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By continuing to use our site, you agree to our use of cookies. For further information, please see our Privacy Policy. Find a model number or product name Ultrahigh purity products for the semiconductor industry. 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. Page 3 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Models 5800S 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 lowflow applications. Page 4 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Models 5800S Table of Contents Section 1Introduction. 5 1.1 Purpose. 5 1.2 How to use this Manual. Page 5 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Section 1 Models 5800S Introduction 1.1 Purpose This instruction manual is intended to provide the user with all the information necessary to install, operate and maintain the Brooks Smart series Mass Flow meters 5860S, 5861S, 5863S and controllers 5850S, 5851S, 5853S. 1.2 How to use this Manual It is recommended to read this manual before installing, operating or repairing these Mass Flow Instruments. An alarm TTL open collector signal output is available to the user. Do not attempt to start the system until the instrument has been permanently installed. It is extremely important that the startup procedures be followed in the exact sequence presented. Page 11 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Section 2 Installation Models 5800S 2.

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6 Mechanical Installation For dimensional drawings see Appendix B Dimensional drawings NOTE When installing the Mass Flow device, care should be taken to prevent foreign materials from entering the instrument's inlet or outlet. Do not remove the protective endcaps until the actual moment of installation. Page 12 Installation and Operation Manual Section 2 Installation XTMF5800SMFCeng PN 541C051AAG November, 2008 Models 5800S 2.8 Electrical Interfacing The installation of Smart TMF includes a 15pin SubD connector. For details of correct installation, see Table 21 Table 21 Electrical interfacing. Smart TMF Pin TMF side 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. Page 13 Installation and Operation Manual Section 2 Installation XTMF5800SMFCeng PN 541C051AAG November, 2008 Models 5800S common on the Dconnector. NOTE Either RS232 or RS485 should be specified at the time of ordering. It allows a maximum of 32 devices to be connected to a computer system. IBMompatible PCs are not equipped with RS485 ports as standard. Page 20 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Models 5800S Section 4 Maintenance 4.1 General No routine maintenance is required on the Smart Mass Flow Meters and Controllers other than occasional cleaning. The inline filter should periodically be replaced or ultrasonically cleaned. NOTE If recalibration is required, but the necessary expertise or equipment is not available, the instrument should be returned to the factory. 4. Page 21 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Section 4 Maintenance Models 5800S necessary, perform the zero adjustment procedure section 3.2. If the output signal does not zero properly, please contact Brooks Instrument. 2.

Connect the instrument to a source of the same gas used for its original calibration. Regulate the Set point to 100% flow and adjust the inlet and outlet pressures to the calibration conditions.

Should contamination persist, subject all wetted 1 components to ultrasonic cleaning. Helium Warmup time Page 27 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Section 5 Specification Models 5800S 27 Page 28 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Models 5800S Appendix A Gas Conversion Tables USE OF THE CONVERSION TABLES If a Mass Flow Meter or Controller is operated on a gas other than the gas it was calibrated with, a scale shift will occur in the relationship between the output signal and the mass flow rate as a result of the difference in heat capacities between the two gases. E' richiesta comunque una speciale attenzione nella scelta dei cavi di segnale da usarsi con la strumentazione soggetta a marchio CE. Speciale aandacht is echter vereist wanneer de signaalkabel gekozen wordt voor gebruik met CE gemarkeerde produkten. Erityista huomiota on kuitenkin kiinnitettava signaalikaapelin valintaan. Signaalikaapelin, kaapelin lapiviennin ja liittimen laatu Brooks toimittaa korkealaatuisia kaapeleita, jotka tayttavat CE sertifikaatin vaatimukset. Kontakt lokale myndigheter for nasjonale eller lokale sikkerhetskoder og andre installasjonskrav. Page 49 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Models 5800S THIS PAGE WAS INTENTIONALLY LEFT BLANK 49 Page 50 Installation and Operation Manual XTMF5800SMFCeng PN 541C051AAG November, 2008 Models 5800S LIMITED WARRANTY Seller warrants that the Goods manufactured by Seller will be free from defects in materials or workmanship under normal use and service and that the Software will execute the programming instructions provided by Seller until the expiration of the earlier of twelve 12 months from the date of initial installation or eighteen 18 months from the date of shipment by Seller. These conditions are in combination with an allowable maximum pressure difference of 100 bar across the instrument.

Other ranges and limits are available on request. SERVICEABILITY The Brooks Smart Mass Flow Meters and Controllers perform. A remote power supply and multipoint interconnection can drive up to 32 devices per COM port. With help of our Smart DDE, COM 1. COM 9 are selectable.Alarm TTL Open Collector Output, signal grounded when activated. Max. 30 Vdc, 25 mA. Or via communication port, when used digitally. Digital HART Hart based programming codes for interface with PC.Prices are indicative only and may vary by country, with changes to the cost of raw materials and exchange rates. 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 products performance and place the safe operation of your process at risk. Lookalike 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. ESD Electrostatic Discharge CAUTION This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling procedure 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. 2 3 XDPTProfibusInterfaceeng Dear Customer, We appreciate this opportunity to service your flow measurement and control requirements with a Brooks Instrument device. 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. This manual covers the additional device features as well as the installation and programming issues with respect to operating the Smart TMF series devices on a ProfibusDP network. Data transferred by the master to the slave e.g. commands, setpoints is referred to as output data. Motherboard Piggyback PNO ProfibusFMS ProfibusDP ProfibusPA SPC3 MFC MFM Slave sensor data to be transferred to the master is referred to as input data. Main electronics board of the Smart TMF series containing the main processor, sensor and valve interface and main connector. Exchangeable board on top of and connected to the main board. This board provides the communications functionality and holds the program and data memory. Profibus Nutzer Organization. Profibus User Organization, based in Germany. Process field bus Fieldbus Message Specification. Profibus protocol for highlevel, object oriented data communication. Can be operated together with ProfibusDP. Process field bus Decentralized Periphery. Profibus protocol for highspeed, cyclic data communication. Process field bus Process Automation. Profibus protocol for intrinsically safe data communication, according to IEC and DIN E19245 T4. ProfibusDP ASIC. Component manufactured by Siemens AG to provide ProfibusDP slave functionality to a host processor. Mass Flow Controller Mass Flow Meter 7 8 1.3.2 Number representations and formats Installation and Operation Manual XDPTProfibusDPInterfaceeng Bit Smallest binary information representation 0 or 1 Nibble Byte or Octet Word Integer Decimal Hexadecimal Real Binary number representation, consists of 4 bits. Repre sents 1 value or 4 situations bitmapped . Repre sents 1 value or 8 situations bitmapped . Represents 1 value or 16 situations bitmapped .

An integer is a whole number not a fractional number that can be positive, negative, or zero. Examples 5, 1, 5, 8, 97, and 3,043. Common numbers in the decimal number system. NOTE Operating procedure do not operate this instrument outside the specification range listed in section 5. Before bringing the unit into operation, make sure that all gas connections have been correctly tightened and that all the necessary electrical connections have been made. 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 your nearest Product Service Department. Brooks Instrument 407 W. Vine Street P.O. Box 903 Hatfield, PA USA Toll Free 888 554FLOW 3569 Tel 215 Fax 215 Brooks Instrument Brooks Instrument Neonstraat Kitasuna KotoKu 6718 WX Ede, Netherlands Tokyo, Japan P.O. Box 428 Tel BK Ede, Netherlands Fax Tel Fax Remove the envelope containing the packing list. Carefully remove the instrument from the packing case.

Make sure spare parts are not discarded with the packing materials. If the equipment has been in storage for more than ten months or if it has not been stored under the recommended conditions, all pressure containing seals should be replaced. This can be obtained from one of the following locations Brooks Instrument 407 W. Vine Street P.O. Box 903 Hatfield, PA USA Toll Free 888 554FLOW 3569 Tel 215 Fax 215 Brooks Instrument Brooks Instrument Neonstraat Kitasuna KotoKu 6718 WX Ede, Netherlands Tokyo, Japan P.O. Box 428 Tel BK Ede, Netherlands Fax Tel Fax Any instrument returned to Brooks requires completion of Form RPR0031, Brooks Instrument Decontamination Statement, as well as, a Material Safety Data Sheet MSDS for the fluids used in the instrument. This is required before any Brooks Personnel can begin processing.

Copies of the form can be obtained from any Brooks Instrument location listed above. 2.5 Gas Connections All models are fitted with the following inlet and outlet connectors as standard NPTF, tube compression fittings, VCR, VCO, DIN or ANSI flanges. Prior to installation, make certain that all piping is clean and free of obstruction. The heart of the system, is the thermal mass flow sensor which produces an electrical output signal as a function of flow rate. The flow ranges per model are listed in Table 21 below. Table 21 Brooks Smart Mass Flow Meters and Controllers. Brooks Smart Mass Flow Products Mass Flow Mass Flow Flow Ranges N Controller Meter 2 Model Model Min. Adaptive signal filtering. Fast response to setpoint changes. Programmable softstart ramp rate. Powerful adaptive control to provide optimal control behaviour and response under varying process conditions. Programmable valve override function. Programmable totalizer function. HighLow flow alarms. Continuous self diagnostics to ensure system integrity as well as signal diagnostics to ensure process integrity. Programmable alarm signalling options. The standard piggyback board part number 097B225ZZZ contains all the necessary hardware and software to implement the standard HART based digital communication protocol, providing access to all calibration data as well as actual data, diagnostics and alarms. The hardware allows the protocol to be operated on either RS232 or RS485 dip switch selectable and on a number of baud rates 1200 baud up to baud. A second type of piggyback board part number 097B296ZZZ is now available containing all the necessary hardware and software to implement the Profibus DP digital communication protocol, providing access to a limited number of settings, the actual data, diagnostics information and alarms.

The ProfibusDP implementation, as defined in the Profibus standard EN 50170, allows the Smart TMF series to be connected to an RS485 network and to be operated from a master device e.g. a PLC using the ProfibusDP protocol at communication speeds of up to 12 Mbaud. Also since the database is located on the motherboard the calibration will not be affected by changing the piggyback board. The next section will discus the ProfibusDP features and function in more detail. 2.7 PROFIBUS ON THE SMART TMF SERIES The Profibus piggyback board on the Brooks Smart TMF series is provided with all the necessary hardware and software to implement ProfibusDP functionality on an RS485 network according to the EN Profibus standard. The Profibus piggyback board is equipped with an additional 9pin subd connector for the 58.Communication can be performed at a number of baud rates ranging from 9600 baud up to 12 Mbaud. The communication electronics allows for automatic baud rate detection, 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, also providing the possibility for fast device replacement, without the need for complex network configuration. Read diagnostics information i.e. get error and alarm status. These message types provides the user with the possibility to select a number of operational settings, as well as to define which actual data are to be exchanged in the data exchange mode. This allows for the selection of only a minimum of required data to be exchanged, thus conserving memory at the master or for the selection of all the actual data. Diagnostics information can be obtained when needed, providing information on device and process integrity as well as communication integrity.

Calibration data as well as device data are not available through the Profibus DP communication, but will require a standard communication piggyback board. ProfibusPA functionality, providing data transfer on intrinsically safe networks is also not supported. Finally the ProfibusDP piggyback board is equipped with a zero command pushbutton, allowing the user to give a manual command to the device to rebalance the flow sensor electronics. It will focus only on the installation requirements necessary to operate the device on a Profibus network as well as on other issues, related to this interface. Two pins on this connector, pin 14 and 15, are reserved for the connection of a digital communications protocol. Whether these pins are used for this purpose, will depend on the type of piggyback board installed. The standard piggyback board will offer HART based communication over either RS232 or RS485 through these pins. If these pins are not used, the installed piggyback will have to provide a separate interface connector to allow connection to the network. The installed piggyback board will provide a separate connector for network connections. This connector is a female 9pin subd connector, specified by the Profibus standard as the preferred connector refer to EN 50170, part 1. Pin layout on this connector is according to this standard. NOTE The presence of this separate connector does NOT make the main connector redundant. The main connector must at least be used to provide the necessary power to the device. In addition however, all the other, noncommunication related functions are still available through this main connector Main connector 5800 series The male 15pin subd connector provides all necessary functionality to operate the device. Despite the presence of a Profibus network connection, all the pins, except for pin 14 and pin 15, retain their functionality and they can still be used.

This allows the device to be used as a plugin replacement for an analogue mass flow meter or controller with the ProfibusDP communication in a monitoring role. Also a mix of both is possible. Figure 31 shows the pin layout and numbering of the main connector. Table 31 lists the pinconfiguration of the main 15pin subd connector. 14 15 XDPTProfibusInterfaceeng Figure 31 Smart TMF main 15pin male subd connector pin numbering. Table 31 Smart TMF main connector pin layout. In case the ProfibusDP piggyback is installed, these pins are not connected. The analogue output signals, representing a measure for the flow on pin 2 voltage output, pin 4 current output and pin 10 flow signal output common can be used in parallel with the network. Information on the flow can be obtained through the network in engineering units, but at the same time as a voltage or current level through pin 2, 4 and 10. The setpoint command Smart Mass Flow Controller models only, can be issued either through the Profibus network or through an analogue signal level. The user has to define the setpoint source and in the case of an 15 16 XDPTProfibusDPInterfaceeng analogue signal input the setpoint level through the network. If the setpoint command is to be issued through an analogue level on pin 7 current input or pin 8 voltage input and pin 1 setpoint return signal, it can be monitored over the Profibus network at the same time. If the setpoint command is issued over the Profibus network, any analogue setpoint signal on pin 7 or 8 is ignored. The valve override input signal on pin 12 Smart Mass Flow Controller models only can always be used in parallel to the network. The command issued through pin 12 OPEN or CLOSE always takes precedence over the network valve override command. If the level on pin 12 is left floating not connected a valve override command issued through the network connection will be carried out.

The TTL open collector alarm output pin 3 can always be used in parallel with the network. Any enabled system diagnostics signalling will activate the alarm output and simultaneously result in a diagnostics message through the network Additional Profibus connector 5800 series The ProfibusDP piggyback board is equipped with a separate female 9pin sub D connector. The connector type as well as the pin layout is compatible with the preferred connector as stated in the Profibus standard EN This allows for the use of standard available, Profibus approved network connectors, enabling fast and easy connection to a Profibus network. Table 32 below shows the pin numbering on the female 9pin subd Profibus connector. The connector is located on top of the Smart Mass Flow device. Figure 32 Profibus 9pin female subd connector pin numbering. Table 32 Smart TMF

ProfibusDP network connector pin layout Function Pin nr. The other defined signals, the 24 Vdc power supply option as well as the optional repeater control signals, are not supported and therefore not connected on the Smart TMF series Profibus piggyback board. The Profibus signals are galvanic isolated from the main electronics. The required line termination is not provided within the Smart TMF series device itself. In these cases this PG11 connector is solely used for the power supply connection and the VOR input signal. Figure 33 shows the terminal connection location for power supply and V.O.R. the power connection as well as the profibus connection terminals can be accesseal by opening the top cover plate by removing the four polts on the top of the cover plate. The command OPEN,or CLOSE issued through this VOR terminal always takes precedence over the network valve override command. If the level on this terminal is left floating not connected a valve override command issued through the network will be carried out.

NOTE With regard to the power supply connections, the attached cable must be as short as possible to ensure that the minimum required voltage and current is available at the mass flow device. The cables with at least 80% shielding. The cable shielding should be connected to the PG connector s metal shell, and have 360 shielding at both ends. The shielding should be connected to an earth terminal. This connector has IP65 protection rate and is defined in the Profibus guideline 2.142 Interconnection Technology Sepecifictions. This allows for the use of standards available, Profibus approved network connectors, enabling fast and easy connection of a Profibus network Figure 34 below shows the pin numbering. The fith connector terminal is the shieldings. Figure 34 Pinnumbering Screw Profibus Function Color connector connector pinning 1 1 P5V Brown 2 2 Alin Green 3 3 Gnd Blue 4 4 Bline Red 5 5 Shield Grey 3.3 STATION ADDRESS SELECTION In order for a Profibus network master device to be able to address individual slave devices on the netowork, a slave device will require the assignment of a unique communication address or station address. This must be done prior to being connected to the network. The slave address can be 126 at maximum since 127 is the Global Station Address. On the Profibus interface piggyback for the Brooks Smart TMF devices, the station address selection is implemented by two rotary switches, located on the side of the device location of the valve, refer to Figure 35 below. Each of the switches allow a setting of an integer number, the units between 0 and 9 and the decimals 0 and 12. The decimal address digit indicates the multiples of ten, whereas the unit address digit indicates the multiples of one. Therefore the allowable station address number ranges from 0 to 126. The decimal switch has a labelling from 0 through F, which is hexadecimal. The letters A through F resprensents 10 through 15.

The letter D, E and F are not allowed since they represent addresses in the range 130, 140 and 150, which is outside the Profibus range of 126. If the total address selection is 126 or higher, the slave address is 126. This option has been disabled in the Brooks Smart TMF series. On top of this unique address number each slave uses three other address numbers 1. Identity number This number is a unique, fixed, WORD size number assigned by the Profibus Organization PNO to each type or class of devices. It is programmed in the device s source code and it is used to establishes the link between the class of devices and its associated GSD file. It is by standard definition part of the addressing mechanism and as such part of every communication service. 2. Global station address This station address, number 127, is a Profibus defined address to be used in the transmission of global control command messages. All slave devices connected to a network will recognize this number as a valid address. Whether they will act up on this command when received will depend on the third addressing option, which must be used together with this global station address. 3. Group number An additional address number can be assigned by the user to a group of different devices. This group number, one byte in size must be set as part of the parameterization service. It can be used in the global command service next to the global station address, to send command to a sub group of devices on a network. Refer to section Appendix A for more information. 3.4 ZERO PUSHBUTTON only for 5800 series In order to be able to initiate a sensor zero request to rebalance

the flow sensor, the device is equipped with a pushbutton. Pressing this button will cause the processor to perform the necessary action to accomplish this. The action can also be initiated through the protocol, by setting the appropriate bit flag in the first command byte.

The zero pushbutton is located on the opposite side of the ProfibusDP address selector switches on the Brooks Smart TMF device. To achieve a valid rebalance of the flow sensor, take the following actions 1. Make sure the device has been fully warmed up after powerup, i.e. it should be powered up for at least 45 minutes. 2. Make sure that no gas flow through the device is present. If there has been any gas flow through the device after powerup, leave the device without gas flow for 15 minutes, in order to stabilize the sensor. 3. Press the zero pushbutton and wait for 10 seconds. After that, the rebalancing of the sensor has been completed and the device is ready to be used. Now gas flow can be reapplied to the device 3.5 SUPPORTED BAUD RATES Since the ProfibusDP interface has been implemented using the Siemens SPC3 ProfibusDP slave ASIC, the baud rates supported are determined by the capabilities of this component. Therefore no hardware means are necessary to select the required baud rate at the slave. Communication initiated by the master at a any of the supported baud rate values will cause the Brooks Smart TMF series device to lock on to this baud rate after an automatic search for it. Also, if no valid messages have been detected on the network after a preprogrammed time out, the Brooks Smart TMF series will switch to baud search mode, and search for the correct baud rate until found. Table 33 Supported baud rate values. The standard EN specifies the type of cable to be used for this implementation. Table 34 below lists the required cable parameters as specified by EN The Profibus cable is a shielded twisted pair cable. The shielding must be connected to protective ground i.e. conductive housing on Brooks Smart TMF series devices in order to prevent EMC interference from entering the device. Figure 36 Profibus line termination configuration. The Brooks Smart TMF series does not provide internal termination resistors.