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Installation and Operation Manual
X-PR-SLA7800-PC-eng
Part Number: 541B047AAG
December, 2008

Brooks® Metal Sealed Pressure Controllers



Model SLA7810A/SLA7820A
Analog I/O,
Pressure Controller

Model SLA7810D/SLA7820D
Digital I/O DeviceNet™
Pressure Controller



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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 1 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 1.
- Meters larger than 25mm or 1" (inch) are in compliance with category I, II, III of PED.
- Meters of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

ESD (Electrostatic Discharge)

⚠ 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 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 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, SMOS, 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.

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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 Scope

Thank you for purchasing a Brooks Instrument Model SLA7810/SLA7820 Pressure Controller. This instruction manual is intended to provide the user with all the information necessary to install, operate and maintain the Brooks Model SLA7810/SLA7820 Pressure Controller. This manual is organized into sections:

Section 1 - Introduction
Section 2 - Installation
Section 3 - Adjustment and Maintenance
Section A - CE Certification

It is recommended that this manual be read in its entirety before attempting to operate or repair the Model SLA7810/SLA7820.

1-2 Description

Brooks Instrument's Model SLA7810/SLA7820 are 1-1/8" wide profile metal sealed instruments that accurately measure and control upstream or downstream pressure. The heart of these devices is a solid-state pressure transducer, which produces an electrical output proportional to pressure. The electronics use this signal to operate a control valve and to provide an output signal. The SLA7800 Series family of pressure measurement and control products offers unparalleled flexibility and performance and is designed for use in advanced gas handling systems. The result is the most accurate, repeatable, and responsive controllers on the market today!

Superior Valve Technology
The co-planar valve offers unmatched performance. Due to its simplified construction, the valve exhibits superior repeatability, stability, and response time. Instruments are less sensitive to pressure variations in the process because of the larger valve control range. The co-planar valve also offers lower leak-by rates compared to other metal sealed controllers. These advancements ensure a more stable process over time.

Highly Adaptable Configurations
The 1-1/8" body offers a compact, space saving footprint. The SLA7800 Series family of pressure controllers is easily retrofitable to existing gas box designs that utilize the traditional 1-1/2" body platform. Likewise, the all-digital electronics is adaptable and allows the SLA7800 Series to serve as a direct replacement for existing analog products bringing with them greatly improved accuracy and reliability.

Broad Array of Communication Options
Brooks offers the SLA7800 Series pressure controllers with a traditional 0-5 volt analog option. Brooks also offers control interface with DeviceNet™, a high-speed (up to 500k baud) digital communication network. Brooks' communication capabilities and device-profiles have been certified by the ODVA (Open DeviceNet Vendor's Association). Other network protocols are in development. Talk to your Brooks representative about your specific needs.

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Reduced Cost of Ownership
The Models SLA7810 and SLA7820 allow multi-gas and multi-range capabilities to reduce customer inventory. Storage and pre-programming of up to 10 pressure applications easily permits users to switch between different gases and ranges on a single device. Also, the greater control range provided by the co-planar valve gives users the option to decrease the number of parts needed to control their entire process.

1-3 Principle of Operation

The pressure to be measured acts on a stainless steel diaphragm. This pressure is transmitted to the actual sensing element, a silicon chip (refer to Figure 1-1). The chip consists of an anisotropically etched diaphragm with four piezo resistive resistors, configured in a Wheatstone bridge, etched into its surface (refer to Figure 1-2). The mechanical deformation of this diaphragm results in an imbalance of the resistors, which is proportional to pressure. An amplifier provides output to the control circuit as well as the electrical output signal.

In addition to the pressure transducer the Model SLA7810/SLA7820 has an integral control valve and control circuitry. A difference between the pressure and set point signals will cause the electronics to modulate the control valve in order to maintain the desired pressure.
A system block diagram is shown in Figure 1-3.

The integration of pressure transducer, control electronics and control valve into one unit results in a compact size. The mounting dimensions are comparable to a mass flow controller. Refer to Figures 1-4 and 1-5.

The “upstream pressure regulation mode” is shown in Figure 1-6 places the pressure controller at the outlet of the pressure vessel. The pressure in the process upstream of the controller will be constant independent of downstream variation. Pressure measurement and control takes place at the outlet side of the pressure vessel.

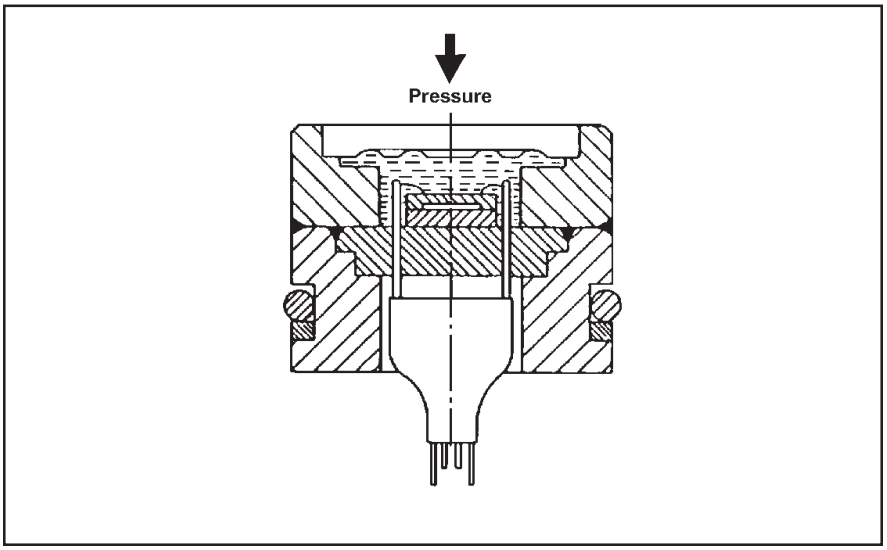


Figure 1-1 Model SLA7810/SLA7820 Pressure Transducer

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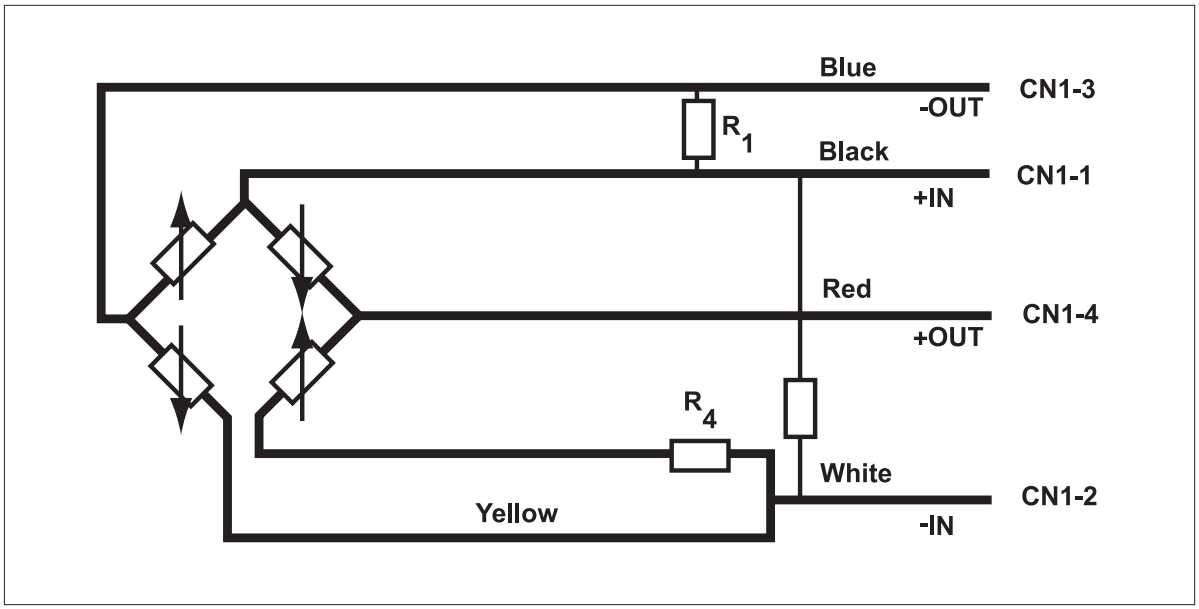


Figure 1-2 Model SLA7810/SLA7820 Silicon Chip Configuration

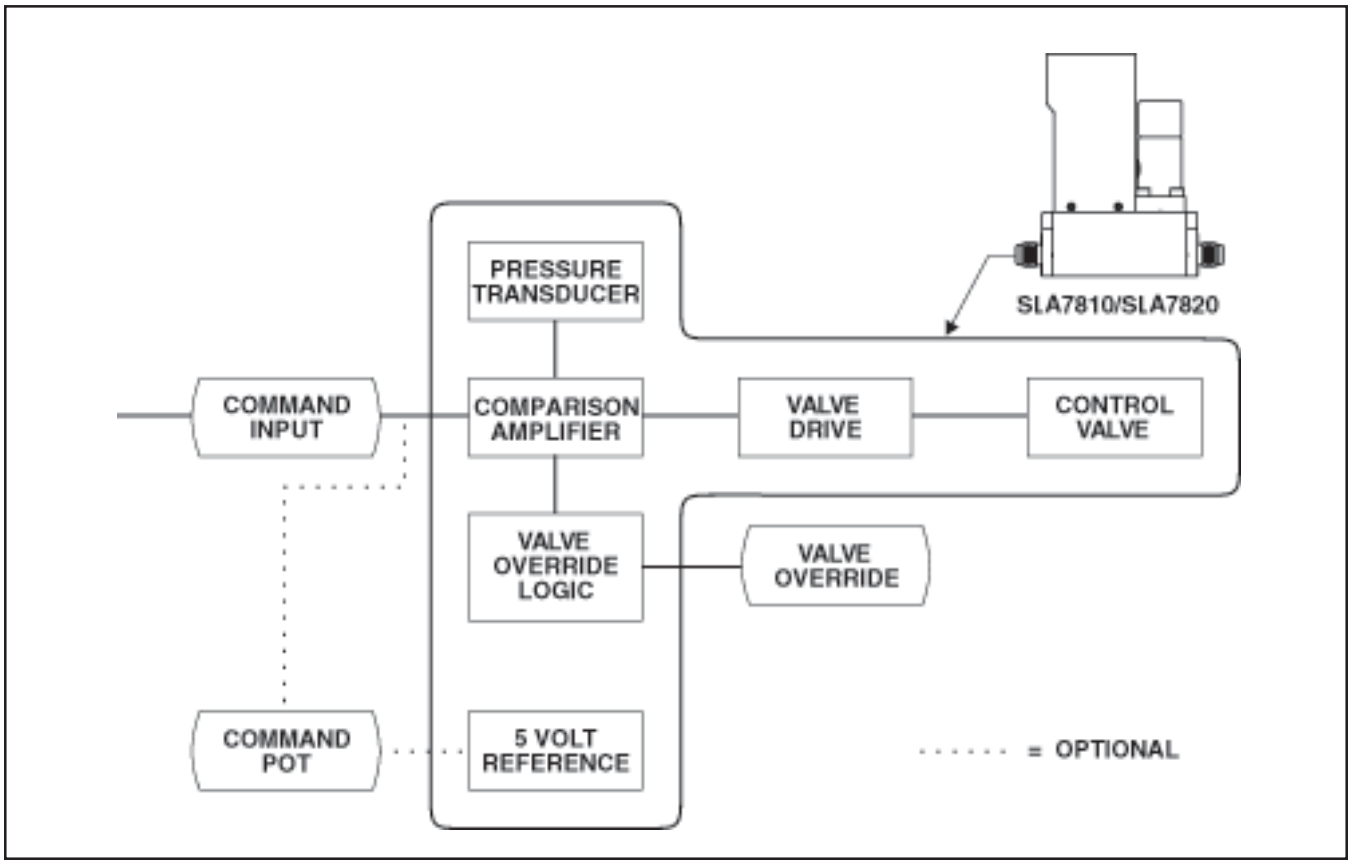
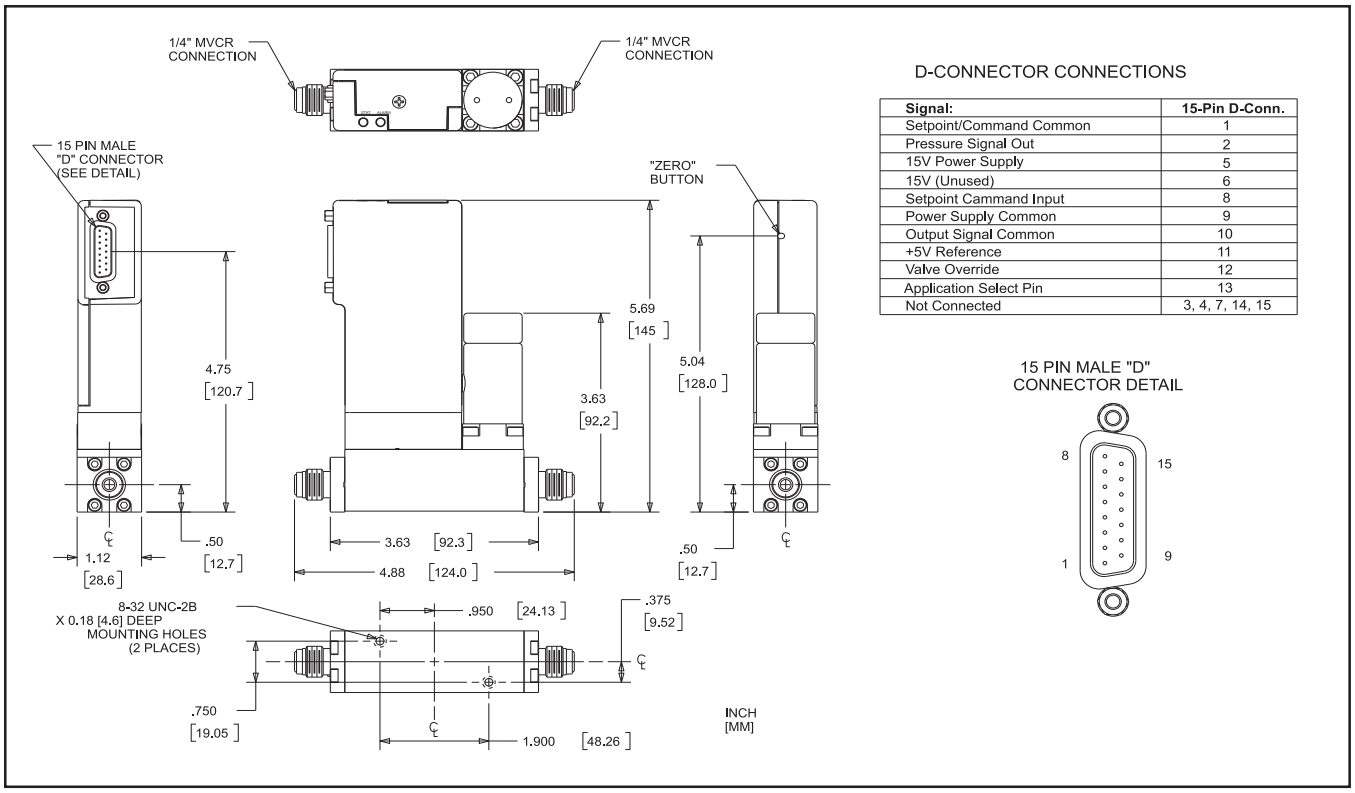


Figure 1-3 Model SLA7810/SLA7820 System Block Diagram.

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Signal:	15-Pin D-Conn.
Setpoint/Command Common	1
Pressure Signal Out	2
15V Power Supply	5
15V (Unused)	6
Setpoint Cammand Input	8
Power Supply Common	9
Output Signal Common	10
+5V Reference	11
Valve Override	12
Application Select Pin	13
Not Connected	3, 4, 7, 14, 15

Figure 1-4 Model SLA7810A/SLA7820A Analog I/O Controller with 1/4" VCR Connections

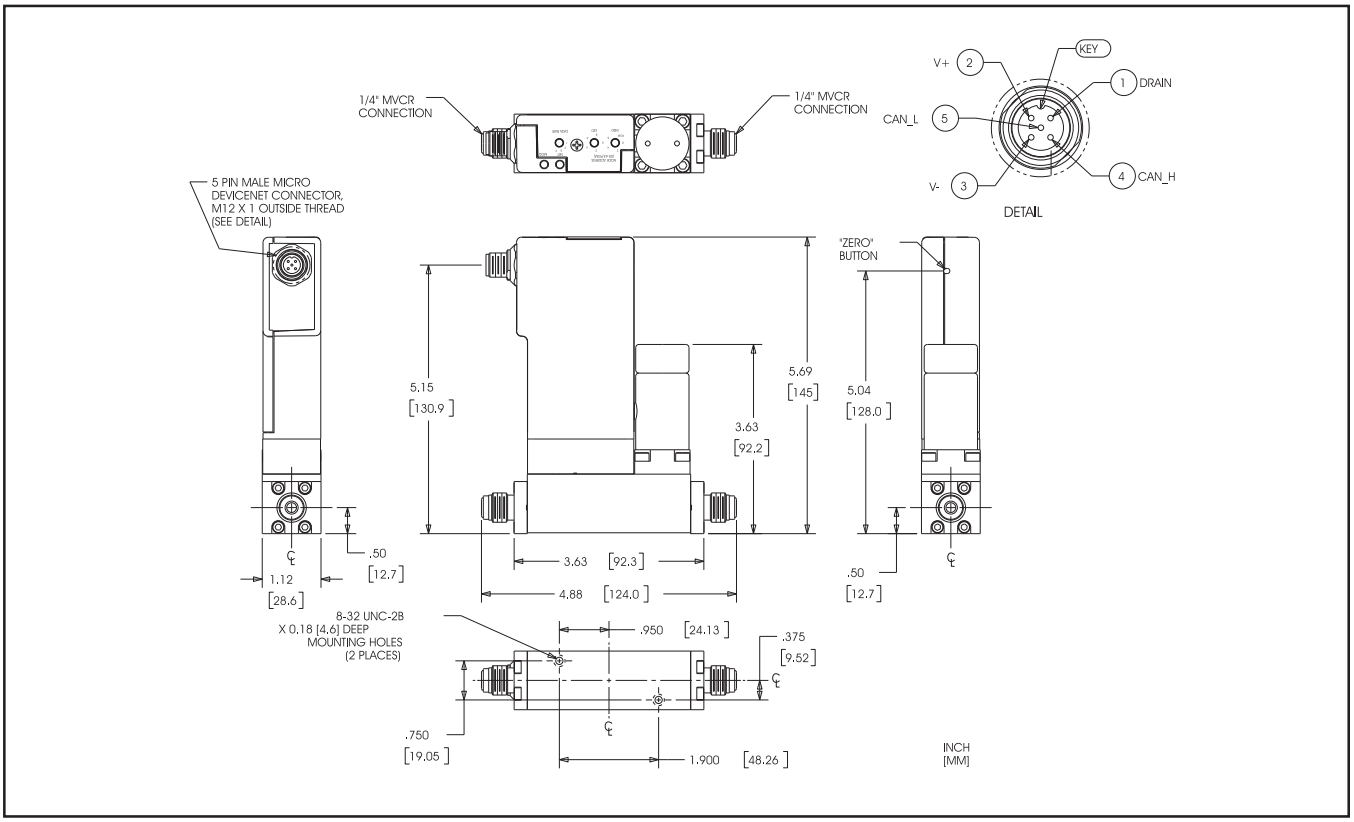


Figure 1-5 Model SLA7810D/SLA7820D Digital I/O DeviceNet Controller with 1/4" VCR Connections

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When the pressure controller is used in the “downstream pressure regulation” mode as shown in Figure 1-7, the pressure in the process vessel will be constant independent of upstream variation, provided the upstream pressure does not fall below the downstream setting. Pressure measurement and control takes place at the inlet side of the pressure vessel.

The most common application of the pressure controller is in conjunction with a mass flow controller (refer to Figure 1-8). Mass flow controllers accurately measure and control the required quantity of process gas flows. In this figure, the mass flow controllers will supply the desired quantity and mixture of process gas while the pressure controller will maintain the desired reactor pressure by varying the gas outflow. This system allows the process reactants to be varied while maintaining a constant reaction pressure.

The Model SLA7810/SLA7820 Pressure Controller has proportional and integral control action. The reset or integral control is combined with the proportional control action (normally referred to as P.I. control). Both proportional band and integration time are customer adjustable with a Brooks service tool.

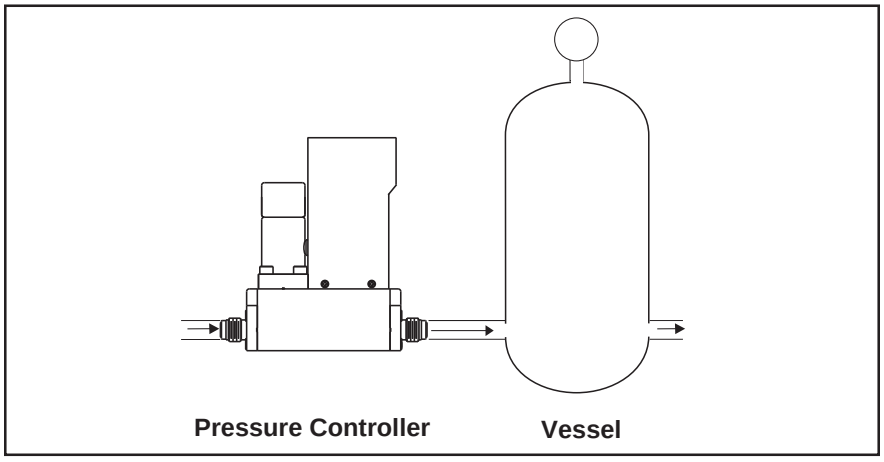


Figure 1-6 Model SLA7820 Controller Upstream

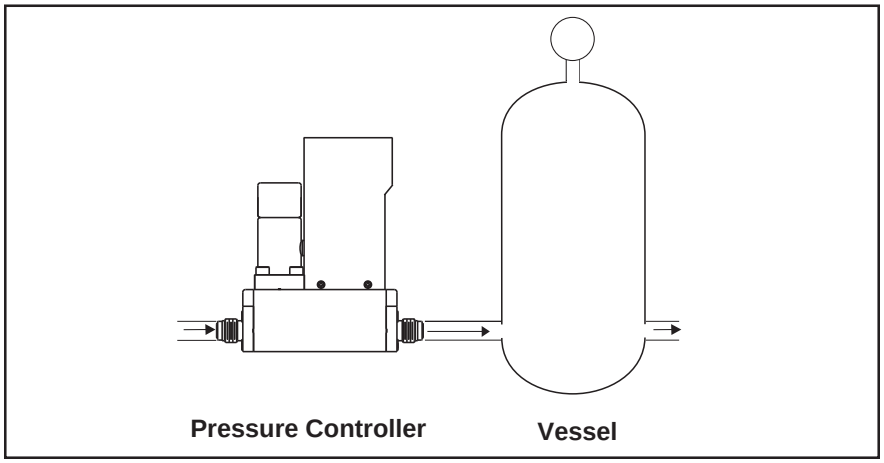


Figure 1-7 Model SLA7810 Controller Downstream

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Note: The Controller Mode and valve type are determined at the time of order. Mechanical parts must be changed to convert modes or valve types.

Upstream Controller Mode - The controller is set to maintain the upstream process pressure constant, independent of downstream pressure or flow variations (ref. Fig. 1-6). This is factory configured.

Downstream Controller Mode The controller is set to maintain the downstream process pressure constant, independent of upstream pressure or flow variations. This is factory configured.

Normally Open/Normally Closed Control Valve - Both Normally Open (N.O.) and Normally Closed (N.C.) configurations are available. Normally Closed is the standard valve type. The Normally Open valve may be specified when Safety, Operation or Process considerations warrant this type of valve.

Voltage Inputs/Outputs are factory configured and available on the analog version of the device. This must be specified when ordered.

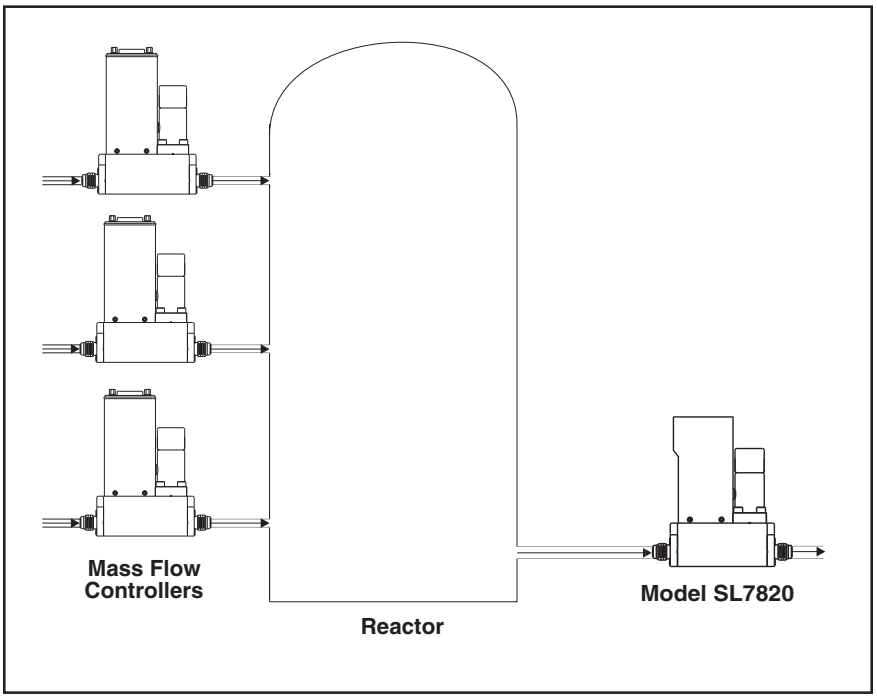


Figure 1-8 Typical Application of Upstream Controller

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1-4 Specifications

⚠WARNING

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

Pressure Ranges
7.25 psia to 290 psia full scale (Metal Seals)

Flow Rates
0-30,000 sccm* (Nitrogen Equivalent).
*Standard pressure and temperature in accordance with SEMI (Semiconductor Equipment and Materials Institute) standard: 32°F (0°C) and 101 kPa (760 Torr). Other reference conditions available upon request.

Accuracy
±0.5% F.S., including linearity and hysteresis for precision control

Repeatability
±0.1% full scale

Control Range
20:1

Zero Stability
0.1% full scale per 30 days

Ambient Temperature Limits
Operating: 0°C to 60°C (32°F to 140°F)
Non-operating: -25°C to 100°C (-13°F to 212°F)

Temperature Sensitivity
±0.1% of F.S. per °C

Maximum Transducer Pressure
21.75 psia for 0-14.5 psia range
108.5 psia for 14.5-72.5 psia range
435 psia for 72.5-290 psia range

Maximum Design Pressure
500 psig

Pressure Equipment Directive (PED) 97/23/EC:
Equipment falls under Sound Engineering Practice (SEP)

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Maximum Fluid Operating Temperature
0°C to 65°C (32°F to 149°F)

Leak Integrity
Inboard to Outboard: 1x10-10 atm scc/sec Helium max.

1-5 Controller Specifications

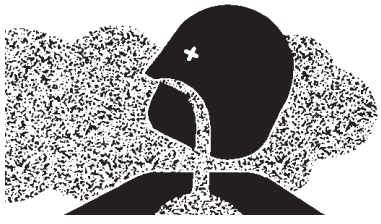
Digital software
Can store 10 selectable P and I settings.

Input/Output Offset
< 0.2% full scale (voltage)

Proportional Gain
User adjustable via Service port or over DeviceNet interface.

Integration Time
User adjustable via Service port or over DeviceNet interface.

Control Action
Upstream or downstream pressure control



⚠ WARNING

METER/CONTROLLER SEAL COMPATIBILITY

Products in this manual may contain metal or elastomeric seals, gaskets, O-rings or valve seats. It is the "user's" responsibility to select materials that are compatible with their process and process conditions. Using materials that are not compatible with the process or process conditions could result in the Meter or Controller leaking process fluid outside the pressure boundary of the device, resulting in personnel injury or death.

It is recommended that the user check the Meter or Controller on a regular schedule to ensure that it is leak free as both metal and elastomeric seals, gaskets, O-rings and valve seats may change with age, exposure to process fluid, temperature, and /or pressure.

Materials of Construction
316L VAR, 316L, and high-alloy
ferritic stainless steel.
External/internal seals: nickel
Valve seat: 316L stainless steel
Internal wetted Surface Finish 32 Ra.

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Electrical Connections
Analog I/O option: 15-pin, male
Digital I/O DeviceNet option: 5-pin Micro-Connector, male
Power Supply Voltage

Electrical Connections (continued)
Analog option: +15 Vdc, ±5%
(traditional -15 Vdc pin is ignored)
Digital I/O DeviceNet option: 11-25 Vdc nominal = +24 Vdc

Power Requirements
Analog I/O option, with valve: 3.6 Watts Typical, 4.0 Watts Max.
Digital I/O DeviceNet option, w/valve: 6.9 Watts Typical, 7.6 Watts Max

Class III Equipment: The dc Mains input shall be supplied from a SELV (Separated Extra-Low Voltage) source.

Output Signals
Pressure Output (Analog I/O option only)
0-5 Vdc into 2 Kohm-minimum load. Output will indicate process-variable up to 5.5 Vdc (110% F.S.).

5 Volt Reference Output
5 Volts ±0.2% min Load 1 Kohms.

Pressure Setpoint Signals
Command-Setpoint Input (Analog I/O option only)
0-5 Vdc: Input will accept signals to 5.5 Vdc (110% F.S.).
Input resistance: 200 Kohm nominal.

Process Connections
Standard inlet and outlet connections supplied on the Model SL7810 and Model SL7820 are 1/4"(M) VCR™ (standard)
C Seal (SEMI 2787.1)
CS Seal (SEMI 2787.5)
W Seal (SEMI 2787.3)

Environmental Conditions
Installation Category: “I”
Pollution Degree: 2
Humidity: 50-80% Relative Humidity
Meter Altitude: 6562 feet (2,000 meters)
For Indoor Use ONLY
Mains supply voltage fluctuations not to exceed ±10% of the nominal voltage

Valve Override Signal (Analog I/O option only)

IF Left floating, unconnected or grounded instrument controls valve to setpoint.

IF Connected to signal at or above 10.0 Volts, valve is forced open.
IF Connected to signal at or below 0.0 Volts, valve is forced closed.

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2-1 General

This section provides installation instructions for the Brooks Model SLA7810/20 PC. Figure 1-2 through Figure 1-8 show the Model SLA7810/20 dimensions, gas connections and electrical connection locations for an MFC.

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
407 W. Vine Street
P.O. Box 903
Hatfield, PA 19440 USA
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E-mail: BrooksAm@BrooksInstrument.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@BrooksInstrument.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@BrooksInstrument.com

Remove the envelope containing the packing list. Outside of your clean area, carefully remove the equipment from the packing case. Make sure spare parts are not discarded with the packing material. Inspect for damaged or missing parts.

This device has been assembled, calibrated and double-vacuum bagged in a Class 100 clean room. In your semi-clean area,remove the outer bag only. Pass your Model SLA7810/20 Metal Seal Pressure Controller into your clean area. Remove the second clean room compatible bag only when the equipment is ready to be tested and/or installed in your clean system.

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. In the original vacuum bag and shipping container.
b. In a sheltered area with the following conditions:
1. Ambient temperature 21°C (70°F) nominal, 32°C (90°F) maximum and 7°C (45°F) minimum.
2. Relative humidity 45% nominal, 60% maximum and 25% minimum.

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2-4 Return Shipment

Prior to returning any instrument to the factory, contact your nearest Brooks location for a Return Materials Authorization Number (RMA#). This can be obtained from 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@BrooksInstrument.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@BrooksInstrument.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@BrooksInstrument.com

Instrument must have been purged in accordance with the following:

Completion of form RPR003-1, Brooks Instrument Decontamination Statement. A copy of this form can be downloaded from the Brooks website www.brooksinstrument.com or is available from any Brooks Instrument location listed above. This is required before any Brooks Personnel can begin processing. Copies of the form can be obtained from any Brooks Instrument location listed above. Provide a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument.

⚠WARNING

Before returning the PC to the factory purge the controller thoroughly with a 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 may occur upon exposure to air.

2-5 Transit Precautions

To safeguard against damage during transit, transport the instrument to the installation site in the same container used for transportation from the factory if circumstances permit.

2-6 Typical Configurations

A pressure controller system can be built in upstream or downstream control configurations (refer to Figures 1-5 and 1-6). When the controller is placed downstream (upstream pressure controller) of the pressure vessel, the flow is usually determined by the MFC(s) in the line upstream of the vessel.

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With the pressure controller upstream of the vessel (downstream pressure controller), the most likely application is controlling a subatmospheric pressure in the vessel. The inlet of the pressure controller can be at atmospheric gas pressure or at vapor pressure of a liquid source. The flow in this situation is usually determined by the characteristics of a vacuum pump.

2-7 Gas Connections

Standard inlet and outlet connections supplied on the Model SLA7810 and Model SLA7820 are 1/4"(M) VCR. Prior to installation ensure all piping is clean and free from obstructions. Install piping in such a manner that permits easy access to the instrument if removal becomes necessary.

2-8 Installation Procedures

⚠CAUTION

When installing the instrument, insure that no foreign materials enter the inlet or outlet of the meter. Do not remove the protective end caps until time of installation.

⚠CAUTION

Any Brooks Instrument pressure controller with a 15 pin D-Connector PC board bearing the "CE Mark" must use a 100% shielded cable and metal shell mating connectors. The shield is tied over 360 degrees to the shell on both ends. This is mandatory to be in compliance with the EMC Directive 989/336/EEC.

Installation Procedures

a. The Model SLA7810/SLA7820 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.
d. The Model SLA7810/SLA7820 pressure controller may be installed in any position.

Note: The control valve in the Model SLA7810/SLA7820 provides precision control and is not designed for positive shut-off. If positive shut-off is required, it is recommended that a separate shut-off valve be installed in-line.

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⚠CAUTION

When used with a reactive (sometime 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. See Brooks' Technical Bulletin T-086 for further information.

⚠CAUTION

Since the 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 pressure controller and the solenoid, resulting in a surge upon opening of the solenoid valve. This surge can be reduced in magnitude by locating the controller and solenoid valve close together.

2-9 In-Line Filter

It is recommended that an in-line filter, such as the Brooks Model 5848, be installed upstream from the controller to prevent the possibility of any foreign material entering the meter. The filter porosity should be approximately ten times smaller than the orifice used in the installation, however, it is recommended that the minimum porosity that does not restrict the flow rate being used. The filtering element should be periodically replaced or cleaned.

2-10 Electrical Interface

Signal:	D-conn
Setpoint/Command Common	**1**
Pressure Signal Out	**2**
15V Power Supply	**5**
15V(unused)	**6**
Setpoint/Command Input	**8**
Power Supply Common	**9**
Output Signal Common	**10**
+5V Reference	**11**
Valve Override	**12**
Application Select Pin	**13**
No Connections	**3, 4, 7,14,15**

Note: The Setpoint Return is internally connected to Signal Return and Supply Voltage Common.

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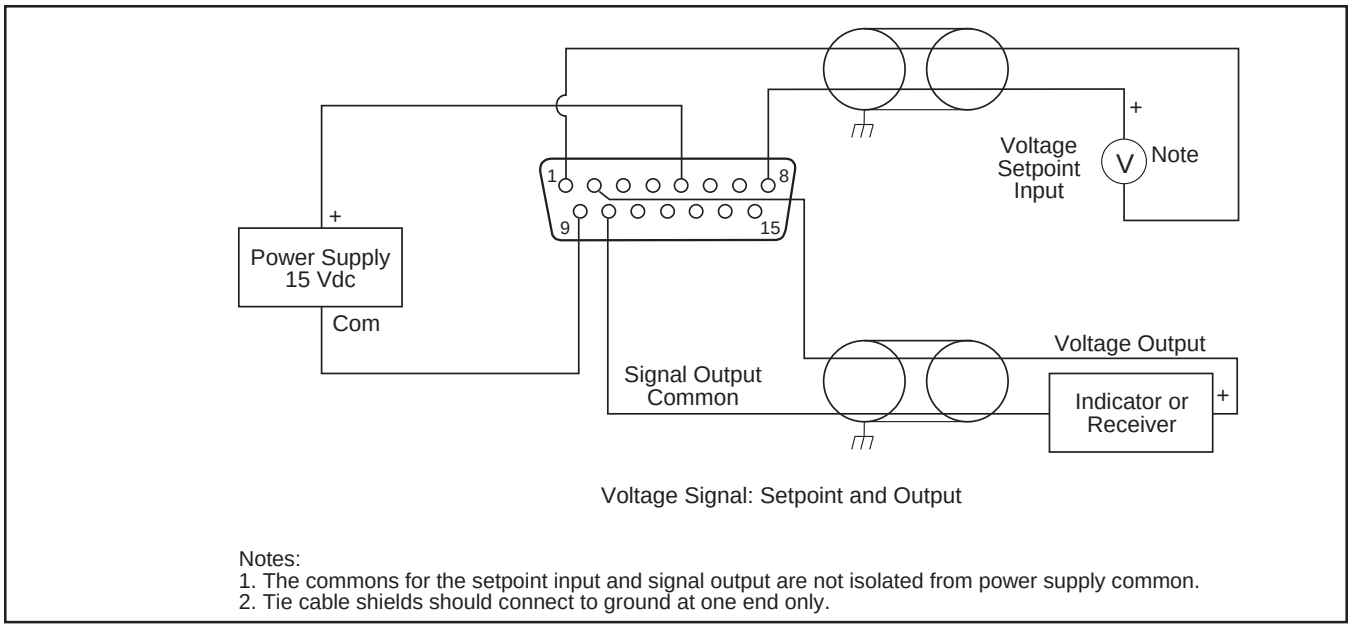


Figure 2-1 Common Electrical Connections, Analog I/O

Electrical Interface DeviceNet Mode
Electrical Interface in DeviceNet mode is covered in the DeviceNet™ Supplemental Instruction Manual for Brooks Models SLA7810 and SLA7820
(X-DeviceNet-PC-eng)

2-11 Remote Setpoint (Command) Input Analog Mode

If the pressure controller will be commanded by an external voltage or current signal, the command potentiometer is not used.
The command hookup is as follows:

a. Voltage Signal: Connect the external setpoint signal to Terminal 8 and the external setpoint return to Terminal 1. Refer to Figure 2-1.

b. Note: The setpoint return is internally connected to signal return and power supply common. Current supplied by the device providing the set point will not be returned on the current loop.

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3-1 Overview

This section contains the following information:

- Proportional Band and Integration Time Constant Adjustment

3-2 Proportional Band and Integration Time Constant Adjustment

The Model SLA7810/SLA7820 Pressure Controller has proportional and integral control action. The reset, or integral, control is combined with the proportional control actions, commonly referred to as P.I. control. Both proportional band and integration time are user adjustable by using special commands over a DeviceNet connection or using Brooks Service Software. The dynamic behavior of the control system is influenced by flow range, pressure range, fluid type, orifice size and system volume. Therefore, the pressure controller may need adjustment in the field to achieve the best dynamic response.

The factory settings usually result in stable control. For most systems the dynamic response is adequate with the factory settings. Improved response can be had by final tuning the P. and I. software parameters in the intended application by the user. The tuning of the P. and I. constants does not affect the calibration of the instrument.

Definitions

Both proportional and integral control actions are defined with respect to a step response error signal. The error signal is the difference between the actual pressure and the setpoint. Since no control system is instantaneous, an error signal will be present while the controller is attempting to reach setpoint.

The SLA7810 and SLA7820 employ digital P.I. controls. There are no potentiometers to adjust these values.

Proportional Control

Proportional control is a basic continuous control mode in which the controller output is proportional to the error input signal to the controller. It provides very rapid response and is relatively stable. Used alone, proportional control has one disadvantage: at steady state; it exhibits an offset. That is there is a difference between the desired value, or setpoint and the actual value of the controlled variable. An integral action added to the proportional mode eliminates offset.

Proportional control is sometimes called proportional gain. The gain of the controller is high when the error is large, and low when the error is small.

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Integral Control
Integral or reset action is an integration of the input error signal over time. This means that with integral action the value of the manipulated variable changes at a rate proportional to the error. With integral action present there can be no offset at steady state since the manipulated variable will continue to change as long as an error is present.

Characteristics of P.I. Control
By using both proportional and integral control actions, rapid control can be achieved with out a steady state offset. Typically there is a slight decrease in system stability due to the presence of the integral mode. The dynamic response of the system is better than the response would be with integral alone. Because the two controller modes are interactive the P.I. controller is somewhat more difficult to tune.

Tuning the P.I. control
Using the Brooks Service tool, read the current values of P. and I. It is highly recommended that the P. and I. values be recorded before adjustment. This will allow easy return to the factory settings. The Brooks Service tool is covered in another document. Increasing the P. parameter will increase the proportional band thus increasing the system response time. If the proportional band is too high, the system may overshoot the setpoint, or oscillate.

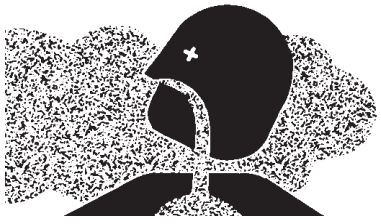
Increasing the Integral parameter will increase the integration time, making the system respond slower, but more stable.

Most applications require fast response time. This can be achieved by using a low Integral number and a high Proportional number. P. and I. should be adjusted so the controller reaches setpoint in the minimum time, without overshoot or oscillation.

Check the adjustment in the system over the expected range of pressures and flows.

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4-1 Overview



⚠ WARNING

METER/CONTROLLER SEAL COMPATIBILITY

Products in this manual may contain metal or elastomeric seals, gaskets, O-rings or valve seats. It is the "user's" responsibility to select materials that are compatible with their process and process conditions. Using materials that are not compatible with the process or process conditions could result in the Meter or Controller leaking process fluid outside the pressure boundary of the device, resulting in personnel injury or death.

It is recommended that the user check the Meter or Controller on a regular schedule to ensure that it is leak free as both metal and elastomeric seals, gaskets, O-rings and valve seats may change with age, exposure to process fluid, temperature, and /or pressure.

Routine maintenance is required on the Models SLA7810 and SLA7820. If an in-line filter is used, the filtering element should be periodically replaced. This section provides the Following information:

- Troubleshooting

4-2 Troubleshooting

⚠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 a 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 pressure controller, upon exposure to air, may also occur.

⚠CAUTION

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

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This section contains suggestions to help diagnose pressure controller related problems in the gas distribution system and answers commonly asked questions.

A. System Checks

The Model SLA7810/SLA7820 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 down time. If possible, make the following system checks before removing a suspected defective pressure controller for bench troubleshooting or return to the factory, especially if the system is new.

1. Verify a low resistance common connection and that the correct power supply voltage and signals are reaching and leaving the controller (for Analog I/O). The Break-out Board (P/N S-273-Z-649-AAA) will make this job much easier.

2. Verify that the process gas connections have been correctly terminated and leak checked.

3. If the pressure controller appears to be functioning but cannot achieve setpoint, verify that sufficient inlet pressure and pressure drop are available at the controller to provide the required flow.

4. Verify correct zero position and/or re-zero device.
   a. Connect the power cable to the PC.
   b. Allow the PC to warm-up for a minimum of 15 minutes.
   c. Close any inlet valves connected to PC.
   d. Connect vacuum pump to PC outlet.
   e. For upstream PC (SLA7820) give zero (0%) set point to device. For downstream PC (SLA7810) give full scale (100%) set point to device.
   f. Turn on the vacuum pump. When the pressure gauge reads less than 1.0 mm Hg, press the zero button on the device.
   g. Output process value should nominally read less than 10 mVdc (0.2% full scale). If reading is greater than 10 mVdc (0.2% full scale), consult factory.

B. Bench Testing

A basic bench test can be performed to isolate the cause of a problem or to verify the proper operation of the pressure controller. This method can be used if the full scale calibration pressure of the Pressure Controller is greater than 14.7 psia (atmospheric).

1. Connect the Pressure controller to the appropriate power supply as required for either Analog or DeviceNet.

2. Apply power to the pressure controller.

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Example of calculations (Analog Version)

a. Pressure controller is calibrated to 1000 torr full scale

b. Therefore a 5 volt output represents 1000 torr.

c. When the pressure controller is open to atmosphere, the actual output signal from the pressure controller is 3.78 Volts DC.
Atmospheric pressure is nominally 14.7 psia (760 torr)

d. The calculated analog output is: (760 torr/1000 torr) x 5 VDC= 3.80 Vdc.

e. The actual output of the pressure controller is within 5% of the calculated value.

Example of calculations (DeviceNet Version)

a. Pressure controller is calibrated to 1000 torr full scale.

b. 100% output equals 1000 torr.

c. When the pressure controller is open to atmosphere, the actual output signal from the pressure controller is 78%.
Atmospheric pressure is nominally 14.7 psia (760 torr)

d. The calculated output is: (760 torr/1000 torr) x 100%= 76%

e. The actual output of the pressure controller is within 5% of the calculated value.

If the pressure controller output is within limits, the problem is in the control valve or the system itself. Please contact Brooks Instrument for further recommendations.

C. Disassembly

It is not practical to disassemble the controller in the field. The spacing between the valve and the orifice is critical and could change when disassembled and reassembled. New screws and metal seals must be used for all pressure boundary components.

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Dansk

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Emne	**:**	**Tillæg til instruktions manual.**
Reference	**:**	**CE mærkning af Masse Flow udstyr**
Dato	**:**	**Januar-1996.**

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 100% dækning.

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

Skærmen skal forbindes, i begge ender, til stikkets metalhus eller PG-forskruningen 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 100% dækning.

Skærmen bør være forbundet til jord.

Forbindelse af stikket; venligst referer til vedlagte instruktions manual.

Med venlig hilsen,

Deutsch

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Subject	**:**	**Nachtrag zur Bedienungsanleitung.**
Referenz	**:**	**CE Zertifizierung für Massedurchflußgeräte**
Datum	**:**	**Januar-1996.**

Nach erfolgreichen Tests enstprechend den Vorschiften 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

100 %igenSchirmababdeckung des Kabels gewährleistet ist.

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

Wenn möglich, sollten Kabeldurchführungen mit Anschlußmöglichkeiten für die Kabelabschrimung 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-Steckverbindunger sind standardmäßige keine metallgeschirmten Verbindungen. Um die Anforderungen der CE-Zertifizierung zu erfüllen, sind Kabel mit einer 100 %igen Schirmababdeckung zu verwenden.

Die Abschirmung ist mit dem Erdpotential zu verbinden.

Die Belegung der Anschlußpins können Sie dem beigelegten Bedienungshandbuch entnehmen.

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English

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Subject	**:**	**Addendum to the Instruction Manual.**
Reference	**:**	**CE certification of Mass Flow Equipment**
Date	**:**	**January-1996.**

The Brooks (electric/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, cable glands and connectors:

Brooks 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 a 100% shield.

“D” or “Circular” type connectors used should be shielded with a metal shield. If applicable, metal cable glands must be used providing cable screen clamping.

The cable screen should be connected to the metal shell or gland and shielded at both ends over 360 Degrees.

The shield should be terminated to a earth ground.

Card Edge Connectors are standard non-metallic. The cables used must be screened with 100% shield to comply with CE certification.

The shield should be terminated to a earth ground.

For pin configuration : Please refer to the enclosed Instruction Manual.

Español

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Asunto	**:**	**Addendum al Manual de Instrucciones.**
Referencia	**:**	**Certificación CE de los Equipos de Caudal Másico**
Fecha	**:**	**Enero-1996.**

Los equipos de Brooks (eléctricos/electrónicos) en relación con la marca CE han pasado satisfactoriamente las pruebas referentes a las regulaciones de Compatibilidad Electro magnética (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 100%.

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 100% para cumplir con la certificación CE.

La pantalla deberá conectarse a tierra.

Para ver la configuración de los pines: Por favor, consultar Manual de Instrucciones adjunto.

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Français

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Sujet	**:**	**Annexe au Manuel d'Instructions.**
Référence	**:**	**Certification CE des Débitmètres Massiques à Effet Thermique.**
Date	**:**	**Janvier 1996.**

Messieurs,

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 100 %.

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 100% pour satisfaire à la réglementation CE.

Tous les blindages doivent être reliés à la terre.

Se référer au manuel d'instruction pour le raccordement des contacts.

Greek

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

α :Προσθήκη στο Εγχειρίδιο Οδηγιών.
:ικά :Πιστοποίηση CE των Οργάνων Μέτρησης Παροχής Μάζας.
ρομηνία :Ιανουάριος - 1996

ζυρίες και Κύριοι,

Γα όργανα (ηλεκτρικά/ηλεκτρονικά) της Brooks τα οποία φέρουν το σήμα CE έχουν πιτυχώς ελεγχθεί σύμφωνα με τους κανονισμούς της Ηλεκτρο-Μαγνητικής ζυμβατότητας (EMC ντιρεκτίβα 89/336/EEC).
Οπωσδήποτε χρειάζεται ειδική προσοχή κατά τήν επιλογή του καλωδίου μεταφοράς ου σήματος το οποίο (καλώδιο) πρόκειται να χρησιμοποιηθεί με όργανα που φέρουν ο σήμα CE.

Ιοιότητα 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 00%.

Οι σύνδεσμοι τύπου "D" ή "Κυκλικοί" των καλωδίων, πρέπει να θωρακίζονται με εταλλική θωράκιση. Εάν είναι εφαρμόσιμο, πρέπει να χρησιμοποιούνται μεταλλικοί τυπιοθλίπτες καλωδίων που να διαθέτουν ακροδέκτη σύνδεσης του πλέγματος του αλωδίου.
Το πλέγμα του καλωδίου πρέπει να συνδέεται στο μεταλλικό περίβλημα ή στον τυπιοθλίπτη 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 α φέρουν πλέγμα θωράκισης 100% για να υπακούουν στην πιστοποίηση CE.
Η θωράκιση πρέπει να καταλήγει σε κάποιο ακροδέκτη γείωσης.

ια την διάταξη των ακροδεκτών: Παρακαλούμε αναφερθείτε στο εσώκλειστο γχειρίδιο Οδηγιών.

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Italiano

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Oggetto : Addendum al manuale di istruzioni.
Riferimento : Certificazione CE dei misuratori termici di portata in massa
Data : Gennaio 1996.

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 Elettomagnetica (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 100%.

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 100% per soddisfare la certificazione CE.

Lo schermo deve essere collegato ad un terminale di terra.

Per il corretto cablaggio dei terminali occorre fare riferimento agli schemi del manuale di istruzioni dello strumento.

Nederlands

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Onderwerp : Addendum voor Instructie Handboek
Referentie : CE certificering voor Mass Flow Meters & Controllers
Datum : Januari 1996

Dames en heren,

Alle CE gemarkeerde elektrische en elektronische produkten 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 produkten.

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 100%.
- "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 kabelscherm in te klemmen
  Het kabelscherm 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 100% om te voldoen aan de CE certificering.
  Het scherm moet worden verbonden met aarde.

Voor pin-configuraties a.u.b. verwijzen wij naar het bijgesloten instruktie handboek.

Hoogachtend,

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Norsk

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Vedrørende	**:**	**Vedlegg til håndbok**
Referanse	**:**	**CE sertifisering av utstyr for massestrømsmåling og regulering**
Dato	**:**	**Januar 1996**

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, 100% 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 kabelen 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, 100% skjerming som kobles til elektrisk jord på riktig pinne i pluggen, for å møte CE sertifiseringskrav.

For tilkobling av medleverte plugger, vennligst se håndboken som hører til utstyret.

Vennlig hilsen

Português

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Assunto	**:**	**Adenda ao Manual de Instruções**
Referência	**:**	**Certificação CE do Equipamento de Fluxo de Massa**
Data	**:**	**Janeiro de 1996.**

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).

Todavia, 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 requesitos 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 100%.

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 360º.

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 100% nos termos da Certificação CE..

A blindagem deve terminar com ligação à massa.

Relativamente à configuração da cavilha, queiram consultar o Manual de Instruções.

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Suomi
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Hatfield, PA 19440
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Asia	**: Lisäys Käyttöohjeisiin**
Viite	**: Massamäärämittareiden CE sertifiointi**
Päivämäärä	**: Tammikuu 1996**

Brooksin CE merkillä varustetut sähköiset laitteet ovat läpäissyt EMC testit (direktiivi 89/336/EEC).
Erityistä huomiota on kuitenkin kiinnitettävä signaalikaapelin valintaan.

Signaalikaapelin, kaapelin läpiviennin ja liittimen laatu
Brooks toimittaa korkealaatuisia kaapeleita, jotka täyttävät CE sertifikaatin vaatimukset. Hankkiessaan signaalikaapelin itse, olisi hankittava 100%:sti suojattu kaapeli.
“D” tai “Circular” tyyppisen liitimen tulisi olla varustettu metallisuojalla. Mikälì mahdollista, tulisi käyttää metallisia kaapeliliittimiä kiinnitettäessä suojaa.
Kaapelin suoja tulisi olla liitetty metallisuojaan tai liittimeen molemmissa päissä 360°:n matkalta.
Suojan tulisi olla maadoitettu.
“Card Edge Connector”it ovat standarditoimituksina ei-metallisia. Kaapeleiden täytyy olla 100%: sesti suojattuja jotta ne olisivat CE sertifikaatin mukaisia.
Suoja on oltava maadoitettu.
Nastojen liittäminen; katso liitteenä oleva manuaali.
Ystävällisin terveisin,

Svensk
Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Subject	**: Addendum to the Instruction Manual**
Reference	**: CE certification of Mass Flow Equipment**
Date	**: January 1996**

Brooks (elektriska / elektronik) utrustning, som är CE-märkt, har testats och godkänts enligt gällande regler för elektromagnetisk kompabilitet (EMC direktiv 89/336/EEC).
Speciell hänsyn måste emellertid tas vid val av signalkabel som ska användas tillsammans med CE-märkt utrustning.

Kvalitet på signalkabel och anslutningskontakter:
Brooks levererar som standard, kablar av hög kvalitet som motsvarar de krav som ställs för CE-godkännande.
Om man använder en annan signalkabel ska kabeln i sin helhet vara skärmad till 100%. “D” eller “runda” typer av anslutningskontakter ska vara skärmade. Kabelgenomföringar ska vara av metall alternativt med metalliserad skärmning.
Kabelns skärm ska, i bada ändar, vara ansluten till kontakternas metallkåpor eller genomföringar med 360 graders skärmning.
Skärmen ska avslutas med en jordförbindelse.
Kortkontakter är som standard ej metalliserade, kablar som används måste vara 100% skarmade för att överensstämma med CE-certifieringen.
Skärmen ska avslutas med en jordförbindelse.
För elektrisk anslutning till kontaktstiften hänvisas till medföljande instruktionsmanual.

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