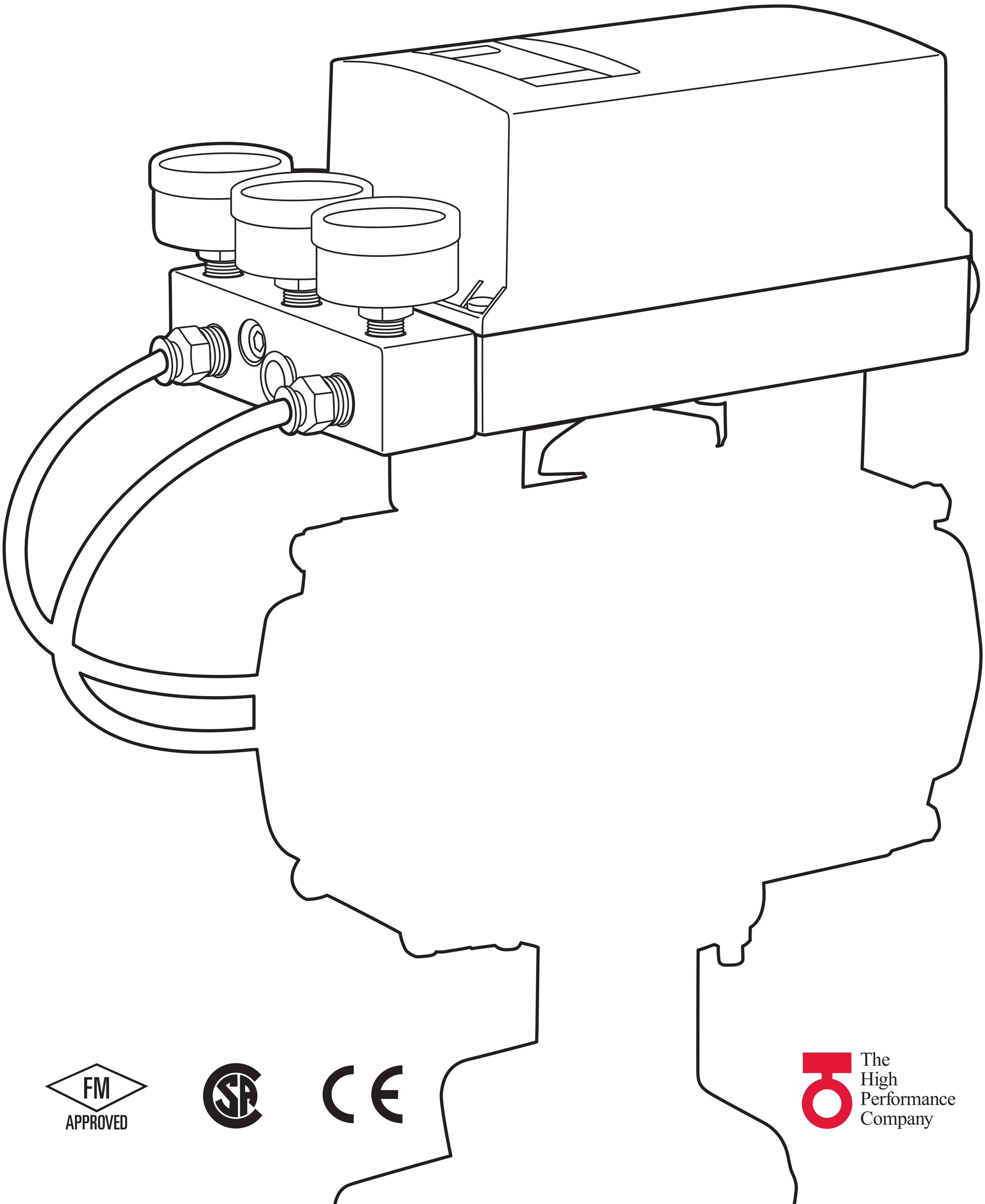
Bray® SERIES 6A

ELECTRO-PNEUMATIC POSITIONER

OPERATION AND MAINTENANCE MANUAL



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SAFETY INFORMATION - DEFINITION OF TERMS

⚠ WARNING	indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.
⚠ CAUTION	indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

Hazard-free use

This device left the factory in proper condition to be safely installed and operated in a hazard-free manner. The notes and warnings in this document must be observed by the user if this safe condition is to be maintained and hazard-free operation of the device assured.

- Take all necessary precautions to prevent damage due to rough handling, impact, or improper storage. Do not use abrasive compounds to clean, or scrape its surfaces with any objects.
- Configuration and calibration procedures are described in this document. Proper configuration and calibration is required for the safe operation.
- The control system in which the unit is installed must have proper safeguards to prevent injury to personnel, or damage to equipment, should failure of system components occur.
- This document does not cover every detail about every version of the product described. It cannot take into account every potential occurrence in installation, operation, maintenance and use.
- If situations transpire that are not documented in sufficient detail, please request the required information from the Bray Distributor or Representative responsible for your area.

Qualified Personel

A qualified person in terms of this document is one who is familiar with the installation, commissioning and operation of the device and who has appropriate qualifications, such as:

- Is trained in the operation and maintenance of electric equipment and systems in accordance with established safety practices.
- Is trained or authorized to energize, de-energize, ground, tag and lock electrical circuits and equipment in accordance with established safety practices.
- Is trained in the proper use and care of personal protective equipment (PPE) in accordance with established safety practices.
- Is trained in first aid.
- In cases where the device is installed in a potentially explosive (hazardous) location – is trained in the operation, commissioning, operation and maintenance of equipment in hazardous locations.

INTRODUCTION

The Bray S6A is a microcontroller based positioner for pneumatic actuators. The S6A converts an analog current signal into a valve position pressure signal and offers positioner, valve and actuator diagnostics using a variety of communication protocols. Optional modules can be added for full range valve position feedback, valve open/close verification, preset alarm warnings and electromagnetic compatibility.

Principles of Operation

The operation of the S6A can be described in three parts; the user defined setpoint, the pneumatic actuator air supply, and the S6A internal controller. The user defined setpoint, which is provided by the incoming analog signal or the communication protocol, tells the positioner where to set the actuator. The pneumatic actuators air supply provides the power to work the valve, and the S6A internal microcontroller monitors the actuator position and provides diagnostics to the end user.

When the microcontroller sees a deviation between the actual position of the actuator and the provided setpoint it will pulse the internal piezo electric valve in order to let air fill the corresponding actuator chambers and drive the actuator from the pneumatic supply lines. Once this deviation is within a desired tolerance or "dead band" the microcontroller will stop the pulsing. Using this process, the S6A only consumes air when it is needed, meaning it will pay for itself within a short period of time.

Electrical Operation

The standard S6A requires 4 to 20mA loop power for all of the internal electronics. It can be installed in a two wire, three wire, or four wire architecture. There is no need to run separate power and signal wiring. The S6A positioners with communication modules get their power directly from the network. All of the wiring diagrams for the different versions of the S6A and any optional modules are shown in the "Field Connections" portion of this manual.

Mechanical Operation

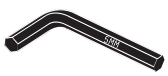
The S6A requires a pneumatic supply in the range of 20 - 102 psi (1.4 - 7 BAR). Using this pneumatic supply, the S6A will position the actuator and valve precisely where it needs to be to regulate the process. Once in the settled state, the S6A has one of the lowest air bleed rates in the market. The S6A requires a pneumatic supply rated at Class 2 in accordance with ISO 8573-1. An optional filter can be installed upstream of the S6A to clean incoming air. Diagrams are provided showing how to make the pneumatic connections in the "Field Connections"portion of this manual.

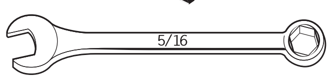
INSTALLATION

Mounting to an Actuator

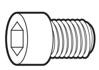
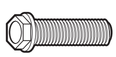
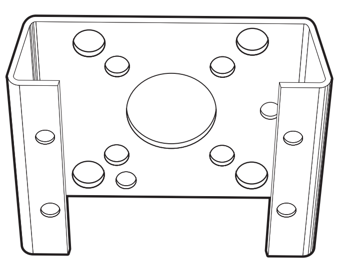
All Bray S6A positioners are suitable for mounting on Bray pneumatic actuators with the use of a standard mounting bracket. With proper mounting hardware, the S6A positioner can be installed onto other linear or quarter turn pneumatic actuators. The standard mounting position is to orient the unit directly over the pneumatic actuator using the NAMUR mounting arrangement in such a way that the LCD and pushbuttons are easily accessible. If the positioner is to be mounted on a vertical pipe, it is recommended that the unit be positioned with the conduit entries on the bottom to prevent condensation from entering the positioner by way of conduit. In all cases, the conduit should be positioned to prevent drainage into the positioner.

Tools Needed:

- 5mm Allen Key 

- 5/16" Wrench 

Parts Needed:

Item	Qty.	
Mounting Bolts [A]	(4)	
Lockwashers	(4)	
Mounting Bolts [B]	(4)	
Mounting Bracket	(1)	

The positioner should be mounted to the actuator as follows:

1. Turn the positioner upside down and align the provided mounting bracket over the positioners output shaft. The bracket should align with the four threaded holes around the output shaft.
2. Using the 5mm allen key affix the mounting bracket to the positioner using the four lockwashers and mounting bolts [A].
3. Turn the positioner right side up and position the output shaft so that the flatted side is facing you.
4. Insert the coupler over the output shaft, ensuring that the couplers set screw is in alignment with the flat of the shaft. Tighten the couplers set screw.
5. Place the yellow indicator on the base of the coupler.
6. Mount the positioner on top of the actuator and tighten it using the 5/16" wrench and the four mounting bolts [B].

Refer to the S6A Quick Start Guide for details.

FIELD WIRING

Each S6A is provided with two conduit entries for power/incoming analog signal of the main unit and any optional modules.

Please refer to the wiring diagrams referenced in this document when connecting the positioner and any optional modules. It is essential to install the optional modules before connecting the positioner electrically. Refer to the following "Technical Description" portion of this manual for relevant power distribution sizing information when installing a S6A positioner and its optional modules.

Safety Notes:

- Local regulations regarding hazardous environments must be followed when installing this device in a hazardous location.
- The conduit connections must be properly sealed to maintain the weatherproof integrity of the actuator enclosure.
- Never connect the current input (terminals 6 and 7 as shown on the diagrams to the right) to a power source; the positioner will probably be destroyed in that case. Always use a current source with a maximum output current of I = 20 mA.
- To maintain auxiliary power, the input current must be a minimum of 3.6 mA.

Note: The plastic enclosure is metallized from inside to increase the electromagnetic compatibility (EMC) with respect to high-frequency radiation. The shield is connected to the threaded bush shown in Figure 1 such that it is electrically conductive. This protection is effective only if you connect at least one of the bushes to the grounded control valves through electrically conductive (bare) attachments.

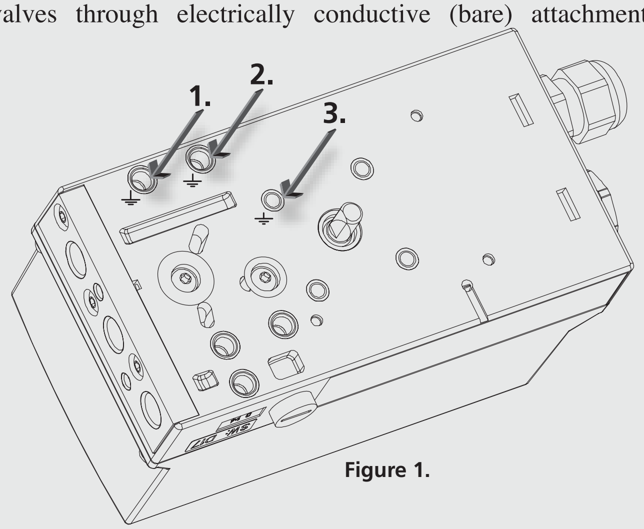
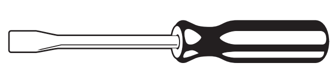


Figure 1.

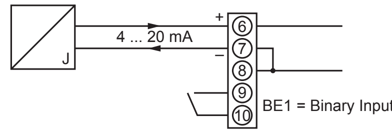
Tools Needed:

- Instrument Screwdriver

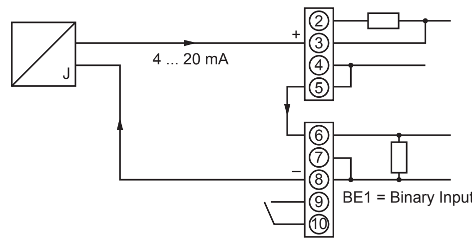


I. General Area

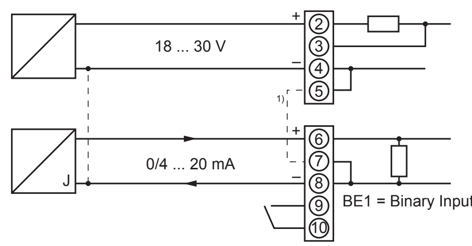
1. Two Wire



2. Two Wire Connection When Using a 2/3/4 Wire Device

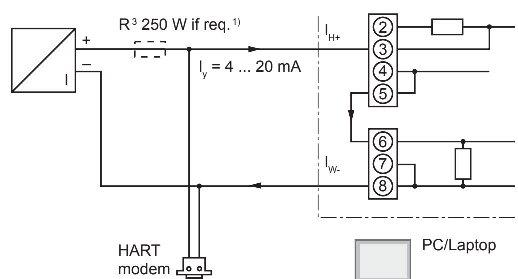


3. Three/Four Wire



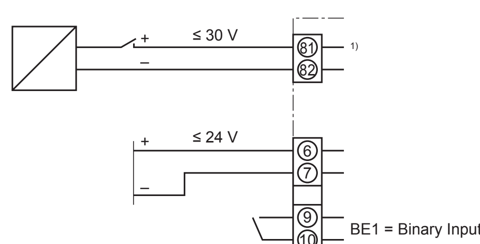
1) Jumper between 5 and 7 only for three-wire system

4. HART



1) Only required with current sources not conforming to HART

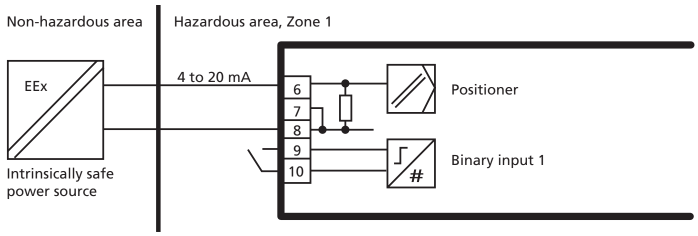
5. Profibus DA/DP, Foundation Fieldbus



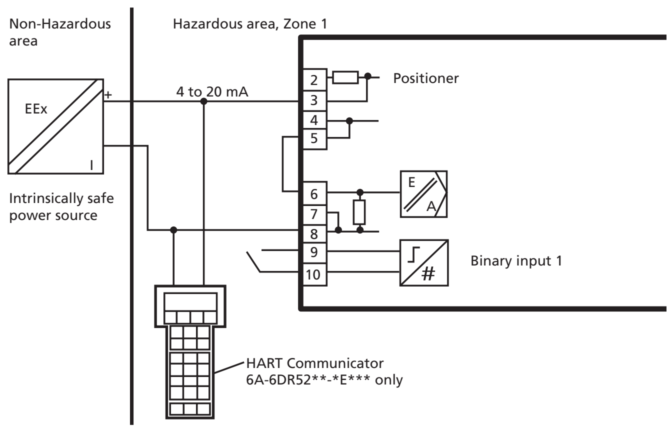
1) Input for safety shutdown (activated using coding jumper)

II. Hazardous Area (Intrinsically Safe)

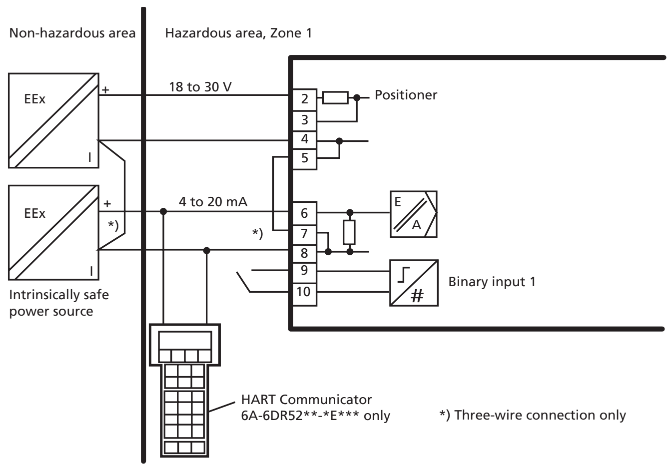
A. Two Wire



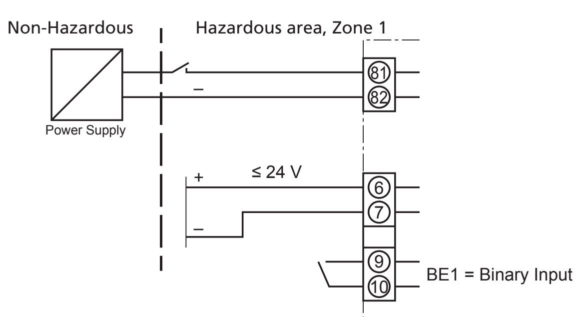
B. and C. Two Wire Connection When Using a 2/3/4 Wire Device and HART



D. Three/Four Wire



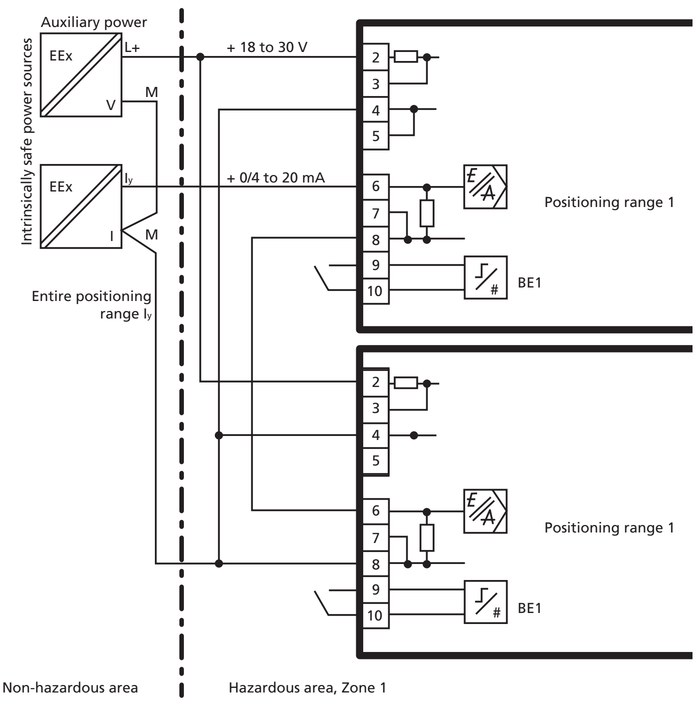
E. Profibus DA/DP, Foundation Fieldbus



1) Input for safety shutdown (activated using coding jumper)

Multiple Positioners Field Wiring

Split Range



Series connection of 2 positioners, e.g. split range (auxiliary power wired separately), EEx i

Connecting Pneumatic Supply Lines

Refer to the Technical Data portion of this manual for specifications regarding air quality.

The S6A is equipped with three pneumatic connections, Y1, Y2 and PZ. PZ is for the pneumatic supply and Y1 and Y2 are used to supply the pneumatic actuator. The S6A can also be equipped with a pressure gauge block for monitoring supply and actuating pressure and a filter to ensure that the S6A is receiving clean air.

Proceed as follows to make the pneumatic connections:

Refer to Figure 2.

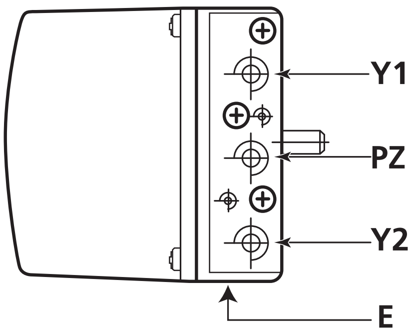


Figure 2. - Pneumatic connection on the standard controller

1. If required, connect the pressure gauge block for supply air and actuating pressure.
2. Connect supply air to PZ.

Connection using female thread G1/4 DIN 45141 or 1/4" NPT:

- PZ supply air 20psi to 102psi (1.4 to 7 bar)
- Y1: actuating pressure for single and double-acting actuators
- Y2: actuating pressure for double-acting actuators
- E: exhaust air outlet; remove the attenuator if required.

For double-acting actuators, connect actuating pressures Y1 or Y2 depending on the desired safety position. The three pneumatic connections will go to the following safety position in case of electrical auxiliary power supply failure:

- Y1: single-acting, depressurized
- Y1: double-acting, max. actuating pressure/supply air pressure.
- Y2: double-acting, depressurized

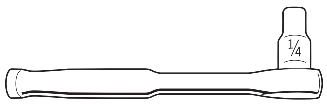
Note: Besides continuous air consumption, the positioner may try to compensate the position deviation due to leakage. This will lead to premature wear in the entire control unit. To prevent this ensure that all pneumatic connections are properly sealed and perform regular maintenance on their fittings.

Restrictors

The S6A is equipped with air restrictors to reduce the air output to achieve actuating times of T > 1.5 s for small actuators. Restrictors 1 and 2 are used for this purpose.

Tools Needed:

- Hexagon socket 2.5 mm



Refer to Figure 3.

When turned clockwise, they reduce the air output and finally shut it off.

In order to set the restrictors, it is recommended to close them and then open them slowly.

In case of double-acting actuators, ensure that both restrictors have approximately the same setting.

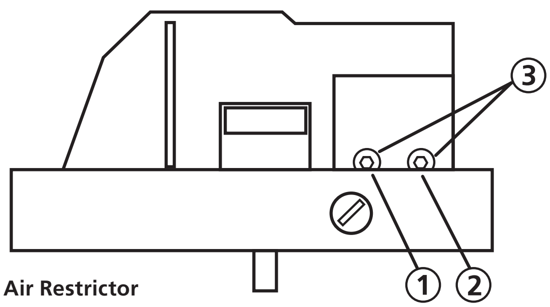


Figure 3. – Air Restrictor

① Restrictor for Y1

② Restrictor for Y2, only in the version for double-acting actuators

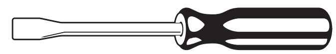
③ Hexagon socket-head screw 2.5 mm

Purging

The S6A is equipped with a purge air switch that allows the actuator to purge air either inside of the unit or directly outside. When the enclosure is open, the purge air switch above the pneumatic terminal strip on the pneumatic block can be accessed.

Tools Needed:

- Instrument Screwdriver



Refer to Figure 4.

In the IN position, the enclosure is flushed from inside with a small volume of clean and dry instrument air.

In the OUT position, the purge air is directed towards outside of the unit.

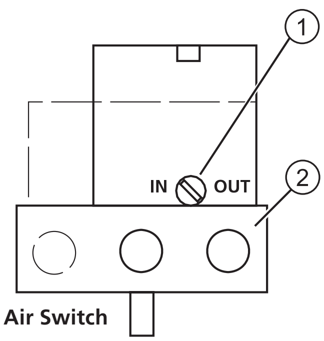


Figure 4. - Purge Air Switch

① Purge Air Switch

② Pneumatic Block

Natural Gas as an Actuator Medium

The S6A can also be operated with natural gas as an actuator medium. When operating the positioner with natural gas, you must follow and adhere to the following safety notes:

1. Only the “EEx ia” version of the positioner and optional modules with the “EEx ia” type of protection may be operated with natural gas. Positioners with other types of protection, i.e. flameproof enclosures for zones 1 and 2 are not permitted.
2. Do not operate the positioner with natural gas in closed spaces.
3. Natural gas is continuously blown off in the servo-drive depending on the model. Special care must therefore be taken during maintenance activities near the positioner. Always ensure that the immediate surroundings of the positioner are adequately ventilated.
4. The mechanical limit switch module may not be used when operating the positioner with natural gas.
5. Depressurize the devices operated with natural gas adequately during maintenance activities. Open the cover in an explosion-free atmosphere and depressurize the device for at least two minutes.

Normally you operate the positioner with compressed air. Natural gas has been approved as an actuator medium for intrinsically safe positioners with the “EEx ia” type of protection. Only use natural gas which is clean, dry and free from additives.

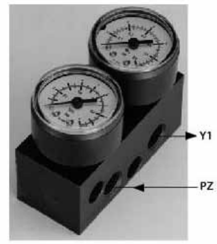
The positioner releases the used natural gas through the exhaust air outlet E (see Figure 2). The exhaust air outlet E is equipped with an attenuator. As an alternative to this standard configuration, the exhaust air outlet can be replaced with a G¼ screwed fitting. You have to dismantle the attenuator for this purpose. Natural gas escapes parallel to the exhaust air outlet E, from the enclosure vent at the bottom side of the device, and from the control air outlet near the pneumatic connections. This escaping natural gas cannot be collected and carried off. When using natural gas as an actuator medium refer to Figure 5 for maximum bleed off values.

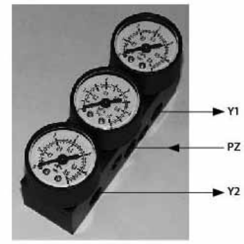
Figure 5. Maximim bleed off values

Bleeding process	Operating mode	6A-6DR5*1*-*E***	6A-6DR5*2*-*E***
		Single-acting	Double-acting
		[Nl/min]	[Nl/min]
Bleed the enclosure volume through the bottom side of the device. Purge air switch is at "IN":	Operation, typical	0.14	0.14
	Operation, max.	0.60	0.60
	Error case, max.	60.0	60,0
Bleed through the control air outlet near the pneumatic connections:	Operation, typical	1.0	2.0
	Operation, max.	8.9	9.9
	Error case, max.	66.2	91.0
Bleed through the exhaust air outlet E	Operation, max.	358.2[1)]	339[1).]
	Error case, max.		
Volume	Max. [l]	1.26	1.23

Optional Accessories

1. **Pressure Gauges** – used to measure and indicate supply and actuating pressures





2. **Filter** – used to clean the supply medium
3. **Non Contacting/External Position Detection System** – used for harsh environments
4. **SIMATIC PDM Operation Software** – used for online diagnostics of the S6A

Contact your Bray representative for specific requirements for your intended application.

CALIBRATION AND COMMISSIONING

Installing a New Unit

Please refer to the S6A Quick Start Guide for the Standard Unit.

Replacing a Unit

The S6A can be replaced in a running system where a S6A was already in use without interrupting the process. By copying and transferring the device and initialization data, it is possible to commission a replacement positioner without needing to initialize it. The S6A uses the communication interface to transfer data. When this is performed, it is crucial to perform a standard initialization of the replacement positioner as soon as possible because the following properties can be ensured only after initializing:

- Optimum adjustment of the positioner as per the mechanical and dynamic properties of the actuator.
- Unrestricted accuracy and dynamic behavior of the positioner.
- Deviation-free position of the hard-end stops.
- Accuracy of the maintenance data

Copy the initialization data and the device parameters as follows:

1. Read in the initialization data and the device parameters of the positioner to be replaced. Use a suitable parameterization tool for this purpose.
2. Save the data in the parameterization tool.

> **Note:** If the positioner to be replaced has already been initialized or configured using the parameterization tool, you need not read in and save the device data.

Proceed as follows to replace a positioner in a running system:

3. Fix the actuator at its current position mechanically or pneumatically.
4. Determine the actual position value.
   – Read the actual position value on the digital display of the positioner to be replaced.

Take note of the read value.

   – If the electronic unit of the positioner is defective, measure the actual position value at the actuator or the valve. Take note of the read value.

5. Dismantle the positioner.
6. Attach the lever arm of the positioner to be replaced to the replacement positioner.
7. Install the replacement positioner on the control valve.
8. Set the transmission ratio selector of the replacement positioner to the same position as that of the positioner to be replaced.
9. Use the parameterization tool to transfer the saved device and initialization data to the replacement positioner.
10. If the displayed actual position value differs from the noted value, correct the deviation by moving the friction clutch.
11. The replacement positioner is ready for operation when the displayed and the noted values match.

Operation

Reading the LCD screen

The S6A digital display has two lines, one on the bottom and one on top. Each element on the top line has seven segments while each element on the bottom line has fourteen. Contents of the display depend on the selected mode. Figure 6 below provides an example of what the display will look like when the unit is powered on.

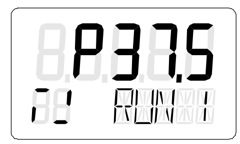


Figure 6.
Example Display

> **Note:** When operated in temperature ranges below 14°F (-10°C), the liquid crystal display of the positioner becomes sluggish and the repetition rate display is reduced considerably.

Using the pushbuttons

The S6A is manually operated using three pushbuttons. The cover of the positioner has to be removed in order to operate the buttons.

> **Note:** The function of the buttons depends on the current Operating Mode. As a general rule the following applies:

The operating mode button is used to select the modes and to forward the parameters.

The decrement button is used to select parameter values when configuring. You can use this button to move the actuator in the manual mode.

The increment button is also used to select parameter values when configuring. You can use the increment button to move the actuator in the manual mode.

\+ *Parameters are activated in the reverse order by pressing the operating mode button and the decrement button at the same time

> **Note:** The IP66/NEMA 4x degree of protection is not ensured as long as the positioner is open.

Operating Modes

The S6A has five different operating modes described in detail below. Refer to Figure 7 to navigate between modes.

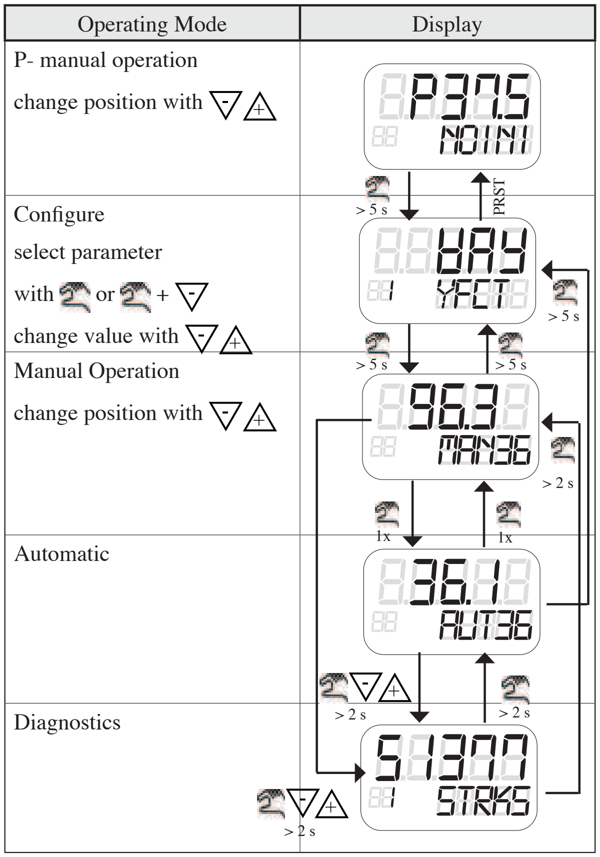
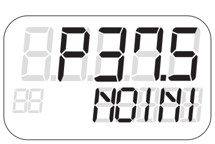


Figure 7. Operating Modes Display

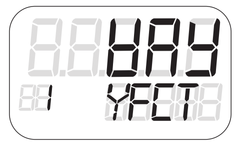
P-manual mode (as-delivered condition)



The "P-manual mode" is preset for the positioner in the as-delivered condition. The digital display of the positioner shows the current potentiometer position in the upper line. "NOINI" blinks in the second line of the digital display. You can move the actuator using the decrement and increment buttons. Switch to Configuration" and "Initialization mode" to adapt the actuator as per the positioner.

Alarms or position feedbacks can be triggered only after initializing the positioner completely.

Configuration and initialization mode



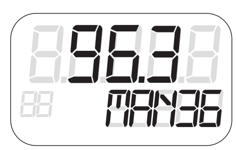
To get to the "Configuration" mode, press the operating mode button for at least 5 seconds. You can use the "Configuration" mode to adjust the positioner individually as per your actuator and start commissioning or initialization. The positioner reports the "Configuration" mode with a configurable fault message. A position feedback or display of limits A1 and A2 is not possible.

Note: If electrical auxiliary power supply fails when configuring, the positioner responds as follows until the power supply is reestablished:

- The positioner switches to the first parameter.
- Settings of the values already configured are retained.

In order to save the changed parameter values, exit the "Configuration" mode or switch to another parameter. When the "Configuration" mode is restarted, the control in the digital display switches to the last activated parameter.

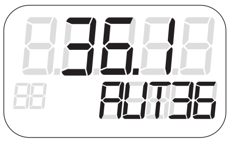
Manual mode (MAN)



You can move the actuator using the decrement and increment buttons in this mode. The setting selected here is retained irrespective of the setpoint current and leakages, if any.

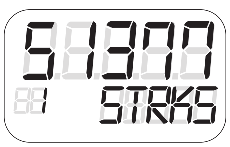
Note: To accelerate the actuator movement keep one of the two direction buttons pressed and simultaneously press the remaining direction. In the event of a failure of the power supply, once the power is reestablished the positioner switches to "Automatic" mode.

Automatic (AUT)



Automatic is the standard mode. In this mode, the positioner compares the setpoint position with the actual position. The positioner moves the actuator until the control deviation reaches the configurable dead zone. A fault message is displayed if the dead zone cannot be reached.

Diagnostics



Proceed as follows to call the "Diagnostics" mode from the "Automatic" or "Manual" modes:

Press the three buttons of the positioner at the same time for at least 2 seconds.

Current operating data can be called and displayed in this mode, e.g.:

- Stroke number
- Number of changes in direction
- Number of fault messages

Note: The "Automatic" and "Manual" modes remain set when switching to the "Diagnostics" mode. The positioner responds as per the set mode:

- The predefined setpoint is used as a control variable in the automatic mode.
- The last reached position is retained in the manual mode.

Using the built in Diagnostics

The S6A has various monitoring functions with which changes on the actuator and valve can be detected and signaled if applicable when a selectable limit has been exceeded. This information may be important for diagnosis of the actuator or valve and will help to schedule preventative maintenance. The measuring data that is monitored is listed below:

- Travel integral
- Number of changes in direction
- Alarm counter
- Self-adjusting dead zone
- Valve end limit position (for detection of valve seat wear or deposits)
- Operating Hours (also according to temperature and travel ranges) as well as min./max. temperature
- Operating Cycles of piezoelectric valves
- Valve positioning time
- Actuator leakages

The diagnostics display has similar structure to that of the "Configuration" mode:

- The upper line shows the value of the diagnosis variable.
- The lower line shows the number and the abbreviation of the displayed variable.

Some diagnostics values can be greater than 99999. In such a case, the display switches over to the exponential view. Example: The value "1234567" is shown as "1.23E6".

In the event of a fault an error code will be shown on the lower left hand corner of the display. There is a fault table in the "Troubleshooting" section of this manual which explains what each of these codes represents.

The following table provides an overview of values that can be displayed. The last column contains "X" if the value can be set to zero.

Overview of Diagnostics Values

No.	Abbreviation	Meaning	Values that can be displayed	Unit	Reset possible
1	STRKS	Stroke number (Strokes)	0 ... 4.29E9	-	X
2	CHDIR	Changes of direction (Changes of Direction)	0 ... 4.29E9	-	X
3	ϟCNT	Number of fault messages (ϟCounter)	0 ... 4.29E9	-	X
4	A1CNT	Number of alarms 1 (Alarm 1 Counter)	0 ... 4.29E9	-	X
5	A2CNT	Number of alarms 2 (Alarm 2 Counter)	0 ... 4.29E9	-	X
6	HOURS	Operating hours (Hours)	0 ... 4.29E9	Hours	-
7	WAY	Determined actuator travel (Way)	0 ... 130	mm or °	-
8	TUP	Actuating time up (Travel Time Up)	0 ... 1000	s	-
9	TDOWN	Actuating time down (Travel Time Down)	0 ... 1000	s	-
10	LEAK	Leakage (Leakage)	P 0.0 ... 100.0	%	-
11	PST	Monitoring of the partial stroke test	OFF / ###.#, fdini, notSt, SdtSt, fdtSt, notd, Strt	s for ###.#	-
12	PRPST	Time since the last Partial-Stroke-Test	###, notSt, Sdtst, fdtSt	Days	-
13	NXPST	Time until the next Partial-Stroke-Test	###, notSt, SdtSt, fdtSt	Days	-
14	DEVI	General control valve fault	OFF, 0.0 ... 100.0	%	-
15	ONLK	Pneumatic leakage	OFF, 0.0 ... 100.0	-	-
16	STIC	Static friction/Slipstick effect	OFF, 0.0 ... 100.0	%	-
17	ZERO	Zero point displacement	OFF, 0.0 .. 100.0	%	-
18	OPEN	Displacement of upper end stop	OFF, 0.0 ... 100.0	%	-
19	PAVG	Position average	0.0 ... 100.0	%	-
20	P0	Potentiometer value of lower end stop (0%)	0.0 ... 100.0	%	-
21	P100	Potentiometer value of upper end stop (100%)	0.0 ... 100.0	%	-
22	IMPUP	Impulse length up (Impuls Length Up)	2 ... 160	ms	-
23	IMPDN	Impulse length down (Impuls Length Down)	2 ... 160	ms	-
24	DBUP	Dead zone up (Dead Band Up)	0.1 ... 10.0	%	-
25	DBDN	Dead zone down (Dead Band Down)	0.1 ... 10.0	%	-
26	SSUP	Slow step zone up (Short Step Zone Up)	0.1 ... 100.0	%	-
27	SSDN	Slow step zone down (Short Step Zone Down)	0.1 ... 100.0	%	-
28	TEMP	Current temperature	-40 ... 85	°C	-
29	TMIN	Minimum temperature ("min/max pointer")	-40 ... 85	°C	-
30	TMAX	Maximum temperature ("min/max pointer")	-40 ... 85	°C	-
31	T1	Number of operating hours in temperature range 1	0 ... 4.29E9	Hours	-
32	T2	Number of operating hours in temperature range 2	0 ... 4.29E9	Hours	-
33	T3	Number of operating hours in temperature range 3	0 ... 4.29E9	Hours	-
34	T4	Number of operating hours in temperature range 4	0 ... 4.29E9	Hours	-
35	T5	Number of operating hours in temperature range 5	0 ... 4.29E9	Hours	-
36	T6	Number of operating hours in temperature range 6	0 ... 4.29E9	Hours	-

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Overview of Diagnostics Values (cont.)

No.	Abbreviation	Meaning	Values that can be displayed	Unit	Reset possible
37	T7	Number of operating hours in temperature range 7	0 ... 4.29E9	Hours	-
38	T8	Number of operating hours in temperature range 8	0 ... 4.29E9	Hours	-
39	T9	Number of operating hours in temperature range 9	0 ... 4.29E9	Hours	-
40	VENT1	Number of switching cycles of pilot valve 1	0 ... 4.29E9	-	-
41	VENT2	Number of switching cycles of pilot valve 2	0 ... 4.29E9	-	-
42	STORE	Save the current value as "last maintenance" (press the increment button for 5 s) (Store)	-	-	-
43	PRUP	Prediction up	1 ... 40	-	-
44	PRDN	Prediction down	1 ... 40	-	-
45	WT00	Number of operating hours in the actuating range WT00	0 ... 4.29E9	Hours	X
46	WT05	Number of operating hours in the actuating range WT05	0 ... 4.29E9	Hours	X
47	WT10	Number of operating hours in the actuating range WT10	0 ... 4.29E9	Hours	X
48	WT30	Number of operating hours in the actuating range WT30	0 ... 4.29E9	Hours	X
49	WT50	Number of operating hours in the actuating range WT50	0 ... 4.29E9	Hours	X
50	WT70	Number of operating hours in the actuating range WT70	0 ... 4.29E9	Hours	X
51	WT90	Number of operating hours in the actuating range WT90	0 ... 4.29E9	Hours	X
52	WT95	Number of operating hours in the actuating range WT95	0 ... 4.29E9	Hours	X

Diagnostic value 53

No.	Abbreviation	Meaning	Values that can be displayed	Unit	Reset possible
53	mA	Setpoint current	0.0 to 20.0	mA	--

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Parameter	Function	Parameter Values	Description
1) YFCT	Type of position actuator	Turn	Automatically sets 2) YAGL to 90˚
		WAY	Used for linear actuators
		LWAY	Used for linear actuators
		ncSt	Used for a non-contacting position sensor on a part turn actuator
		-ncSt	Used for a non-contacting position sensor on a part turn actuator with a reverse direction of action
		ncSL	Used for linear actuators
		ncSLL	Used for linear actuators
2) YAGL	Angle of rotation	33˚	Used for linear actuators
		90˚	
3) YWAY	Range of Stroke		Used for linear actuators
4) INITA	Initialization (automatic)	NOINI | no/ ###.# | Strt	Starts the automatic initialization process
5) INITM	Initialization (manual)	NOINI | no/ ###.# | Strt	Starts the manual initialization process
6) SCUR	Current range of setpoint	0 MA	0 MA only available for 3 to 4 wire connections.
		4 MA	Factory setting.
7) SDIR	Setpoint Setup	riSE	Used to reverse the direction of the action of the setpoint. Factory setting is "rise"
		FALL	
8) SPRA	Setpoint split range start	0.0 … 100.0	Used to limit the setpoint. Factory setting is "0"
9) SPRE	Setpoint split range end	0.0 … 100.0	Factory setting is "100"
10) TSUP	Setpoint ramp OPEN	Auto / 0 … 400	Limits the speed of change of the effective setpoint. Factory setting is "0"
11) TSDO	Setpoint ramp CLOSED	0 … 400	
12) SFCT	Setpoint Function	1 – 25	Equal Percentage. Linearizes valve characteristics. Factory setting is "Lin"
		1 – 33	
		1 – 50	
		n1 – 25	Inverse equal percentage
		n1 – 33	
		n1 – 50	
		FrEE	Freely Adjustable
13) SLO …33) SL20	Setpoint Turning Point	0.0 … 100.0	Assigns a flow metric to each setpoint interpolation in units of 5%.
34) DEBA	Dead Zone of Closed-Loop Controller	Auto / .1 … 10.0	Adjust the dead zone to the requirements of the control loop. Factory setting is "Auto"
35) YA	Start of the manipulated variable limit	0.0 … 100.0	Used to limit the mechanical actuator travel from stop to stop to the configured values. "YE" must always be larger than "YA". Factory setting is "100"
36) YE	End of the manipulated variable limit	0.0 … 100.0	
37) YNRM	Manipulated variable scaling	MPOS	Mechanical position from 0 to 100% between hard stops.
		FLOW	Scaling from 0 to 100% over the range between "YA" and "YE"
38) YDIR	Direction of Manipulated Variable	riSE	Used to set the direction of action of the display and the position feedback Iy. Factory setting is "riSE"
		FALL	
39) YCLS	Manipulated variable tight closing	No	Used to move the valve into its seat with the maximum force of the actuator. Factory setting is "No"
		uP	
		Do	
		uP do	
40) YCDO	Lower value for tight closing	0.0 … 0.5 … 100%	Factory setting is "0.5"

41) YCUP	Upper value for tight closing	0.0 … 99.5 … 100%		Used to set the value for tight "Tight closing below" and "Tight closing above". Factory setting is "99.5"
42) BIN1 2)	Function of BE1	Normally Open	Normally Closed	Functions while in binary input mode.
		OFF		Factory setting.
		on	-on	Binary message from peripherals
		bloc1		Used to lock the configuration operation
		bloc2		
		uP	-uP	Actuator regulating to the valve specified by parameters "YA" and "YE"
		doWn	-doWn	
		StoP	-StoP	Piezo valves are blocked. Actuator remains at last position.
		PST	-PST	Used to trigger a partial stroke test
43) BIN2 2)	Function of BE2	Normally Open	Normally Closed	Functions while in binary input mode.
		OFF		Factory setting.
		on	-on	Binary message from peripherals
		uP	-uP	Actuator regulating to the valve specified by parameters "YA" and "YE"
		doWn	-doWn	
		StoP	-StoP	Piezo valves are blocked. Actuator remains at last position.
		PST	-PST	Used to trigger a partial stroke test
44) AFCT 3)	Alarm Function	Normal	Inverted	Used to determine the value at which going above or below a given offset or angle will result in a message.
		Off		
		Mi MA	-Mi -MA	
		Mi Mi	-Mi -Mi	
		MA MA	-MA -MA	
45) A1	Trigger threshold, alarm 1	0.0 … 10.0 … 100 %		Used to specify when an alarm should be displayed.
46) A2	Trigger threshold, alarm 2	0.0 … 90.0 …100%		
47) FCT 3)	Function for fault message output	Normal	Inverted	Cannot be switched off. Can be suppressed by switching to "No Automatic Mode"
		S	-S	
		SnA	-SnA	
		SnAb	-SnAb	
48) TIM	Monitoring time for setting of fault message	Auto / 0 … 100		Used to set the time in seconds that the positioner must have reached the regulated condition.
49) LIM	Response threshold for fault message	Auto / 0 … 100		Used to set a value for the permissible size of the regulation device to trigger a fault message.
50) PRST	Preset (factory setting)	no		Used to restore factory settings and reset initialization. Press increment button for 5 seconds.
		Strt		
		oCAY		
51) XDIAG	Activation of extended diagnostics	OFF		Used to activate extended diagnostics.
		On1		
		On2		
		On3		
52) FSTY	Safety Seating	FSVL		Actuator controlled using the parameterization safety point. Effective after a power failure.
		FSSP		Actuator controlled using the last effective set point
		FSAC		Valves move to location based on spring force. (Factory Defined)

53) FSTI	Monitoring Period for setting the safety seating	0 … 100	(s). Once this set value expires the positioner switches to its safety position. (Factory defined at 0)
54) FSVL	Safety Setpoint	0.0 … 100.0	(%). Default value of the safety position. (Factory setting is 0%)
55) STNR	Station Number	0 … 126	Independent value for each station. (Default position is 126)
56) IDENT	Device operating mode (ID No.)	0	Profile Compliant. Can be replaced with other positioners complying with Profibus PA profile 3.0
		1	Compliant with Extensions (Factory Defined).

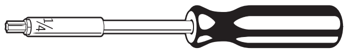
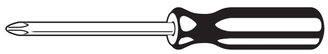
Parameter	Function	Parameter Values	Description
A. PST	Partial Stroke Test		Used to activate the partial stroke test for cyclic or manual test of up/down and servo solenoid valves.
A1.STPOS	Starting position	0.0 … 100.0	Start position in %. Factory setting is “100.0”
A2.STTOL	Starting tolerance	0.1 … 2.0 … 10.0	Start position tolerance in %. Factory setting is “2.0”
A3.STEP	Step height	0.1 ..10.0 ..100.0	Step height of partial stroke test in %
A4.STEPD	Step Direction	uP / do / uP do	Step direction of partial stroke test. Factory setting is “do”
A5.INTRV	Test Interval	OFF / 1 … 365	Interval time for cyclic partial stroke in days. “Off”
A6.PSTIN	Partial Stroke ref. step time	NOINI / (C) ###.# / Fdini / rEAL	Reference step time for partial stroke in s. “NOINI”
A7.FACT1	Factor 1	0.1 … 1.5 … 100.0	Factor for the formation of limit threshold 1. “1.5”
A8.FACT2	Factor 2	0.1 … 3.0 … 100.0	Factor for the formation of limit threshold 2. “3.0”
A9.FACT3	Factor 3	0.1 … 5.0 … 100.0	Factor for the formation of limit threshold 3. “5.0”
b. DEVI	General Control Valve Fault		Test for dynamic monitoring of control valve response.
b1.TIM	Time constant	Auto / 1 … 400	Defines the attenuation effect of the low-pass filter. “Auto”
b2.LIMIT	Limit	0.1 … 1.0 … 100.0	Sets a base limit in %. “1.0”
b3.FACT1	Factor 1	0.1 … 5.0 … 100.0	Factor for the formation of limit threshold 1. “5.0”
b4.FACT2	Factor 2	0.1 ..10.0..100.0	Factor for the formation of limit threshold 2. “10.0”
b5.FACT3	Factor 3	0.1..15.0..100.0	Factor for the formation of limit threshold 3. “15.0”
C. LEAK	Pneumatic leakage		Activates the pneumatic leakage test
C1.LIMIT	Limit	0.1 .. 30.0 .. 100.0	Sets the limit of the leakage indicator in %. “30.0”
C2.FACT1	Factor 1	0.1 … 1.0 … 100.0	Factor for the formation of limit threshold 1. “1.0”
C3.FACT2	Factor 2	0.1 … 1.5 … 100.0	Factor for the formation of limit threshold 2. “1.5”
C4.FACT3	Factor 3	0.1 … 2.0 … 100.0	Factor for the formation of limit threshold 3. “2.0”
d. STIC	Friction (slip-stick effect)		Monitors the current static friction of the final controlling element
d1.LIMIT	Limit	0.1 … 1.0 … 100.0	Sets the base limit for the slipstick detection in %. “1.0”
d2.FACT1	Factor 1	0.1 … 2.0 … 100.0	Factor for the formation of limit threshold 1. “2.0”
d3.FACT2	Factor 2	0.1 … 5.0 … 100.0	Factor for the formation of limit threshold 2. “5.0”
d4.FACT3	Factor 3	0.1 ..10.0..100.0	Factor for the formation of limit threshold 3. “10.0”
E. DEBA	Dead zone monitoring		Used to measure the automatic adjustment of the dead zones
e1.LEVEL3	Threshold	0.1 … 2.0 … 10.0	Sets the factor limit threshold to monitor the dead zone adjustment

F. ZERO	Zero point monitoring		Activates the zero point displacement test
F1.LEVEL1	Threshold 1	0.1 … 1.0 … 100.0	Sets a threshold in % of the lower hard stop. “1.0”
F2.LEVEL2	Threshold 2	0.1 … 2.0 … 100.0	Sets a threshold in % of the lower hard stop “2.0”
F3.LEVEL3	Threshold 3	0.1 … 4.0 … 100.0	Sets a threshold in % of the lower hard stop “4.0”
G. OPEN	Displacement of the upper stop		Activates the test to monitor the displacement of the upper end stop.
G1.LEVEL1	Threshold 1	0.1 … 1.0 … 100.0	Sets a threshold in % of the upper hard stop. “1.0”
G2.LEVEL2	Threshold 2	0.1 … 2.0 … 100.0	Sets a threshold in % of the upper hard stop. “2.0”
G3.LEVEL3	Threshold 3	0.1 … 4.0 … 100.0	Sets a threshold in % of the upper hard stop. “4.0”
H. TMIN	Monitoring of the lower limit temperature		Activates the test to continuously monitor the lower limit temperature
H1.TUNIT	Temperature Unit		Sets the temp. parameter from “C” to “F”. “C”
H2.LEVEL1	Threshold 1	-40 … 194	Sets a threshold in degrees “C” or “F”. “-25 C”
H3.LEVEL2	Threshold 2	-40 … 194	Sets a threshold in degrees “C” or “F”. “-30 C”
H4.LEVEL3	Threshold 3	-40 … 194	Sets a threshold in degrees “C” or “F”. “-40 C”
J. TMAX	Monitoring of the upper limit temperature		Activates the test to continuously monitor the upper limit temperature
J1.TUNIT	Temperature Unit		Sets the temp. parameter from “C” to “F”. “C”
J2.LEVEL1	Threshold 1	-40 … 194	Sets a threshold in degrees “C” or “F”. “75 C”
J3.LEVEL2	Threshold 2	-40 … 194	Sets a threshold in degrees “C” or “F”. “80 C”
J4.LEVEL3	Threshold 3	-40 … 194	Sets a threshold in degrees “C” or “F”. “90 C”
L. STRK	Monitoring the path integral		Monitors the entire path covered by the final controlling element.
L1.LIMIT	Limit for the number of changes of direction	1 … 1E6 … 1E8	Sets the base limit for the number of strokes. “1.00 E6”
L2.FACT1	Factor 1	0.1 … 1.0 … 40.0	Factor for the formation of limit threshold 1. “1.0”
L3.FACT2	Factor 2	0.1 … 2.0 … 40.0	Factor for the formation of limit threshold 2. “2.0”
L4.FACT3	Factor 3	0.1 … 5.0 … 40.0	Factor for the formation of limit threshold 3. “5.0”
O. DCHG	Monitoring the changes in direction		Continuously monitors the number of changes of direction of the actuator caused in the dead zone.
O1.LIMIT	Limit for the number of changes of direction	1 … 1E6 … 1E8	Sets the base limit for the number of changes of direction. “1.00 E6”
O2.FACT1	Factor 1	0.1 … 1.0 … 40.0	Factor for the formation of limit threshold 1. “1.0”
O3.FACT2	Factor 2	0.1 … 2.0 … 40.0	Factor for the formation of limit threshold 2. “2.0”
O4.FACT3	Factor 3	0.1 … 5.0 … 40.0	Factor for the formation of limit threshold 3. “5.0”
P. PAVG	Position mean value calculation		Activates the test to calculate and monitor the position average
P1.TBASE	Time base of the mean value generation	.5h / 8h / 5d / 60d / 2.5y	Sets the time interval to calculate the position average
P2.STATE	State of the position mean value calculation	IdLE/ rEF / ###.# / Strt	Starting time for the calculation of position average. “IdLE”
P3.LEVEL1	Threshold 1	0.1 … 2.0 … 100.0	Sets a threshold for the maximum deviation of the current position average from the reference avg. “2.0”
P4.LEVEL2	Threshold 2	0.1 … 5.0 … 100.0	Sets a threshold for the maximum deviation of the current position average from the reference avg. “5.0”
P5.LEVEL3	Threshold 3	0.1 ..10.0..100.0	Sets a threshold for the maximum deviation of the current position average from the reference avg. “10.0”

FACTORY OR FIELD INSTALLABLE OPTIONS

The S6A comes standard with guides beneath the motherboard so that optional modules can be added.

Tools Needed:

- T2O Torx 
- Phillips Screwdriver 

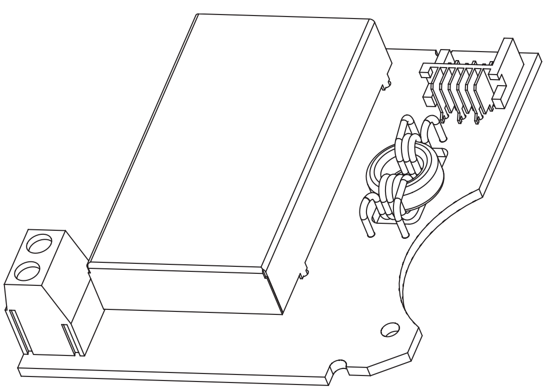
Step A

To install any of the optional modules proceed as follows:

1. Disconnect electrical power from the supply to the positioner
2. Remove pressure from the pneumatic supply lines to the positioner.
3. Remove the positioner cover by loosening the 4 screws using the Phillips screwdriver.
4. Remove the module cover by loosening the 2 screws using the T20 torx drive.

> **Note:** Step A must be performed before installing any of the modules.

Installing the Feedback Module (Iy Module)



Feedback Module (ly Module)

Function

The optional Iy module indicates the current actuator position as a dual line signal with Iy = 4 to 20 mA. The Iy module is potentially isolated from the standard controller. Due to the dynamic control, this module can report the arising operational faults automatically.

Device features

The Iy module is:

- Single channel
- Potentially isolated from the standard controller.

> **Note:** The current actuator position is indicated only after a successful initialization of the positioner. [Refer to the "Calibration and Commissioning" section]

Proceed as follows to install the optional Iy module:

1. **Perform Step A to remove the module cover**
2. Slide the Iy module up to the end stop in the lower stack of the module rack.
3. Connect the module to the motherboard. For this purpose, use the 6-pole flat ribbon cable provided.
4. Refer to Figure 8 and Figure 9 to connect the Iy module in standard and intrinsically safe applications.

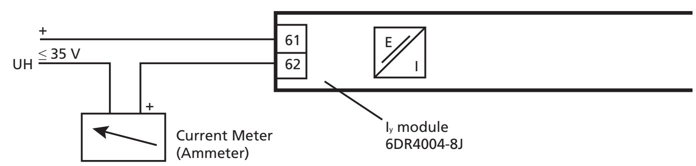


Figure 8.- Iy module 6DR4004-8J, not Ex

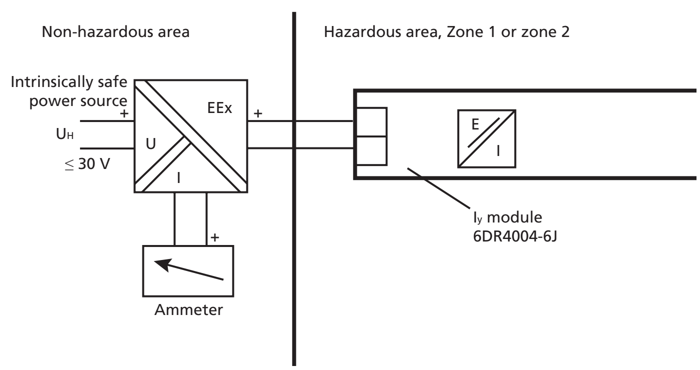
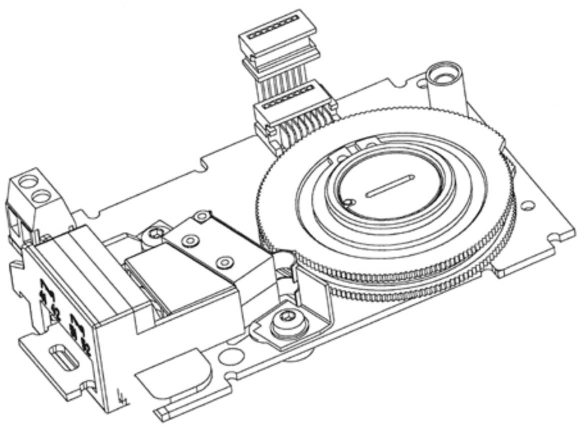


Figure 9. - Iy module 6DR4004-6J, EEx i

Installing the Mechanical Limit Switch Module



Mechanical Limit Switch Module

Function

This module is used to report two limits. These two limit switches are voltage free and rated for 4A at 24V DC or AC 250V.

Device features

The mechanical limit switch module consists of:

- One binary output to display a collective fault message. Compare with the device features of the alarm unit.
- Two switches to report two mechanically adjustable limits.

Both of these switches are electrically independent from the remaining electronic unit.

Note: Only qualified personnel should be allowed to install and connect the Mechanical Limit switch module

Proceed as follows to install the mechanical limit switch module:

1. **Perform Step A to remove the module cover**
2. Disengage the motherboard by carefully bending the four brackets.
3. Insert the mechanical limit switch module from the top up to the upper printed circuit board guide of the module rack.
4. Slide the mechanical limit switch module unit into the printed circuit board of the module rack approximately 1/8" towards the right.
5. Screw in the special screw through the mechanical limit switch module into the positioner shaft. Tighten the special screw with a torque of 17.7 in-lbs.

NOTICE

A pin in the actuating disc bearing is pressed. Align this pin before it touches the special screw. You must rotate the actuating disc bearing and the special screw simultaneously so that the pin is inserted into the special screw.

An insulating cover is provided over the mechanical limit switch module. Place the insulating cover to one side under the motherboard seat on the container wall. The recesses of the insulating cover must fit in the corresponding webs of the container wall.

6. Place the insulating cover on the mechanical limit switch module by bending the container walls carefully.
7. Engage the motherboard into the four brackets.
8. Connect the motherboard and the optional modules to the ribbon cables provided.
9. Connect the motherboard and the potentiometer to the potentiometer cable.
10. Using both the screws, fasten the module cover provided.

Do not use the standard module cover.

11. Refer to Figures 10 and 11 to connect the Mechanical Limit switch module in standard and intrinsically safe applications.

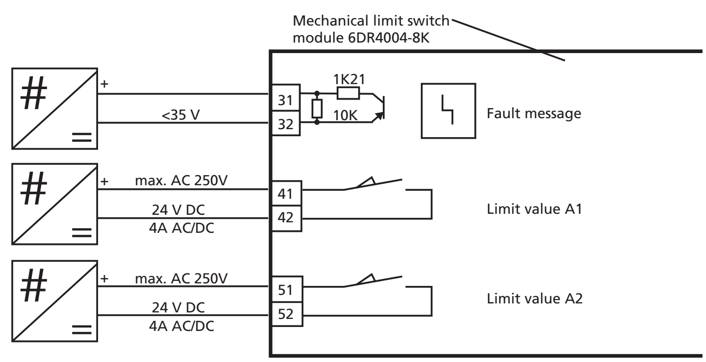


Figure 10. - Mechanical limit switch module 6DR4004-8K, not Ex

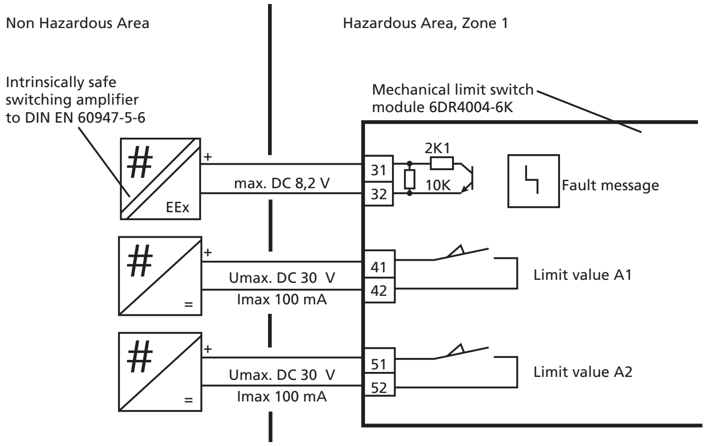


Figure 11. - Mechanical limit switch module 6DR4004-6K, EEx i

Connect the mechanical limit switch module as follows:

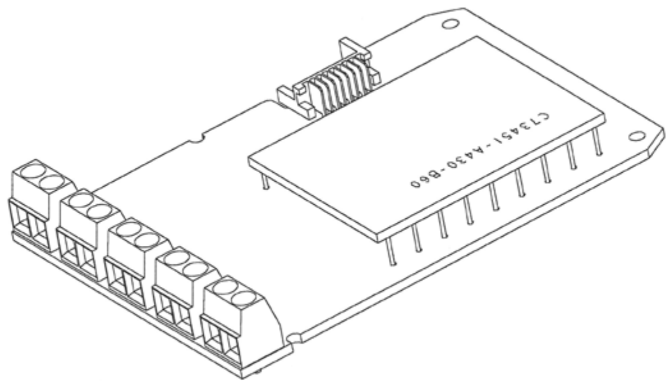
1. Loosen the screw on the transparent cover
2. Pull the transparent cover up to the front end stop.
3. Tighten every cable in the corresponding terminal.

NOTICE

Verify the electrical specifications for these terminals based on the wiring diagram. Do not use the non Ex board in a hazardous environment.

4. Slide the transparent cover up to the end stop of the motherboard.
5. Tighten the screw on the transparent cover
6. Connect the cables of each switch to the lug of the printed circuit board in pairs. Use the provided cable tie for this purpose.

Installing the Alarm Module



Alarm Unit

Function

The alarm unit triggers fault messages and alarms using binary outputs. The message function is based on the change in the signal status:

If the signal status is "HIGH", there is no alarm message and the binary inputs are conductive.

If the signal status is "LOW", the module reports an alarm by shutting down binary outputs using a high-resistance.

Due to the dynamic control, this module can report the arising operational faults automatically. Set parameters 44 to 51 to activate and parameterize the output of alarms and fault messages. Apart from binary outputs, the alarm unit has a double-acting binary input BE2. Depending on the selected parameters, it is used to block or to move the actuator it to its end position. Configure the suitable settings on parameter 43.

Device features

The alarm unit has the following features:

Available in two versions.

- Explosion-proof version for connecting to a switching amplifier in conformity with EN 60947-5-6.
- Non-explosion-proof version for connecting to power sources having a maximum of 35 V.

Three binary outputs. Binary inputs are potentially isolated from the standard controller and from each other. The binary input has dual functionality. Both inputs are implemented as logical OR combination.

- Isolated for voltage level
- Not isolated for dry contacts

Proceed as follows to install the alarm unit:

1. **Perform Step A to remove the module cover**
2. Slide the alarm unit below the motherboard in the module rack. Ensure that you slide it up to the end stop.
3. Connect the module to the motherboard. For this purpose, use the 8-pole flat ribbon cable provided.
4. Refer to Figures 12 and 13 to connect the Alarm unit in standard and intrinsically safe applications

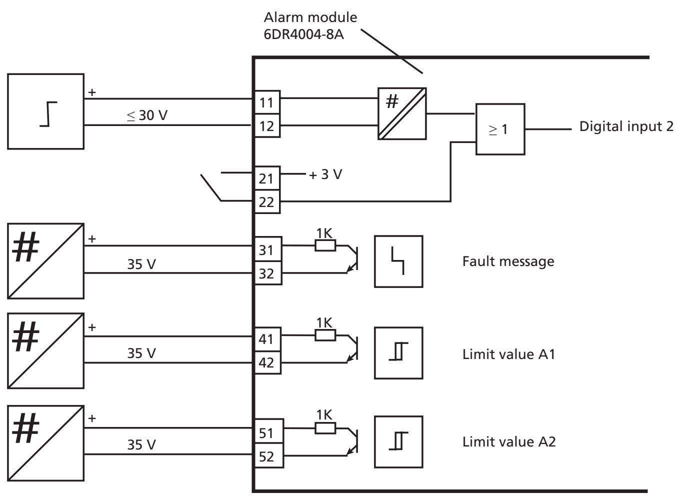


Figure 12. - Alarm unit 6DR4004-8A, not Ex

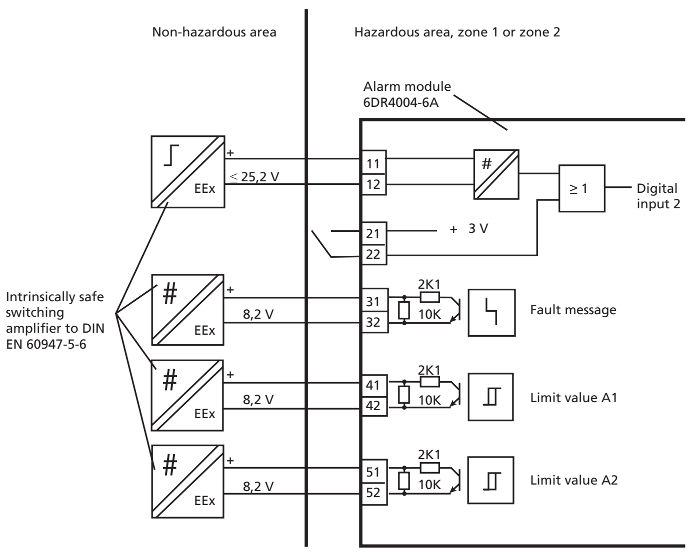
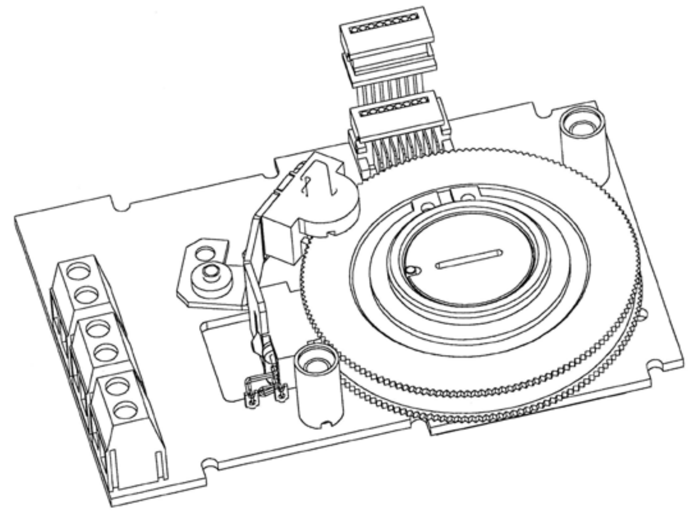


Figure 13. - Alarm unit 6DR4004-6A, EEx i

Installing the Slotted Initiator Alarm Unit



Slotted Initiator Alarm Unit

Function

If the standard controller requires electrically independent limit value messages, the slotted initiator alarm unit is used instead of the standard alarm unit.

A binary output is used to display a collective fault message. Compare with the function of the alarm unit. The floating binary output is implemented as an automatic fault indicating semiconductor output.

The other two binary outputs are used for the message of two limits L1 and L2 which can be adjusted mechanically using slotted initiators. Both these binary outputs are electrically independent from the remaining electronic unit.

Device features

The slotted initiator alarm unit, abbreviated as SIA unit consists of three binary outputs.

Proceed as follows to install the SIA unit:

1. **Perform Step A to remove the module cover**
2. Unscrew both the screws on the motherboard.
3. Disengage the motherboard by carefully bending the four brackets.
4. Insert the SIA unit from the top up to the upper printed circuit board guide of the module rack.
5. Slide the SIA unit in the printed circuit board of the module rack approximately 1/8" to the right.
6. Screw in the special screw through the SIA unit into the positioner shaft. Tighten the special screw with a torque of 17.7 in-lbs.

NOTICE

A pin in the actuating disc bearing is pressed. Align this pin before it touches the special screw. You must rotate the actuating disc bearing and the special screw simultaneously so that the pin is inserted into the special screw.

7. An insulating cover is provided over the SIA unit. Place the insulating cover to one side under the motherboard seat on the container wall. The recesses of the insulating cover must fit in the corresponding webs of the container wall.
8. Place the insulating cover on the SIA unit by bending the container walls carefully.
9. Engage the motherboard into the four brackets.
10. Tighten the motherboard using the two screws.
11. Reestablish all electrical connections between the motherboard and the optional modules. Connect the motherboard and the optional modules to the ribbon cables provided. Connect the motherboard and the potentiometer to the potentiometer cable.
12. Using both the screws, fasten the module cover provided. **Do not use the standard module cover**.
13. Refer to Figures 14 and 15 to connect the SIA module in standard and intrinsically safe applications

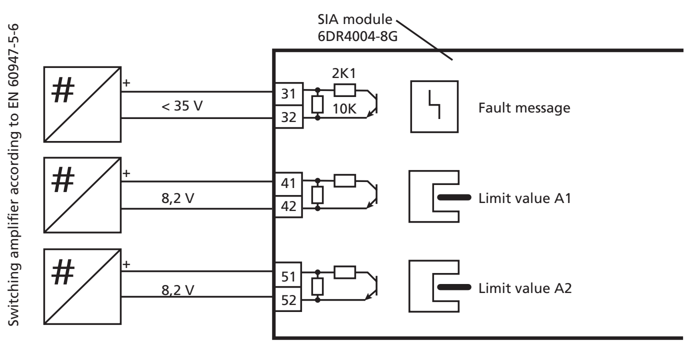


Figure 14. - SIA unit 6DR4004-8G, not Ex

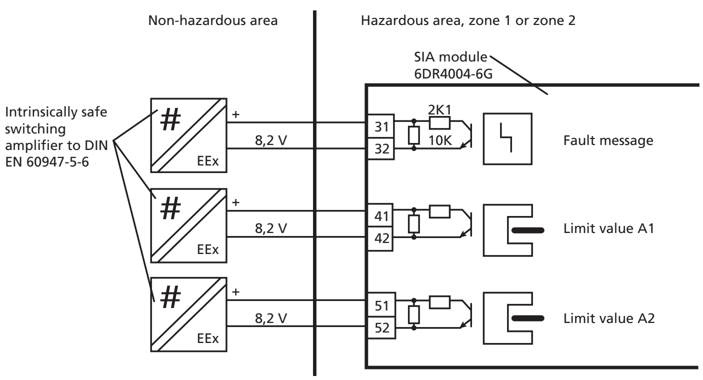


Figure 15. - SIA unit 6DR4004-6G, EEx i

Setting The Limits Of The Slotted Initiator Alarm Unit

You will require a suitable display device to determine the switch status. For example, use the initiator tester type 2 / Ex by Pepperl + Fuchs.

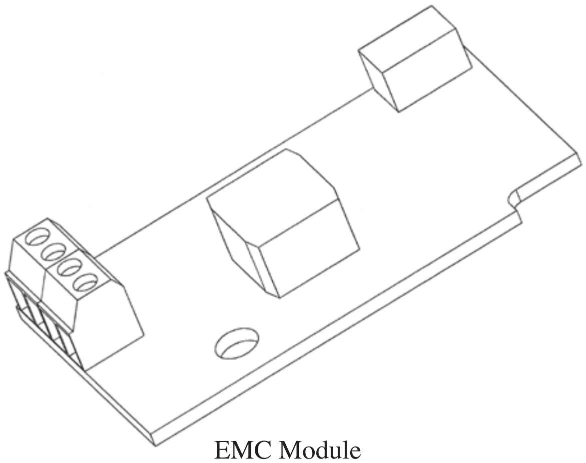
1. Connect the display device to the following terminals of the SIA unit:
   - 41 and 42
   - 51 and 52
2. Read the switch status of slotted initiators

Proceed as follows to set the limits:

1. Move the actuator to the first desired mechanical position.
2. Adjust the upper actuating disc manually until the output signal at terminals 41 and 42 changes. Set a high-low or a low-high switch over as follows:
   - Rotate the actuating disc beyond the switching point until you reach the next switching point.
3. Move the actuator to the second desired mechanical position.
4. Adjust the lower actuating disc manually until the output signal at terminals 51 and 52 changes. Set a high-low or a low-high switch over as follows:
   - Rotate the actuating disc beyond the switching point until you reach the next switching point.

Note: The actuating discs are relatively difficult to move. This design prevents their unintentional movement during operation. You can achieve an easier and finer adjustment by reducing friction temporarily. Move the actuator to and fro while simultaneously holding the actuating discs.

Installing the EMC Filter Module



EMC Module

Function

You will require the EMC filter module if you use an external position sensor on the positioner, e.g. a potentiometer or a non-contacting position sensor. The EMC filter module forms the interface between external position sensors and the motherboard of the positioner. This module protects the positioner from electromagnetic effects.

Device features include:

- EMC protection
- Connection to motherboard
- Connecting terminals for an external potentiometer

Proceed as follows to install the EMC filter module:

1. **Perform Step A to remove the module cover**
2. Remove the module cover.
3. Dismantle all existing optional modules.
4. Unscrew the screws of the module rack that are opposite to the blanking plugs.
5. The EMC filter module has a fastening hole. Tighten the module on the module rack using the screws provided
6. Lay the ribbon cable of the EMC filter module towards left through the opening of the module rack.
7. Unplug the connector of the internal potentiometer from the motherboard.
8. Connect the ribbon cable of the EMC module to the motherboard.
9. Connect the external position sensor to the terminals of the EMC module.
10. Reinstall the other optional modules in the reverse order.
11. Refer to Figures 14 and 15 to reconnect the SIA module in standard and intrinsically safe applications
12. Install the module cover.

TROUBLESHOOTING

During operation of the positioner, a few important values and parameters are continually monitored. In configuration mode, you can configure that monitoring so that the fault message output will be activated if, for instance, a limit is exceeded. Information about what events can activate the fault message output can be found in Figure 16

Fault	See Table #:
In which mode does a fault occur?	
Initialization	1
Manual and automatic modes	2, 3, 4, 5
In which environment and under which boundary conditions does a fault occur?	
Wet environment (e.g. strong rain or constant condensation)	2
Vibrating (oscillating) control valves	2, 5
Impact or shock loads (e.g. vapor shocks or breakaway valves)	5
Moist (wet) compressed air	2
Dirty (contaminated with solid particles) compressed air	2, 3
When does a fault occur?	
Regularly (reproducible)	1, 2, 3, 4
Sporadically (not reproducible)	5
Mostly after a specific operation time	2, 3, 5

Figure 16. - Fault Messages

In automatic and manual mode, when the fault message output triggers the digital display shows what fault triggered the message. The two digits on the lower left show the corresponding error code. If multiple triggers occur at the same time, they are displayed one after the other cyclically. The device status, including all fault messages, can be called up using command "#48" over HART. For other protocols please refer to their specific guide on www.bray.com.

You can use the advance diagnostics parameters to display fault messages in one, two or three stages. The three stage method uses "traffic light signaling" symbolizing the type of fault occurring. The user will see either a green, yellow, or red wrench on their HMI in relation to the S6A. Green indicates a need for maintenance, yellow an urgent need for maintenance and red indicates imminent danger of unit failure or general failure. In addition to the fault message output, alarm outputs 1 and 2 are then used. For this purpose, set the "XDIAG" parameter as described in Figure 17.

Figure 17. XDIAG Parameters

Settings of XDIAG	Message due to
OFF	Advanced diagnostics not activated
On 1	Fault message output for threshold 3 fault messages (one-stage)
On 2	Fault message output for threshold 3 fault messages and alarm output 2 for threshold 2 fault messages (two-stage)
On 3	Fault message output for threshold 3 fault messages and alarm output 2 for threshold 2 fault messages and alarm output 1 for threshold 1 fault messages (three-stage)

When a fault occurs an error code will show up on the lower left hand corner of the screen. Remedial Measures Tables 1-5 respectively, show possible causes of the fault messages, events which activate the fault message output or alarm outputs, settings of parameters needed for event monitoring, and remedial measures to cancel a fault message.

Remedial Measures Table 1

Fault profile (symptoms)	Possible cause(s)	Remedial measures
Positioner remains in "RUN 1".	Initialization started from the end position The response time of a maximum of 1 minute was not observed Network pressure not connected or it is too low	A waiting time of up to 1 minute is essential Do not start initialization from the end position Provide the network pressure
Positioner remains in "RUN 2".	Transmission ratio selector and parameter 2 do not match the actuator type. Incorrectly set stroke on the lever Piezo valve does not activate	Check settings: see leaflet: "Device view (7)" picture as well as parameters 2 and 3 Check the stroke setting on the lever. See table 2
Positioner remains in "RUN 3".	Actuator actuating time is too high	Open the restrictor completely and/or set the pressure PZ (1) to the highest permissible value Use a booster if required
Positioner remains "RUN 5", does not go up to "FINISH" (waiting time > 5 min)	"Gap" (play) in the positioner - actuator - control valve system	Part-turn actuator: check for the firmness of the grub screw of the coupling wheel Linear actuator: check for the firmness of the lever on the positioning shaft Remove any play between the actuator and the control valve.

Remedial Measures Table 2

Fault profile (symptoms)	Possible cause(s)	Remedial measures
"CPU test" blinks on the digital display approximately every two seconds. Piezo valve does not activate.	Water in the pneumatic block (due to wet compressed air)	At an early stage, this fault can be rectified with a subsequent operations using dry air, if required, in a temperature cabinet at 50 to 70°C Otherwise: repair [1)]
In the manual and automatic modes, the actuator cannot be moved or can be moved only in one direction	Moisture in the pneumatic block	
Piezo valve does not activate (a gentle click sound is not audible when the "+" or "-" buttons are pressed in the manual mode.)	The screw between the shrouding cover and the pneumatic block has not been tightened firmly or the cover got stuck	Tighten the screw firmly; if required realign cover.
	Dirt (swarf, particles) in the pneumatic block	Repair or a new device; clean and/or replace the built-in fine screens
	Deposits on the contacts between the electronic printed circuit board and the pneumatic block may develop due to abrasion owing to continuous loads resulting from strong vibrations	Clean all contact surfaces with spirit; if required, bend the pneumatic block contact springs

Remedial Measures Table 3

Fault profile (symptoms)	Possible cause(s)	Remedial measures
Actuator does not move.	Compress air < 1.4 bar	Set the supply air pressure to >20 psi
Piezo valve does not activate (a gentle click sound is however audible when the "+" or "-" buttons are pressed in the manual mode.)	Restrictor valve turned off (screw at the right end stop)	Open the restrictor screw by turning it counter clockwise, see leaflet, "Device view (6)"
	Dirt in the pneumatic block	Repair[1)] or a new device: clean and/or replace the built-in fine screens
A piezo valve activates constantly in the stationary automatic mode (constant setpoint) and the manual mode.	Pneumatic leakage in the positioner - actuator system; start the leakage test in "RUN3" (initialization). Dirt in the pneumatic block, see above	Rectify leakage in the actuator and/or feed line. In case of an intact actuator and tight feed line; repair[1)] or a new device

Remedial Measures Table 4

Fault profile (symptoms)	Possible cause(s)	Remedial measures
In stationary automatic mode (constant setpoint) and in manual mode, both piezo valves continually switch alternately, and the actuator oscillates around a mean value.	Sticking friction of the packing gland from the control valve or actuator too large	Reduce friction or increase dead zone of positioner (parameter "dEbA") until the oscillation stops
	Looseness (play) in the positioner/actuator/control valve system Actuator is too fast	Part-turn actuator: Check for firm seating of set screw on coupling wheel Linear actuator: Check for firm seating of lever on positioner shaft Correct any other play between the actuator and the control valve
Positioner doesn't move control valve to the stop (at 20 mA)	Supply pressure too low. Load on the feeding controller or system output is too low	Increase supply pressure, insert ballast converter Select 3/4-wire mode

Remedial Measures Table 5

Fault profile (symptoms)	Possible cause(s)	Remedial measures
Zero point displaces sporadically (> 3%).	Impact or shock loads result in accelerations so high that the friction clutch moves, e.g. due to "vapor shocks" in vapor lines	Rectify the causes for shock loads Re-initialize the positioner
The device function has completely failed: no view even on the digital display.	Electrical auxiliary power supply is not adequate	Check the electrical auxiliary power supply
	In case of very high continuous loads due to vibrations (oscillations): Screws of the electrical connecting terminals may be loose Electrical connecting terminals and/or electronic components may be knocked out	Tighten the screws firmly x Repair [1)] For prevention: install the positioner on the damping pads

SERVICE AND MAINTENANCE

The S6A is maintenance-free to a large extent. Screens are installed in the pneumatic connections of the positioners to protect them from debris. If there are dirt particles in the pneumatic auxiliary power supply, they damage the screens and hamper the function of the positioner.

Perform the following steps when needing to clean the screens:

Cleaning the Screens

CAUTION

Danger Positioner in the plastic enclosure:

Risk of explosion due to electrostatic charge. Electrostatic charges develop when cleaning the positioner in the plastic enclosure with a dry cloth. It is imperative you avoid electrostatic charges in the hazardous environment.

1. Disconnect the pneumatic power supply.
2. Remove the lines.
3. Unscrew the cover.
4. Unscrew the three self-tapping screws on the pneumatic terminal strip.
5. Remove the screens and O-rings behind the terminal strip.
6. Clean the screens, e.g. using compressed air.

Installation of the Screens

CAUTION

Damage to the enclosure. The enclosure is damaged due to screwing in the self-tapping screws improperly. Ensure that the available thread pitches are used. Turn the screws counterclockwise until they engage noticeably in the thread pitch. Tighten the self-tapping screws only after they have engaged.

1. Insert the screens into the recesses of the plastic enclosure.
2. Place the O-rings on the screens.
3. Fit the pneumatic terminal strip on both studs so that it fits flushly.
4. Screw-on the three self-tapping screws.
5. Place the cover and tighten it.
6. Reconnect the pipelines and feed the pneumatic power supply

TECHNICAL DATA

1. Basic Units

Technical specifications

SIPART PS2	Basic device without Ex protection	Basic device with Ex d protection (flameproof enclosure)	Basic device with Ex ia/ib protection	Basic device with Ex n/ dust protection
3-/4-wire device (terminals 2/4 and 6/8) (6DR52.. and 6DR53..)				
• Power supply U_H	18 ... 35 V DC		18 ... 30 V DC	
• Current consumption I_H	$(U_H$ - 7.5 V)/2,4 kΩ [mA]			
• Internal capacitance C_i	–		22 nF	22 nF (at "nL")
• Internal inductance L_i	–		0.12 mH	0.12 mH (at "nL")
• For connection to circuits with the following peak values	–		intrinsically safe U_i = 30 V DC I_i = 100 mA P_i = 1 W	at "nA" and "tD": U_n = 30 V DC I_n = 100 mA at "nL": U_i = 30 V DC I_i = 100 mA
Current input I_W				
Rated signal range	0/4 ... 20 mA			
Load voltage at 20 mA	≤ 0.2 V (corresponds to 10 Ω)		≤ 1 V (corresponds to 50 Ω)	
Internal capacitance Ci	–		22 nF	22 nF (at "nL")
Internal inductance Li	–		0.12 mH	0.12 mH (at "nL")
For connection to circuits with the following peak values	–		intrinsically safe U_i = 30 V DC I_i = 100 mA P_i = 1 W	at "nA" and "tD": U_n = 30 V DC I_n = 100 mA at "nL": U_i = 30 V DC I_i = 100 mA
Electrical isolation	between U_H and I_W		between U_H and I_W (2 intrinsically safe circuits)	between U_H and I_W
Test voltage	840 V DC, (1 s)			
Connections				
• Electrical	Screw terminals 2.5 AWG28-12 Cable gland M20x1.5 or ½-14 NPT	Screw terminals 2.5 AWG28-12 Ex d certified cable gland M20x1.5, ½-14 NPT or M25x1.5	Screw terminals 2.5 AWG28-12 Cable gland M20x1.5 or ½-14 NPT	
• Pneumatic	Female thread G1/4 EN ISO 228-1 or ¼ -18 NPT			
External position sensor (potentiometer or NCS; as option) with the following peak values				
• U_o	–		5 V	
• I_o (static)	–		75 mA	
• I_s (short-time)	–		160 mA	–
• P_o	–		120 mW	
Maximum permissible external capacitance C_o	–		1 µF	
Maximum permissible external inductance L_o	–		1 mH	

Technical specifications

SIPART PS2 PA	Basic device without Ex protection	Basic device with Ex d protection (flameproof enclosure)	Basic device with Ex ia/ib protection	Basic device with Ex n/ dust protection
Explosion protection as per ATEX	Without	Ex d II 2 G Ex d II C T4/T5/T6	Ex ia/ib II 2 G Ex ia/ib II C T6	Ex n II 3 G Ex nA nL[nL] IIC T6 Dust II 3 D Ex tD A22 IP66 T100°C
Mounting location		Zone 1		Zone 2/22
Permissible ambient temperature for operation At ≤ -10 °C (+14 °F) the display refresh rate of the digital display is limited. (for basic devices with Ex protection the following applies: Only T4 is permissible when using I_y module.)	-30 ... +80 °C (-22 ... +176 °F)	T4: -30 ... +80 °C (-22 ... +176 °F) T5: -30 ... +65 °C (-22 ... +149 °F) T6: -30 ... +50 °C (-22 ... +122 °F)		T4: -20 ... +75 °C (-4 ... +167 °F) T5: -20 ... +65 °C (-4 ... +149 °F) T6: -20 ... +50 °C (-4 ... +122 °F)
Electrical specifications				
Input				
Power supply (terminals 6/7)	Bus-supplied			
Bus voltage	9 ... 32 V		9 ... 24 V	9 ... 32 V
• Bus connection with supply unit	–		Intrinsically safe FISCO	at "nA" and "tD": Un = 32 V DC at "nL": FNICO
- Max. supply voltage U_o	–		17.5 V	
- Max. short-circuit current I_o	–		380 mA	570 mA
- Max. power P_o	–		5.32 W	–
• Bus connection with barrier			intrinsically safe	at "nL"
- Max. supply voltage (Uo)	–		24 V	32 V
- Max. short-circuit current (Io)	–		250 mA	–
- Max. power P_o	–		1.2 W	–
Current consumption	11.5 mA ± 10 %			
Additional error signal	0 mA			
Effective internal inductance L_i	–		8 µH	8 µH (at "nL")
Effective Internal capacitance C_i	–		Negligible	
Safety shutdown can be activated with coding bridge (terminals 81/82; electrically isolated from the basic device)				
• Input resistance	> 20 kΩ			
• Signal status "0" (shutdown active)	0 ... 4.5 V or unused			
• Signal status "1" (shutdown not active)	13 ... 30 V			
• Effective Internal capacitance C_i	–		Negligible	
• Effective internal inductance L_i	–		Negligible	
• For connection to power supply with	–		intrinsically safe	At "nA", "nL" and "tD"
- Max. supply voltage U_i	–		30 V	30 V
- Max. short-circuit current I_i	–		100 mA	100 mA
- Maximum power P_i	–		1 W	–
Electrical isolation	Between basic device and the input for safety shutdown, as well as the outputs of the option modules		The basic device and the input to the safety shutdown, as well as the outputs of the option modules, are separate, intrinsically safe circuits	Between basic device and the input for safety shutdown, as well as the outputs of the option modules
Test voltage	840 V DC, 1 s			

Technical specifications

SIPART PS2 PA	Basic device without Ex protection	Basic device with Ex d protection (flameproof enclosure)	Basic device with Ex ia/ib protection	Basic device with Ex n/ dust protection
Communication	Layers 1 and +2 according to PROFIBUS PA, transmission technology according to IEC 1158-2; slave function; layer 7 (protocol layer) according to PROFIBUS DP, EN 50170 standard with the extended PROFIBUS functions (all data acyclic, manipulated variable, feedbacks and status also cyclic)			
C2 connections	Four connections to master class 2 are supported, automatic connection setup 60 s after break in communication			
Device profile	PROFIBUS PA profile B, version 3.0, more than 150 objects			
Response time to master message	Typically 10 ms			
Device address	126 (when delivered)			
PC parameterizing software	SIMATIC PDM, supports all device objects. The software is not included in the scope of delivery			
Connections				
• Electrical	Screw terminals 2.5 AWG28-12 Cable gland M20x1.5 or ½-14 NPT	Screw terminals 2.5 AWG28-12 Ex d certified cable gland M20x1.5, ½-14 NPT or M25x1.5	Screw terminals 2.5 AWG28-12 Cable gland M20x1.5 or ½-14 NPT	
• Pneumatic	Female thread G¼ EN ISO 228-1 (¼ -18 NPT)			
External position sensor (potentiometer or NCS; as option) with the following peak values				
• U_o	–		5 V	
• I_o (static)	–		75 mA	
• I_s (short-time)	–		160 mA	–
• P_o	–		120 mW	
• Maximum permissible external capacitance C_o	–		1 µF	
• Maximum permissible external inductance L_o	–		1 mH	

Technical specifications

SIPART PS2 FF	Basic device without Ex protection	Basic device with Ex d protection (flameproof enclosure)	Basic device with Ex ia/ib protection	Basic device with Ex n/ dust protection
Explosion protection as per ATEX	Without	Ex d II 2 G Ex d II C T4/T5/T6	Ex ia/ib II 2 G Ex ia/ib II C T6	Ex n II 3 G Ex nA nL[nL] IIC T6 Dust II 3 D Ex tD A22 IP66 T100°C
Mounting location		Zone 1		Zone 2/22
Permissible ambient temperature for operation	-30 ... +80 °C (-22 ... +176 °F)	T4: -30 ... +80 °C (-22 ... +176 °F)		T4: -20 ... +75 °C (-4 ... +167 °F)
At ≤ 10 °C (+14 °F) the display refresh rate of the indicator is limited		T5: -30 ... +65 °C (-22 ... +149 °F)		
(for basic devices with Ex protection the following applies: Only T4 is permissible when using I_y module.)		T6: -30 ... +50 °C (-22 ... +122 °F)		
Electrical specifications				
Input				
Power supply (terminals 6/7)	Bus-supplied			
Bus voltage	9 ... 32 V		9 ... 24 V	9 ... 32 V
• Bus connection with supply unit	–		Intrinsically safe FISCO	at "nA" and "tD": Un = 32 V DC at "nL": FNICO
- Max. supply voltage U_o	–		17.5 V	
- Max. short-circuit current I_o	–		380 mA	570 mA
- Max. power P_o	–		5.32 W	–
• Bus connection with barrier			intrinsically safe	at "nL"
- Max. supply voltage (Uo)	–		24 V	32 V
- Max. short-circuit current (Io)	–		250 mA	–
- Max. power P_o	–		1.2 W	–
Electrical specifications				
Current consumption	10.5 mA ± 10 %			
Additional error signal	0 mA			
Effective internal inductance L_i	–		8 µH	8 µH (at "nL")
Effective Internal capacitance C_i	–		Negligible	
Safety shutdown can be activated with coding bridge (terminals 81/82; electrically isolated from the basic device)				
• Input resistance	> 20 kΩ			
• Signal status "0" (shutdown active)	0 ... 4.5 V or unused			
• Signal status "1" (shutdown not active)	13 ... 30 V			
• Effective Internal capacitance C_i	–		Negligible	
• Effective internal inductance L_i	–		Negligible	
• For connection to power supply with	–		intrinsically safe	At "nA", "nL" and "tD"
- Max. supply voltage U_i	–		30 V	
- Max. short-circuit current I_i	–		100 mA	
- Maximum power P_i	–		1 W	–
Electrical isolation	Between basic device and the input for safety shutdown, as well as the outputs of the option modules		The basic device and the input to the safety shutdown, as well as the outputs of the option modules, are separate, intrinsically safe circuits	Between basic device and the input for safety shutdown, as well as the outputs of the option modules
Test voltage	840 V DC, 1 s			

Technical specifications

SIPART PS2 FF	Basic device without Ex protection	Basic device with Ex d protection (flameproof enclosure)	Basic device with Ex ia/ib protection	Basic device with Ex n/ dust protection
Communication				
Communications group and class	According to technical specification of the Fieldbus Foundation for H1 communication			
Function blocks	Group 3, Class 31PS (publisher, subscriber)			
	1 resource block (RB2)			
	1 analog output function block (AO)			
	1 PID function block (PID)			
	1 transducer block (standard advanced positioner valve)			
Execution times of the blocks	AO: 60 ms			
	PID: 80 ms			
Physical layer profile	123, 511			
FF registration	Tested with ITK 5.0			
Device address	22 (when delivered)			
Connections				
• Electrical	Screw terminals 2.5 AWG28-12 Cable gland M20x1.5 or ½-14 NPT	Screw terminals 2.5 AWG28-12 Ex d certified cable gland M20x1.5, ½-14 NPT or M25x1.5	Screw terminals 2.5 AWG28-12 Cable gland M20x1.5 or ½-14 NPT	
• Pneumatic	Female thread G¼ EN ISO 228-1 (¼ -18 NPT)			
External position sensor (potentiometer or NCS; as option) with the following peak values				
• U_o	–		5 V	
• I_o (static)	–		75 mA	
• I_s (short-time)	–		160 mA	–
• P_o	–		120 mW	
• Maximum permissible external capacitance C_o	–		1 µF	
• Maximum permissible external inductance L_o	–		1 mH	

Technical specifications

SIPART PS2 (all versions)	
General data	
Range of stroke (linear actuators)	3 ... 130 mm (0.12 ... 5.12 inch) (angle of positioner shaft 16 ... 90°)
Angle of rotation (part-turn actuators)	30 ... 100°
Assembly	
• On linear actuators	Using mounting kit 6DR4004-8V and where necessary with an additional lever arm 6DR4004-8L on actuators according to IEC 534-6 (NAMUR) with ribs, bars or flat face
• On part-turn actuators	Using mounting kit 6DR4004-8D on actuators with mounting plane according to VDI/VDE 3845 and DIN 3337: The required mounting console has to be provided on the actuator side; shaft with groove and female thread M6
Controller unit	
• Five-point switch	Self-adjusting
• Deadband	
- dEbA = Auto	Self-adjusting or can be set as fixed value
- dEbA = 0.1 ... 10 %	Self-adjusting or can be set as fixed value
A/D converter	
• Scan time	10 ms
• Resolution	≤ 0.05 %
• Transmission error	≤ 0.2 %
• Temperature influence effect	≤ 0.1 %/10 K (≤ 0.1 %/18 °F)
Cycle time	
• 20 mA/HART device	20 ms
• PA device	60 ms
• FF device	60 ms (min. loop time)
Binary input BE1 (terminals 9/10; electrically conn. to basic device)	Suitable only for floating contact; max. contact load < 5 µA with 3 V
Degree of protection	IP66 to EN 60 529/NEMA 4X
EMC requirements	EN 61326/A1 Appendix A.1 and NAMUR NE21 August 98
Material	
• Enclosure	
- 6DR5..0-... (plastic)	Glass-fiber-reinforced Macrolon
- 6DR5..1-... (aluminum)	GD AISi12
- 6DR5..2-... (stainless steel)	Austenitic stainl. steel mat. No. 1.4581
- 6DR5..5-... (alum., press.-proof)	GK AISi12
• Pressure gauge block	Aluminium AIMgSi, anodized
Vibration resistance	
• Harmonic oscillations (sine-wave) according to EN 60068-2-6/05.96	3.5 mm (0.14 inch), 2 ... 27 Hz 3 cycles/axis 98.1 m/s² (321.84 ft/s²), 27 ... 300 Hz, 3 cycles/axis
• Bumping (half-sine) to EN 60068-2-29/03.95	150 m/s² (492 ft/s²), 6 ms, 1000 shocks/axis
• Noise (digitally controlled) to EN 60068-2-64/08.95	10 ... 200 Hz; 1 (m/s²)²/Hz (3.28 (ft/s²)²/Hz) 200 ... 500 Hz; 0.3 (m/s²)²/Hz (0.98 (ft/s²)²/Hz) 4 hours/axis
• Recommended continuous duty range of the complete fitting	≤ 30 m/s² (≤ 98.4 ft/s²) without resonance sharpness

Weight, basic device	
• Glass-fiber-reinforced Makrolon enclosure	Approx. 0.9 kg (1.98 lb)
• Aluminum enclosure	Approx. 1,3 kg (2.86 lb)
• Stainless steel enclosure	Approx. 3.9 kg (8.58 lb)
• Pressure-proof alum. enclosure	Approx. 5.2 kg (11.46 lb)
Dimensions	See Dimensional drawings
Climatic class	According to DIN EN 60721-3-4
• Storage 1)	1K5, but -40 ... +80 °C (-40 ... +176 °F)
• Transport 1)	2K4, but -40 ... +80 °C (-40 ... +176 °F)
• Operation 2)	4K3, but -30 ... +80 °C 3) (-22 ... +176 °F)
Certificates and approvals	
Classification according to pressure equipment directive (PED 97/23/EC)	For gases of fluid group 1, complies with requirements of article 3, par. 3 (sound engineering practice SEP)
CE marking	You can find the appropriate guidelines and standards applied, including the relevant versions, in the EC Declaration of Conformity on the Internet
Pneumatic data	
Auxiliary power (air supply)	Compressed air, nitrogen or cleaned natural gas
• Pressure	1.4 ... 7 bar (20.3 ... 101.5 psi): Sufficiently greater than max. drive pressure (actuating pressure)
Air quality to ISO 8573-1	
• Solid particulate size and density	Class 2
• Pressure dew point	Class 2 (min. 20 K (36 °F) below ambient temperature)
• Oil content	Class 2
Unrestricted flow (DIN 1945)	
• Inlet air valve (ventilate actuator) 4)	
- 2 bar (29 psi)	4.1 Nm³/h (18.1 USgpm)
- 4 bar (58 psi)	7.1 Nm³/h (31.3 USgpm)
- 6 bar (87 psi)	9.8 Nm³/h (43.1 USgpm)
• Outlet air valve (vent actuator) 4)	
- 2 bar (29 psi)	8.2 Nm³/h (36.1 USgpm)
- 4 bar (58 psi)	13.7 Nm³/h (60.3 USgpm)
- 6 bar (87 psi)	19.2 Nm³/h (84.5 USgpm)
Valve leakage	< $6 \cdot 10^{-4}$ Nm³/h (0.0026 USgpm)
Throttle ratio	Adjustable up to ∞ : 1
Auxiliary power consumption in the controlled state	< $3{,}6 \cdot 10^{-2}$ Nm³/h (0.158 USgpm)
Device versions	
• In Makrolon enclosure	Single-acting and double-acting
• In aluminum enclosure	Single-acting
• In pressure-proof aluminum encl.	Single-acting and double-acting
• In stainless steel enclosure	Single-acting and double-acting

1) During commissioning at ≤ 0 °C (≤ 32 °F) make sure that the valves are flushed long enough with the dry medium.
2) At ≤ -10 °C (≤ 14 °F) the display refresh rate of the indicator is limited. Only T4 is permissible when using I_y module.
3) -20 ... +80 °C (-4 ... + 176 °F) for 6DR55..-0G..., 6DR56..-0G..., 6DR55..-0D... and 6DR56..-0D...
4) With the Ex d version (6DR5..5-...) the values are reduced by approx. 20 %

Gauge made of	Plastic	Steel	Stainl. Steel 316
Degree of protection	IP31	IP44	IP54
Vibration resistance		acc. to DIN EN 837-1	

Technical specifications

SIPART PS2	Basic device without Ex protection	Basic device with Ex d protection (flameproof enclosure)	Basic device with Ex ia/ib protection	Basic device with Ex n/ dust protection
Explosion protection ATEX	-	Ex d II 2 G Ex d II C T6	Ex ia/ib II 2 G Ex ia/ib II C T6	Ex n II 3 G Ex nA nL[nL] IIC T6 Dust II 3 D Ex tD A22 IP66 T100°C
Mounting location	-	Zone 1		Zone 2/22
Permissible ambient temperature for operation At ≤ -10 °C (+14 °F) the display refresh rate of the indicator is limited. (for basic devices with EX ia/ib and Ex n protection the following applies: Only T4 is permissible when using I_y module)	-30 ... +80 °C (-22 ... +176 °F)	T4: -30 ... +80 °C (-22 ... +176 °F) T5: -30 ... +65 °C (-22 ... +149 °F) T6: -30 ... +50 °C (-22 ... +122 °F)		
Electrical specifications				
Input				
2-wire connection (terminals 6/8)				
Rated signal range	4 ... 20 mA			
Current to maintain the auxiliary power supply	≥ 3.6 mA			
Required load voltage U_B (corresponds to Ω at 20 mA)				
• Without HART (6DR50..)				
- Typical	6.36 V (corresponds to 318 Ω)		7.8 V (corresponds to 390 Ω)	
- max.	6.48 V (corresponds to 324 Ω)		8.3 V (corresponds to 415 Ω)	
• Without HART (6DR53..)				
- Typical	7.9 V (corresponds to 395 Ω)	–		
- max.	8.4 V (corresponds to 420 Ω)	–		
• With HART (6DR51..)				
- Typical	6.6 V (corresponds to 330 Ω)		–	
- max.	–			
• With HART (6DR52..)				
- Typical	–	8.4 V (corresponds to 420 Ω)		
- max.	–	8.8 V (corresponds to 440 Ω)		
• Static destruction limit	± 40 mA		–	
Internal capacitance C_i				
• Without HART	–		22 nF	22 nF (at "nL")
• With HART	–		7 nF	7 nF (at "nL")
Internal inductance L_i				
• Without HART	–		0.12 mH	0.12 mH (at "nL")
• With HART	–		0.24 mH	0.24 mH (at "nL")
For connection to circuits with the following peak values	–		intrinsically safe U_i = 30 V DC I_i = 100 mA P_i = 1 W	at "nA" and "tD": U_n = 30 V DC I_n = 100 mA at "nL": U_i = 30 V DC I_i = 100 mA

2. Optional Models

Technical specifications

Add-on modules	Without Ex protection/ with Ex d protection	With Ex ia/ib protection	With Ex n/dust protection
Ex protection acc. to ATEX	–	II 2G Ex ia/ib II C T4/T5/T6[1]	Ex n II 3 G Ex nA nL[nL] IIC T6 Dust II 3 D Ex tD A22 IP66 T100°C
Mounting location	–	Zone 1	Zone 2/22
Permissible ambient temperature for operation (For devices with Ex protection: Only in conjunction with the basic device 6DR5... -.E.... Only T4 permissible when using I_y module.)	-30 ... +80 °C (-22 ... +176 °F)	T4: -30 ... +80 °C (T4: -22 ... +176 °F) T5: -30 ... +65 °C (-22 ... +149 °F) T6: -30 ... +50 °C (-22 ... +122 °F)	
Alarm unit	6DR4004-8A		
Binary alarm outputs A1, A2 and alarm output			
• Signal status High (not responded) Signal status Low* (responded) (* Low is also the status when the basic device is faulty or has no electric power supply)	Conductive, R = 1 kΩ, +3/1 %* Disabled, I_R < 60 µA (* When used in the flameproof enclosure the current consumption must be limited to 10 mA per output.)	≥ 2.1 mA ≤ 1.2 mA (Switching threshold with supply to EN 60947-5-6: U_H = 8.2 V, R_i = 1 kΩ)	
• Internal capacitance C_i	–	5.2 nF	5.2 nF (at "nL")
• Internal inductance L_i	–	Negligible	
• Power supply U_H	≤ 35 V	–	
• Connecting to circuits with the following peak values	–	Intrinsically safe switching amplifier to EN 60947-5-6 U_i = 15.5 V DC I_i = 25 mA P_i = 64 mW	at "nA" and "tD": U_n = 15.5 V DC at "nL": U_i = 15.5 V DC I_i = 25 mA
Binary input BE2			
• Electrically connected to the basic device			
- Signal status 0	Floating contact, open		
- Signal status 1	Floating contact, closed		
- Contact load	3 V, 5 mA		
• Electrically isolated from the basic device			
- Signal status 0	≤ 4.5 V or open		
- Signal status 1	≥ 13 V		
- Natural resistance	≥ 25 kΩ		
• Static destruction limit	± 35 V	–	
• Internal inductance and capacitance	–	Negligible	
• Connecting to circuits with the following peak values	–	Intrinsically safe U_i = 25.2 V	at "nA" and "tD": U_n = 25.2 V DC at "nL": U_i = 25.2 V DC
Electrical isolation	The 3 outputs, the input BE2 and the basic device are electrically isolated from each other		
Test voltage	840 V DC, 1 s		

[1] Only in conjunction with the basic device 6DR5...-.E.... Only T4 permissible when using with I_y module.

Technical specifications

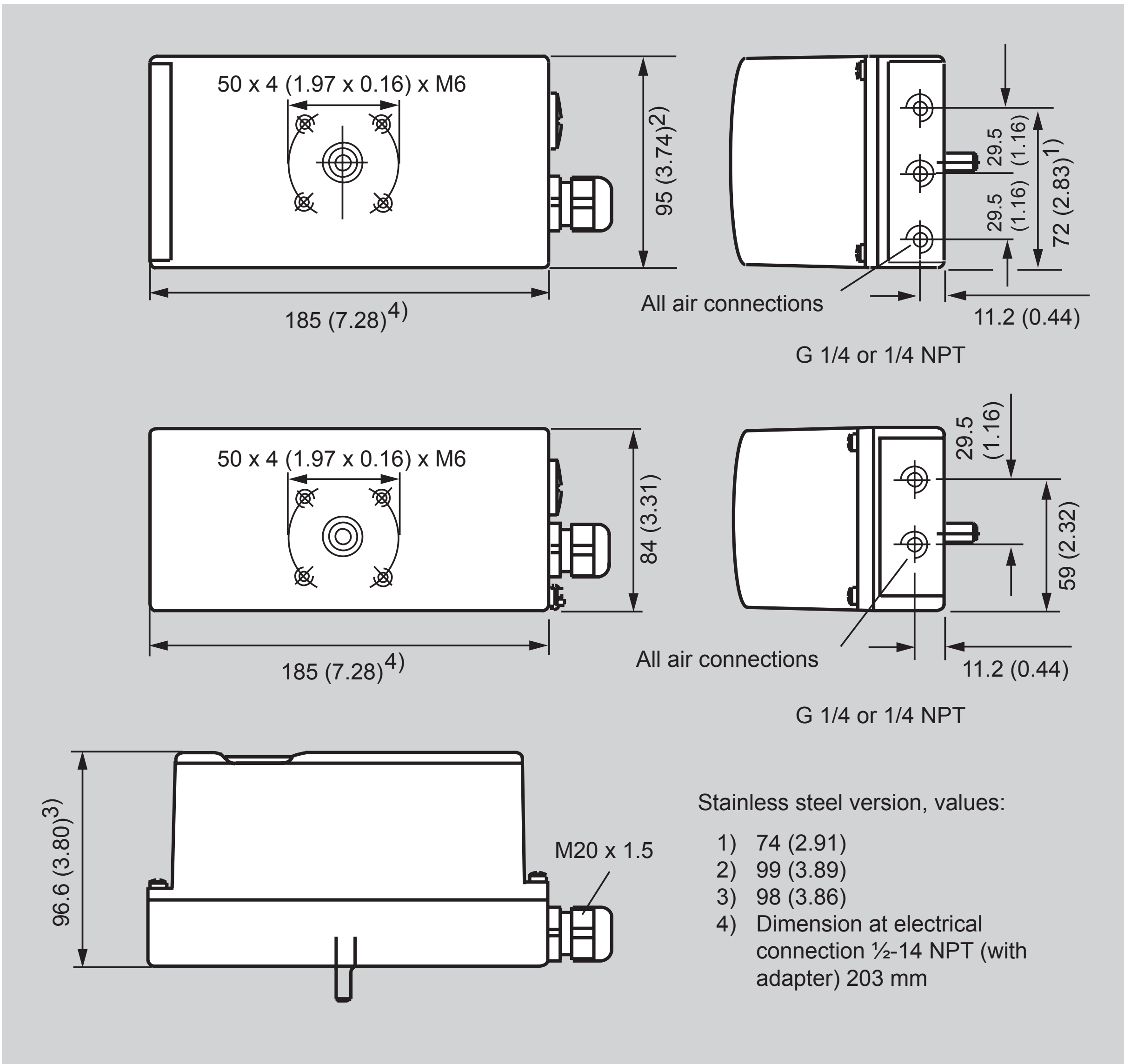
Add-on modules	Without Ex protection/ with Ex d protection	With Ex ia/ib protection	With Ex n/dust protection
SIA module **Limit transmitter with slot-type initiators and alarm output**	6DR4004-8G (not for Ex d version)	6DR4004-6G	
Limit transmitter A1, A2	2-wire connection		
Ex protection	Without	II 2 G Ex ia/ib IIC T6	II 3 G Ex nA nL [nL] IIC T6
Connection	2-wire system to EN 60947-5-6 (NAMUR), for switching amplifier to be connected on load side		
2 slot-type initiators	Type SJ2-SN		
Function	NC (normally closed)		
Connecting to circuits with the following peak values	rated voltage 8 V Current consumption: ≥ 3 mA (limit value not responded) ≤ 1 mA (limit value responded)	Intrinsically safe switching amplifier EN 60947-5-6 U_i = 15.5 V DC I_i = 25 mA P_i = 64 mW	at "nA" and "tD": U_n = 15.5 V DC P_n = 64 mW at "nL": U_i = 15.5 V DC I_i = 25 mA
Internal capacitance C_i	–	41 nF	41 nF (at "nL")
Internal inductance L_i	–	100 µH	100 µH (at "nL")
Electrical isolation	The 3 outputs are electrically isolated from the basic device		
Test voltage	840 V DC, 1 s		
Alarm output			
Connection	To switching amplifier according to EN 60947-5-6 (NAMUR), U_H = 8.2 V, R_i = 1 kΩ		
Signal state High (not activated)	R = 1.1 kΩ	≥ 2.1 mA	
Signal state Low (activated)	Ri = 10 kΩ	≤ 1.2 mA	
Internal capacitance Ci	–	5.2 nF	5.2 nF (at "nL")
Internal inductance Li	–	Negligible	
Power supply UH	U_H ≤ 35 V DC I ≤ 20 mA	–	
Connecting to circuits with the following peak values	–	Intrinsically safe switching amplifier acc. to EN 60947-5-6 U_i = 15.5 V DC I_i = 25 mA P_i = 64 mW	at "nA" and "tD": U_n = 15.5 V DC at "nL": U_i = 15.5 V DC I_i = 25 mA
Limit value contact module **Limit transmitter with mechanical ground contact and alarm output**	6DR4004-8K (not for Ex d version)	6DR4004-6K	
Limit transmitter A1, A2			
Ex protection	Without	II 2 G Ex ia/ib IIC T6	II 3 G Ex nL [nL] IIC T6
Max. switching current AC/DC	4 A	Connection to intrinsically safe circuit with maximum values: U_i = 30 V, I_i = 100 mA, P_i = 750 mW	Connection to circuits with maximum values: at "nL": U_i = 30 V I_i = 100 mA,
Max. switching voltage AC/DC	250 V/24 V	30 V DC	30 V DC
Internal capacitance	–	Negligible	Negligible
Internal inductance	–	Negligible	Negligible
Electrical isolation	The 3 outputs are electrically isolated from the basic device		
Test voltage	3150 V DC, 2 s		
Alarm output			
Connection	To switching amplifier according to EN 60947-5-6 (NAMUR), U_H = 8.2 V, R_i = 1 kΩ		
Signal state High (not activated)	R = 1.1 kΩ	≥ 2.1 mA	
Signal state Low (activated)	Ri = 10 kΩ	≤ 1.2 mA	
Internal capacitance Ci	–	5.2 nF	5.2 nF (at "nL")
Internal inductance Li	–	Negligible	
Power supply UH	U_H ≤ 35 V DC I ≤ 20 mA	–	
Connecting to circuits with the following peak values	–	Intrinsically safe switching amplifier acc. to EN 60947-5-6 U_i = 15.5 V DC I_i = 25 mA P_i = 64 mW	at "nL": U_i = 15.5 V DC I_i = 25 mA

Technical specifications

Add-on modules	Without Ex protection/ with Ex d protection	With Ex ia/ib protection	With Ex n protection
I_y module	6DR4004-8J	6DR4004-6J	
DC output for position feedback	2-wire connection		
Rated signal range	4 ... 20 mA, short-circuit-proof		
Total operating range	3.6 ... 20.5 mA		
Power supply U_H	+12 ... +35 V	+12 ... +30 V	
External loads R_B [kΩ]	≤ (U_H [V] - 12 V) /i [mA]		
Transmission error	≤ 0,3 %		
Temperature influence effect	≤ 0.1 %/10 K (≤ 0.1 %/18 °F)		
Resolution	≤ 0,1 %		
Residual ripple	≤ 1 %		
Internal capacitance C_i	–	11 nF	11 nF (at "nL")
Internal inductance L_i	–	Negligible	
For connection to circuits with the following peak values		Intrinsically safe: U_i = 30 V DC I_i = 100 mA P_i = 1 W (only T4)	at "nA" and "tD": U_n = 30 V DC I_n = 100 mA P_n = 1 W (only T4) at "nL": U_i = 30 V DC I_i = 100 mA
Electrical isolation	Electrically isolated from the basic device		
Test voltage	840 V DC, 1 s		
NCS sensor	(not for Ex d version)		
Position range			
• Linear actuator	3 ... 130 mm (0.12 ... 5.12 inch), to 200 mm (7.87 inch) on request	3 ... 130 mm (0.12 ... 5.12 inch), to 200 mm (7.87 inch) on request	-
• Part-turn actuator	30° ... 100° (not for Ex d version)	30° ... 100°	-
Linearity (after correction by SIPART PS2)			
• Linear actuator	± 1 %	± 1 %	-
• Part-turn actuator	± 1 %	± 1 %	-
Hysteresis	± 0.2 %	± 0.2 %	-
Continuous working temperature	-40 °C ... +85 °C (-40 °F ... +185 °F), extended temperature range on request	-40 °C ... +85 °C (-40 °F ... +185 °F), extended temperature range on request	-
Vibration resistance Harmonic oscillations (sine-wave) according to EN 60062-2-6/05.96	7 mm (0.28 inch), 5 ... 54 Hz 500 m/s^2 (1640 ft/s^2), 80 ... 200 Hz		
For connection to circuits with the following peak values		Intrinsically safe U_i = 5 V DC	at "nL": U_i = 5 V DC
Internal capacitance C_i	–	10 nF	10 nF (at "nL")
Internal inductance L_i	–	240 µH	240 µH (at "nL")
Degree of protection of enclosure	IP68/NEMA 4X		-

DIMENSIONAL DRAWINGS

Dimensional drawings



Makrolon and stainless steel enclosure double acting (top), aluminum enclosure single acting (center), Makrolon and aluminum enclosure (bottom), dimensions in mm (inch)

Note: Drawings are shown in first angle

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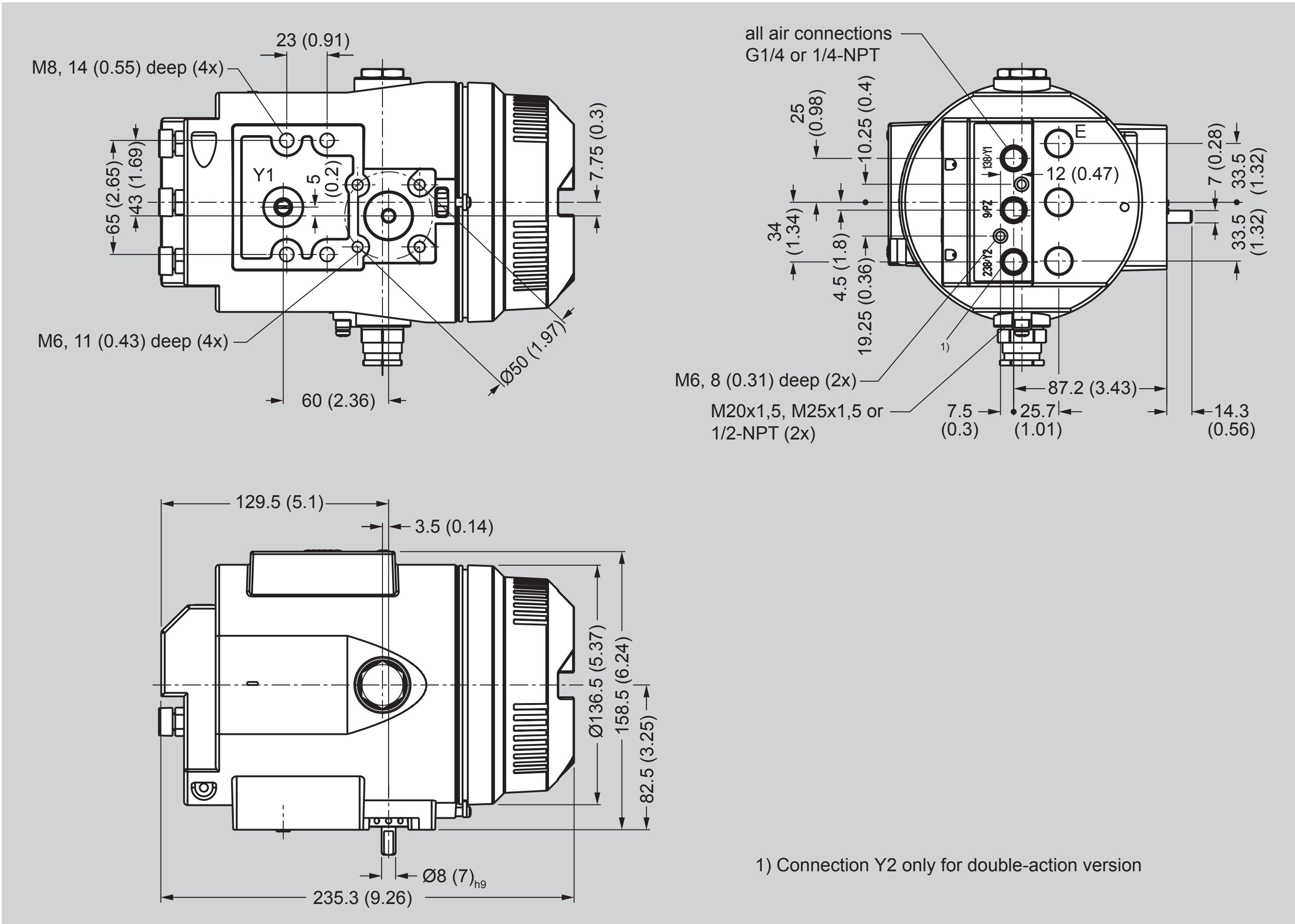
xperience with their application.



Flameproof enclosure dimensions in mm (inch)

Note: Drawings are shown in first angle

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