetapparatuur.
3. Overtuig u zelf, vòòr het in gebruik nemen, dat het instrument volgens de geldende voorschriften is ingebouwd in de leiding en aangesloten op het (eventuele) spanningsnetwerk.
4. **IN GEBRUIK NEMEN:** (a) Langzaam opvoeren van de stroom in het systeem. Open de kranen langzaam om een plotselinge golfbeweging van de vloeistofstroom te voorkomen. (b) Controleer het instrument op eventuele lekkage, met name de in- en uitlaat aansluitingen. Als er geen lekkage wordt ontdekt, kan het systeem op bedrijfsdruk worden gebracht.
5. **WAARSCHUWING:** Nalatig onderhoud van dit instrument kan ernstig persoonlijk letsel en/of beschadiging van de meet apparatuur tot gevolg hebben. Overtuig uzelf ervan dat de procesdruk is afgevoerd alvorens onderhoud aan het instrument te plegen.
6. Overtuig u ervan dat er uitsluitend originele Brooks Instrument onderdelen worden gebruikt voor onderhoud en service aan het instrument. U wordt erop gewezen dat het gebruik van universele onderdelen en voorschriften om daar mee om te gaan, nadelige gevolgen kunnen hebben voor het gebruik van het instrument, en daardoor de juiste werking van uw proces in gevaar kan komen. Zelfs kan het gebruik daarvan resulteren in brandgevaarlijke situaties, electriciteitsgevaar of onjuist functioneren.

SUOMI

TURVAOHJEET

Tämä liite sisältää tärkeitä turva- ja käyttöohjeita Brooks:Thermal Mass Flow Meter / Controller Series Instrumentit kuuluvat CE-direktiiviin (PED) PRESSURE EQUIPMENT CE DIRECTIVE 97/23/EC.

Kysy lisää paikallisilta viranomaisilta koskien kansainvälisiä ja/tai paikallisia turvakodeja sekä muita asennusvaatimuksia.

TURVAOHJEET

1. Kaikki ohjeet ja (1) virtausmittariin kiinnitetyt varoittavat merkinnät sekä (2) manuaalin soveltuvat kohdat on luettava ennen laitteen käyttöönottoa.
2. **VAROITUS:** Älä käytä tätä instrumenttia yli manuaalissa mainittujen maksimiarvojen. Mikäli tätä varoitusta ei noudateta, voi seurauksena olla vakava henkilövahinko ja/tai laitteen vaurioituminen.
3. Varmista, että mittalaite on oikein asennettu sekä prosessiputkistoon että sähköisesti.
4. **KÄYTTÖ:** (a) Päästä paineet hitaasti järjestelmään. Avaa putkistossa olevat venttiilit hitaasti, jotta välttyttäisiin paineiskuulta. (b) Tarkista mahdolliset vuodot mittarin prosessiliittimien kohdalta. Mikäli vuotoja ei ole, nosta prosessipaine käyttöpaineeseen.
5. **VAROITUS:** Mikäli tätä laitetta ei huolleta asianmukaisesti, saattaa korkea käyttöpainne aiheuttaa vakavia henkilövahinkoja ja/tai laitteen rikkoutumisen. On varmistettava, että putkistopaine on poistettu huollon ajaksi.
6. Tulee varmistaa, että käytetään Brooks'in alkuperäisiä varaosia kun laite vaatii huoltoa. Huomaa että korvaavat näköisoosat sekä käsittely voi vaikuttaa laitteen toimintaan sekä saattaa prosessin riskialttiiksi. Lisäksi tämä voisi aiheuttaa palo- tai sähköisen vaaran tai toimintaongelmia.

Model 5850TR

GERMAN

WICHTIGE SICHERHEITSHINWEISE

Dieser Anhang enthält wichtige Hinweise für einen sicheren Betrieb des Ganzmetall-Schwebekörperdurchflussmessers der Baureihe Thermal Mass Flow Meter / Controller Series von Brooks Instrument. Das Gerät entspricht den gültigen PED-Richtlinien (PRESSURE EQUIPMENT CE DIRECTIVE 97/23/EC). Konsultieren Sie lokale Zulassungsbehörden für nationale und/oder regionale Sicherheitsbestimmungen bzw. weitergehende Installationsvorschriften..

SICHERHEITSHINWEISE

1. Bitte lesen Sie alle gekennzeichneten Sicherheitshinweise/ Warnungen auf (1.) dem Gerät und (2.) alle entsprechenden Kapitel in der dazugehörigen Installations- und Bedienungsanleitung vor dem Betrieb des Gerätes.
2. **WARNUNG:** Betreiben Sie das Gerät nicht außerhalb der Spezifikationen. In der Installations- und Bedienungsanleitung finden Sie den baugrößenspezifischen MAXIMALEN BETRIEBSDRUCK in der entsprechenden Tabelle. Bei Nichtbeachtung dieses Hinweises kann das Gerät beschädigt und/ oder zerstört werden und dies kann zu ernsthaften Verletzungen und/oder zum Tod von Personen führen.
3. Bitte stellen Sie sicher, dass das Gerät einwandfrei mit elektrischen und druckbeaufschlagten Leitungen verbunden ist.
4. **BETRIEB:** (a) Lassen Sie das Gerät zu Beginn langsam durchströmen. Öffnen Sie Ventile langsam, damit Druckstöße verhindert werden. (b) Prüfen Sie den Aufbau am Ein- und Ausgang des Gerätes auf Leckagen. Wenn Sie kein Leck feststellen können, erhöhen Sie langsam den Systemdruck bis der gewünschte Prozessdruck erreicht ist.
5. **WARNUNG:** Bei unsachgemäßer Wartung des Gerätes geht von diesem aufgrund potentiell hoher Betriebsdrücke ein hohes Sicherheitsrisiko für Personen und Material aus. Bitte vergewissern Sie sich vor Wartungsarbeiten, dass die Leitungen drucklos sind.
6. Verwenden Sie ausschließlich Original-Ersatzteile von Brooks Instrument für die Wartung und Reparatur von Geräten. Verwendung von Fremdfabrikaten oder Nachbildungen kann die Leistung des Gerätes einschränken und die Betriebssicherheit aufheben. Fehlfunktionen und gefährliche Betriebszustände können weitere Folgen sein.

FRENCH

INSTRUCTIONS IMPORTANTES DE SECURITE

Cet appendice contient des instructions importantes de sécurité pour l'utilisation du Thermal Mass Flow Meter / Controller Series. Cet instrument est conforme aux nouvelles directives PED "PRESSURE EQUIPMENT CE DIRECTIVE 97/23/EC".

INSTRUCTIONS

1. Veuillez bien lire toutes les instructions, remarques et avertissements (1) sur l'appareil et (2) dans le manuel d'installation, d'utilisation et d'entretien.
2. **AVERTISSEMENTS:** Ne pas utiliser cet instrument en dehors des caractéristiques de fonctionnement spécifiées dans le manuel d'instructions. Dans le cas contraire, le personnel risque de se blesser grièvement et/ou d'endommager le matériel.
3. S'assurer que l'appareil est bien relié électriquement et soumis à une pression de travail.
4. **OPERATION:** (a) Lorsque l'installation du débitmètre dans la canalisation est achevée. La mise en débit du débitmètre doit être exécutée progressivement en ouvrant doucement le vanne de régulation afin d'éviter tout sur débit (b) Vérifier que les raccordements d'entrée et sortie soient parfaitement étanches (sans fuite), puis mettre sous pression de travail.
5. **AVERTISSEMENT:** Lors d'interventions d'entretien, bien s'assurer que la pression dans la canalisation est proche de zéro. Dans le cas contraire, le personnel risque de se blesser grièvement et/ou d'endommager le matériel.
6. Bien s'assurer que les pièces d'origine Brooks sont utilisées pour des interventions d'entretien. Des pièces de substitution pourraient affecter les performances de l'appareil et engendrer de graves dysfonctionnements.

NORSK

VIKTIG SIKKERHETS INSTRUKS

Dette tillegget inneholder viktige sikkerhets og drifts instruksjoner for bruk av Brooks metall rør mengde måler Thermal Mass Flow Meter / Controller Series. Instrumentet tilfredstiller (PED) PRESSURE EQUIPMENT CE DIRECTIVE 97/23/EC. Kontakt lokale myndigheter for nasjonale eller lokale sikkerhetskoder og andre installasjonskrav.

SIKKERHETS INSTRUKS

1. Les alle instruksjoner og sikkerhetsanmerkninger for (1) mengde måleren (Flow meteret) og (2) alle aktuelle seksjoner av instruksjons manualen før bruk av produktet.
2. **ADVARSEL:** Bruk ikke dette instrumentet utover de spesifikasjonene som er gitt i instruksjons boken. Dersom advarslene ikke følges kan det resultere i alvorlig personskader og/eller ødeleggelse av utstyret.
3. Kontroller at instrumentet er skikkelig koblet både elektrisk og mekanisk.
4. **DRIFT:** (a) Start forsiktig. Ventilen åpnes langsomt for å unngå strømming sjokk. (b) Kontroller at det ikke er lekkasjer rundt målerens inn- og utløpstilkoblinger. Dersom det ikke er synlige lekkasjer kan ventilen åpnes til fullt operasjonstrykk.
5. **ADVARSEL:** Dersom utstyret ikke blir riktig vedlikeholdt kan det føre til alvorlige personskader og/eller skade på instrumentet på grunn av potensielle høye trykk. Påse at prosessstrykket er avlastet før utstyret demonteres.
6. Bruk alltid Brooks original deler ved service. Merk at selv om erstatningene ser like ut kan de påvirke produktets virkemåte og gjøre prosessen usikker. Det kan videre føre til brann, elektrisk risiko eller feil virkemåte.

ITALIAN

IMPORTANTI ISTRUZIONI PER LA SICUREZZA

Questa appendice contiene importanti istruzioni sia per la sicurezza che per l'uso corretto degli flussometri metallici della Brooks Instrument B.V. della Thermal Mass Flow Meter / Controller Series. Questi strumenti seguono la normativa (PED) Direttiva CE 97/23/EC per gli strumenti in pressione. Consultare le autorità locali per i codici di sicurezza nazionali/internazionali e per ulteriori norme di installazione.

ISTRUZIONI DI SICUREZZA

1. Prima di utilizzare il prodotto leggere attentamente tutte le istruzioni ed i marchi di sicurezza applicati sui flussimetri (1) e Appendici relative delle istruzioni e del manuale operativo (2).
2. **ATTENZIONE:** Non utilizzare questo strumento oltre i limiti massimi delle specifiche elencate sia nelle istruzioni per l'uso che nel manuale operativo. La mancata osservanza di tali istruzioni potrebbe causare il rischio di lesioni personali e/o al danneggiamento dello strumento stesso.
3. Controllare che lo strumento sia correttamente collegato alle fonti di pressione che a quelle elettriche.
4. **ISTRUZIONI OPERATIVE:** (a) Lentamente procedere ad aprire il flusso allo strumento. Aprire lentamente le valvole di processo dello strumento per evitare picchi di pressione. (b) Controllare l'assenza di perdite sia sui raccordi di entrata che in quelli di uscita dello strumento. Se non si riscontra alcuna perdita, portare lo strumento alla pressione di esercizio.
5. **ATTENZIONE:** Se allo strumento non viene fatta regolarmente una corretta manutenzione, alle alte pressioni potrebbero verificarsi lesioni personali e/o danni allo strumento. Assicurarsi che la pressione di processo sia stata tolta laddove si necessita effettuare una manutenzione.
6. Assicurarsi che siano utilizzate solo parti originali nella manutenzione degli strumenti. Si fa notare che la sostituzione con parti compatibili e la manutenzione effettuata non seguendo le procedure del fornitore, posso provocare alterazioni nelle prestazioni dello strumento ed alterare lo stato di sicurezza delle Vs. linee di processo. Ancor più potrebbe provocare rischi di incendio, rischi elettrici o far risultare errati i processi in corso..

Model 5850TR

SWEDISH

VIKTIG SÄKERHETSINFORMATION

Denna bilaga innehåller viktig information om säkerhet och handhavande vid installation och användande av Brooks Flödesmätare i Thermal Mass Flow Meter / Controller Series. Instrumentet är i överensstämmande med (PED) PRESSURE EQUIPMENT CE DIRECTIVE 97/23/EC. Kontakta de lokala myndigheterna angående eventuella nationella föreskrifter och ytterligare föreskrifter angående krav på riktig installation.

SÄKERHETS INSTRUKTION

1. Läs alla instruktioner och varningsföreskrifter på (1) flödesmätaren och (2) alla aktuella avsnitt i Instruktion - och handhavande manualen innan produkten tas i drift.
2. **VARNING!** Använd inte detta instrument utanför de angivna specifikationerna, som anges i Instruktion - och handhavande manualen. Att ej beakta denna varning kan resultera i alvarlig personskada och/eller skada på utrustningen.
3. Vänligen kontrollera att instrumentet är rätt inkopplat elektriskt och mekaniskt med avseende på elektrisk spänning och aktuellt tryck.
4. **Vid igångsättning:** (a) Släpp långsamt på aktuellt flöde i systemet. Öppna processventiler långsamt för att undvika för höga flöden. (b) Kontrollera om det finns några läckage runt flödesmätarens anslutningar. Om det inte finns något läckage, öka försiktigt till aktuellt arbetstryck.
5. **Varning:** Om denna utrustning inte servas enligt instruktionsboken kan alvarlig personskada inträffa. Utrustningen kan skadas av för högt tryck. Vänligen kontrollera att processtrycket på mätaren är fränkopplat i samband med service.
6. Vänligen kontrollera att bara BROOKS originaldelar används i samband med service. Observera att delar med motsvarande utseende, men ej originaldelar, kan påverka flödesmätarens funktion och prestanda samt påverkar säkerheten i processen. □□□ □□□ □□□□ □□□□□□□□ □ □□□□□□□, □□□□□□□□ □□□□ □□□□ □□□□□□□□ □□□□□□□□.

SPANISH

IMPORTANTES INSTRUCCIONES DE SEGURIDAD

Este apéndice contiene importantes instrucciones de operación y seguridad para el uso de los rotámetros de tubo de vidrio BROOKS de la Thermal Mass Flow Meter / Controller. El instrumento es conforme a la directiva 97/23/CE sobre Equipos a Presión de la Comunidad Europea (PED). Consulte con sus autoridades locales por si existieran normas ó directivas adicionales sobre el uso y/o instalación de dicho tipo de instrumentos.

INSTRUCCIONES DE SEGURIDAD

1. Lea con cuidado todas y cada una de las identificaciones del aparato (1) así como las secciones del Manual de Instalación y Operación antes de usar el rotámetro.
2. **ATENCIÓN!** No operar nunca el instrumento por encima de las especificaciones de Máxima Presión de Operación reseñadas en el Manual de Instalación y Operación. El no seguir estas instrucciones puede provocar daños y perjuicios en personas y/o equipos.
3. Asegurarse de que el instrumento ha sido conectado e instalado correctamente a la fuente de presión y/o eléctrica.
4. **OPERACION:** (a) Empezar abriendo el caudal cuidadosamente. Abra lentamente las válvulas para evitar puntas de caudal. (b) Comprobar si existen fugas en el caudalímetro y sus conexiones. Si no se encuentran fugas continuar abriendo hasta conseguir las condiciones normales de servicio.
5. **ATENCIÓN!** Llevar un mantenimiento adecuado con el fin de prevenir y evitar fallos debidos a altas presiones de operación. El no seguir estas instrucciones puede provocar daños y perjuicios en personas y/o equipos. Despresurizar la línea antes de desmontar el rotámetro.
6. Utilice solo piezas originales BROOKS para el mantenimiento de su rotámetro. El uso de piezas de otros suministradores con apariencia similar puede afectar las prestaciones y la seguridad del equipo. Cualquier cambio indebido puede resultar en una explosión ó operación incorrecta.



(1) **TYPE EXAMINATION CERTIFICATE**

(2) **Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC**

- (3) Type Examination Certificate Number: **KEMA 03ATEX1531 X** Issue Number: **3**
- (4) Equipment: **Thermal Mass Flowmeter / Flowcontroller Model 5850TR**
- (5) Manufacturer: **Brooks Instrument LLC**
- (6) Address: **407 West Vine Street, Hatfield, PA 19440, USA**
- (7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
- (8) KEMA Quality B.V. certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

The examination and test results are recorded in confidential test report no. 2113693-9.
- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-15 : 2003
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This Type Examination Certificate relates only to the design, examination and tests of the specified equipment and not to the manufacturing process and supply of this equipment.
- (12) The marking of the equipment shall include the following:



II 3 G EEx nA II T4

This certificate is issued on March 21, 2008 and, as far as applicable, shall be revised before the date of cessation of presumption of conformity of (one of) the standards mentioned above as communicated in the Official Journal of the European Union.

KEMA Quality B.V.

C.G. van Es
Certification Manager



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Model 5850TR

LIMITED WARRANTY

Seller warrants that the Goods manufactured by Seller will be free from defects in materials or workmanship under normal use and service and that the Software will execute the programming instructions provided by Seller until the expiration of the earlier of twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer.

All replacements or repairs necessitated by inadequate preventive maintenance, or by normal wear and usage, or by fault of Buyer, or by unsuitable power sources or by attack or deterioration under unsuitable environmental conditions, or by abuse, accident, alteration, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense.

Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller.

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 dedicated flow experts 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 our 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 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:

- Americas 1-888-554-FLOW
Europe +(31) 318 549 290 Within Netherlands 0318 549 290
Asia +011-81-3-5633-7100



Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.

TRADEMARKS

- Brooks Brooks Instrument, LLC
Buna DuPont Dow Elastomers
Kalrez DuPont Dow Elastomers
Teflon E.I. DuPont de Nemours & Co.
Viton DuPont Performance Elastomers

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