Installation and Operation Manual
X-PR-SLA5800-SLAMf-Series-RevB-PC-eng
Part Number: 541B198AAG
November, 2020

Brooks® Digital
Elastomer Sealed Pressure Controllers
Models SLA5810/20 and SLAMf10/20

Model SLA5810/20

Model SLAMf10/20

Models SLA5810/20 and SLAMf10/20

Essential Instructions
Read before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. These products must be properly installed, operated and maintained 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, operating and maintaining Brooks Instrument products.

- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- 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.

⚠ **WARNING: Do not operate this instrument in excess of the specifications listed in the Instruction and Operation Manual. Failure to heed this warning can result in serious personal injury and / or damage to the equipment.**

- 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.

⚠ **WARNING: Prior to installation ensure this instrument has the required approval ratings to meet local and national codes. Failure to heed this warning can result in serious personal injury and / or damage to the equipment.**

- 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.
- Operation: (1) Slowly initiate flow into the system. Open process valves slowly to avoid flow surges. (2) Check for leaks around the flow meter inlet and outlet connections. If no leaks are present, bring the system up to the operating pressure.
- Please make sure that the process line pressure is removed prior to service. 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 to prevent electrical shock and personal injury, except when maintenance is being performed by qualified persons.

⚠ **WARNING: For liquid flow devices, if the inlet and outlet valves adjacent to the devices are to be closed for any reason, the devices must be completely drained. Failure to do so may result in thermal expansion of the liquid that can rupture the device and may cause personal injury.**

European 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 Specifications Section of this manual contains instructions related to the PED directive.
- Products described in this manual are in compliance with EN directive 2014/34/EU.
- All Brooks Instrument Flowmeters fall under fluid group 1.
- Products larger than 25mm or 1" (inch) are in compliance with PED category I, II or III.
- Products of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

European Electromagnetic Compatibility (EMC)

The Brooks Instrument (electric/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (EMC directive 2014/30/EU).
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 Instrument 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 an 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 an earth ground.
For pin configuration : Please refer to the enclosed Instruction Manual.

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 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 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.

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

Figures

Tables

1-1 Scope

Thank you for purchasing a Brooks Instrument Digital Pressure Product. This manual, X-PR-SLA5800-SLAMf-Series-RevB-PC-eng is an installation and operation manual for your instrument.

If you have purchased a Brooks® Digital Mass Flow Product with DeviceNet™ or Profibus® Communications, a separate Instruction Manual shall also be provided as part of the operating documentation.

1-2 Purpose

The Brooks models SLA5810/20 and SLAMf10/20 are pressure measurement devices designed for accurately measuring and rapidly controlling the upstream or downstream pressure in a flow system. This instruction manual is intended to provide the user with all the information necessary to install, operate and maintain the Brooks® PC. This manual is organized into the following sections.

Section 1	Introduction
Section 2	Installation
Section 3	Operation
Section 4	Maintenance & Troubleshooting
Section A	Essential Instructions
Back Cover	Warranty, Local Sales/Service Contact Information

It is recommended that this manual be read in its entirety before attempting to operate or repair these Digital products.

1-3 Description

Brooks Instrument's digital elastomer sealed pressure measurement and control product line offers unparalleled flexibility and performance. The SLA5800/SLAMf Series of Elastomer Seal pressure measurement and control devices are the most accurate, repeatable, and responsive controller on the market today!

Brooks offers traditional analog options as well as RS485 digital communications ("S-protocol", based on HART). Brooks also offers control interfaces via digital network protocols like DeviceNet, a high speed (up to 500k baud) digital communication network, and Profibus. Brooks' communication capabilities and device-profiles have been certified by the ODVA (Open DeviceNet Vendor's Association) and the ITK (Interoperability Test Kit). Other network protocols are in development. Talk to your Brooks representative about your specific needs.

The process and command data may be 'wired' either using traditional 5 volt analog connections or digital communications networks; The measurement and control performance is the same!

The SLA5800/SLAMF Series microprocessor uses a multi-point calibration to deal with any residual integral sensor non-linearity, yielding a highly accurate process signal.

The SLA5800/SLAMf Series family of products utilizes a modular system in

both it's mechanical and electrical construction. This modularity allows for simplified customer ordering and factory configuration, enabling Brooks to easily meet the ever changing needs of our global customers.

This flexibility yields products for pressure measurement and control, using either traditional analog connections or leading edge network-communication protocols.

Brooks SLA5800 and SLAMf Series of pressure controllers can directly replace existing analog pressure controllers with the advantage of improved digital accuracy. Both analog and digital applications will see settling time and accuracy improvements.

1-4 Specifications

⚠ WARNING

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.

⚠ CAUTION

It is the user's responsibility to select and approve all materials of construction. Careful attention to metallurgy, engineered materials and elastomeric materials is critical to safe operation.

PC-based Support Tools

Brooks Instrument offers a variety of PC-based process control and service tools to meet the needs of our customers. SmartDDE may be used with any unit supporting RS485 in a multidrop configuration, thus allowing users to control and monitor their Brooks devices. The Brooks Expert Support Tool may be used to monitor, diagnose and tune SLA Enhanced Pressure Controllers. The Brooks Expert Support Tool interfaces with the SLA Enhanced Pressure Controllers via a service diagnostic port located on the top lid of the device (SLA58XX) or just inside the top cover (SLAMf).

Table 1-1 Flow Ranges and Pressure Ratings

Flow Ranges and Pressure Ratings:

Pressure Controller Model	Pressure Controller Control Mode	Flow Ranges N2 Eq. Ratings (lpm)		Minimum Full Scale Pressure	Maximum Full Scale Pressure	Pressure Equipment Directive (PED) Module H Category
		Min. F.S.	Max. F.S.	Standard	Standard	
SLA5810/SLAMf10	Downstream (Pressure Regulator)	0.003	50*	1 psi	1500 psia/103 bara	Sound Engineering Practices (SEP)
		0.1	10	1500 psi	4500 psia/310 bara	
SLA5820/SLAMf20	Upstream (Back Pressure Regulator)	0.003	50*	1 psi	1500 psia/103 bara	Sound Engineering Practices (SEP)
		0.1	10	1500 psi	4500 psia/310 bara	

* Consult sales agent or Brooks Instrument for flow limitations < 10 psi F.S. pressure

Table 1-2 Specifications

Performance	SLA58510/20 & SLAMf10/20
Pressure Accuracy (Including Linearity and Hysteresis)	±0.25% of Transducer F.S., F.S. > 300 psia ±0.12% of Transducer F.S., F.S. ≤ 300 psia
Flow Accuracy (N2 equivalent)	N/A
Control Range	20:1 Typical - Application specific
Repeatability & Reproducibility	0.20% S.P.
Linearity	Included in accuracy
Response Time (Settling time within ±2% F.S. for 0-100% command step)	System dependent
Zero Stability	< ± 0.001% F.S. per 30 days
Temperature Coefficient	±0.1% of F.S. per °C
Pressure Coefficient (Flow Measurement Only)	N/A
Attitude Sensitivity	The accuracy of the Pressure Sensor is not attitude dependent

Ratings

Operating Temperature Range	-14 to 65°C (7 to 149°F)**
Transducer Pressure Ratings	15 psia/1.03 bara for < 15 psia full scale 15 psig/1.03 barg for < 15 psig full scale 100 psia/6.9 bara for < 100 psia full scale 100 psig/6.9 barg for 15-100 psig full scale 300 psia/20.7 bara for 100-300 psia full scale 300 psig/20.7 barg for 100-300 psig full scale 3000 psia/206.9 bara for 300-3000 psia full scale 4500 psia/310.3 bara for 3000-4500 psia full scale
Leak Integrity (external)	$1x10^{-9}$ atm. cc/sec He

Mechanical

Valve Type	Normally Closed, Normally Open
Primary Wetted Materials	316L Stainless Steel, High Alloy Stainless Steel, Viton® fluoroelastomers. Optional Buna-N, Kalrez®, Teflon®/Kalrez®, and EPDM

Diagnostics

Status Lights	MFC Health, Network Status
Alarms*	Sensor Output, Control Valve Output, Over Temperature, Power Surge/Sag, Network Interruption
Diagnostic/Service Port	RS485 via 2.5 mm jack (Located under the top cover in SLAMf version)

*Alarm modes are dependent on the communications interface. These are described in the corresponding digital communication interface manual.
**Hazardous area certifications have a temperature range limitation of 0-65°C.

Table 1-3 Communication Protocols

Communication Protocol	RS485	Profibus®	DeviceNet® ***
Electrical Connection (SLA58xx)	1 x 15-pin Male Sub-D, (A)	1 x 15-pin Male Sub-D 1 x 9-pin Female Sub-D	1 M12 with threaded coupling nut (B)
Electrical Connection (SLAMf)	PG11 Cable Gland, 1/2" NPT (F) Conduit, M20 x 1.5 Conduit		N/A
Analog I/O	0-5 V, 1-5 V, 0-10 V, 0-20 mA, 4-20 mA		N/A
Power Max./Purge	From +13.5 Vdc to +27 Vdc		From +11 Vdc to +25 Vdc
Power Requirements Watts, Max.	Valve Orifice > 0.032": 8.7 Watts Valve Orifice ≤ 0.032": 5.2 Watts Without Valve: 2 Watts		Valve Orifice > 0.032": 10 Watts Valve Orifice ≤ 0.032": 7 Watts Without Valve: 4 Watts
Voltage Set Point Input Specifications			
Nominal Range	0-5 Vdc, 1-5 Vdc or 0-10 Vdc		N/A
Full Range	(-0.5)-11 Vdc		N/A
Absolute Max.	18 V (without damage)		N/A
Input Impedence	>990 kOhms		N/A
Current Set Point Input Specifications			
Nominal Range	4-20 mA or 0-20 mA		N/A
Full Range	0-22 mA		N/A
Absolute Max.	24 mA (without damage)		N/A
Input Impedence	100 Ohms		N/A
Flow Output (Voltage) Specifications			
Nominal Range	0-5 Vdc, 1-5 Vdc or 0-10 Vdc		N/A
Full Range	(-1)-11 Vdc		N/A
Min Load Resistance	2 kOhms		N/A
Flow Output (Current) Specifications			
Nominal Range	0-20 mA or 4-20 mA		N/A
Full Range	0-22 mA		N/A
Max. Load	380 Ohms		N/A
Analog I/O Alarm Ouput*			
Type	Open Collector		N/A
Max. Closed (On) Current	25 mA		N/A
Max. Open (Off) Leakage	1µA		N/A
Max. Open (Off) Voltage	30 Vdc		N/A
Analog I/O Valve Override Signal Specifications**			
Floating/Unconnected	Instrument controls valve to command set point		N/A
VOR < 0.3 Vdc	Valve Closed		N/A
0.3 Vdc < VOR < 4.8 Vdc	Undefined		N/A
VOR > 4.8 Vdc	Valve Open		N/A
Input Impedence	60 kOhms		N/A
Absolute Max. Input	(-25 Vdc) < VOR < 25 Vdc (without damage)		N/A

*The Alarm Output is an open collector or "contact type" that is CLOSED (on) whenever an alarm is active.
The Alarm Output may be set to indicate any one of various alarm conditions.

** The Valve Override Signal (VOR) is implemented as an analog input which measures the voltage at the input and controls the valve based upon the measured reading as shown in this section.

*** Available on SLA5810/20/40 only.

Table 1-4 Certifications - SLA58XX

Mark	Agency	Certification	Applicable Standard	Details
c UL us	UL (Recognized)	Class I, Div 2, Group A, B, C, D Class I, Zone 2, IIC T4 Class II, Zone 22	UL & CSA Standards	E73889 Vol 3, Sec 4
Ex	ATEX	II 3 G Ex ec IIC T4 Gc	EN 60079-0 : 2018 EN 60079-7 : 2015	KEMA 04ATEX 1118X
	IECEx	II 3 G Ex ec IIC T4 Gc	IEC 60079-0 : 2017 (Ed. 7) IEC 60079-7 : 2015 (Ed. 5)	IECEx DEK 14.0072X
KCs	KOSHA	Ex nA IIC T4		15-AV4BO-0641 15-AV4BO-0640
CE	CE	EMC Directive 2014/30/EU Directive 2011/65/EU	EN:61326-1:2013	EMC RoHS

Note: Not all certifications are available for all SLA5800 specifications and configurations. Please contact Applications Engineering for assistance.

*ATEX/IECEx Special Conditions for safe use:

1. The module shall be installed in a suitable enclosure providing a degree of protection of at least IP54 according to EN 60529 / IEC 60529, taking into account the environmental conditions under which the equipment will be used.
2. When the temperature under rated condition exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable shall be in compliance with the actual measured temperature values.
3. Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40%.
4. The equipment shall only be used in an area of not more than pollution degree 2, as defined in IEC 60664-1.

Table 1-5 Certifications - SLAMfXX

Mark	Agency	Certification	Applicable Standard	Details
c UL us	UL (Recognized)	Class I, Div 2, Group A, B, C, D Class I, Zone 2, IIC T4 Class II, Zone 22 IP66	UL & CSA Standards	E73889 Vol 3, Sec 4
c UL us	UL (Listed)	Class I, Div 2, Group A, B, C, D Class I, Zone 2, IIC T4 Class II, Zone 22 IP66	UL & CSA Standards	E73889 Vol 1, Sec 25
Ex	ATEX	II 3 G Ex ec IIC T4 Gc II 3 D Ex tc IIIC T 85 °C Dc IP66	EN 60079-0 : 2018 EN 60079-7 : 2015 EN 60079-31 : 2014	KEMA 04ATEX1290 X
	IECEx	Ex ec IIC T4 Gc Ex tc IIIC T 85 °C Dc IP66	IEC 60079-0 : 2017 (Ed. 7) IEC 60079-7 : 2015 (Ed. 5) IEC 60079-31 : 2013 (Ed. 2)	IEC KEM 07.0043X
KCs	KOSHA	Ex nA IIC T4 Ex tD A22 IP66 T85°C		15-AV4BO-0638 15-AV4BO-0639 16-AV4BO-0328X 16-AV4BO-0327X
CE	CE	EMC Directive 2014/30/EU Directive 2011/65/EU	EN 61326-1:2013	EMC RoHS

Note: Not all certifications are available for all SLAMF specifications and configurations. Please contact Applications Engineering for assistance.

ATEX Special Conditions:

1. When the temperature under rated condition exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable shall be in compliance with the actual measured temperature values.
2. Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40%.

IECEx Special Conditions:

1. When the temperature under rated condition exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable shall be in compliance with the actual measured temperature values.
2. Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40%.
3. The equipment shall only be used in an area of not more than pollution degree 2, as defined in IEC 60664-1.

SLAMf UL Listed Installation Instructions:

1. The hazardous locations classes, groups and division as described under products covered.
2. WARNING – EXPLOSION HAZARD – Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.
3. WARNING – EXPLOSION HAZARD - Substitution of any components may impair suitability for Class I, Division 2.
4. To maintain type 4X/IP66 rating zero screw must be installed.

UL Recognized versions of SLAMf - Conditions of Acceptability:

1. These devices are to be used within their ratings.
2. These devices are to be mounted in a suitable enclosure in the end product rated not less than IP40.
3. The wiring terminals are suitable for field wiring.
4. The suitability of the wiring method is to be determined in the end-use application.
5. These devices are intended to be powered by a class 2 power source.
6. These devices were evaluated for use in a maximum ambient temperature of 65°C.

KOSHA Special Conditions:

1. The equipment shall only be used in an area of not more than pollution degree 2, as defined in KS C IEC 60664-1.
2. When the temperature under rated condition exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable shall be in compliance with the actual measured temperature values.
3. The surge protector should be installed to prevent a transient voltage. (140% of rated voltage)

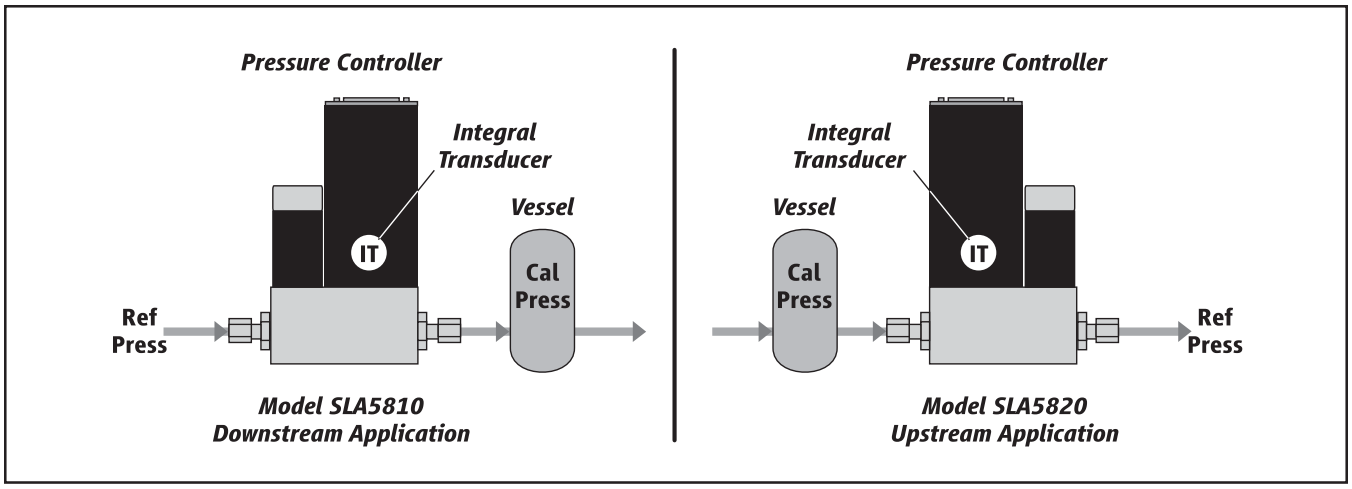
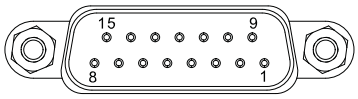


Figure 1-1 Typical Configurations

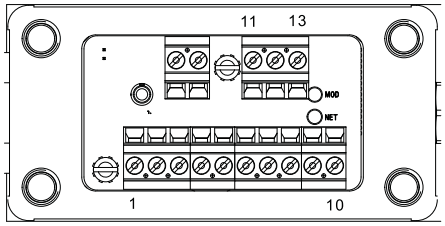
Analog/RS485: SLA5810/20



15-PIN SUB-D MALE CONNECTOR	
PIN #	FUNCTION
1	SETPOINT COMMON
2	PRESSURE OUTPUT (0-5V, 1-5V)
3	ALARM OUT
4	PRESSURE OUTPUT (0-20 mA, 4-20 mA)
5	POWER SUPPLY (13.5-27V)
6	NOT CONNECTED
7	SETPOINT INPUT (0-20mA, 4-20mA)
8	SETPOINT INPUT (0-5V, 1-5V)
9	POWER COMMON
10	PRESSURE OUT COMMON
11	NOT CONNECTED
12	VALVE OVERRIDE INPUT
13	AUX INPUT (0-5V, 0-10V)
14	RS-485, B (-), INPUT/OUTPUT
15	RS-485, A (+), INPUT/OUTPUT

Analog/RS485: SLAMf10/20

TOP VIEW
SHOWN WITH COVER REMOVED



TERMINAL	FUNCTION
1	SETPOINT COMMON
2	PRESSURE OUTPUT (0-5V, 1-5V)
3	ALARM OUT
4	PRESSURE OUTPUT (0-20mA, 4-20mA)
5	POWER SUPPLY (13.5-27V)
6	SETPOINT INPUT (0-20mA, 4-20mA)
7	SETPOINT INPUT (0-5V, 1-5V)
8	POWER COMMON
9	PRESSURE OUT COMMON
10	VALVE OVERRIDE INPUT
11	AUX INPUT (0-5V, 0-10V)
12	RS-485, B (-), INPUT/OUTPUT
13	RS-485, A (+), INPUT/OUTPUT

Figure 1-2 SLA5810/20 and SLAMf10/20 Analog/RS485 Connections and Pinouts

RS485 Communications

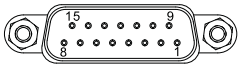
The Brooks Digital Series is equipped with RS485 communication capability. Refer to Figure 1-2 (Analog I/O pin connections), that enables the device to communicate via a personal computer for process control.

Baud rate selections for the Brooks Digital Series related to RS485 are: 1200, 2400, 4800, 9600, 19200 and 38400 baud and can be selected via the Brooks Expert Support Tool (BEST).

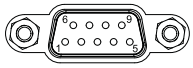
The RS485 is essentially a multidrop connection. It allows a maximum of 32 devices to be connected to a computer system. IBM-compatible PC's are not equipped with RS485 ports as standard. An RS232/USB to RS485 converter or RS485 interface board is therefore required to connect an RS485 network to a standard PC. The RS485 bus, a daisy chain network, meaning that the wires are connected at the units.

Note: Aux Input is used for Remote Transducer Pressure Controllers only.

Profibus: SLA5810/20

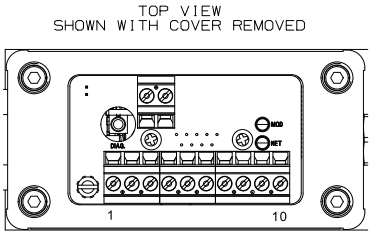


15-PIN SUB-D MALE CONNECTOR	
PIN #	FUNCTION
1	SETPOINT COMMON
2	PRESSURE OUTPUT (0-5V, 1-5V, 0-10V)
3	ALARM OUT
4	PRESSURE OUTPUT (0-20mA, 4-20mA)
5	POWER SUPPLY (13.5-27V)
6	NOT CONNECTED
7	SETPOINT INPUT (0-20mA, 4-20mA)
8	SETPOINT INPUT (0-5V, 1-5V, 0-10V)
9	POWER COMMON
10	PRESSURE OUT COMMON
11	NOT CONNECTED
12	VALVE OVERRIDE INPUT
13	AUX INPUT (0-5V, 0-10V)
14	NOT CONNECTED
15	NOT CONNECTED



9-PIN SUB-D FEMALE CONNECTOR	
PIN #	FUNCTION
1	NOT CONNECTED
2	NOT CONNECTED
3	RXD/TXD - B - red wire
4	NOT CONNECTED
5	GROUND
6	+5Vdc
7	NOT CONNECTED
8	RXD/TXD - A - green wire
9	NOT CONNECTED

Profibus: SLAMf10/20



TERMINAL	FUNCTION	
1	POWER SUPPLY (13.5-27V)	
2	VALVE OVERRIDE INPUT	
3	POWER COMMON	
4	AUX COMMON	
5	AUX INPUT (0-5V, 0-10V)	
TERMINAL	PROFIBUS M12 CONNECTOR WIRES TO TERMINALS 6-10	
6	P5V	(BROWN)
7	RXD/TXD - B-LINE	(RED)
8	GROUND	(BLUE)
9	RXD/TXD - A-LINE	(GREEN)
10	SHIELD	(GRAY)

Note: Aux Input is used for
Remote Transducer Pressure Controllers only.

Figure 1-3 SLA5810/20 and SLAMF10/20 Profibus Connections and Pinouts

Profibus® Communications

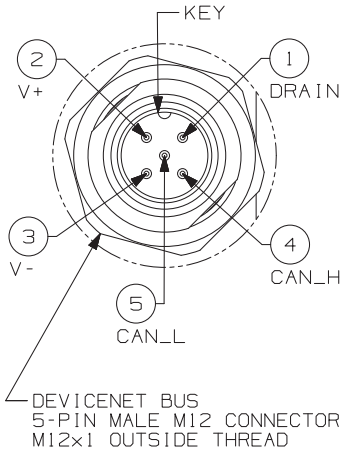
The Brooks SLA58xx/SLAMfxx is now equipped to support the Profibus communication protocol. Profibus is a fieldbus-based automation standard of Profibus and Profinet International (PI). Via a single bus cable, Profibus links controller or control systems with decentralized field devices (sensors and actuators) on the field level and also enables consistent data exchange with higher ranking communication systems. A 9-pin sub-D connector is included on every device and is galvanic isolated from the main electronics as defined by the EN 50170 Profibus standard to allow easy network connection separate from the main connector. The main 15-pin sub-D connector or termination board is still needed for the power supply, but also allows for the standard analog I/O signals, analog valve override, and (open-collector) alarm signaling to be used separate from the network connection.

The communication electronics allows for automatic baud rate detection ranging from 9600 baud to 12 Mbaud, thus making the need for any hardware baud rate selection methods not required. For selecting the device address, which must be unique on the network, two rotary switches are provided. This allows a user to easily select any address number ranging from 0 to 126. This can provide fast device replacement without complex network configurations. The Profibus-DP piggyback board is equipped with a zero command pushbutton, allowing the user to give a manual command to the device to (re)balance the flow sensor electronics. This command can also be issued through the protocol.

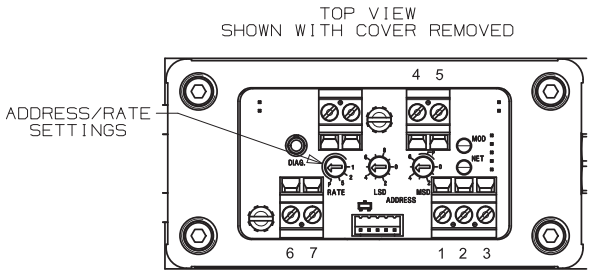
The Profibus-DP communication option supports the following message types:

- Cyclic data exchange (Write/Read data).
- Read inputs (e.g. status, flow, temperature, totalizer, etc.).
- Read outputs (e.g. commands, setpoint).
- Global control commands (e.g. fail safe, sync).
- Get configuration (i.e. read number of I/O bytes and composition).
- Read diagnostics information (i.e. get error and alarm status).
- Set parameters (i.e. select gas number, engineering units, I/O configuration
- Set parameters (i.e. select gas number, engineering units, I/O configuration etc.).
- Check configuration (i.e. check I/O composition).

DeviceNet: SLA5810/20



DeviceNet: SLAMf10/20



TERMINAL	FUNCTION
1	DRAIN
2	POWER SUPPLY (11-25V)
3	POWER COMMON
4	CAN_H
5	CAN_L
6	AUX COMMON
7	AUX INPUT (0-5V, 0-10V)

Note: Aux Input is used for Remote Transducer Pressure Controllers only.

Figure 1-4 SLA5810/20 and SLAMf10/20 DeviceNet Connections and Pinouts

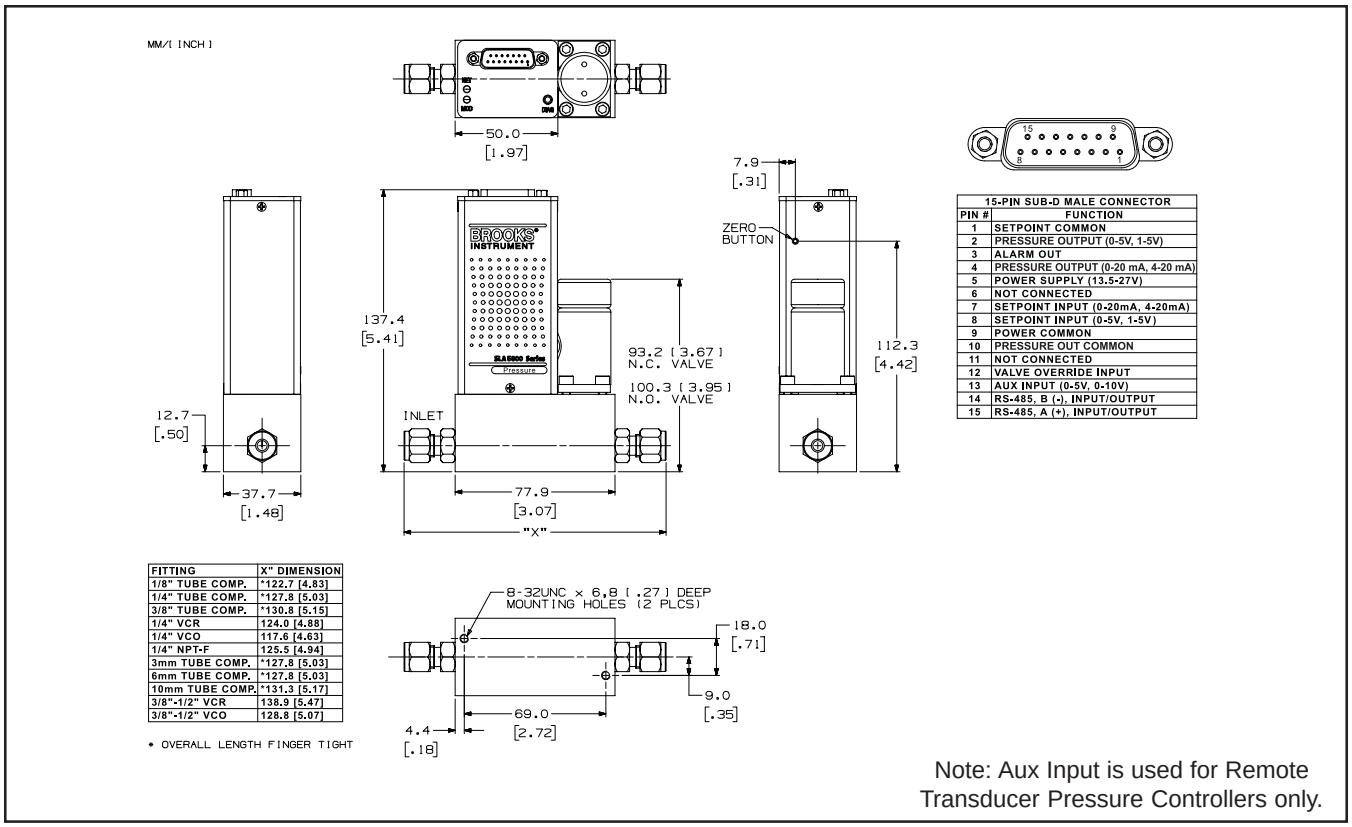
DeviceNet™ Communications

The Brooks SLA58xx/SLAMfxx is also available with DeviceNet™ communication capability. DeviceNet is an open digital protocol capable of high speeds and easy system connectivity. Brooks Instrument has several of its devices available on this popular networking standard, and is a member of ODVA™ (Open DeviceNet Vendors Association), the governing standard body for DeviceNet.

DeviceNet is similar to the RS485 standard in that it is a multi-drop connection that allows a maximum of 64 devices to be connected on the same network. Baud rate selections for DeviceNet products are 125K, 250K and 500K and can be selected via MAC ID switches mounted on the device.

The DeviceNet communication link also provides access to many of the Brooks SLAMf Digital Series functions for “control and monitor” operations, including:

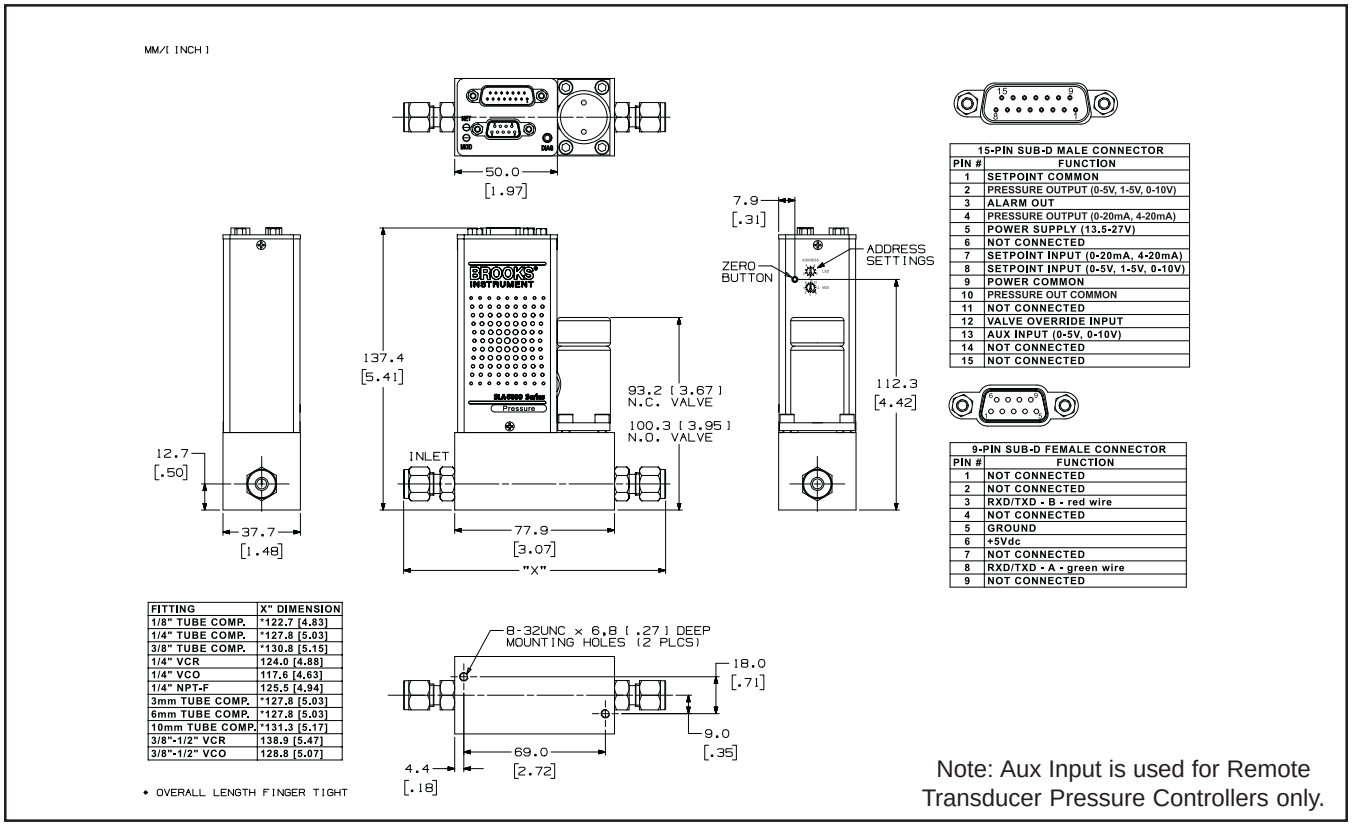
- Accurate setpoint adjustment and flow output measurement (including units of measure selection)
- PID Settings (controller only)
- Valve Override (controller only)
- Calibration Gas Select
- Soft Start Control (controller only)



FITTING	X" DIMENSION
1/8" TUBE COMP.	*122.7 [4.83]
1/4" TUBE COMP.	*127.8 [5.03]
3/8" TUBE COMP.	*130.8 [5.15]
1/4" VCR	124.0 [4.88]
1/4" VCO	117.6 [4.63]
1/4" NPT-F	125.5 [4.94]
3mm TUBE COMP.	*127.8 [5.03]
6mm TUBE COMP.	*127.8 [5.03]
10mm TUBE COMP.	*131.3 [5.17]
3/8"-1/2" VCR	138.9 [5.47]
3/8"-1/2" VCO	128.8 [5.07]

15-PIN SUB-D MALE CONNECTOR	
PIN #	FUNCTION
1	SETPOINT COMMON
2	PRESSURE OUTPUT (0-5V, 1-5V)
3	ALARM OUT
4	PRESSURE OUTPUT (0-20 mA, 4-20 mA)
5	POWER SUPPLY (13.5-27V)
6	NOT CONNECTED
7	SETPOINT INPUT (0-20mA, 4-20mA)
8	SETPOINT INPUT (0-5V, 1-5V)
9	POWER COMMON
10	PRESSURE OUT COMMON
11	NOT CONNECTED
12	VALVE OVERRIDE INPUT
13	AUX INPUT (0-5V, 0-10V)
14	RS-485, B (-), INPUT/OUTPUT
15	RS-485, A (+), INPUT/OUTPUT

Figure 1-5 Dimensions - Models SLA5810/20, Thru-Flow, RS485

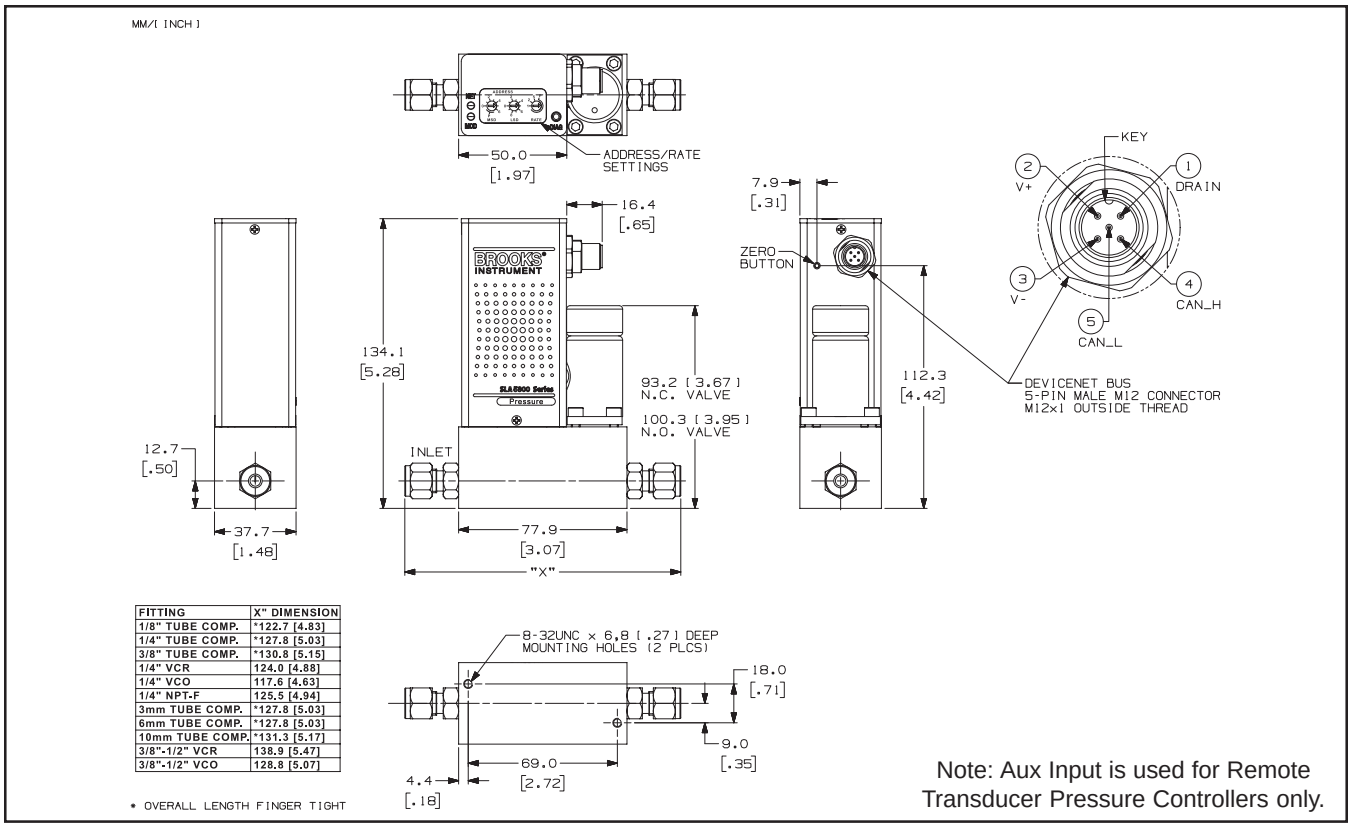


FITTING	X" DIMENSION
1/8" TUBE COMP.	*122.7 [4.83]
1/4" TUBE COMP.	*127.8 [5.03]
3/8" TUBE COMP.	*130.8 [5.15]
1/4" VCR	124.0 [4.88]
1/4" VCO	117.6 [4.63]
1/4" NPT-F	125.5 [4.94]
3mm TUBE COMP.	*127.8 [5.03]
6mm TUBE COMP.	*127.8 [5.03]
10mm TUBE COMP.	*131.3 [5.17]
3/8"-1/2" VCR	138.9 [5.47]
3/8"-1/2" VCO	128.8 [5.07]

15-PIN SUB-D MALE CONNECTOR	
PIN #	FUNCTION
1	SETPOINT COMMON
2	PRESSURE OUTPUT (0-5V, 1-5V, 0-10V)
3	ALARM OUT
4	PRESSURE OUTPUT (0-20mA, 4-20mA)
5	POWER SUPPLY (13.5-27V)
6	NOT CONNECTED
7	SETPOINT INPUT (0-20mA, 4-20mA)
8	SETPOINT INPUT (0-5V, 1-5V, 0-10V)
9	POWER COMMON
10	PRESSURE OUT COMMON
11	NOT CONNECTED
12	VALVE OVERRIDE INPUT
13	AUX INPUT (0-5V, 0-10V)
14	NOT CONNECTED
15	NOT CONNECTED

9-PIN SUB-D FEMALE CONNECTOR	
PIN #	FUNCTION
1	NOT CONNECTED
2	NOT CONNECTED
3	RXD/TXD - B - red wire
4	NOT CONNECTED
5	GROUND
6	+5Vdc
7	NOT CONNECTED
8	RXD/TXD - A - green wire
9	NOT CONNECTED

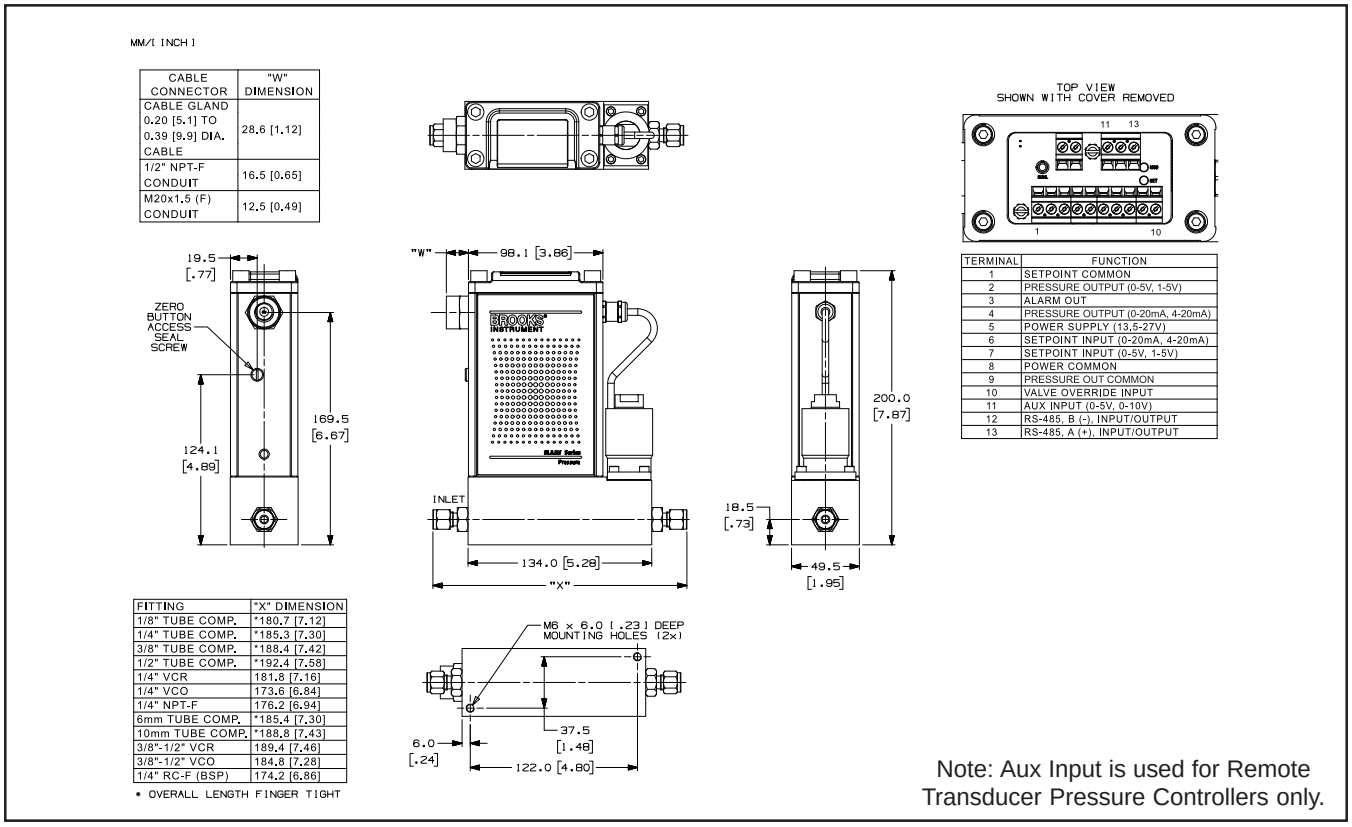
 Figure 1-6 Dimensions - Models SLA5810/20, Thru-Flow, Profibus



FITTING	"X" DIMENSION
1/8" TUBE COMP.	*122.7 [4.83]
1/4" TUBE COMP.	*127.8 [5.03]
3/8" TUBE COMP.	*130.8 [5.15]
1/4" VCR	124.0 [4.88]
1/4" VCO	117.6 [4.63]
1/4" NPT-F	125.5 [4.94]
3mm TUBE COMP.	*127.8 [5.03]
6mm TUBE COMP.	*127.8 [5.03]
10mm TUBE COMP.	*131.3 [5.17]
3/8"-1/2" VCR	138.9 [5.47]
3/8"-1/2" VCO	128.8 [5.07]

* OVERALL LENGTH FINGER TIGHT

Figure 1-7 Dimensions - Models SLA5810/20, Thru-Flow, DeviceNet



CABLE CONNECTOR	"W" DIMENSION
CABLE GLAND 0.20 [5.1] TO 0.39 [9.9] DIA. CABLE	28.6 [1.12]
1/2" NPT-F CONDUIT	16.5 [0.65]
M20x1.5 (F) CONDUIT	12.5 [0.49]

FITTING	"X" DIMENSION
1/8" TUBE COMP.	*180.7 [7.12]
1/4" TUBE COMP.	*185.3 [7.30]
3/8" TUBE COMP.	*188.4 [7.42]
1/2" TUBE COMP.	*192.4 [7.58]
1/4" VCR	181.8 [7.16]
1/4" VCO	173.6 [6.84]
1/4" NPT-F	176.2 [6.94]
6mm TUBE COMP.	*185.4 [7.30]
10mm TUBE COMP.	*188.8 [7.43]
3/8"-1/2" VCR	189.4 [7.46]
3/8"-1/2" VCO	184.8 [7.28]
1/4" RC-F (BSP)	174.2 [6.86]

* OVERALL LENGTH FINGER TIGHT

TERMINAL	FUNCTION
1	SETPOINT COMMON
2	PRESSURE OUTPUT (0-5V, 1-5V)
3	ALARM OUT
4	PRESSURE OUTPUT (0-20mA, 4-20mA)
5	POWER SUPPLY (13.5-27V)
6	SETPOINT INPUT (0-20mA, 4-20mA)
7	SETPOINT INPUT (0-5V, 1-5V)
8	POWER COMMON
9	PRESSURE OUT COMMON
10	VALVE OVERRIDE INPUT
11	AUX INPUT (0-5V, 0-10V)
12	RS-485, B (-), INPUT/OUTPUT
13	RS-485, A (+), INPUT/OUTPUT

Figure 1-8 Dimensions - Models SLAMf10/20, Thru-Flow, RS485

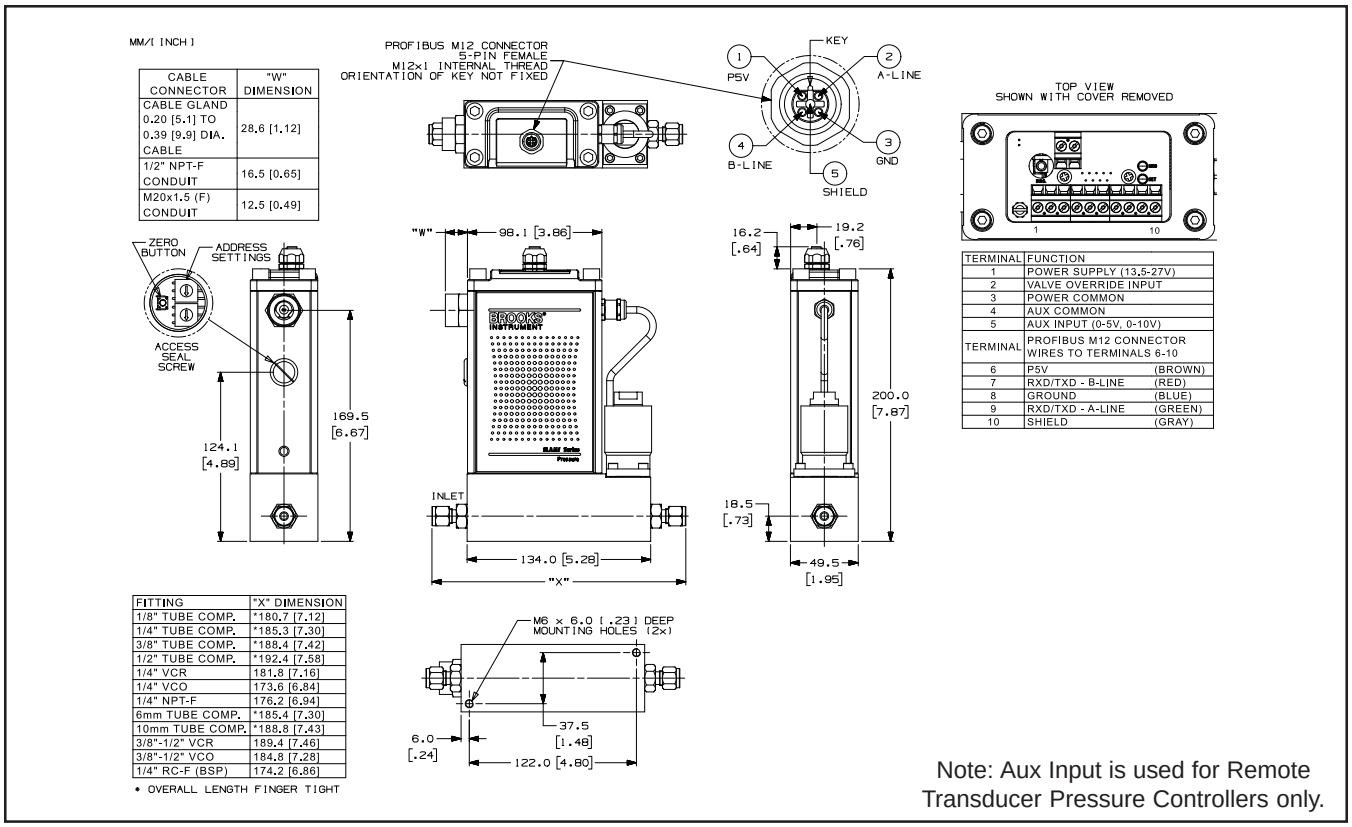


Figure 1-9 Dimensions - Models SLAMf10/20, Thru-Flow, Profibus

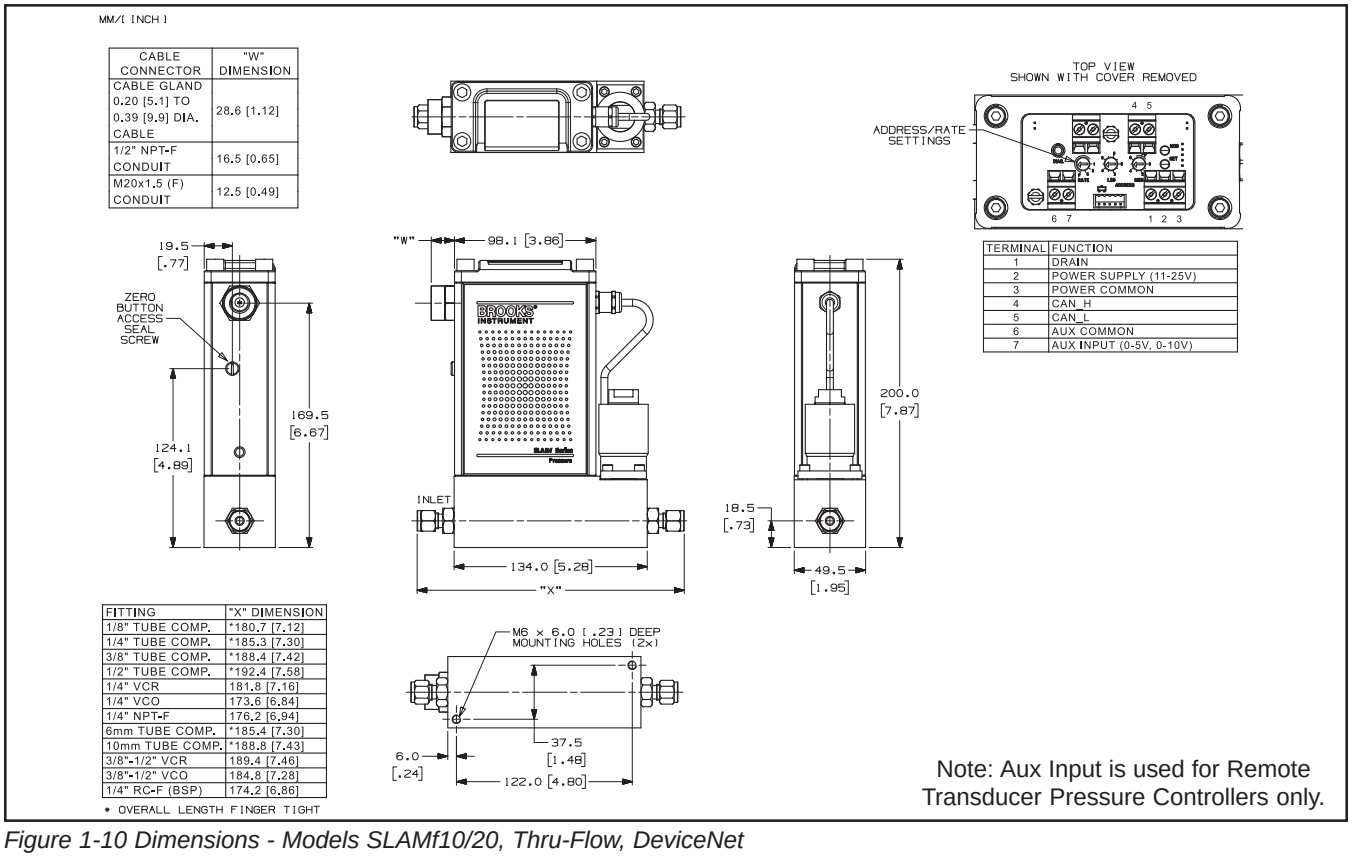


Figure 1-10 Dimensions - Models SLAMf10/20, Thru-Flow, DeviceNet

2-1 General

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

2-2 Receipt of Equipment

When the equipment 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 the nearest Brooks Instrument location listed on the Global Service Network page on our website: BrooksInstrument.com/GlobalSupportCenters

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 dry, temperature controlled room
c. 15°C (32°F) minimum, 35°C (149°F) maximum.
d. Relative humidity 45% nominal, 60% maximum, 25% minimum.
e. 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 for any reason, visit our website for instructions on how to obtain a Return Materials Authorization Number (RMA #) and complete a Decontamination Statement to accompany it: BrooksInstrument.com/Service. All instruments returned to Brooks also require a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument. Failure to provide this information will delay processing of the instrument.

Instrument must have been purged in accordance with the following:

⚠ WARNING

Before returning the device, purge thoroughly with a dry inert gas such as Nitrogen before disconnecting process connections. Failure to correctly purge the instrument 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 Removal from Storage

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

2-7 Gas Connections

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 In-Line Filter

It is recommended that an in-line filter be installed upstream from the pressure controller to prevent the possibility of any foreign material entering the sensor or control valve. The filtering element should be replaced periodically or ultrasonically cleaned.

Table 2-1 Recommended Filter Size

Maximum Flow Rate	Recommended Filter
100 sccm	2 micron
500 sccm	5 micron
1 to 5 slpm	10 micron
10 to 50 slpm	40 micron

2-9 Installation

Recommended installation procedures:

a. The Pressure Controller should be located in a clean, dry atmosphere relatively free from shock and vibration.

b. Install in such a manner that permits easy removal if the instrument requires servicing.

c. Leave sufficient room for access to Self-zero function push-button.

d. Note the PC is zeroed at the factory in a no flow condition at a vacuum pressure less than 2 millitorr. If the PC needs to be rezeroed, it is imperitive to do so at factory conditions.

⚠ 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 instrument purged with clean, dry N_2 before use.

⚠ CAUTION

Any sudden change in system pressure may cause mechanical damage to elastomer materials. Damage can occur when there is a rapid expansion of fluid that has permeated elastomer materials. The user must take the necessary precautions to avoid such conditions.

⚠ CAUTION

Since the SLA control valve is not designed to provide positive shut-off, a separate shut-off valve may be installed downstream or upstream for that purpose. It should be noted that a small amount of gas may be trapped between the pressure controller and the shut-off valve which will result in a surge upon actuation of the shut-off valve. This surge can be reduced in magnitude by locating the controller and the shut-off valve close together.

2-10 Electrical Interface

SLA Enhanced pressure controllers are controlled using analog signals or digital control via RS485, DeviceNet or Profibus. For an analog unit the minimum set of connections which must be made to the pressure controller include: power supply+ , supply common, setpoint, setpoint common, output signal and output signal common. All signals are supplied via the 15-pin 'D' connector.

SLA Enhanced pressure controller electrical interface is designed to facilitate low-loss and quiet signal connections. Separate returns (commons) are supplied for the analog setpoint, analog flow signal, and the power supply. These commons are electrically connected together on the PC board.

Voltage I/O Version

- Signal Common
- Signal Output
- +13.5 to +27 Vdc Supply
- Setpoint Input
- Setpoint Common
- Supply Common

For a DeviceNet unit, 11-25 Vdc power and communication I/O are supplied via the standard 5-pin Circular Micro-Connector.

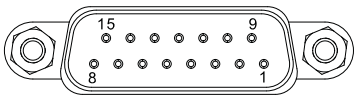
For a Profibus unit, the power and analog signals are via the 15-pin 'D' connector. The Profibus communication signals are via the auxiliary 9-pin 'D' connector.

Refer to Figure 2-1 for analog/RS485 pin connections, Figure 2-2 for Profibus pin connections and Figure 2-3 for DeviceNet pin connections.
Refer to Figures 2-4, 2-5 and 2-6 for typical electrical I/O configurations.

(The Brook's Pressure Controller acts as a current sink to a setpoint input signal. The 0/4-20 mA setpoint signal should be "driven" into the MFC input by a controlled current source. Reference Brook's device specifications for the setpoint input impedance.)

(*The Brook's Pressure Controller acts as the current source when providing a 0/4-20 mA output signal to the load. The output signal is "driven" by the MFC into the customer load. Reference Brook's device specifications for maximum load capacity.)*

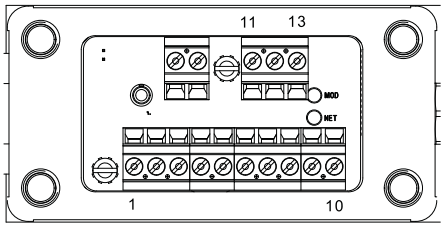
Analog/RS485: SLA5810/20



15-PIN SUB-D MALE CONNECTOR	
PIN #	FUNCTION
1	SETPOINT COMMON
2	PRESSURE OUTPUT (0-5V, 1-5V)
3	ALARM OUT
4	PRESSURE OUTPUT (0-20 mA, 4-20 mA)
5	POWER SUPPLY (13.5-27V)
6	NOT CONNECTED
7	SETPOINT INPUT (0-20mA, 4-20mA)
8	SETPOINT INPUT (0-5V, 1-5V)
9	POWER COMMON
10	PRESSURE OUT COMMON
11	NOT CONNECTED
12	VALVE OVERRIDE INPUT
13	AUX INPUT (0-5V, 0-10V)
14	RS-485, B (-), INPUT/OUTPUT
15	RS-485, A (+), INPUT/OUTPUT

Analog/RS485: SLAMf10/20

TOP VIEW
SHOWN WITH COVER REMOVED

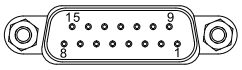


TERMINAL	FUNCTION
1	SETPOINT COMMON
2	PRESSURE OUTPUT (0-5V, 1-5V)
3	ALARM OUT
4	PRESSURE OUTPUT (0-20mA, 4-20mA)
5	POWER SUPPLY (13.5-27V)
6	SETPOINT INPUT (0-20mA, 4-20mA)
7	SETPOINT INPUT (0-5V, 1-5V)
8	POWER COMMON
9	PRESSURE OUT COMMON
10	VALVE OVERRIDE INPUT
11	AUX INPUT (0-5V, 0-10V)
12	RS-485, B (-), INPUT/OUTPUT
13	RS-485, A (+), INPUT/OUTPUT

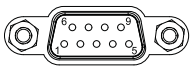
Note : Aux. Input only used for Remote Transducer Pressure Controllers.

Figure 2-1 Shielded Cable Hookup Diagram - Analog/RS485

Profibus: SLA5810/20



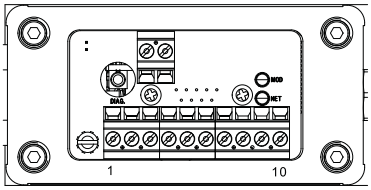
15-PIN SUB-D MALE CONNECTOR	
PIN #	FUNCTION
1	SETPOINT COMMON
2	PRESSURE OUTPUT (0-5V, 1-5V, 0-10V)
3	ALARM OUT
4	PRESSURE OUTPUT (0-20mA, 4-20mA)
5	POWER SUPPLY (13.5-27V)
6	NOT CONNECTED
7	SETPOINT INPUT (0-20mA, 4-20mA)
8	SETPOINT INPUT (0-5V, 1-5V, 0-10V)
9	POWER COMMON
10	PRESSURE OUT COMMON
11	NOT CONNECTED
12	VALVE OVERRIDE INPUT
13	AUX INPUT (0-5V, 0-10V)
14	NOT CONNECTED
15	NOT CONNECTED



9-PIN SUB-D FEMALE CONNECTOR	
PIN #	FUNCTION
1	NOT CONNECTED
2	NOT CONNECTED
3	RXD/TXD - B - red wire
4	NOT CONNECTED
5	GROUND
6	+5Vdc
7	NOT CONNECTED
8	RXD/TXD - A - green wire
9	NOT CONNECTED

Profibus: SLAMf10/20

TOP VIEW
SHOWN WITH COVER REMOVED

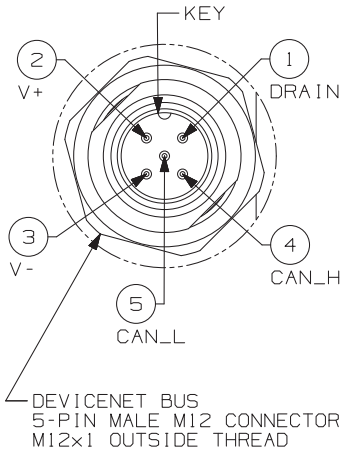


TERMINAL	FUNCTION	
1	POWER SUPPLY (13.5-27V)	
2	VALVE OVERRIDE INPUT	
3	POWER COMMON	
4	AUX COMMON	
5	AUX INPUT (0-5V, 0-10V)	
TERMINAL	PROFIBUS M12 CONNECTOR WIRES TO TERMINALS 6-10	
6	P5V	(BROWN)
7	RXD/TXD - B-LINE	(RED)
8	GROUND	(BLUE)
9	RXD/TXD - A-LINE	(GREEN)
10	SHIELD	(GRAY)

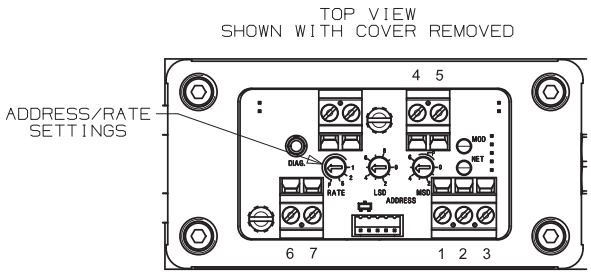
Note: Aux Input is used for
Remote Transducer Pressure Controllers only.

Figure 2-2 Shielded Cable Hookup Diagram - Profibus

DeviceNet: SLA5810/20



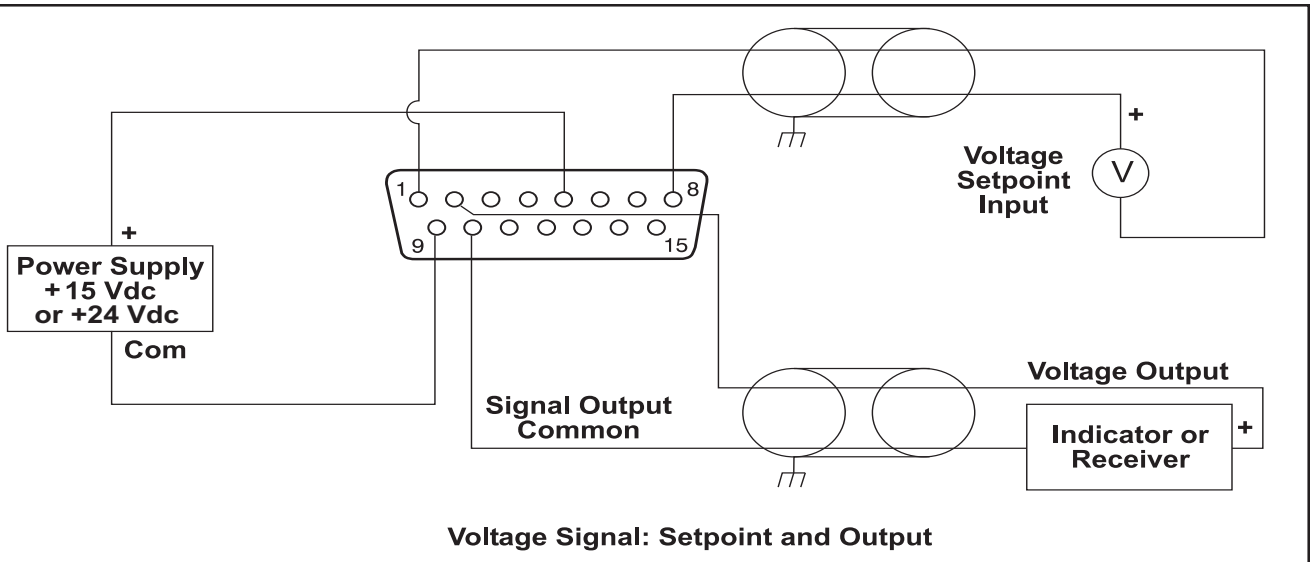
DeviceNet: SLAMf10/20



TERMINAL	FUNCTION
1	DRAIN
2	POWER SUPPLY (11-25V)
3	POWER COMMON
4	CAN_H
5	CAN_L
6	AUX COMMON
7	AUX INPUT (0-5V, 0-10V)

Note : Aux. Input only used for Remote Transducer Pressure Controllers.

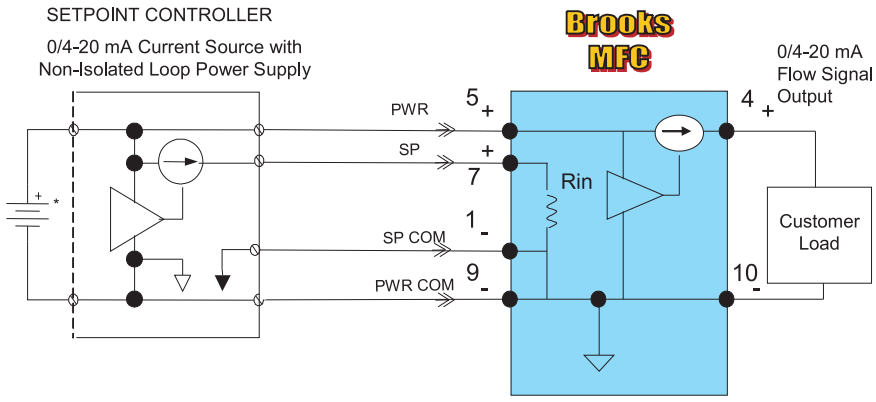
Figure 2-3 Shielded Cable Hookup Diagram - DeviceNet



Voltage Signal: Setpoint and Output

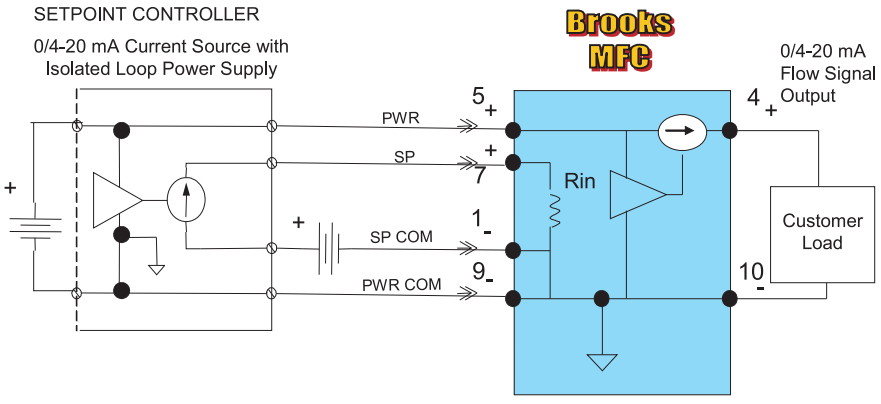
Notes:
1. The commons for the setpoint and signal output are not isolated from power supply common.
2. The cable shields should connect to chassis ground at one end only (Pressure Controller only).
3. Input impedence of setpoint input is >990KΩ. Maximum allowable input signal is 20 Vdc.
4. Minimum load resistance of voltage output is 2KΩ.

Figure 2-4 Common Electrical Hookups Voltage I/O Version



Note: Setpoint common, flow signal common, and power supply common are connected internally in the PC. Reference Brooks' device specifications for power supply voltage and setpoint input impedence.
Input: The 4/20 mA setpoint signal is "driven" into the PC input using a controlled source.
Output: The 4/20 mA output signal is "sourced" by the PC into the customer load.

Figure 2-5 Recommended I/O Wiring Configuration for Current Signals (Non-Isolated Power Supply)



Note: Setpoint common, flow signal output common, and power supply common are connected internally in the PC. Reference Brooks' device specifications for power supply voltage and setpoint input impedence.
Input: The 4/20 mA setpoint signal is "driven" into the PC input using a controlled source.
Output: The 4/20 mA output signal is "sourced" by the PC into the customer load.

Figure 2-6 Recommended I/O Wiring Configuration for Current Signals (Isolated Power Supply)

3-1 Overview

This section contains the following information:

- Theory of Operation (Pressure Controllers)
- Features (Pressure Controllers)

3-2 Theory of Operation for Pressure Control

The pressure is measured via a stainless steel diaphragm that mechanically transmits a resistance change to a Wheatstone bridge configuration. The change in the bridge resistance is proportional to pressure. An electronic amplifier provides output to the control circuit as well as the electrical output signal.

In addition to the pressure transducer the Models SLA5810/20 and SLAMf10/20 have an integral control valve and control circuitry. A difference between the pressure and setpoint signals will cause the electronics to modulate the control valve to maintain the desired pressure. A system block diagram is shown in Figure 3-1.

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 1-5 to 1-10.

The “upstream pressure regulation mode” shown in Figure 1-1 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.

3-3 Features

Note: All digital pressure controllers are configured at the factory according to customer order and do not require adjustment. Not all features are available on all instruments.

The SLA5810/20 and SLAMF10/20 are full-featured digital pressure controllers. The digital pressure controller performs much like a traditional analog pressure controller, but with improved accuracy, step response and valve control. The analog interface matches that of Brooks' popular analog pressure controllers so it can be retrofitted into tools using analog pressure controllers. Other versions of the digital pressure controller can provide a variety of digital protocols such as Profibus, DeviceNet & RS485.

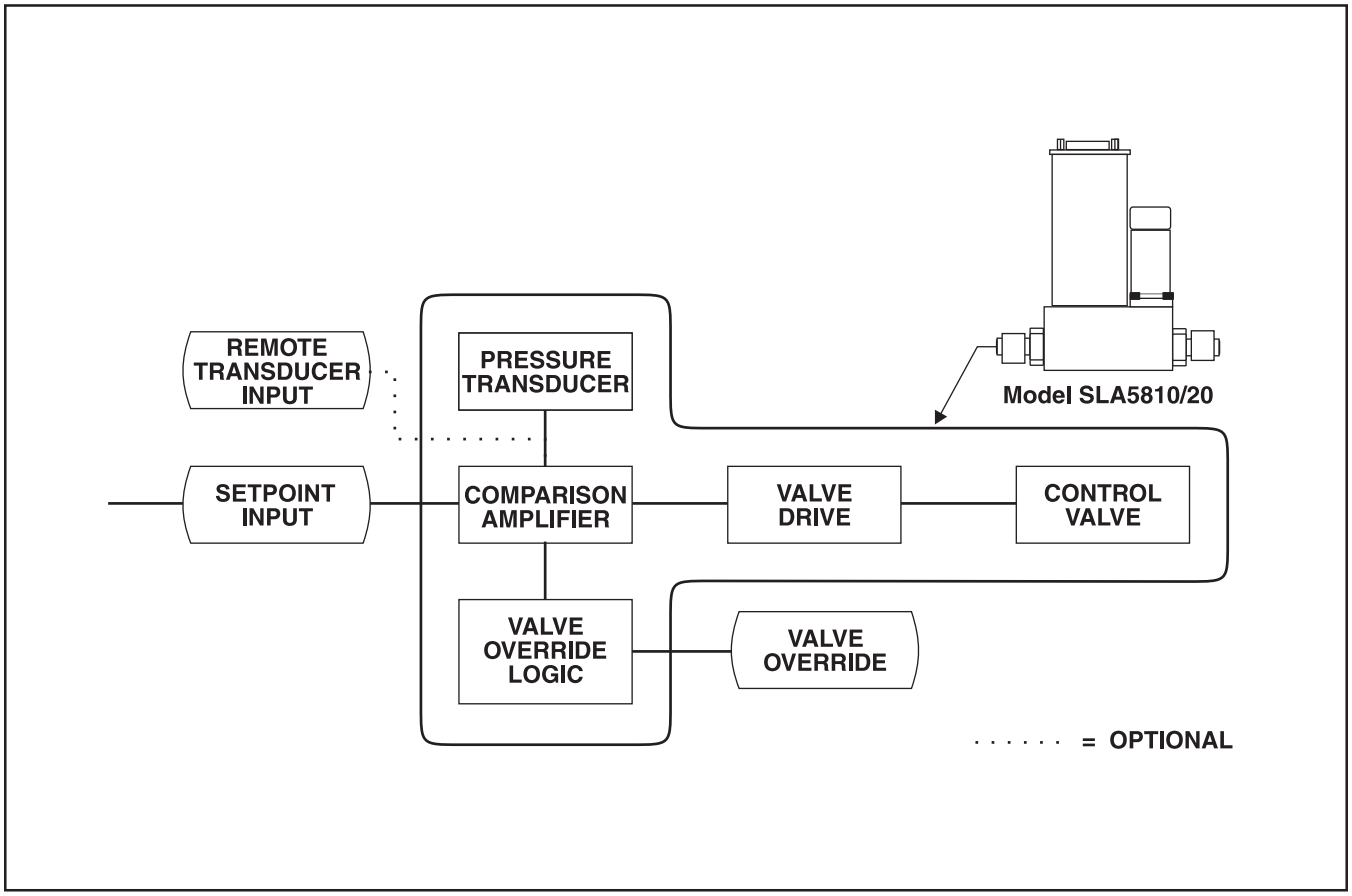


Figure 3-1. Model SLA5810/20 System Block Diagram (Downstream version).

The digital pressure controller is capable of storing up to 6 different sets of PID controller settings and valve performance data. The digital pressure controller can contain settings for different gases or for the same gas at multiple conditions (pressures, full-scale flow rates).

The supplemental manuals for Profibus, DeviceNet and RS485 contain additional details regarding specific communication features.

Calibrations will appear in the calibration table in the same order as they appeared on the customer order, unless otherwise specified. The first listed gas will appear as calibration #1 the second as calibration #2 and so on. Note that unless specified otherwise on the customer order any unit containing a single calibration will have that calibration stored in calibration position 1.

Figure 3-2 Externally Accessible Adjustment for all SLA5810/20 Controllers.

3-4 Analog I/O Mode of Operation

The following paragraphs describe the basic features of the Brooks Digital Series Pressure Controllers.

NOTE: Read Section 3-3, Features, before reading this section. See Profibus, DeviceNet and RS485 Supplemental Instruction Manuals for specific details on communication features.

A. Functional Description

The analog interface may include any of the following I/O options as specified by the user:

0 - 5 Vdc setpoint, 0 - 5 Vdc flow output
1 - 5 Vdc setpoint, 1 - 5 Vdc flow output
0 - 10 Vdc setpoint, 0 - 10 Vdc flow output
0 - 20 mA setpoint, 0 - 20 mA flow output
4 - 20 mA setpoint, 4 - 20 mA flow output

Also included is the Valve Override input pin. All analog signals available are on the 15 pin D-Connector. (See Fig. 2-1 for connections). Only those calibrations ordered will be available in the instrument. Unless otherwise specified, a Brooks digital pressure controller ordered with only one calibration will have that calibration stored in calibration #1.

Before operating the pressure controller, apply power and warm-up the instrument for approximately 15 minutes. After warm-up, apply gas pressure then proceed by following the instructions in the following sections.

B. Analog I/O Setpoint (MFC Only)

This input allows the user to establish the pressure controller setpoint,. Several input types are available as follows:

Setpoint Signal Type	Full Scale	Minimum Signal	Maximum Signal
0 to 5 Vdc	5 Vdc	0 V	5.5 Vdc = 110%
1 to 5 Vdc	5 Vdc	1 V	5.5 Vdc = 111%
0 to 10 Vdc	10 Vdc	0 V	11 Vdc = 110%
0 to 20 mA	20 mA	0 mA	22 mA = 110%
4 to 20 mA	20 mA	4 mA	22 mA = 111%

C. Analog I/O Flow Signal

This output is used to indicate the flow signal. A negative flow signal indicates reverse flow through the device, but is NOT calibrated.

Several flow signal types are available:

Anolog I/O Type	Full Scale	Minimum Signal	Maximum Signal
0 to 5 Vdc	5 Vdc	-0.5 V	5.5 Vdc = 110%
1 to 5 Vdc	5 Vdc	0.5 V	5.5 Vdc = 111%
0 to 10 Vdc	10 Vdc	0 V	11 Vdc = 110%
0 to 20 mA	20 mA	0 mA	22 mA = 110%
4 to 20 mA	20 mA	3.8 mA	22 mA = 111%

D. Valve Override

This allows the valve to be forced to its most closed state or its most open state, regardless of setpoint. If this input is not electrically connected the pressure controller will operate according to the current values of the other pressure controller inputs.

If this input is held at 0 Vdc or -15 Vdc the value will be forced to its most closed state. If this input is held at +15 Vdc or greater (max. = 24 Vdc).

E. PC Zero

The pressure controller has been zeroed at the factory to a known vacuum condition. It should not require any further adjustment. Reference Section 2-9 for further details.

3-5 Communications Features

3-5-1 Analog/RS485 Communications Features

Digital communication, designed to emulate the Brooks S-series "S-protocol" or pseudo-HART communications is available on the Brooks Digital Series via RS485. This form of multi-drop capable communication provides access to many of the Brooks Digital Series functions for "control and monitor" operations, including:

- Accurate setpoint adjustment flow output measurement (including units of measure selection)
- Valve Override (controller only)
- Flow Totalizer
- Alarm status and settings
- Soft Start Control (controller only)

RS485 equipped units support the following baud rates. Please specify the desired baud rate when ordering (default is 19200 baud). Alternately, baud rate may be changed using the Brooks Expert Support Tool (BEST).

Baud Rates: 1200, 2400, 4800, 9600, **19200** and 38400

Reference the Brooks document "Supplemental Manual for RS485 Communications for Brooks® MFCs/MFMs, for SLA5800/SLAMf Revsion B Series" (X-DPT-RS485-SLA5800-SLAMf-Series-RevB-MFC-PC-RT-eng) for more details regarding the capabilities of this communication interface.

3-5-2 Profibus Communications Features

The Brooks SLA5810/20 and SLAMF10/20 is now equipped to support the Profibus communication protocol.

The communication electronics allows for automatic baud rate detection ranging from 9600 baud to 12 Mbaud, thus making the need for any hardware baud rate selection methods not required. For selecting the device address, which must be unique on the network, two rotary switches are provided. This allows a user to easily select any address number ranging from 0 to 126. This can provide fast device replacement without complex network configurations. The device is equipped with a zero command pushbutton, allowing the user to give a manual command to the device to (re)balance the flow sensor electronics. This command can also be issued through the protocol.

The Profibus-DP communication option supports the following message types:

- Cyclic data exchange (Write/Read data).
- Read inputs (e.g. status, flow, temperature, totalizer, etc.).
- Read outputs (e.g. commands, setpoint).
- Global control commands (e.g. fail safe, sync).
- Get configuration (i.e. read number of I/O bytes and composition).
- Read diagnostics information (i.e. get error and alarm status).
- Set parameters (i.e. select gas number, engineering units, I/O configuration
- Set parameters (i.e. select gas number, engineering units, I/O configuration etc.).
- Check configuration (i.e. check I/O composition).

3-5-3 DeviceNet Communications Features

The Brooks Digital Pressure Controllers are also available with DeviceNet™ communication capability. DeviceNet is an open digital protocol capable of high speeds and easy system connectivity. Brooks Instrument has several of its devices available on this popular networking standard, and is a member of ODVA™ (Open DeviceNet Vendors Association), the governing standard body for DeviceNet.

DeviceNet is similar to the RS485 standard in that it is a multi-drop connection that allows a maximum of 64 devices to be connected on the same network. Baud rate selections for DeviceNet products are 125K, 250K and 500K and can be selected via MAC ID switches mounted on the device.

The DeviceNet communication link also provides access to many of the Brooks SLAMf Digital Series functions for “control and monitor” operations, including:

- Accurate setpoint adjustment and flow output measurement (including units of measure selection)
- PID Settings (controller only)
- Valve Override (controller only)
- Calibration Gas Select
- Soft Start Control (controller only)

4-1 Overview

No routine maintenance is required on the Brooks Digital PC. If an in-line filter is used, the filtering elements should be periodically replaced. This section provides the following information:

• Troubleshooting

⚠ 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.

4-2 Troubleshooting

Most pressure controller applications are often paired with a mass flow controller as there is typically an input or output flow that must be maintained. It is important that these two devices are sized to match each other in your application. If one or the other cannot achieve the necessary flows, then the response of the pressure controller may be sluggish or slow.

For instance, a command to an upstream pressure controller to increase pressure in a vessel will cause the valve to close. How fast the pressure builds depends on the incoming flow and the size of the vessel to be filled.

Similarly, a downstream pressure controller will open to increase pressure in the vessel. How fast the increase or decrease of pressure happens is directly related to the associated components in your process.

In some cases ot troubleshooting, it may be helpful to isolate the device by forcing in-lin isolation valves either open or closed to help prove the functionality of the device. Please keep in mind during testing that any abnormal configuration may not give the expected results as the pressure controller seeks to lock in aat the requested pressure. A controlled flow into or out of the setup is required.

⚠ CAUTION

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

⚠ WARNING

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

⚠ WARNING

If it becomes necessary to remove the instrument from the system, power to the device must be disconnected.

A. System Checks

The SLA5800 pressure controller 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. The Brooks Expert Support Tool will make this job much easier.
2. Connections may not be secure. Check all cable connections.
3. If the pressure 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.

B. Problem: signal doesn't reach setpoint.

Failure of the pressure signal to achieve the setpoint could be caused by a number of factors:

1. Insufficient pressure in system (low or no pressure).

2. Valve Override pin is active. If the valve override pin is active, the valve will be forced open or closed. Set this pin to its normal level before setting a setpoint.

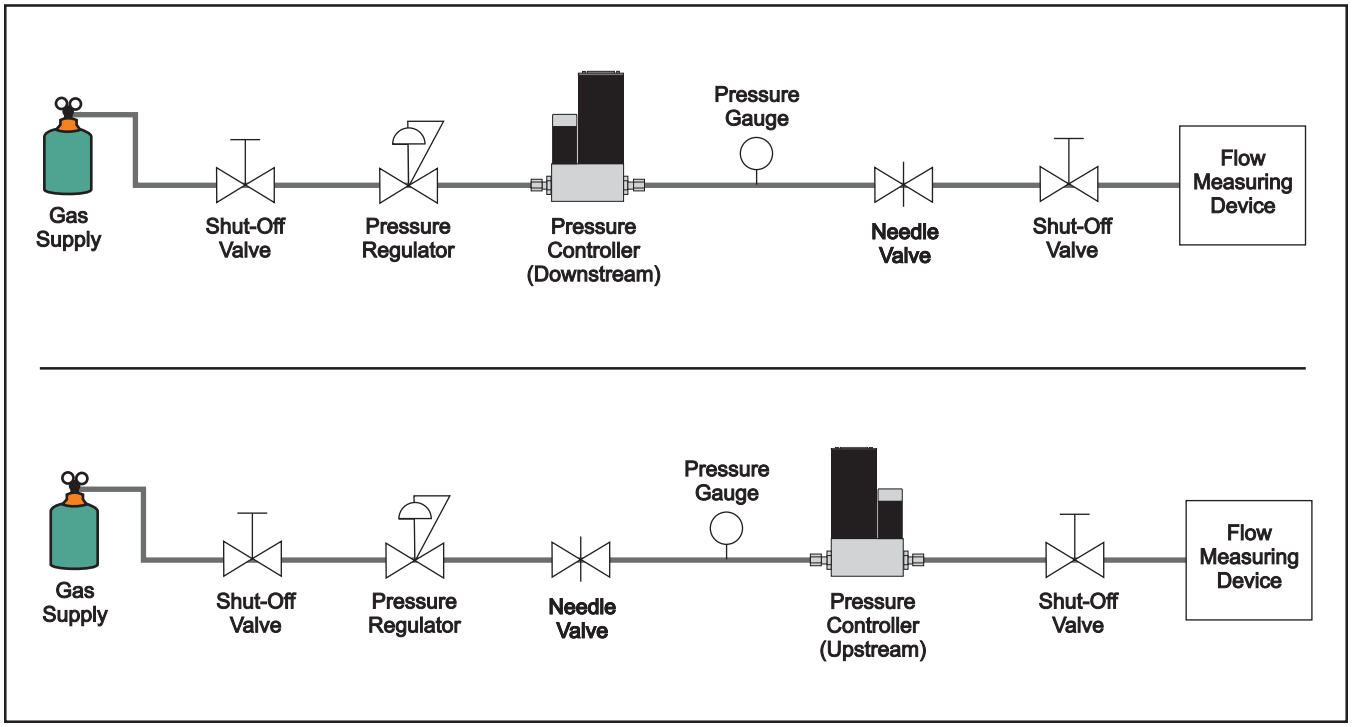


Figure 4-1 Bench Troubleshooting Circuits

Models SLA5810/20 and SLAMf10/20

LIMITED WARRANTY

Visit www.BrooksInstrument.com for the terms and conditions of our limited warranty.

BROOKS SERVICE AND SUPPORT

Brooks is committed to assuring all of our customers receive the ideal flow solution for their application, along with outstanding service and support to back it up. We operate first class repair facilities located around the world to provide rapid response and support. Each location utilizes primary standard calibration equipment to ensure accuracy and reliability for repairs and recalibration and is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.

Visit www.BrooksInstrument.com to locate the service location nearest to you.

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.

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

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