

SIEMENS

SIPART

Electropneumatic positioners SIPART PS2 (6DR5...)

Compact Operating Instructions


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6DR5...
With and without HART
With PROFIBUS PA
With FOUNDATION Fieldbus


Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.

 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.

 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.


If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

 WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1.1 Purpose of this documentation

These instructions are a brief summary of important features, functions and safety information, and contain all information required for safe use of the device. Read the instructions carefully prior to installation and commissioning. In order to use the device correctly, first review its principle of operation.

The instructions are aimed at persons who install and commission the device.

To realize optimum performance from the device, read the complete operating instructions.

See also

SIPART PS2 product information (<http://www.siemens.com/sipartps2>)

1.2 Product compatibility

The following table describes the compatibility between the edition of the document, device revision, engineering system and associated Electronic Device Description (EDD).

HART

Manual edition	Comments	Device revision	Compatible version of device integration package	
11/2022	New device features	FW: 5.04.00 or higher Device revision 8 or higher	SIMATIC PDM V9.1	EDD: 25.00.00 or higher
			SIMATIC PDM V8.2 SP1	EDD: 25.00.00 or higher
			AMS Device Manager V12.5	EDD: 25.00.00 or higher
			SITRANS DTM V4.1	EDD: 25.00.00 or higher
11/2021	New manual edition	FW: 5.02.00 or higher Device revision 7 or higher	SIMATIC PDM V9.0	EDD: 24.00.00 or higher
			SIMATIC PDM V8.2 SP1	EDD: 24.00.00 or higher
			AMS Device Manager V12.5	EDD: 24.00.00 or higher
			SITRANS DTM V4.1	EDD: 24.00.00 or higher
			Field communicator	EDD: 24.00.00 or higher
09/2020	New device features	FW: 5.02.00 or higher Device revision 7 or higher	SIMATIC PDM V9.0	EDD: 24.00.00 or higher
			SIMATIC PDM V8.2 SP1	EDD: 24.00.00 or higher
			AMS Device Manager V12.5	EDD: 24.00.00 or higher
			SITRANS DTM V4.1	EDD: 24.00.00 or higher
			Field communicator	EDD: 24.00.00 or higher

PROFIBUS PA

Manual edition	Comments	Device revision	Compatible version of device integration package	
11/2021	New manual edition	PROFIBUS PA FW: 6.01.00 or higher	SIMATIC PDM V9.0	EDD: 23.00.00 or higher
			SIMATIC PDM V8.2 SP1	EDD: 23.00.00 or higher
			SITRANS DTM V4.1	EDD: 23.00.00 or higher
09/2020	New device features	PROFIBUS PA FW: 6.01.00 or higher	SIMATIC PDM V9.0	EDD: 23.00.00 or higher
			SIMATIC PDM V8.2 SP1	EDD: 23.00.00 or higher
			SITRANS DTM V4.1	EDD: 23.00.00 or higher

FOUNDATION Fieldbus

Manual edition	Comments	Device revision	Compatible version of device integration package	
11/2021	New manual edition	FW: 3.01.00 or higher Device revision 3	SITRANS DTM V4.1	EDD: 4.00.00 or higher
			AMS Device Manager V12.5	EDD: 4.00.00 or higher
			Field communicator	EDD: 4.00.00 or higher
09/2020	New device features	FW: 3.01.00 or higher Device revision 3	SITRANS DTM V4.1	EDD: 4.00.00 or higher
			AMS Device Manager V12.5	EDD: 4.00.00 or higher
			Field communicator	EDD: 4.00.00 or higher

1.3 Designated use

Use the device in accordance with the information on the nameplate and in the Technical data (Page 57).

1.4 Checking the consignment

1. Check the packaging and the delivered items for visible damages.
2. Report any claims for damages immediately to the shipping company.
3. Retain damaged parts for clarification.
4. Check the scope of delivery by comparing your order to the shipping documents for correctness and completeness.

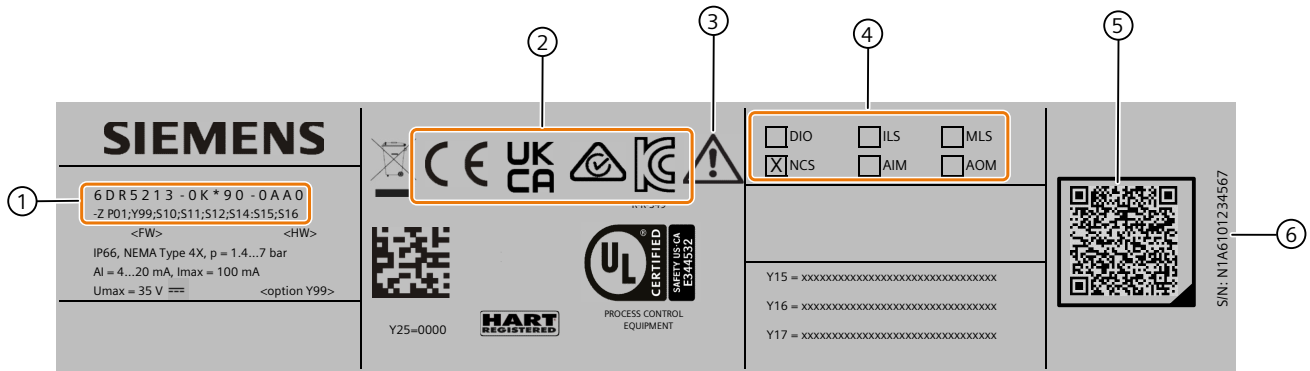
**WARNING****Using a damaged or incomplete device**

Risk of explosion in hazardous areas.

- Do not use damaged or incomplete devices.

1.5 Manufacturer nameplate

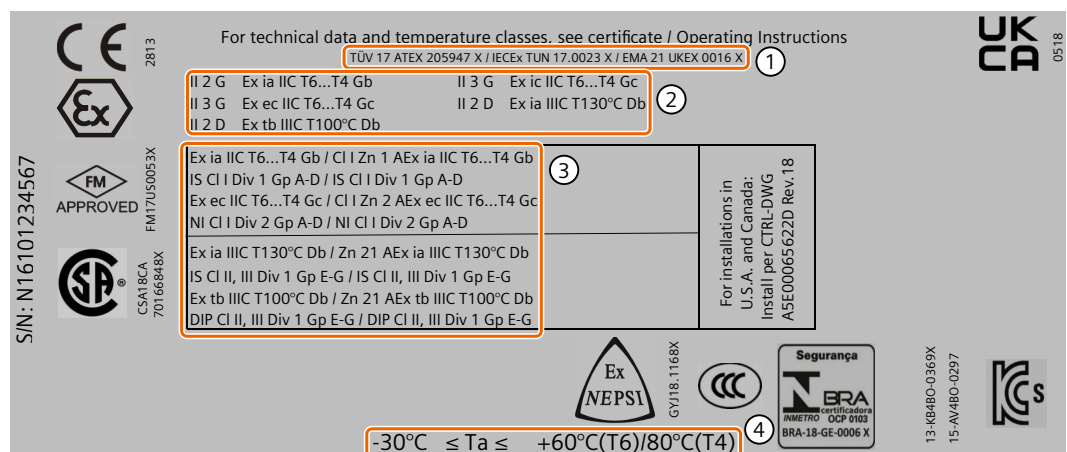
Example



- ① Article number and order suffix (order code)
- ② Conformity with country-specific directives
- ③ Observe the operating instructions
- ④ Built-in option modules
- ⑤ QR code to the mobile website with device-specific product information
- ⑥ Serial number

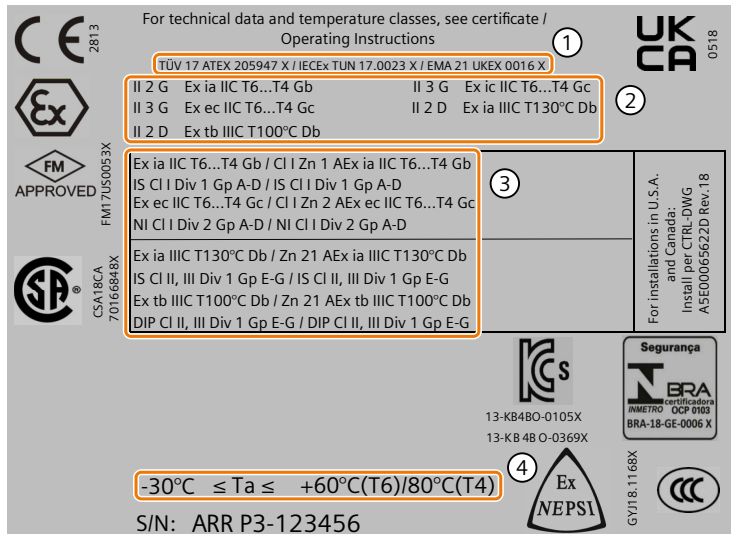
1.6 Explosion protection nameplate

Examples



- ① Approvals
- ② ATEX/IECEx marking for hazardous area
- ③ FM/CSA marking for hazardous area
- ④ Permissible ambient temperature for operation in hazardous areas

Figure 1-1 Enclosure type: 6DR5 (b = 0), 6DR5 (b = 1), 6DR5 (b = 2), 6DR5 (b = 3)



- ① Approvals
- ② ATEX/IECEx marking for hazardous area
- ③ FM/CSA marking for hazardous area
- ④ Permissible ambient temperature for operation in hazardous areas

Figure 1-2 Enclosure type: 6DR5 (b = 5), 6DR5 (b = 6)

1.7 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens’ products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit <https://www.siemens.com/industrialsecurity>.

Siemens’ products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer’s exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under <https://www.siemens.com/cert>.

NOTICE**Unauthorized product information or software**

Use only authorized Siemens websites when accessing any product information or software, including firmware updates, device integration files (EDD, for example), as well as other product documentation. Using unauthorized product information or software could result in a security incident, such as breach of confidentiality, or loss of integrity and availability of the system.

For more information, see Product documentation and support (Page 81).

1.8 Transportation and storage

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly packaged to provide sufficient protection during transport. Siemens cannot assume liability for any costs associated with transportation damages.

NOTICE**Insufficient protection during storage**

The packaging only provides limited protection against moisture and infiltration.

- Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Technical data (Page 57).

1.9 Notes on warranty

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The sales contract contains all obligations on the part of Siemens as well as the complete and solely applicable warranty conditions. Any statements regarding device versions described in the manual do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of publishing. Siemens reserves the right to make technical changes in the course of further development.


Safety instructions

2.1 Precondition for use

This device left the factory in good working condition. In order to maintain this status and to ensure safe operation of the device, observe these instructions and all the specifications relevant to safety.

Observe the information and symbols on the device. Do not remove any information or symbols from the device. Always keep the information and symbols in a completely legible state.

2.2 Warning symbols on the device

Symbol	Explanation
	Consult operating instructions

2.3 Laws and directives

Observe the test certification, provisions and laws applicable in your country during connection, assembly and operation. These include, for example:

- National Electrical Code (NEC - NFPA 70) (USA)
- Canadian Electrical Code (CEC) (Canada)

Further provisions for hazardous area applications are for example:

- IEC 60079-14 (international)
- EN 60079-14 (EU)
- For Korea only:

이 기기는 업무용(A 급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정 외의

지역에서사용하는 것을 목적으로 합니다

2.4 Conformity with European directives

The CE marking on the device shows conformity with the regulations of the following European guidelines:

Electromagnetic compatibility EMC 2014/30/EU	Directive of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to electromagnetic compatibility.
Atmosphère explosive ATEX 2014/34/EU	Directive of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres.
2011/65/EU RoHS	Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment

The directives applied can be found in the EU declaration of conformity for the associated device.

2.5 Conformity with UK directives

The UKCA marking on the device shows conformity with the following UK directives:

Electromagnetic Compatibility SI 2016/1091	Electromagnetic Compatibility Directives 2016
Explosive Atmospheres SI 2016/1107	Directives for Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres 2016
Directive on the Restriction of the Use of Certain Hazardous Substances SI 2012/3032	Directives on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment 2012

The applicable directives can be found in the UKCA declaration of conformity of the specific device.

2.6 Product approval and UL compliance

Classification according to pressure equipment directive (PED 2014/68/EU) For fluid group 1 gases; fulfills requirements according to article 4, paragraph 3 (good engineering practice SEP)

CE conformity The applicable directives and applied standards can be found in the EU declaration of conformity on the Internet.

UL conformity Conformity has been proven based on US and Canadian safety requirements. For applicable safety requirements, refer to the UL CERTIFICATE OF COMPLIANCE on the Internet at: Certificates (<http://www.siemens.com/processinstrumentation/certificates>)

Соответствие ТР ТС
012/2011

Изделие соответствует требованиям ТР ТС 012/2011
О безопасности оборудования для работы во взрывоопасных средах

2.7 Improper modifications

⚠ WARNING
Improper device modifications
Risk to personnel, system and environment can result from modifications to the device, particularly in hazardous areas.
<ul style="list-style-type: none">• Only carry out modifications that are described in the instructions for the device. Failure to observe this requirement cancels the manufacturer's warranty and the product approvals.

⚠ WARNING
Improper modification on positioner 6DR5...6
Danger of explosion. The pneumatic terminal plate on the SIPART PS2 positioner 6DR5..6 is a safety-related component of the flameproof enclosure.
<ul style="list-style-type: none">• Never loosen the screws ① of the pneumatic terminal plate.

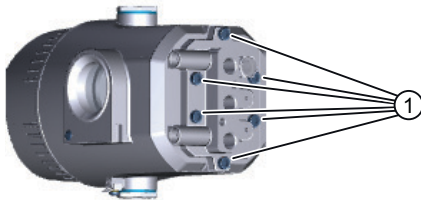



Figure 2-1 Screws of the pneumatic terminal plate on the positioner 6DR5..6


2.8 Use in areas subject to explosion hazard

Qualified personnel for hazardous area applications

Persons who install, connect, commission, operate, and service the device in a hazardous area must have the following specific qualifications:

- They are authorized, trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, high pressures, aggressive, and hazardous media.
- They are authorized, trained, or instructed in carrying out work on electrical circuits for hazardous systems.
- They are trained or instructed in maintenance and use of appropriate safety equipment according to the pertinent safety regulations.

 WARNING
Use in hazardous area Risk of explosion. <ul style="list-style-type: none">• Only use equipment that is approved for use in the intended hazardous area and labeled accordingly.• Do not use devices that have been operated outside the conditions specified for hazardous areas. If you have used the device outside the conditions for hazardous areas, make all Ex markings unrecognizable on the nameplate.

 WARNING
Loss of safety of device with type of protection "Intrinsic safety Ex i" If the device or its components have already been operated in non-intrinsically safe circuits or the electrical specifications have not been observed, the safety of the device is no longer ensured for use in hazardous areas. There is a risk of explosion. <ul style="list-style-type: none">• Connect the device with type of protection "Intrinsic safety" solely to an intrinsically safe circuit.• Observe the specifications for the electrical data on the certificate and/or in Technical data (Page 57).

Installing/mounting

3.1 Basic safety instructions

 WARNING**High operating force with pneumatic actuators**

Risk of injury when working on control valves due to the high operating force of the pneumatic actuator.

- Please observe the corresponding safety instructions for the pneumatic actuator in use.

 WARNING**Lid gasket may be damaged**

If the lid gasket is not positioned correctly in the groove of the base plate, it could be damaged when the lid is mounted and screwed tight.

- Therefore, make sure that the lid gasket is seated correctly.

 WARNING**Exceeded maximum permissible operating pressure**

Risk of injury or poisoning.


The maximum permissible operating pressure depends on the device version, pressure limit and temperature rating. The device can be damaged if the operating pressure is exceeded. Hot, toxic and corrosive process media could be released.


Ensure that maximum permissible operating pressure of the device is not exceeded. Refer to the information on the nameplate and/or in Technical data (Page 57).


 WARNING**Electrostatic charging of nameplates**

The nameplates used on the device can reach a capacity of 5 pF.

- Keep the device and the cables at a distance from strong electromagnetic fields.

 CAUTION
Unsuitable compressed air
Device damage. As a general rule, the positioner must only be operated with dry and clean compressed air.
<ul style="list-style-type: none">• Use the customary water separators and filters. An additional dryer is required in extreme cases.• Use dryers, especially if you operate the positioner at low ambient temperatures.

 CAUTION
Adhere to the following instructions before working on the control valve and when attaching the positioner
Danger of injury.
<ul style="list-style-type: none">• Prior to working on the control valve, you must move the actuator and the process valve into a completely pressureless state. Proceed as follows:<ul style="list-style-type: none">– Depressurize the actuator chambers.– Switch off the supply pressure PZ.– Secure the process valve.• Make sure that the actuator has reached the pressureless state.• If you interrupt the supply pressure PZ to the positioner, the pressureless position can only be reached after a certain waiting time.• When mounting, adhere strictly to the following order to avoid injuries or mechanical damage to the positioner/mounting kit:<ul style="list-style-type: none">– Mount the positioner mechanically.– Electric connection.– Connect supply pressure PZ.– Commission the positioner.

 WARNING
Mechanical impact energy
In order to ensure the degree of protection of the housing (IP66), protect the housing versions of the positioners listed here from mechanical impact energy:
<ul style="list-style-type: none">• 6DR5..3; not greater than 2 Joule• 6DR5..0; not greater than 1 Joule• 6DR5..1 with inspection window; not greater than 1 Joule

NOTICE**Torque with NPT screwed gland**

Device damage. The maximum torque of the cable gland must not be exceeded.

- To avoid damage to the device, the NPT adapter must be held in place while the NPT gland is screwed into the NPT adapter. Refer to the section "Technical specifications > Construction (Page 59)" for the torque value.

3.1.1 Proper mounting

NOTICE**Incorrect mounting**

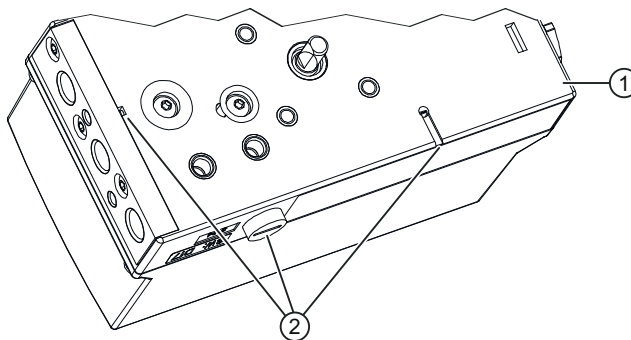
The device can be damaged, destroyed, or its functionality impaired through improper mounting.

- Before installing ensure there is no visible damage to the device.
- Make sure that process connectors are clean, and suitable gaskets and glands are used.
- Mount the device using suitable tools. Refer to the information in Construction (Page 59).

NOTICE**Freezing of the exhaust air outlets**

When devices of the type 6DR5..0/1/2/3 are used, the exhaust air outlets ② may freeze. The function of the device is impaired.

- Do **not** install the positioner with the base plate ① pointing up.



- ① Base plate
- ② Exhaust air outlets

Figure 3-1 Exhaust air outlets, base plate

3.2 Mounting to linear actuator

For linear actuators, use the "linear actuator" mounting kit 6DR4004-8V or the integrated attachment.

You require different installation parts depending on the selected actuator type. The mounting kit is suitable for a stroke of 3 to 35 mm. For a larger stroke range, you require a separately ordered lever 6DR4004-8L. Refer to the detailed operating instructions for further information on mounting.

3.3 Mounting to part-turn actuator

You require an actuator-specific VDI/VDE 3845 mount to install the positioner on a part-turn actuator. You receive the mount and screws from the actuator manufacturer. Ensure that the mount has a sheet metal thickness of > 4 mm and reinforcements. You also need the mounting kit 6DR4004-8D or the stainless steel coupling TGX: 16300-1556. Refer to the detailed operating instructions for further information on mounting.

3.4 Installing option modules

NOTICE

Improper installation of option modules

Risk of explosion in hazardous areas.

- If you upgrade the device with an option module, check the corresponding text box on the type plate as in the example below.
- Before you commission the device, follow the safety-related requirements according to the specifications in the valid certificate and in the "Technical specifications" section.

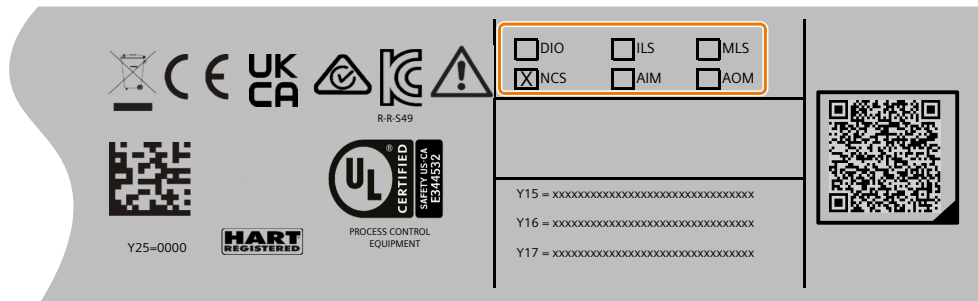


Figure 3-2 Example

Depending on the version of the positioner, the following option modules are available:

- Digital I/O Module (DIO) 6DR4004-6A / -8A
- Analog Input Module (AIM) 6DR4004-6F / -8F
- Inductive Limit Switches (ILS) 6DR4004-6G / -8G
- Analog Output Module (AOM) 6DR4004-6J / -8J

- Mechanic Limit Switches (MLS) 6DR4004-6K
- Internal NCS module 6DR4004-5L / -5LE
- NCS sensor 6DR4004-6N / -8N


For additional information and the corresponding safety notes to be observed when installing the option modules, refer to the detailed operating instructions for your respective device version.


3.4.1 Internal NCS module


The internal NCS module is used for wear-free position detection and is an optional equipment version in the positioner. The internal NCS module is installed as an alternative to the Analog Output Module (AOM) at the same slot in the positioner.


Connecting

4.1 Basic safety instructions

 WARNING
<p>Lever for position detection</p> <p>Danger of crushing and shearing with mounting kits which use a lever for position detection. During commissioning and ongoing operation, severing or squeezing of limbs could occur as a result of the lever. Risk of injury when working on control valves due to the high operating force of the pneumatic actuator.</p> <ul style="list-style-type: none"> • Do not reach into the range of motion of the lever following mounting of the positioner and mounting kit.

 WARNING
<p>With intrinsically device version (Ex i)</p> <p>Risk of explosion in hazardous areas.</p> <p>For intrinsically safe device versions only the certified circuits may be connected as auxiliary power supply, control and signal circuits.</p> <ul style="list-style-type: none"> • Make sure that the power source of the used circuits is marked as intrinsically safe.

 WARNING
<p>Leaky threads for "Flameproof enclosure Ex d / XP" type of protection</p> <p>Risk of explosion in hazardous areas. Threads must be completely screwed into the enclosure.</p> <ul style="list-style-type: none"> • Screw the cable glands, thread adapter or sealing plug with at least 5 threads into enclosure.

 WARNING
<p>Unsuitable cables, cable glands and/or plugs</p> <p>Risk of explosion in hazardous areas.</p> <ul style="list-style-type: none"> • Use only cable glands/plugs that comply with the requirements for the relevant type of protection. • Tighten the cable glands in accordance with the torques specified in Construction (Page 59). • Close unused cable inlets for the electrical connections. • When replacing cable glands, only use cable glands of the same type. • After installation, check that the cables are seated firmly.

NOTICE**Condensation in the device**

Damage to device through formation of condensation if the temperature difference between transportation or storage and the mounting location exceeds 20 °C (36 °F).

- Before taking the device into operation, let the device adapt for several hours in the new environment.

NOTICE**Ambient temperature too high**

Damage to cable sheath.

- At an ambient temperature ≥ 60 °C (140 °F), use heat-resistant cables suitable for an ambient temperature at least 20 °C (36 °F) higher.

**WARNING****Improper power supply**

Risk of explosion in hazardous areas as result of incorrect power supply.

- Connect the device in accordance with the specified power supply and signal circuits. The relevant specifications can be found in the certificates, in Technical data (Page 57) or on the nameplate.

**WARNING****Lack of equipotential bonding**

Danger of explosion in hazardous areas by compensating current or ignition sparks due to lack of equipotential bonding.

- Make sure that equipotential bonding exists for the device.

**WARNING****Unprotected cable ends**

Risk of explosion through unprotected cable ends in hazardous areas.

- Protect unused cable ends in accordance with IEC/EN 60079-14.

⚠ WARNING**Improper laying of shielded cables**

Risk of explosion through compensating currents between hazardous area and the non-hazardous area.

- Shielded cables that cross into hazardous areas should be grounded only at one end.
- If grounding is required at both ends, use an equipotential bonding conductor.

⚠ WARNING**Connecting or disconnecting device in energized state**

Risk of explosion in hazardous areas.

- Connect or disconnect devices in hazardous areas only in a de-energized state.
- Install a suitable switch-off device.

Exceptions:

- Devices having the type of protection "Intrinsic safety Ex i" may also be connected in energized state in hazardous areas.

⚠ WARNING**Incorrect selection of type of protection**

Risk of explosion in areas subject to explosion hazard.

This device is approved for several types of protection.

1. Decide in favor of one type of protection.
2. Connect the device in accordance with the selected type of protection.
3. In order to avoid incorrect use at a later point, make the types of protection that are not used permanently unrecognizable on the nameplate.

NOTICE**Standard cable gland/torque**

Device damage.

- Owing the reasons pertaining to tightness (IP enclosure rating) and the required tensile strength, only use the cables having a diameter ≥ 8 mm for standard M20x1.5 cable gland, or use a suitable seal insert in case of smaller diameters.
- In the NPT version, the positioner is delivered with a coupling. When inserting a counter piece in the coupling, ensure that the maximum permissible torque of 10 Nm is not exceeded.

Two-wire mode

NOTICE**Connection of voltage source to current input**

Device damage if a voltage source is connected to the current input I_w (terminals 6 and 7).

- Never connect the current input I_w to a low-resistance voltage source, otherwise the positioner may be destroyed.
- Always use a high-impedance power source.
- Observe the static destruction limit specified in the "Electrical data (Page 64)".

Note**Improvement of interference immunity**

- Lay signal cables separate from cables with voltages > 60 V.
- Use cables with twisted wires.
- Keep device and cables at a distance from strong electromagnetic fields.
- Take account of the conditions for communication specified in the Technical data (Page 57).
- Use shielded cables to guarantee the full specification according to HART/PA/FF/Modbus/EIA-485/Profibus DP.

4.1.1 Additional safety notes for PA and FF

If the bus shield is fully effective, the interference immunity and the interference emission conform to the specifications. The following measures ensure that the bus shield is fully effective:

- The shields have been connected to the metallic connections of the positioner.
- The shields have been laid up to the terminal boxes, the distributor and the transceiver.

Note**Dissipation of glitch impulses/equipotential bonding**

In order to dissipate glitch impulses, the positioner must be connected to an equipotential bonding cable (earth potential) using a low resistance. The positioner in the polycarbonate enclosure is therefore equipped with an additional cable. Connect this cable to the shield of the bus cable and the equipotential bonding cable using a cable clamp.

Devices in the stainless steel or aluminum enclosure have a corresponding terminal on the outer side of the enclosure. This terminal must also be connected to the equipotential bonding cable.

For applications in hazardous areas, ensure an adequately suitable equipotential bonding between the hazardous and non-hazardous areas.

The positioner is equipped with an additional input (terminal 81 [+] and terminal 82 [-]) to approach the safety position. After activating this function, this input must be continuously supplied with +24 V in order to retain the normal control function.

If the 24-V signal is interrupted, the safety position is set as described in chapter "Pneumatic connection (Page 35)".

Communication with the master is still possible. The "Jumper" on the electronics is used to activate this function. It can be accessed after removing the module cover, and must be switched from the right position (delivery state) to the left position.

4.2 Electrical connection

4.2.1 SIPART PS2 with 4 to 20 mA/HART

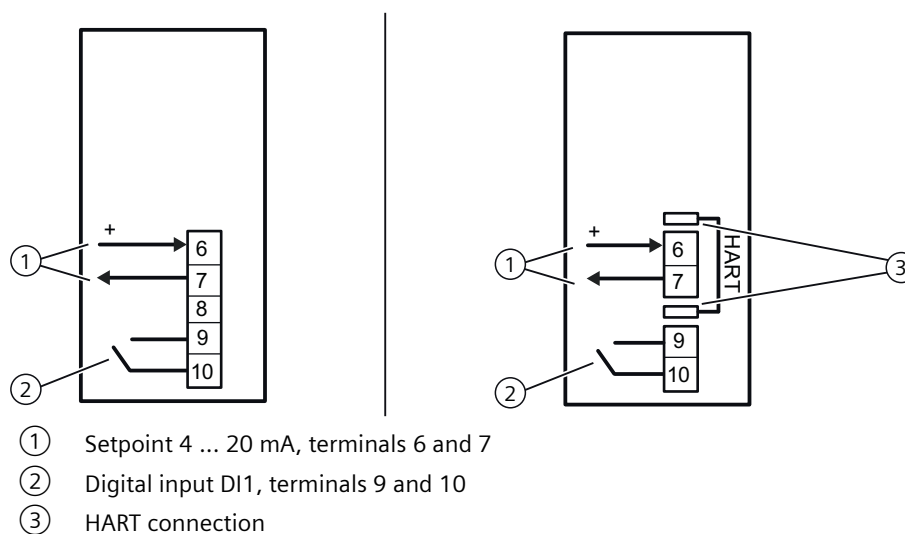


Figure 4-1 Connection diagram for electronics 2-wire

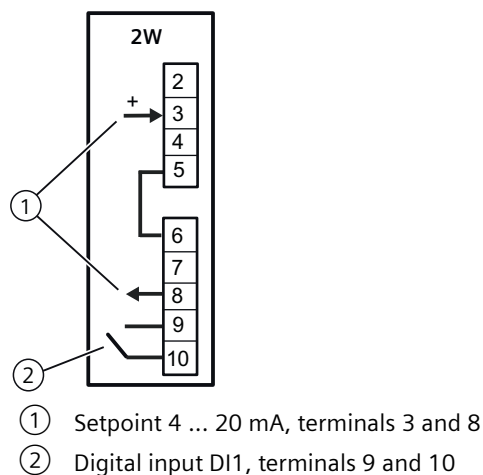
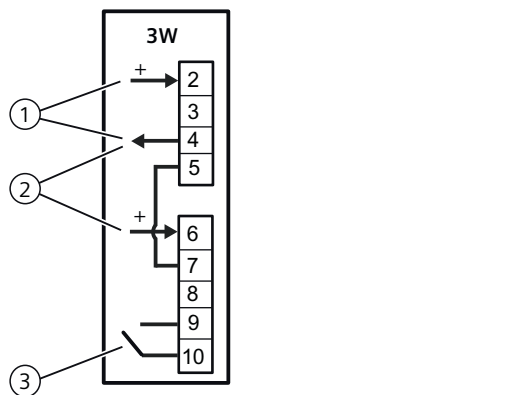
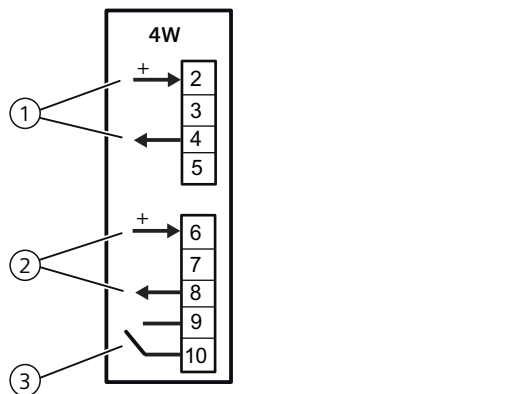


Figure 4-2 Connection diagram for electronics, 2/3/4-wire, with wiring configuration 2-wire



- ① Power source 18 ... 30 V, terminals 2 and 4
- ② Setpoint 0/4 ... 20 mA, terminals 6 and 4
- ③ Digital input DI1, terminals 9 and 10

Figure 4-3 Connection diagram for electronics, 2/3/4-wire, with wiring configuration 3-wire



- ① Power source 18 ... 30 V, terminals 2 and 4
- ② Setpoint 0/4 ... 20 mA, terminals 6 and 8
- ③ Digital input DI1

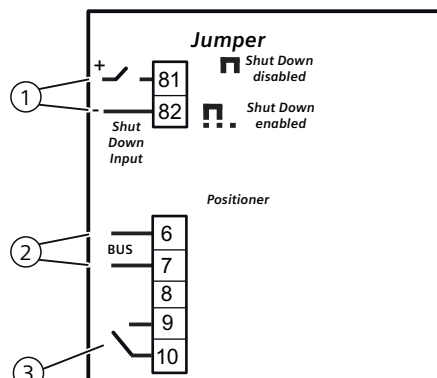
Figure 4-4 Connection diagram for electronics, 2/3/4-wire, with wiring configuration 4-wire

See also

Electrical data (Page 64)

Technical data (Page 57)

4.2.2 SIPART PS2 with PROFIBUS PA



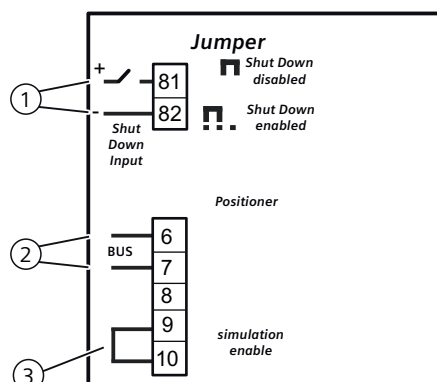
- ① Input: Safety shutdown, terminals 81 and 82
- ② Auxiliary power supply bus circuit, terminals 6 and 7
- ③ Digital input DI, terminals 9 and 10

Figure 4-5 Device version with PROFIBUS PA

See also

Electrical data (Page 67)

4.2.3 SIPART PS2 with FOUNDATION Fieldbus



- ① Input: Safety shutdown can be activated with "jumper", terminals 81 and 82
- ② Auxiliary power supply bus circuit, terminals 6 and 7
- ③ Digital input DI, terminals 9 and 10 (simulation release)

Figure 4-6 Device version with FOUNDATION Fieldbus

See also

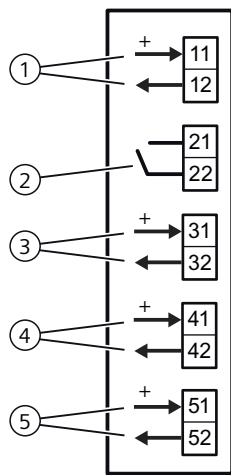
Electrical data (Page 67)

4.2.4 Split range

For further information about "Split-range" operation, refer to the detailed operating instructions for your respective device version.

4.2.5 Option modules

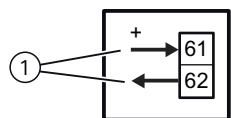
4.2.5.1 Digital I/O Module (DIO) 6DR4004-6A / -8A



- ① Digital input 2, galvanically isolated
- ② Digital input 2, floating contact
- ③ Fault message output
- ④ Digital output 1
- ⑤ Digital output 2

Figure 4-7 Digital I/O Module (DIO)

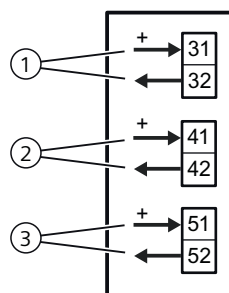
4.2.5.2 Analog Output Module (AOM) 6DR4004-6J / -8J



- ① Analog output AO

Figure 4-8 Analog Output Module (AOM)

4.2.5.3 Inductive Limit Switches (ILS) 6DR4004-6G / -8G



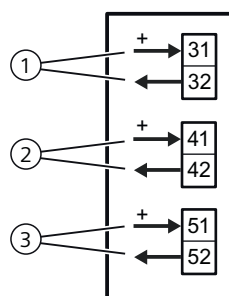
- ① Fault message output, has no function in combination with 6DR4004-3ES
- ② Digital output 1
- ③ Digital output 2

Figure 4-9 Inductive Limit Switches (ILS)

See also

Inductive Limit Switches (ILS) 6DR4004-6G / -8G (Page 72)

4.2.5.4 Mechanic Limit Switches (MLS) 6DR4004-6K



- ① Fault message output, has no function in combination with 6DR4004-4ES
- ② Digital output 1
- ③ Digital output 2

Figure 4-10 Mechanic Limit Switches (MLS)

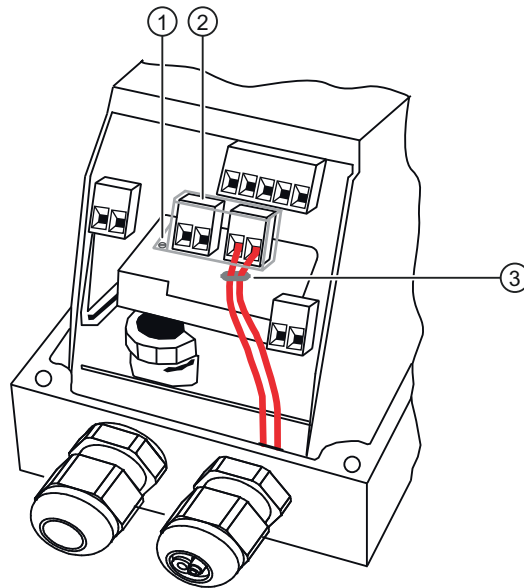
See also

Mechanic Limit Switches (MLS) 6DR4004-6K (Page 73)

Procedure

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

4. Slide the transparent cover ② up to the end stop of the electronics.
5. Tighten the screw ① of the transparent cover ②.
6. Connect the cables of each switch to the lug of the printed circuit board in pairs. Use the provided cable ties ③ for this purpose.



- ① Screw
- ② Cover
- ③ Cable tie

Figure 4-11 Connecting the cables

4.2.6 Option device version M12 connector

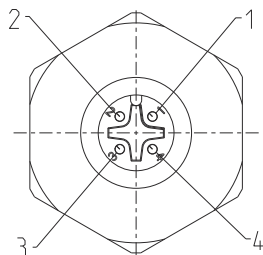
This section describes which terminal of the devices and option modules listed below is connected with the respective pole of the M12 connector.

Note

Technical specifications

Observe the specifications for the electrical data in the certificate and/or in section "Technical data (Page 57)".

View of the mating side pole pattern



Pole designation	Wire color of M12 basic connector socket
1	Brown
4	Black
3	Blue
2	White

4.2.6.1 In the basic unit with 4 to 20 mA/HART

You have a positioner 6DR50/1..-0.R.. or 6DR50/1..-0.S. In this version of the positioner, the current input I_W 4 to 20 mA of the electronics is connected via the M12 device plug.

Table 4-1 Assignment diagram

Current input terminal	Pole designation
6 (+)	1 - Brown
Shield support of enclosure	4 - Black
7 and 8 (-)	3 - Blue

4.2.6.2 In the basic unit with PROFIBUS PA

You have a positioner 6DR55..-0.R.. or 6DR55..-0.S. In this case the M12 connector is connected to the bus circuit of the basic electronics.

Table 4-2 Assignment diagram

Bus circuit terminal	Pole designation
7	1 - Brown
Shield support of enclosure	4 - Black
6	3 - Blue

4.2.6.3 In the basic unit with FOUNDATION Fieldbus

You have a positioner 6DR56..-0.R.. or 6DR56..-0.S.. In this case the M12 connector is connected to the bus circuit of the basic electronics.

Table 4-3 Assignment diagram

Bus circuit terminal	Pole designation
7	1 - Brown
Shield support of enclosure	4 - Black
6	3 - Blue

4.2.6.4 In the basic unit with Analog Output Module (AOM) 6DR4004-6J / -8J (-Z D53)

You have a positioner with order suffix -Z order code D53. In this version of the positioner, the current output of Analog Output Module (AOM) is electrically connected to the M12 connector.

Table 4-4 Assignment diagram

Current output terminal	Pole designation
61 (+)	1 - Brown
Shield support of enclosure	4 - Black
62 (-)	3 - Blue

4.2.6.5 In the basic unit with Position Transmitter (-Z D54)

You have a positioner with order suffix -Z order code D54. In this version of the positioner, the installed Analog Input Module (AIM) 6DR4004-6F/-8F is electrically connected to the M12 connector. You connect the Position Transmitter 6DR4004-1ES/-2ES using the M12 connector.

Table 4-5 Assignment diagram

Terminal	Pole designation
REF	2 - White
POS	3 - Blue
GND	4 - Black
VCC	1 - Brown

4.2.6.6 In the basic unit with Digital I/O Module (DIO) 6DR4004-6A / -8A (-Z D55)

You have a positioner with order suffix -Z order code D55. In this version of the positioner, the current output of Digital I/O Module (DIO) is electrically connected to the M12 connector.

Table 4-6 Assignment diagram

Terminal of digital outputs A1 and A2	Pole designation
41 (+)	1 - Brown
52 (-)	4 - Black
42 (-)	3 - Blue
51 (+)	2 - White

4.2.6.7 In the basic unit with Inductive Limit Switches (ILS) 6DR4004-6G /-8G (-Z D56)

You have a positioner with order suffix -Z order code D56. In this version of the positioner, the digital outputs A1 and A2 of the Inductive Limit Switches (ILS) are electrically connected to the M12 device plug.

Table 4-7 Assignment diagram

Terminal of digital outputs A1 and A2	Pole designation
41 (+)	1 - Brown
52 (-)	4 - Black
42 (-)	3 - Blue
51 (+)	2 - White

4.2.6.8 In the basic unit with Mechanic Limit Switches (MLS) 6DR4004-6K (-Z D57)

You have a positioner with order suffix -Z order code D57. In this version of the positioner, the digital outputs A1 and A2 of the Mechanic Limit Switches (MLS) are electrically connected to the M12 connector.

Table 4-8 Assignment diagram

Terminal of digital outputs A1 and A2	Pole designation
41 (+)	1 - Brown
52 (-)	4 - Black
42 (-)	3 - Blue
51 (+)	2 - White

4.3 Pneumatic connection

WARNING

Supply pressure PZ

For safety reasons, the supply pressure PZ can be fed after installation only if the positioner is switched to "P-Manual mode" when an electrical signal is present. This operating mode is preset in the delivery state.

Note

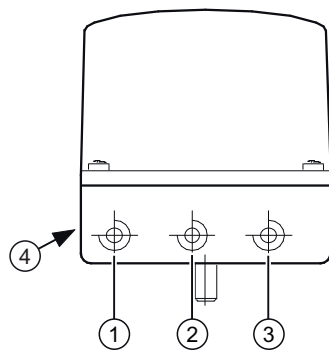
Specifications regarding air quality

Observe the specifications regarding the air quality in section "Technical specifications > Pneumatic data (Page 58)".

Note**Leakage**

Besides continuous air consumption, a leakage can cause the positioner to try to compensate the position deviation. This will result in premature wear in the entire control device.

- Check offline for leakage using the "11.LEAK" diagnostic parameter.
- If there is leakage, check the pneumatic connections for leaks.

4.3.1 Pneumatic connection for 6DR5..0/1/2/3

- ① Output: Actuating pressure Y2 *)
- ② Input: Supply pressure PZ
- ③ Output: Actuating pressure Y1
- ④ Exhaust air outlet with sound absorber, thread G $\frac{1}{4}$

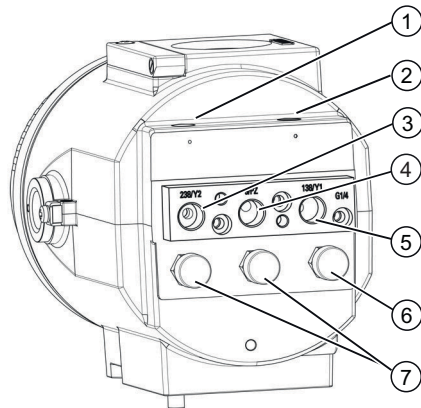
*) for double-acting actuators

Figure 4-12 Pneumatic connection, example

4.3.2 Pneumatic connection for 6DR5..5 and 6DR5..6

Structure

The pneumatic connections are provided on the right side of the positioner.



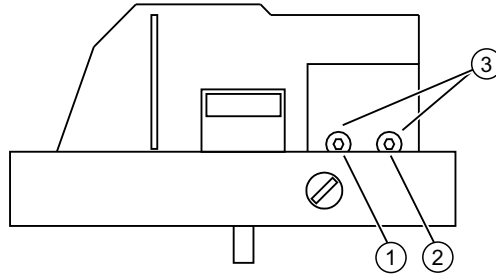
- | | |
|------------------------------------|---------------------------------|
| ① Restrictor Y2 *) | ⑤ Output: Actuating pressure Y1 |
| ② Restrictor Y1 | ⑦ Enclosure ventilation (2x) |
| ③ Output: Actuating pressure Y2 *) | ⑥ Exhaust air outlet |
| ④ Input: Supply pressure PZ | |
- *) for double-acting actuators

Figure 4-13 Pneumatic connection in the flameproof enclosure

4.4 Restrictors

- Reduce the air output to achieve travel times of $T > 1.5$ s for small actuators. Use restrictors Y1 ① and Y2 ② for this purpose.
- When turned clockwise, they reduce the air output and finally shut it off.

- In order to set the restrictors, we recommend closing them and then opening slowly.
- In case of double-acting valves, ensure that both restrictors have approximately the same setting.




- ① Restrictor Y1
- ② Restrictor Y2, only in the version for double-acting actuators *)
- ③ Hexagon socket-head screw 2.5 mm


Figure 4-14 Restrictors


*) Restrictor Y2 ② is not active for single-acting Fail in Place F01


Commissioning

5.1 Basic safety instructions

 WARNING
Lever for position detection Danger of crushing and shearing with mounting kits which use a lever for position detection. During commissioning and ongoing operation, severing or squeezing of limbs could occur as a result of the lever. Risk of injury when working on control valves due to the high operating force of the pneumatic actuator. <ul style="list-style-type: none">• Do not reach into the range of motion of the lever following mounting of the positioner and mounting kit.

 WARNING
Improper commissioning in hazardous areas Device failure or risk of explosion in hazardous areas. <ul style="list-style-type: none">• Do not commission the device until it has been mounted completely and connected in accordance with the information in Installing/mounting (Page 17).• Before commissioning take the effect on other devices in the system into account.

 WARNING
Commissioning and operation with pending error If an error message appears, correct operation in the process is no longer guaranteed. <ul style="list-style-type: none">• Check the gravity of the error.• Correct the error.• If the error still exists:<ul style="list-style-type: none">– Take the device out of operation.– Prevent renewed commissioning.

 WARNING
Loss of explosion protection Risk of explosion in hazardous areas if the device is open or not properly closed. <ul style="list-style-type: none">• Close the device as described in Installing/mounting (Page 17).

 **WARNING**

Opening device in energized state

Risk of explosion in hazardous areas

- Only open the device in a de-energized state.
- Check prior to commissioning that the cover, cover locks, and cable inlets are assembled in accordance with the directives.

Exception: Devices having the type of protection "Intrinsic safety Ex i" may also be opened in energized state in hazardous areas.

 **WARNING**


Water in compressed air line

Device damage and possibly loss of type of protection. The factory setting for the purging air selector is "IN". In the "IN" position, water from the compressed air line may enter the device from the pneumatics during initial commissioning.

- Before commissioning, make sure that no water is present in the compressed air line.

If you cannot be sure that there is no water in the compressed air line:

- Set the purging air selector to "OUT". In this way, you prevent water from the compressed air line from penetrating the device.
- Only set the purging air selector to "IN" again when all water has been discharged from the compressed air line.


 **CAUTION**

Increased sound pressure level

Changes to the sound absorber of the positioner or the mounting of pneumatic components or pneumatic options on the positioner can cause a sound pressure with a level of 80 dBA to be exceeded.

- Wear suitable hearing protection to protect yourself against hearing damage.

When operating the positioner with natural gas, you must follow and adhere to the following safety notes:

<p> WARNING</p> <p>Operation with natural gas</p> <ol style="list-style-type: none"> 1. Only positioners and option modules which are connected to power supplies with type of protection "Intrinsic safety, protection level [ia]" may be operated with natural gas. 2. Do not operate the positioner with natural gas in closed spaces. 3. Natural gas is continuously blown off, 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. The maximum values for ventilation are listed in section "Natural gas as actuator medium (Page 63)". 4. If you operate the positioner with natural gas, it is not permitted to use Mechanic Limit Switches (MLS). 5. You must depressurize devices operated with natural gas adequately for maintenance work. Open the lid in an explosion-free atmosphere and depressurize the device for at least two minutes.

Note

Quality of natural gas

Only use natural gas which is clean, dry and free from additives.

5.2 Overview

Note

- During the initialization process, the operating pressure must be at least one bar more than that required to close or open the valve. However, the operating pressure should not be greater than the maximum permissible operating pressure for the actuator.
-

General information about commissioning

1. After installing the positioner on a pneumatic actuator, you must supply electric and pneumatic auxiliary power to it.
2. The positioner is in the "P manual mode" before initialization. At the same time, "NOINI" blinks in the lower line of the display.
3. Position feedback: You can adjust the range of position detection using the friction clutch if necessary.
4. Adjust the positioner as per the respective actuator with the help of the initialization process and by setting the parameters. If required, use the "PRST" parameter to cancel the adjustment of the positioner on the actuator. The positioner is again in the "P manual mode" after this process.

Types of initialization

You can initialize the positioner as follows:

- Automatic initialization:
during automatic initialization, the positioner determines the following one after the other:
 - The direction of action
 - The actuator travel and angle of rotation
 - The travel time of the actuator

The positioner also adjusts the control parameters as per the dynamic response of the actuator.

- Manual initialization:
the actuator travel and the angle of rotation of the actuator are set manually. The remaining parameters are automatically determined. This function is useful for valves which are lined, for example, with PTFE.
- Copying the initialization data when replacing a positioner:
the initialization data of a positioner can be read and copied into another positioner. A defective device can thus be replaced without interrupting an ongoing process through initialization.

You have to define a few parameters for the positioner before initialization. Owing to the preset values, you cannot adjust further parameters for initialization.

With a suitable parameter assignment of the "DI1" parameter and activated digital input DI1, you protect the settings that were made against unintentional adjustment.

5.3 Sequence of automatic initialization

See detailed operating instructions for information on sequence of automatic initialization.

5.4 Parameter

Introduction

Parameters 1 to 5 are the same for all versions of the positioner. These parameters are used to adjust the positioner to the actuator. Normally, setting these parameters is sufficient to be able to operate the positioner on an actuator.

If you want to get to know all details of the positioner, gradually try out the effects of the remaining parameters by systematic testing.

Note

Factory-set parameter values are printed in bold in the following table.

Overview

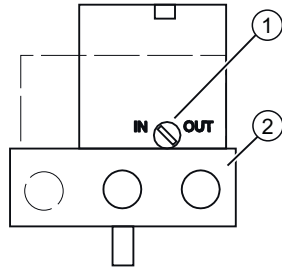
Parameter	Function	Parameter values		Unit
1.YFCT	Type of actuator	Normal	Inverted	
	Part-turn actuator	turn	-turn	
	Linear actuator	WAY	-WAY	
	Linear actuator - carrier pin on actuator spindle	FWAY	-FWAY	
	Linear actuator - external linear potentiometer (e.g. with cylinder drives)	LWAY	-LWAY	
	Part-turn actuator with NCS/iNCS	ncSt	-ncSt	
	Linear actuator with NCS	ncSL	-ncSL	
	Linear actuator with NCS/iNCS and lever	ncSLL	-ncLL	
2.YAGL	Rated angle of rotation of positioner shaft ¹⁾			
		33°		Degrees
		90°		
3.YWAY ²⁾	Range of stroke (optional setting) ³⁾			
		OFF		mm
		5 10 15 20 (Short lever 33°, range of stroke 5 mm to 20 mm)		
		25 30 35 (Short lever 90°, range of stroke 25 mm to 35 mm)		
	40 50 60 70 90 110 130 (Long lever 90°, range of stroke 40 mm to 130 mm)			
4.INITA	Initialization (automatic)	NOINI no / ###.# Strt		
5.INITM	Initialization (manual)	NOINI no / ###.# Strt		

¹⁾	Set the transmission ratio selector accordingly.
²⁾	Parameter only appears with "WAY", "-WAY", "ncSLL", and "-ncLL"
³⁾	If used, the value on the actuator must correspond to the set range of stroke on the lever arm. Carrier must be set to the value of the actuator travel or, if this value is not scaled, to the next larger scale value.

5.5 Purge air switching

When the enclosure is open, the purging air selector above the pneumatic manifold on the pneumatic block can be accessed.

- 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 directly directed towards outside.



- ① Purging air selector
- ② Pneumatic connections Y1, PZ and Y2

Figure 5-1 Purging air selector on the pneumatic block; view of the pneumatic connection side of the positioner with open lid

The factory setting is the "IN" position.

5.6 Commissioning linear actuators

5.6.1 Preparing linear actuators for commissioning

Requirement

You have already installed the positioner using the suitable mounting kit.

Setting the transmission ratio selector

Commissioning

The setting of the transmission ratio selector is extremely important to commission the positioner.

Stroke [mm]	Position of the transmission ratio selector
5 ... 20	33°
25 ... 35	90°
40 ... 130	90°

Connecting the positioner

1. Connect a suitable power supply. The positioner is now in the "P manual mode". The current potentiometer voltage (P) in percent is shown in the upper line of the display, e.g. "P37.5", and "NOINI" flashes in the bottom line:



2. Connect the actuator and the positioner to the pneumatic lines.
3. Supply the pneumatic auxiliary power to the positioner.

Setting the actuator

1. Check whether the mechanical unit can be moved freely in the entire travel range. Move the actuator to the respective end position for this purpose using the \triangle or ∇ button.
2. Now move the actuator to the horizontal position of the lever.
3. A value between "P48.0" and "P52.0" is shown on the display.
4. If a value beyond this range is shown on the display, you must move the friction clutch. Move the friction clutch until a value between "P48.0" and "P52.0" is reached. The closer this value is to "P50.0", the more accurately the positioner determines the stroke travel.

The following applies to the flameproof enclosure version:

The inner friction clutch is fixed. Therefore, only move the outer friction clutch. This also applies when using an internal NCS module.

The following applies to device versions without flameproof enclosure with internal NCS module 6DR4004-5L.:

The inner friction clutch has no function. This means you should only adjust the adjustment wheel of the magnet clamp. Requirement: 'YFCT (Page 42)' parameter is set.

5.6.2 Automatic initialization of linear actuators

Requirements


The following conditions must be fulfilled before activating the automatic initialization:

1. The actuator spindle can be moved completely.
2. The actuator spindle is at a central position after travel.

Initializing the linear actuator automatically

Note

Interrupting initialization


An ongoing initialization can be interrupted at any time. To do this, press . The settings configured until then are retained.

All parameters are reset to factory settings only if you have explicitly activated the preset settings in the "PRST" parameter.


Note

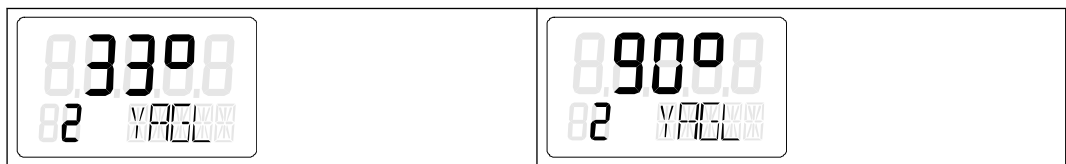
Commissioning of a tight-closing valve

If the valve is tight-closing, set the "YCLS" parameter before commissioning. This ensures that the end positions are approached for at least 15 seconds during initialization.



1. Switch to the "Configuration" mode. To do this, keep the  button pressed for at least 5 seconds. The display shows the following:





2. Call the "2.YAGL" parameter. To do this, press . The following is shown on the display depending on the setting:




3. Check whether the value displayed in the "2.YAGL" parameter matches the setting of the transmission ratio selector. If required, change the setting of the transmission ratio selector to 33° or 90°.


4. Set the "3.YWAY" parameter to determine the total stroke in mm. The setting of parameter 3 is optional. The display shows the determined total stroke at the end of the initialization phase.
 - Press the  button if you do not require any information about the total stroke in mm. You then reach parameter 4.
 - Call the "3.YWAY" parameter. To do this, press . The display shows the following:

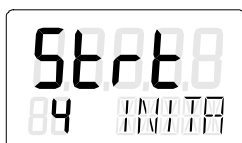
**Note****Set the "3.YWAY" parameter**

1. On the scale of the lever, read the value marked by the carrier pin.
2. Set the parameter with the buttons  and  to the read value.

5. Call the "4.INITA" parameter. To do this, briefly press the  button. The display shows the following:



6. Start the initialization process. To do this, keep the  button pressed for at least 5 seconds until the display shows the following:



The positioner runs through several initialization steps during the automatic initialization process. The lower line of the display indicates which initialization step is currently being run through. The initialization process depends on the actuator used, and takes up to 15 minutes.

7. The following display indicates that the initialization is complete:



5.6.3 Manual initialization of linear actuators

See detailed operating instructions for information on manual initialization of linear actuators.

5.7 Commissioning part-turn actuators

5.7.1 Preparing part-turn actuators for commissioning

Note

Setting of the adjustment angle

The usual adjustment angle for part-turn actuators is 90°.

- Set the transmission ratio selector in the positioner to 90°.
-

Condition



The following conditions must be fulfilled before activating the initialization:

1. You have installed the positioner for the part-turn actuators using the suitable mounting kit.
2. You have connected the actuator and the positioner to the pneumatic lines.
3. Supplying the positioner with the supply pressure PZ.
4. The positioner has been connected to a suitable power supply.

Setting the actuator



1. The positioner is in the "P manual mode". The current potentiometer voltage P in percent is shown on the upper line in the display. "NOINI" blinks in the lower line of the display. Examples of corresponding displays are given below:



2. Check whether the mechanical unit can be moved freely in the entire travel range. Move the drive to the respective end position for this purpose using the  or  button.

Note

End position

By simultaneously pressing the  and  buttons, you reach the end position faster.

3. After checking, move the actuator to a central position. This accelerates the initialization process.

5.7.2 Automatic initialization of part-turn actuators

Requirement


The following conditions must be fulfilled before activating the automatic initialization:

1. The travel range of the actuator can be passed through completely.
2. The actuator shaft is at a central position.

Initializing the part-turn actuator automatically

Note

Interrupting initialization


An ongoing initialization can be interrupted at any time. To do this, press . The settings configured until then are retained.

All parameters are reset to factory settings only if you have explicitly activated the preset settings in the "PRST" parameter.


Note

Commissioning of a tight-closing valve


If the valve is tight-closing, set the "YCLS" parameter before commissioning. This ensures that the end positions are approached for at least 15 seconds during initialization.

1. Switch to the "Configuration" mode. To do this, press the  button for at least 5 seconds until the display shows the following:




2. Use the  button to change from linear actuator to part-turn actuator until the display shows the following:




3. Call the "2.YAGL" parameter. To do this, briefly press the  button. This parameter has already been set to 90° automatically. The display shows the following:



5.8 Canceling initialization

- 4. Call the "4.INITA" parameter. To do this, briefly press the  button. The display shows the following:



- 5. Start the initialization process. To do this, press the  button for at least 5 seconds until the display shows the following:



The positioner runs through five initialization steps during the automatic initialization process. The displays for the initialization steps from "RUN 1" to "RUN 5" are located in the lower line of the display. The initialization process depends on the actuator used, and takes up to 15 minutes.




- 6. The following display indicates that the automatic initialization is complete. The total angle of rotation of the actuator is shown on the upper line on the display:



5.7.3 Manual initialization of part-turn actuators

See detailed operating instructions for information on manual initialization of part-turn actuators.

5.8 Canceling initialization

- 1. Press the  button.
 - Canceling automatic initialization: the display shows "INITA".
 - Canceling manual initialization: the display shows "INITM".The positioner is in the "Configuration" mode.
- 2. Exit the "Configuration" mode. To do this, press the  button for at least 5 seconds. The software version is displayed. After releasing the  button, the positioner is in "P manual mode". The positioner is not initialized.

Service and maintenance

6.1 Basic safety instructions

6.1.1 Maintenance

The device is maintenance-free. However, a periodic inspection according to pertinent directives and regulations must be carried out.

An inspection can include, for example, check of:

- Ambient conditions
- Seal integrity of the process connections, cable entries, and cover
- Reliability of power supply, lightning protection, and grounds

 WARNING
--

Dust layers above 5 mm

Risk of explosion in hazardous areas.

Device may overheat due to dust build up.

- | |
|---|
| <ul style="list-style-type: none">• Remove dust layers in excess of 5 mm. |
|---|

 CAUTION
--

Releasing button lock

Improper modification of parameters could influence process safety.

- | |
|--|
| <ul style="list-style-type: none">• Make sure that only authorized personnel may cancel the button locking of devices for safety-related applications. |
|--|

NOTICE

Penetration of moisture into the device
--

Device damage

- | |
|---|
| <ul style="list-style-type: none">• Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device. |
|---|

6.2 Cleaning

The positioner is maintenance-free to a large extent. Screens are installed in the pneumatic connections of the positioners to protect them from rough dirt particles. If there are dirt particles in the supply air (PZ), they damage the screens and hamper the function of the positioner. Clean the screens as described in the following two chapters.

6.2.1 Positioners 6DR5..0, 6DR5..3 and 6DR5..5

Procedure for removal and cleaning of the sieves

1. Switch off the supply pressure PZ.
2. Remove the pneumatic pipelines.
3. Unscrew the lid of the 6DR5..0 or 6DR5..3 enclosure.
4. Remove the three screws on the pneumatic terminal strip.
5. Remove the sieves and O-rings behind the terminal strip.
6. Clean the sieves, e.g. using compressed air.

Procedure for installation of the sieves



CAUTION

Damage to the polycarbonate enclosure 6DR5..0

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

1. Insert the sieves into the recesses of the enclosure.
2. Place the O-rings on the sieves.
3. Insert the pneumatic terminal strip.
4. Tighten the three screws. Note: With the polycarbonate enclosure, the screws are self-tapping.
5. Place the lid on and tighten it.
6. Connect the pneumatic pipelines again.

6.2.2 Positioners 6DR5..1, 6DR5..2 and 6DR5..6

Removal, cleaning and installation of the screens

1. Switch off the supply pressure PZ.
2. Remove the pneumatic connecting cables.
3. Remove the metal screen from the bores carefully.
4. Clean the metal screens, e.g. using compressed air.
5. Insert the screens.
6. Connect the pneumatic pipelines again.

Cleaning the enclosure

- Clean the outside of the enclosure with the inscriptions and the display window using a cloth moistened with water or a mild detergent.
- Do not use any aggressive cleansing agents or solvents, e.g. acetone. Plastic parts or the painted surface could be damaged. The inscriptions could become unreadable.

 WARNING

Electrostatic charge

Risk of explosion in hazardous areas if electrostatic charges develop, for example, when cleaning plastic surfaces with a dry cloth.
--

- | |
|--|
| <ul style="list-style-type: none">• Prevent electrostatic charging in hazardous areas. |
|--|


6.3 Maintenance and repair work


Send defective devices to the repairs department, together with information on the malfunction and the cause of the malfunction. When ordering replacement devices, please provide the serial number of the original device. You can find the serial number on the nameplate.


 WARNING
--

Impermissible repair of the device

- | |
|--|
| <ul style="list-style-type: none">• Repair must be carried out by Siemens authorized personnel only. |
|--|

 WARNING
Maintenance during continued operation in a hazardous area
There is a risk of explosion when carrying out repairs and maintenance on the device in a hazardous area.
<ul style="list-style-type: none">• Isolate the device from power.
- or -
<ul style="list-style-type: none">• Ensure that the atmosphere is explosion-free (hot work permit).

 WARNING
Impermissible accessories and spare parts
Risk of explosion in areas subject to explosion hazard.
<ul style="list-style-type: none">• Only use original accessories or original spare parts.• Observe all relevant installation and safety instructions described in the instructions for the device or enclosed with the accessory or spare part.

 WARNING
Improper connection after maintenance
Risk of explosion in areas subject to explosion hazard.
<ul style="list-style-type: none">• Connect the device correctly after maintenance.• Close the device after maintenance work.
Refer to Electrical connection (Page 27).

6.4 Return procedure

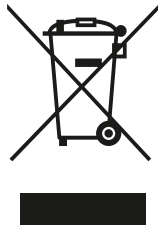
Enclose the bill of lading, return document and decontamination certificate in a clear plastic pouch and attach it firmly to the outside of the packaging. Any devices/replacement parts which are returned without a decontamination declaration will be cleaned at your expense before further processing. For further details, refer to the operating instructions.

See also

Return document (<http://www.siemens.com/processinstrumentation/returngoodsnote>)

Decontamination declaration (<http://www.siemens.com/sc/declarationofdecontamination>)

6.5 Disposal



Devices described in this manual should be recycled. They may not be disposed of in the municipal waste disposal services according to the Directive 2012/19/EC on waste electronic and electrical equipment (WEEE).

Devices can be returned to the supplier within the EC, or to a locally approved disposal service for eco-friendly recycling. Observe the specific regulations valid in your country.

Further information about devices containing batteries can be found at: Information on battery/product return (WEEE) (<https://support.industry.siemens.com/cs/document/109479891/>)

Technical data

7.1 All device versions

7.1.1 Rated conditions

Rated conditions	
Ambient conditions	For use indoors and outdoors.
Ambient temperature	In hazardous areas, observe the maximum permissible ambient temperature corresponding to the temperature class.
<ul style="list-style-type: none"> Permissible ambient temperature for operation ²⁾³⁾ 	-30 ... +80 °C (-22 ... +176 °F)
<ul style="list-style-type: none"> Maximum permissible height above sea level 	Up to 2000 m
<ul style="list-style-type: none"> Relative humidity 	0 ... 100%
Degree of pollution	2
Overvoltage category	II
Degree of protection ¹⁾	IP66 / Type 4X to UL 50E
Vibration resistance	
<ul style="list-style-type: none"> Harmonic oscillations (sine) according to IEC 60068-2-6 	3.5 mm (0.14"), 2 ... 27 Hz, 3 cycles/axis 98.1 m/s ² (321.84 ft/s ²), 27 ... 300 Hz, 3 cycles/axis
<ul style="list-style-type: none"> Bump (half-sine) according to IEC 60068-2-27 	150 m/s ² (492 ft/s ²), 6 ms, 1000 shocks/axis
<ul style="list-style-type: none"> Noise (controlled digitally) according to IEC 60068-2-64 	10 ... 200 Hz; 1 (m/s ²) ² /Hz (3.28 (ft/s ²) ² /Hz) 200 ... 500 Hz; 0.3 (m/s ²) ² /Hz (0.98 (ft/s ²) ² /Hz) 4 hours/axis
<ul style="list-style-type: none"> Recommended range of continuous operation of the entire control valve 	≤ 30 m/s ² (98.4 ft/s ²) without resonance peak
Climate class	
<ul style="list-style-type: none"> Storage 	1K5, -40 ... +80 °C (-40 ... +176 °F)
<ul style="list-style-type: none"> Transport 	2K4, -40 ... +80 °C (-40 ... +176 °F)

¹⁾ Max. impact energy 1 Joule for enclosure with inspection window 6DR5..0 and 6DR5..1 or max. 2 Joule for 6DR5..3

²⁾ At ≤ -10 °C (≤ 14 °F) the display refresh rate of the indicator is limited.

³⁾ The following applies to order suffix (order code) **-Z M40**: -40 ... +80 °C (-40 ... +176 °F)

See also

Proper mounting (Page 19)

Ambient temperature (Page 62)

7.1.2 Pneumatic data

Pneumatic data	
Auxiliary power (air supply)	Compressed air, carbon dioxide (CO ₂), nitrogen (N), noble gases or cleaned natural gas
• Pressure ¹⁾	1.4 ... 7 bar (20.3 ... 101.5 psi)
Air quality to ISO 8573-1	
• Solid particulate size and density	Class 3
• Pressure dew point	Class 3 (min. 20 K (36 °F) below ambient temperature)
• Oil content	Class 3
Unrestricted flow (DIN 1945)	
• Pressurize actuator ²⁾	
2 bar; 0.1 KV (29 psi; 0.116 CV)	4.1 Nm ³ /h (2.6 scfm)
4 bar; 0.1 KV (58 psi; 0.116 CV)	7.1 Nm ³ /h (4.4 scfm)
6 bar; 0.1 KV (87 psi; 0.116 CV)	9.8 Nm ³ /h (6.1 scfm)
• Depressurize actuator for all versions except fail in place ²⁾	
2 bar; 0.2 KV (29 psi; 0.232 CV)	8.2 Nm ³ /h (5.1 scfm)
4 bar; 0.2 KV (58 psi; 0.232 CV)	13.7 Nm ³ /h (8.5 scfm)
6 bar; 0.2 KV (87 psi; 0.232 CV)	19.2 Nm ³ /h (12.0 scfm)
• Depressurize actuator for fail in place version	
2 bar; 0.1 KV (29 psi; 0.116 CV)	4.3 Nm ³ /h (2.7 scfm)
4 bar; 0.1 KV (58 psi; 0.116 CV)	7.3 Nm ³ /h (4.5 scfm)
6 bar; 0.1 KV (87 psi; 0.116 CV)	9.8 Nm ³ /h (6.1 scfm)
Valve leakage	< 6·10 ⁻⁴ Nm ³ /h (3.7·10 ⁻⁴ scfm)
Throttle ratio	Adjustable up to ∞: 1
Typical auxiliary power consumption in the controlled state	0.01 Nm ³ /h (0.006 scfm)
Sound pressure level	L _{A eq} < 75 dB L _{A max} < 80 dB
Sound pressure with installed booster ³⁾	L _{A eq} < 95.2 dB L _{A max} < 98.5 dB

¹⁾ The following applies to fail in place double acting: 3 ... 7 bar (43.5 ... 101.5 psi)

²⁾ When using device versions Ex d (6DR5..5-... and 6DR5..6-...), values are reduced by approximately 20%.

³⁾ Read the warning notice "Increased sound pressure level".

See also

Basic safety instructions (Page 39)

7.1.3 Construction

Construction	
How does it work?	
• Range of stroke (linear actuator)	3 to 130 mm (0.12 to 5.12")
• Angle of rotation (part-turn actuator)	30° ... 100° 15° ... 160°
	• For 6DR50.5, 6DR51.5, 6DR50.6 and 6DR51.6
Mounting method	
• On the linear actuator	Using mounting kit 6DR4004-8V and, where necessary, an additional lever arm 6DR4004-8L on actuators according to IEC 60534-6-1 (NAMUR) with a fin, columns, or a plane surface.
• On the part-turn actuator	Using mounting kit 6DR4004-8D or TGX:16300-1556 on actuators with mounting plane according to VDI/VDE 3845 and IEC 60534-6-2: The required mount must be provided on the actuator-side.
Weight, positioner without option modules or accessories	
• 6DR5..0 Glass-fiber reinforced polycarbonate enclosure	Approx. 0.9 kg (1.98 lb)
• 6DR5.11 aluminum enclosure, only single-acting	Approx. 1.3 kg (2.86 lb)
• 6DR5..2 stainless steel enclosure	Approx. 3.9 kg (8.6 lb)
• 6DR5..3 aluminum enclosure	Approx. 1.6 kg (3.53 lb)
• 6DR5..5 aluminum enclosure, flameproof, rugged	Approx. 5.2 kg (11.46 lb)
• 6DR5..6 stainless steel enclosure, flameproof, rugged	Approx. 8.4 kg (18.5 lb)
Material	
• Enclosure	
6DR5..0 polycarbonate	Glass-fiber reinforced polycarbonate (PC)
6DR5.11 aluminum, only single-acting	GD AISi12
6DR5..2 stainless steel	Austenitic stainless steel 316Cb, mat. No. 1.4581
6DR5..3 aluminum	GD AISi12
6DR5..5 aluminum, flameproof, rugged	GK AISi12
6DR5..6 stainless steel enclosure, flameproof, rugged	Austenitic stainless steel 316L, mat. No. 1.4409
• Pressure gauge block	Aluminum AlMgSi, anodized or stainless steel 316
Versions	
• In the polycarbonate enclosure 6DR5..0	Single-acting and double-acting
• In aluminum enclosure 6DR5.11	Single-acting
• In aluminum enclosures 6DR5..3 and 6DR5..5	Single-acting and double-acting
• In stainless steel enclosures 6DR5..2 and 6DR5..6	Single-acting and double-acting
Torques	
• Part-turn actuator fixing screws DIN 933 M6x12-A2	5 Nm (3.7 ft lb)
• Linear actuator fixing screws DIN 933 M8x16-A2	12 Nm (8.9 ft lb)
• Gland pneumatic G¼	15 Nm (11.1 ft lb)
• Pneumatic gland 1/4-18 NPT	

Technical data

7.1 All device versions

Construction	
Without sealant	12 Nm (8.9 ft lb)
With sealant	6 Nm (4.4 ft lb)
• Cable glands	
Screw-in torque for plastic gland in all enclosures	4 Nm (3 ft lb)
Screw-in torque for cable gland made of metal/stainless steel in polycarbonate enclosure	6 Nm (4.4 ft lb)
Screw-in torque for metal/stainless steel glands in aluminum/stainless steel enclosure	6 Nm (4.4 ft lb)
Screw-in torque for NPT adapter made of metal/stainless steel in polycarbonate enclosure	8 Nm (5.9 ft lb)
Screw-in torque for NPT adapter made of metal/stainless steel in aluminum/stainless steel enclosure	15 Nm (11.1 ft lb)
Screw-in torque for NPT gland in the NPT adapter	68 Nm (50 ft lb)
NOTE: To avoid damage to the device, the NPT adapter must be held in place while the NPT gland is screwed into the NPT adapter.	
Tightening torque for union nut made of plastic	2.5 Nm (1.8 ft lb)
Tightening torque for union nut made of metal/stainless steel	4 Nm (3 ft lb)
• Pressure gauge block fixing screws	6 Nm (4.4 ft lb)
Manometer	
• Degree of protection	
Manometer made of plastic	IP31
Manometer, steel	IP44
Manometer made of stainless steel 316	IP54
• Vibration resistance	In accordance with DIN EN 837-1
Connections, electrical	
• Screw terminals	2.5 mm ² AWG30-14
• Cable gland	
Without Ex protection as well as with Ex i	M20 x 1.5 or 1/2-14 NPT
With explosion protection Ex d	Ex d-certified M20 x 1.5; 1/2-14 NPT or M25 x 1.5
Connections, pneumatic	Female thread G $\frac{1}{4}$ or $\frac{1}{4}$ -18 NPT

7.1.4 Controller

Controller	
Control unit	
• Five-point controller	Adaptive
• Dead zone	
dEbA = auto	Adaptive
dEbA = 0.1 ... 10 %	Can be set as fixed value

Controller	
Analog-to-digital converter	
• Scanning time	10 ms
• Resolution	≤ 0,05 %
• Transmission error	≤ 0,2 %
• Temperature influence	≤ 0.1 %/10 K (≤ 0.1 %/18 °F)

7.1.5 Certificates and approvals

7.1.5.1 Markings for explosion protection

Basic unit: ATEX-IECEX / CSA / FM

Table 7-1 Article number

1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-				
6	D	R	5	a	*	b	-	0	c	d	e	f	-	g	*	*	h	-	Z	j	j	j

a =	b =	c =	Z =	ATEX / IECEX / UKEx marking	CSA marking	FM marking
0, 2, 5, 6	1, 2, 3	D	-	II 3 G Ex ec IIC T6 ... T4 Gc II 2 D Ex tb IIIC T100°C Db	Ex ec IIC T6 ... T4 Gc NI I Div 2 Gp A-D	CI I Zn 2 AEx ec IIC T6 ... T4 Gc NI CI I Div 2 Gp A-D
1, 5, 6	2, 3, 5, 6		P01, P02		Ex tb IIIC T100°C Db DIP CI II, III Div 1 Gp E-G	Zn 21 AEx tb IIIC T100°C Db DIP CI II, III Div 1 Gp E-G
0, 2, 5, 6	0	E	-	II 2 G Ex ia IIC T6 ... T4 Gb II 3 G Ex ic IIC T6 ... T4 Gc	Ex ia IIC T6 ... T4 Gb IS CI I Div 1 Gp A-D	CI I Zn 1 AEx ia IIC T6 ... T4 Gb IS CI I Div 1 Gp A-D
0, 2, 5, 6	1, 2, 3	E	-	II 2 G Ex ia IIC T6 ... T4 Gb II 3 G Ex ic IIC T6 ... T4 Gc	Ex ia IIC T6 ... T4 Gb IS CI I Div 1 Gp A-D	CI I Zn 1 AEx ia IIC T6 ... T4 Gb IS CI I Div 1 Gp A-D
1, 5, 6	2, 3, 5, 6		P01, P02		II 2 D Ex ia IIIC T130°C Db	Ex ia IIIC T130°C Db IS CI II, III Div 1 Gp E-G
0, 1, 2, 3, 5, 6	5, 6	E	-	II 2 G Ex db IIC T6 ... T4 Gb II 2 D tb IIIC T100°C Db	Ex db IIC T6 ... T4 Gb XP CI I Div 1 Gp C-D Ex tb IIIC T100°C Db DIP CI II, III Div 1 Gp E-G	CI I Zn 1 AEx db IIC T6 ... T4 Gb XP CI I Div 1 Gp A-D Zn 21 AEx tb IIIC T100°C Db DIP CI II, III Div 1 Gp E-G
0, 2, 5, 6	1, 2, 3, 5, 6	F	-	II 2 G Ex ia IIC T6 ... T4 Gb II 3 G Ex ic IIC T6 ... T4 Gc	Ex ia IIC T6 ... T4 Gb IS CI I Div 1 Gp A-D	CI I Zn 1 AEx ia IIC T6 ... T4 Gb IS CI I Div 1 Gp A-D
1, 5, 6	2, 3, 5, 6		P01, P02		II 3 G Ex ec IIC T6 ... T4 Gc II 2 D Ex ia IIIC T130°C Db	Ex ec IIC T6 ... T4 Gc NI CI I Div 2 Gp A-D Ex ia IIIC T130°C Db IS CI II, III Div 1 Gp E-G

7.1 All device versions

a =	b =	c =	Z =	ATEX / IECEx / UKEx marking	CSA marking	FM marking	
0, 2, 5, 6	1, 2, 3, 5, 6	G	-	II 3 G Ex ec IIC T6 ... T4 Gc	Ex ec IIC T6 ... T4 Gc NI Cl I Div 2 Gp A-D	Cl I Zn 2 AEx ec IIC T6 ... T4 Gc NI Cl I Div 2 Gp A-D	
1, 5, 6	2, 3, 5, 6		P01, P02				
0, 2, 5, 6	1, 2, 3, 5, 6	K	-	II 2 G Ex db ia IIC T6 ... T4 Gb II 3 G Ex ic IIC T6 ... T4 Gc	Ex ia IIC T6 ... T4 Gb IS Cl I Div 1 Gp A-D	Cl I Zn 1 AEx ia IIC T6 ... T4 Gb IS Cl I Div 1, Gp A-D	
1, 5, 6	2, 3, 5, 6		P01, P02	-	II 3 G Ex ec IIC T6 ... T4 Gc II 2 D Ex ia IIIC T130°C Db II 2 D Ex tb IIIC T100°C Db	Ex ec IIC T6 ... T4 Gc NI Cl I Div 2 Gp A-D Ex ia IIIC T130°C Db IS Cl II, III Div 1 Gp E-G Ex tb IIIC T100°C Db DIP Cl II, III Div 1 Gp E-G	Cl I Zn 2 AEx ec IIC T6 ... T4 Gc NI Cl I Div 2 Gp A-D Zn 21 AEx ia IIIC T130°C Db IS Cl I, II, III Div 1 Gp E-G Zn 21 AEx tb IIIC T100°C Db DIP Cl II, III Div 1 Gp E-G
				-	II 2 G Ex db ia IIC T6 ... T4 Gb	Ex db ia IIC T6...T4 Gb XP IS Cl I Div 1 Gp A-D	Cl I Zn 1 AEx db ia IIC T6 ... T4 Gb XP IS Cl I Div 1 Gp A-D
1, 5, 6		P01, P02					

Position Transmitter and NCS: ATEX-IECEX / CSA / FM

	ATEX/IECEX /UKEX marking	Marking CSA	FM marking
Option Position Transmitter <ul style="list-style-type: none"> 6DR4004-1ES / -2ES / -3ES / -4ES 	II 2 G Ex ia IIC T6 ... T4 Gb II 3 G Ex ic IIC T6 ... T4 Gc II 3 G Ex ec IIC T6 ... T4 Gc II 2 D Ex ia IIIC T130°C Db II 2 D Ex tb IIIC T100°C Db	Ex ia IIC T6 ... T4 Gb IS Cl I Div 1 Gp A-D Ex ec IIC T6 ... T4 Gc NI Cl I Div 2 Gp A-D Ex ia IIIC T130°C Db IS Cl II, III Div 1 Gp E-G Ex tb IIIC T100°C Db DIP Cl II, III Div 1 Gp E-G	Cl I Zn 1 AEx ia IIC T6 ... T4 Gb IS Cl I Div 1, Gp A-D Cl I Zn 2 AEx ec IIC T6 ... T4 Gc NI Cl I Div 2 Gp A-D Zn 21 AEx ia IIIC T130°C Db IS Cl II, III Div 1 Gp E-G Zn 21 AEx tb IIIC T100°C Db DIP Cl II, III Div 1 Gp E-G
Option Non-Contacting Sensor (NCS) <ul style="list-style-type: none"> 6DR4004-6N 	II 2 G Ex ia IIC T6 ... T4 Gb II 3 G Ex ic IIC T6 ... T4 Gc II 3 G Ex ec IIC T6 ... T4 Gc II 2 D Ex ia IIIC T130°C Db	Ex ia IIC T6 ... T4 Gb IS Cl I Div 1, 2 Gp A-D Ex ec IIC T6 ... T4 Gc NI Cl I Div 2 Gp A-D Ex ia IIIC T130°C Db Cl II, III Div 1 Gp E-G	Cl I Zn 1 AEx ia IIC T6 ... T4 Gb IS Cl I Div 1, Gp A-D Cl I Zn 2 AEx ec IIC T6...T4 Gc NI Cl I Div 2 Gp A-D Zn 21 AEx ia IIIC T130°C Db IS Cl II, III Div 1 Gp E-G

7.1.5.2 Ambient temperature

Maximum permitted ambient temperature during operation in hazardous areas

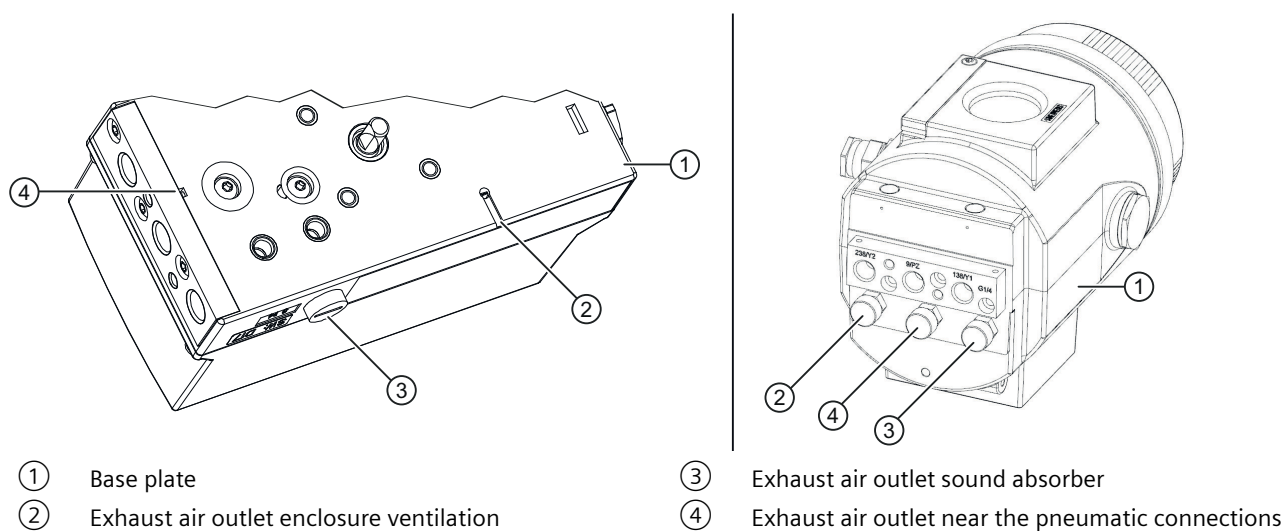
Positioner and option modules	Temperature class T4	Temperature class T6
Positioner		
<ul style="list-style-type: none"> 6DR5ayb-0cdef-g*Ah-Z jjj for f ≠ 0, 2 	-30 °C ≤ Ta ≤ +80 °C	-30 °C ≤ Ta ≤ +50 °C
<ul style="list-style-type: none"> 6DR5ayb-0cdef-g*Ah-Z M40 for (b ≠ 0), (f ≠ 0, 2) 	-40 °C ≤ Ta ≤ +80 °C	-40 °C ≤ Ta ≤ +50 °C

Positioner and option modules	Temperature class T4	Temperature class T6
<ul style="list-style-type: none"> 6DR5ayb-0cdef-g*Ah-Z jjj for (a = 0, 1, 2) and (f = 0, 2) and for T6: (Z ≠ L1A) 	-30 °C ≤ Ta ≤ +80 °C	-30 °C ≤ Ta ≤ +60 °C
<ul style="list-style-type: none"> 6DR5ayb-0cdef-g*Ah-Z M40 for (b ≠ 0) and (a = 0, 1, 2) and (f = 0, 2) and for T6: (Z ≠ L1A) 	-40 °C ≤ Ta ≤ +80 °C	-40 °C ≤ Ta ≤ +60 °C
Option modules		
<ul style="list-style-type: none"> Non-Contacting Sensor (NCS) 6DR4004-6N 	-40 °C ≤ Ta ≤ +90 °C	-40 °C ≤ Ta ≤ +70 °C
<ul style="list-style-type: none"> Position Transmitter (Potentiometer) 6DR4004-1ES 	-40 °C ≤ Ta ≤ +90 °C	-40 °C ≤ Ta ≤ +60 °C
<ul style="list-style-type: none"> Position Transmitter (NCS) 6DR4004-2ES 	-40 °C ≤ Ta ≤ +90 °C	-40 °C ≤ Ta ≤ +50 °C
<ul style="list-style-type: none"> Position Transmitter (NCS, ILS) 6DR4004-3ES 		
<ul style="list-style-type: none"> Position Transmitter (NCS, MLS) 6DR4004-4ES 		

7.1.6 Natural gas as actuator medium

Introduction

For operation with natural gas, note that used natural gas escapes at the exhaust air outlets.



Note

The following applies for exhaust air outlet with sound absorber ③:

The positioner is supplied as standard with a sound absorber. To provide an outlet for the exhaust air, replace the sound absorber by a G¼ pipe coupling.

The following applies for enclosure ventilation ② and control air outlet ④:

1. With the "flameproof enclosure" device version in an aluminum enclosure with order suffix -Z K50 "Operation with natural gas", you can completely collect and discharge the escaping natural gas.
2. In all other device versions, the escaping natural gas is released into the environment.

Maximum values for escaping natural gas

- The quantity of escaping natural gas is negligible during regulated operation.
- If a control error occurs, a maximum of 30 NI/min of natural gas will escape at the enclosure vent ② and a maximum of 89 NI/min at the control air outlet ④.

7.2 With 4 to 20 mA/HART

7.2.1 Electrical data

	Electronics without explosion protection	Electronics with explosion protection Ex "db"	Electronics with explosion protection Ex "ia", "db ia"	Electronics with explosion protection Ex "ic", "ec", "tb"
Current input I_w				
Rated signal range	4 ... 20 mA			
Test voltage	840 V DC, 1 s			
Digital input DI1 (terminals 9/10; galvanically connected to basic device)	Suitable only for floating contact; max. contact load < 5 µA at 3 V			
2-wire connection				
6DR50.. and 6DR53.. 4 ... 20 mA				
6DR51.. and 6DR52.. HART				
Current to maintain the auxiliary power	≥ 3.8 mA			
Required load voltage U _B (corresponds to Ω at 20 mA)				
• 6DR50.0/1/2/3				
Typical	6.36 V (= 318 Ω)	6.36 V (= 318 Ω)	7.8 V (= 390 Ω)	7.8 V (= 390 Ω)
Max.	6.53 V (= 327 Ω)	6.53 V (= 327 Ω)	8.3 V (= 415 Ω)	8.3 V (= 415 Ω)

	Electronics without explosion protection	Electronics with ex- plosion protection Ex "db"	Electronics with ex- plosion protection Ex "ia", "db ia"	Electronics with ex- plosion protection Ex "ic", "ec", "tb"
• 6DR50.5/6				
Typical	8.25 V (= 413 Ω)	8.25 V (= 413 Ω)	7.9 V (= 395 Ω)	7.9 V (= 395 Ω)
Max.	8.8 V (= 440 Ω)	8.8 V (= 440 Ω)	8.5 V (= 425 Ω)	8.5 V (= 425 Ω)
• 6DR51.0/1/2/3				
Typical	6.6 V (= 330 Ω)	6.6 V (= 330 Ω)	-	-
Max.	6.79 V (= 340 Ω)	6.79 V (= 340 Ω)	-	-
• 6DR51.5/6				
Typical	8.75 V (= 438 Ω)	8.75 V (= 438 Ω)	8.45 V (= 423 Ω)	8.45 V (= 423 Ω)
Max.	9.3 V (= 465 Ω)	9.3 V (= 465 Ω)	9 V (= 450 Ω)	9 V (= 450 Ω)
• 6DR52..				
Typical	-	8.4 V (= 420 Ω)	8.4 V (= 420 Ω)	8.4 V (= 420 Ω)
Max.	-	9 V (= 450 Ω)	9 V (= 450 Ω)	9 V (= 450 Ω)
• 6DR53..				
Typical	7.9 V (= 395 Ω)	-	-	-
Max.	8.4 V (= 420 Ω)	-	-	-
Static destruction limit	± 40 mA	± 40 mA	-	-
Effective inner capacitance C_i	-	-	11 nF	"ic": 11 nF
Effective inner inductance L_i	-	-	209 μH	"ic": 209 μH
For connecting to circuits with the following peak values	-	$U_{max} \leq 35\text{ V}$ $P_{max} \leq 2.5\text{ W}$	$U_i \leq 30\text{ V}$ $I_i \leq 100\text{ mA}$ $P_i \leq 1\text{ W}$	"ic": $U_i \leq 30\text{ V}$ $I_i \leq 100\text{ mA}$ "ec"/"tb": $U_n \leq 30\text{ V}$ $I_n \leq 100\text{ mA}$

3-/4-wire connection

6DR52.. HART

6DR53.. 4 ... 20 mA

Load voltage at 20 mA

• 6DR52..	-	-	$\leq 1\text{ V (= }50\text{ }\Omega)$	$\leq 1\text{ V (= }50\text{ }\Omega)$
• 6DR53..	$\leq 0.2\text{ V (= }10\text{ }\Omega)$	$\leq 0.2\text{ V (= }10\text{ }\Omega)$	-	-
Auxiliary power U_{Aux}	18 ... 35 V DC	18 ... 35 V DC	18 ... 30 V DC	18 ... 30 V DC
Current consumption I_{Aux}	$(U_{Aux} - 7.5\text{ V}) / 2.4\text{ k}\Omega$ [mA]			
For connecting to circuits with the following peak values	-	$U_{max} \leq 35\text{ V}$ $P_{max} \leq 2.5\text{ W}$	$U_i \leq 30\text{ V}$ $I_i \leq 100\text{ mA}$ $P_i \leq 1\text{ W}$	"ic": $U_i \leq 30\text{ V}$ $I_i \leq 100\text{ mA}$ "ec"/"tb": $U_n \leq 30\text{ V}$ $I_n \leq 100\text{ mA}$
Effective inner capacitance C_i	-	-	11 nF	11 nF

7.2 With 4 to 20 mA/HART

	Electronics without explosion protection	Electronics with explosion protection Ex "db"	Electronics with explosion protection Ex "ia", "db ia"	Electronics with explosion protection Ex "ic", "ec", "tb"
Effective inner inductance L_i	-	-	312 μ H	312 μ H
Galvanic isolation	Between U_{Aux} and I_W	Between U_{Aux} and I_W	Between U_{Aux} and I_W (2 intrinsically safe circuits)	Between U_{Aux} and I_W

7.2.2 Electrical data for pressure sensor module

	Electronics without explosion protection	Electronics with explosion protection Ex "db"	Electronics with explosion protection Ex "ia", Ex "db ia"	Electronics with explosion protection Ex "ic", "ec", "tb"
Electronics for the pressure sensor module				
6DR51.. -Z P01 und -Z P02 HART, non-Ex				
6DR51.. -Z P01 und -Z P02 HART, Ex				
Current input I_W				
• Rated signal range			4 ... 20 mA	
• Test voltage			840 V DC, 1 s	
• Digital input DI1 (terminals 9/10; galvanically connected to basic device)		Suitable only for floating contact; max. contact load < 5 μ A at 3 V		
Current to maintain the auxiliary power			≥ 3.8 mA	
Required load voltage U_B (corresponds to Ω at 20 mA)	9.4 V (= 470 Ω)	9.4 V (= 470 Ω)	9 V (= 450 Ω)	9 V (= 450 Ω)
Static destruction limit	± 30 V	± 30 V	-	-
Effective inner capacitance C_i	-	-	12.2 nF	"ic": 12.2 nF
Effective inner inductance L_i	-	-	105 μ H	"ic": 105 μ H
For connecting to circuits with the following peak values	-	$U_{max} \leq 35$ V $P_{max} \leq 2.5$ W	$U_i \leq 30$ V $I_i \leq 100$ mA $P_i \leq 1$ W	"ic": $U_i \leq 30$ V $I_i \leq 100$ mA "ec"/"tb": $U_n \leq 30$ V $I_n \leq 100$ mA

7.2.3 Communication (HART)

HART communication	
HART version	7
PC parameter assignment software	SIMATIC PDM; supports all device objects. The software is not included in the scope of delivery.

7.3 With PROFIBUS PA / with FOUNDATION Fieldbus

7.3.1 Electrical data

Note

Pressure sensor module

The following electrical data also apply to electronics with pressure sensor module.

	Basic device without explosion protection	Basic device with explosion protection Ex "db"	Basic device with explosion protection Ex "ia", Ex "db ia"	Basic device with explosion protection Ex "ic", "ec", "tb"
Auxiliary power supply bus circuit (terminals 6 and 7)	Bus-powered			
Bus voltage	9 ... 32 V	9 ... 32 V	9 ... 24 V	9 ... 32 V
For connecting to circuits with the following peak values				
• Bus connector with FISCO supply unit	-	$U_{max} \leq 35 \text{ V}$ $P_{max} \leq 2.5 \text{ W}$	$U_i \leq 17.5 \text{ V}$ $I_i \leq 380 \text{ mA}$ $P_i \leq 5.32 \text{ W}$	"ic": $U_i \leq 17.5 \text{ V}$ $I_i \leq 570 \text{ mA}$ "ec"/"tb": $U_n \leq 32 \text{ V}$
• Bus connector with barrier	-	$U_{max} \leq 35 \text{ V}$ $P_{max} \leq 2.5 \text{ W}$	$U_i \leq 24 \text{ V}$ $I_i \leq 250 \text{ mA}$ $P_i \leq 1.2 \text{ W}$	"ic": $U_i \leq 32 \text{ V}$ "ec"/"tb": $U_n \leq 30 \text{ V}$ $I_n \leq 100 \text{ mA}$
Effective inner capacitance C_i	-	-	Negligible	Negligible
Effective inner inductance L_i	-	-	8 μH	"ic": 8 μH
Current consumption	11.5 mA \pm 10 %			
Additional fault current	0 mA			
Safety shutdown can be activated using "Jumper" (terminals 81 and 82)	Electrically isolated from bus circuit and digital input			
• Input resistance	> 20 k Ω			
• Signal status "0" (shutdown active)	0 ... 4.5 V or unused			
• Signal status "1" (shutdown not active)	13 ... 30 V			

7.3 With PROFIBUS PA / with FOUNDATION Fieldbus

	Basic device without explosion protection	Basic device with explosion protection Ex "db"	Basic device with explosion protection Ex "ia", Ex "db ia"	Basic device with explosion protection Ex "ic", "ec", "tb"
<ul style="list-style-type: none"> For connecting to power source with the following peak values 	-	$U_{max} \leq 35 \text{ V}$ $P_{max} \leq 2.5 \text{ W}$	$U_i \leq 30 \text{ V}$ $I_i \leq 100 \text{ mA}$ $P_i \leq 1 \text{ W}$	"ic": $U_i \leq 30 \text{ V}$ $I_i \leq 100 \text{ mA}$ "ec"/"tb": $U_n \leq 30 \text{ V}$ $I_n \leq 100 \text{ mA}$
<ul style="list-style-type: none"> Effective internal capacitance and inductance 	-	-	Negligible	Negligible
Digital input DI1 (terminals 9 and 10) electrically connected to the bus circuit		Jumpered or connection to switch contact. Suitable only for floating contact; max. contact load < 5 μA with 3 V		
Galvanic isolation				
<ul style="list-style-type: none"> For basic device without explosion protection and for basic device with Ex "db" 	Galvanic isolation between the basic device and the input for safety shutdown and the outputs of option modules.			
<ul style="list-style-type: none"> For basic device Ex "ia" 	The basic device, the input for safety shutdown, and the outputs of option modules are individual intrinsically safe circuits.			
<ul style="list-style-type: none"> For basic device Ex "ic", "ec", "tb" 	Galvanic isolation between the basic device and the input for safety shutdown and the outputs of option modules.			
Test voltage	DC 840 V, 1 s			

7.3.2 PROFIBUS PA communication

Communication	Layers 1 + 2 as per PROFIBUS PA, transmission technique as per IEC 1158-2; slave function layer 7 (protocol layer) as per PROFIBUS DP, standard EN 50170 with the extended PROFIBUS functionality (all data is acyclic, manipulated variable, feedbacks and statuses are additionally cyclic)
C2 connections	Four connections with the master class 2 are supported; automatic connection termination 60 s after interruption in communication
Device profile	PROFIBUS PA profile B, version 3.0; over 150 objects
Response time for a master telegram	Typically, 10 ms
Device address	126 (in the as-delivered condition)
PC parameter assignment software	SIMATIC PDM; supports all device objects. The software is not included in the scope of delivery.

7.3.3 FOUNDATION Fieldbus communication

Communication group and class	According to the 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)

7.4 Option modules

7.4.1 Digital I/O Module (DIO) 6DR4004-6A / -8A

	Without explosion protection or suitable for use in Ex "db" version	With explosion protection Ex "ia", "db ia"	With explosion protection Ex "ic", "ec", "tb"
	6DR4004-8A	6DR4004-6A	6DR4004-6A
3 digital output current circuits			
<ul style="list-style-type: none"> Digital output A1: Terminals 41 and 42 Digital output A2: Terminals 51 and 52 Fault message output: Terminals 31 and 32 			
<ul style="list-style-type: none"> Auxiliary power supply U_{Aux} 	≤ 35 V and the current consumption is to be limited to < 25 mA	-	-
<ul style="list-style-type: none"> Signal status 			
High (not addressed)	Conductive, $R = 1$ k Ω , $+3/-1$ % *)	≥ 2.1 mA	≥ 2.1 mA
Low *) (addressed)	Deactivated, $I_R < 60$ μ A	≤ 1.2 mA	≤ 1.2 mA
*) The status is also Low if the basic device is faulty or without a auxiliary power.	*) When using in the flame-proof enclosure, the current consumption must be restricted to 10 mA per digital output.	Switching threshold for supply according to EN 60947-5-6: $U_{Aux} = 8.2$ V, $R_i = 1$ k Ω	Switching threshold for supply according to EN 60947-5-6: $U_{Aux} = 8.2$ V, $R_i = 1$ k Ω
<ul style="list-style-type: none"> For connecting to circuits with the following peak values 	-	$U_i \leq 15$ V DC $I_i \leq 25$ mA $P_i \leq 64$ mW	"ic": $U_i \leq 15$ V DC $I_i \leq 25$ mA "ec"/"tb": $U_n \leq 15$ V DC

7.4 Option modules

	Without explosion protection or suitable for use in Ex "db" version	With explosion protection Ex "ia", "db ia"	With explosion protection Ex "ic", "ec", "tb"
	6DR4004-8A	6DR4004-6A	6DR4004-6A
Effective internal capacitance	-	$C_i \leq 5.2 \text{ nF}$	$C_i \leq 5.2 \text{ nF}$
Effective internal inductance	-	$L_i = \text{negligibly small}$	$L_i = \text{negligibly small}$
1 digital input current circuit			
<ul style="list-style-type: none"> Digital input DI2: Terminals 11 and 12, terminals 21 and 22 (jumper) Galvanically connected with the basic device 			
Signal status 0		Floating contact, open	
Signal status 1		Floating contact, closed	
Contact load		3 V, 5 μ A	
<ul style="list-style-type: none"> Electrically isolated from the basic device 			
Signal status 0		$\leq 4.5 \text{ V}$ or open	
Signal status 1		$\geq 13 \text{ V}$	
Internal resistance		$\geq 25 \text{ k}\Omega$	
Static destruction limit	$\pm 35 \text{ V}$	-	-
Connecting to circuits with the following peak values	-	$U_i \leq 25.2 \text{ V DC}$	"ic": $U_i \leq 25.2 \text{ V DC}$ "ec"/"tb": $U_n \leq 25.2 \text{ V DC}$
Effective internal capacitance	-	$C_i = \text{negligibly small}$	$C_i = \text{negligibly small}$
Effective internal inductance	-	$L_i = \text{negligibly small}$	$L_i = \text{negligibly small}$
Galvanic isolation	The three digital outputs, the DI1 digital input and the basic device are galvanically isolated from each other.		
Test voltage	DC 840 V, 1 s		

7.4.2 Analog Output Module (AOM) 6DR4004-6J / -8J

	Without explosion protection or suitable for use in Ex d version	With explosion protection Ex "ia", "db ia"	With explosion protection Ex "ic", "ec", "tb"
	6DR4004-8J	6DR4004-6J	6DR4004-6J
Direct current output for position feedback			
1 current output, terminals 61 and 62		2-wire connection	
<ul style="list-style-type: none"> Rated signal range Dynamic range 		4 ... 20 mA, short-circuit proof	
<ul style="list-style-type: none"> Auxiliary power supply U_{Aux} External load R_B [kΩ] 		3.6 ... 20.5 mA	
		$+12 \dots +30 \text{ V}$	
		$\leq (U_{Aux} [\text{V}] - 12 \text{ V})/I [\text{mA}]$	

	Without explosion protection or suitable for use in Ex d version	With explosion protection Ex "ia", "db ia"	With explosion protection Ex "ic", "ec", "tb"
	6DR4004-8J	6DR4004-6J	6DR4004-6J
• Transmission error		≤ 0.3%	
• Temperature influence		≤ 0.1%/10 K (≤ 0.1%/18 °F)	
• Resolution		≤ 0.1%	
• Residual ripple		≤ 1 %	
• For connecting to circuits with the following peak values		U _i ≤ DC 30 V I _i ≤ 100 mA P _i ≤ 1 W	"ic": U _i ≤ DC 30 V I _i ≤ 100 mA "ec"/"tb": U _n ≤ DC 30 V I _n ≤ 100 mA P _n ≤ 1 W
Effective internal capacitance	-	C _i ≤ 11 nF	C _i ≤ 11 nF
Effective internal inductance	-	L _i = negligibly small	
Galvanic isolation	Electrically isolated from the alarm option and safely isolated from the basic device		
Test voltage	DC 840 V, 1 s		

7.4.3 Analog Input Module (AIM) 6DR4004-6F / -8F

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec", "tb"
	6DR4004-8F	6DR4004-6F	6DR4004-6F

The Analog Input Module (AIM) 6DR4004-6F and -8F is required to connect a Non-Contacting Sensor (NCS) or Position Transmitter 6DR4004-1ES to -4ES.

For devices without explosion protection, other types of potentiometers with resistance values between 3 and 20 KΩ can be connected.

R-potentiometer

• Peak values when supplied by other basic devices (6DR50/1/2/3/9)	U _{max} = 5 V	U _o ≤ 5 V I _o ≤ 100 mA P _o ≤ 33 mW C _o ≤ 1 μF L _o ≤ 1 mH	U _{max} = 5 V
• Maximum values when powered by the base unit with PA (6DR55) or FF communication (6DR56)	U _{max} = 5 V	U _o ≤ 5 V I _o ≤ 75 mA static I _o ≤ 160 mA transient P _o ≤ 120 mW C _o ≤ 1 μF L _o ≤ 1 mH	U _{max} = 5 V
Signal 20 mA			
• Rated signal range	0 ... 20 mA		-
• Internal load R _b	200 Ω		-

7.4 Option modules

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec", "tb"
	6DR4004-8F	6DR4004-6F	6DR4004-6F
• Static destruction limit	40 mA	-	-
Signal 10 V			
• Rated signal range	0 ... 10 V	-	-
• Internal resistance R_i	25 k Ω	-	-
• Static destruction limit	20 V	-	-
Supply and signal power circuits	Galvanically connected with the basic device		

7.4.4 Inductive Limit Switches (ILS) 6DR4004-6G / -8G

	Without explosion protection	With explosion protection Ex "ia", "db ia"	With explosion protection Ex "ic", "ec", "tb"
	6DR4004-8G	6DR4004-6G	6DR4004-6G
Limit encoder with slotted initiators and fault message output			
2 slotted initiators			
<ul style="list-style-type: none"> • Digital output 1: Terminals 41 and 42 • Digital output 2: Terminals 51 and 52 			
• Connection	2-wire technology in accordance with EN 60947-5-6 (NAMUR), for switching amplifiers connected on load side		
• Signal state High (not triggered)		> 2.1 mA	
• Signal state Low (triggered)		< 1.2 mA	
• 2 slotted initiators		Type SJ2-SN	
• Function		NC contact (NC, normally closed)	
• Connecting to circuits with the following peak values	Rated voltage 8 V, power consumption: ≥ 3 mA (limit not activated), ≤ 1 mA (limit activated)	$U_i \leq$ DC 15 V $I_i \leq$ 25 mA $P_i \leq$ 64 mW	"ic": $U_i \leq$ DC 15 V $I_i \leq$ 25 mA "ec"/"tb": $U_n \leq$ DC 15 V $P_n \leq$ 64 mW
Effective internal capacitance	-	$C_i \leq$ 161 nF	$C_i \leq$ 161 nF
Effective internal inductance	-	$L_i \leq$ 120 μ H	$L_i \leq$ 120 μ H
1 fault message output			
<ul style="list-style-type: none"> • Digital output: Terminals 31 and 32 			
• Connection	At switching amplifier in accordance with EN 60947-5-6: (NAMUR), $U_{Aux} = 8.2$ V, $R_i = 1$ k Ω).		
• Signal state High (not triggered)	$R = 1.1$ k Ω	> 2.1 mA	> 2.1 mA

	Without explosion protection	With explosion protection Ex "ia", "db ia"	With explosion protection Ex "ic", "ec", "tb"
	6DR4004-8G	6DR4004-6G	6DR4004-6G
• Signal state Low (triggered)	R = 10 kΩ	< 1.2 mA	< 1.2 mA
• Auxiliary power U _{Aux}	U _{Aux} ≤ DC 35 V I ≤ 20 mA	-	-
• Connecting to circuits with the following peak values	-	U _i ≤ DC 15 V I _i ≤ 25 mA P _i ≤ 64 mW	"ic": U _i ≤ DC 15 V I _i ≤ 25 mA "ec"/"tb": U _n ≤ DC 15 V P _n ≤ 64 mW
Effective internal capacitance	-	C _i ≤ 5.2 nF	C _i ≤ 5.2 nF
Effective internal inductance	-	L _i = negligibly small	L _i = negligibly small
Galvanic isolation	The 3 outputs are galvanically isolated from the basic device.		
Test voltage	DC 840 V, 1 s		

7.4.5 Mechanic Limit Switches (MLS) 6DR4004-6K

	Without explosion protection	With explosion protection Ex "ia", "db ia"	With explosion protection Ex "ic", "tb"
Limit encoder with mechanical switching contacts			
2 limit contacts			
• Digital output DO1: Terminals 41 and 42			
• Digital output DO2: Terminals 51 and 52			
• Max. switching current AC/DC	100 mA	-	-
• For connecting to circuits with the following peak values	-	U _i ≤ 30 V I _i ≤ 100 mA P _i ≤ 750 mW	"ic": U _i ≤ 30 V I _i ≤ 100 mA "tb": U _n ≤ 30 V I _n ≤ 100 mA
Effective internal capacitance	-	C _i = negligibly small	C _i = negligibly small
Effective internal inductance	-	L _i = negligibly small	L _i = negligibly small
• Max. switching voltage AC/DC	DC 30 V	DC 30 V	DC 30 V
1 fault message output			
• Digital output: Terminals 31 and 32			
• Connection	On switching amplifier according to EN 60947-5-6: (NAMUR), U _{Aux} = 8.2 V, R _i = 1 kΩ).		
• Signal state High (not triggered)	R = 1.1 kΩ	> 2.1 mA	> 2.1 mA
• Signal state Low (triggered)	R = 10 kΩ	< 1.2 mA	< 1.2 mA

7.4 Option modules

	Without explosion protection	With explosion protection Ex "ia", "db ia"	With explosion protection Ex "ic", "tb"
• Auxiliary power	$U_{Aux} \leq DC\ 35\ V$ $I \leq 20\ mA$	-	-
• Connecting to circuits with the following peak values	-	$U_i \leq 15\ V$ $I_i \leq 25\ mA$ $P_i \leq 64\ mW$	"ic": $U_i \leq 15\ V$ $I_i \leq 25\ mA$ "tb": $U_n \leq 15\ V$ $I_n \leq 25\ mA$
Effective internal capacitance	-	$C_i \leq 5.2\ nF$	$C_i \leq 5.2\ nF$
Effective internal inductance	-	$L_i =$ negligibly small	$L_i =$ negligibly small
Galvanic isolation	The 3 outputs are galvanically isolated from the basic device		
Test voltage	3150 V DC, 2 s		
Rated condition height	Max. 2 000 m above sea level. At altitudes greater than 2 000 m above sea level, use a suitable power supply.	-	-

7.4.6 Internal NCS module 6DR4004-5L / 6DR4004-5LE

Additional modules	Without explosion protection	With explosion protection Ex "ia", "db ia"	With explosion protection Ex "ic", "ec", "tb"
	6DR4004-5L	6DR4004-5LE	6DR4004-5LE
Linearity (after corrections made by positioner)		$\pm 1\ \%$	
Hysteresis		$\pm 0.2\ \%$	
For connecting to circuits with the following peak values	-	$U_i \leq 5\ V$ $I_i \leq 160\ mA$ $P_i \leq 120\ mW$	$U_i \leq 5\ V$
Effective internal capacitance	-	$C_i = 110\ nF + 110\ nF$ per meter of connecting cable	
Effective internal inductance	-	$L_i = 270\ \mu H + 6.53\ \mu H$ per meter of connecting cable	

7.4.7 External position detection

7.4.7.1 Rated conditions for external position detection

Rated conditions	
Ambient temperature	In hazardous areas, observe the maximum permissible ambient temperature corresponding to the temperature class.
• Permissible ambient temperature for operation	-40 ... +90 °C (-40 ... +194 °F)
Degree of protection ¹⁾	IP66 / Type 4X to UL 50E
Climate class	According to IEC/EN 60721-3
• Storage	1K5, but -40 ... +90 °C (1K5, but -40 ... +194 °F)
• Transport	2K4, but -40 ... +90 °C (2K4, but -40 ... +194 °F)
• Operation	4K3, but -40 ... +90 °C (4K3, but -40 ... +194 °F)

¹⁾) Impact energy max. 1 joule.

See also

Construction (Page 59)

7.4.7.2 External NCS sensors 6DR4004-6N / -8N

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec"
	6DR4004-8N	6DR4004-6N	6DR4004-6N
Travel range			
• Linear actuator 6DR4004-6/-8N.20		3 to 14 mm (0.12 to 0.55")	
• Linear actuator 6DR4004-6/-8N.30	10 to 130 mm (0.39 to 5.12"); up to 200 mm (7.87") on request		
• Part-turn actuator		30 to 100°	
Linearity (after corrections made by positioner)		± 1 %	
Hysteresis		± 0.2 %	
Temperature influence (range: rotation angle 120° or stroke 14 mm)	≤ 0.1 %/10 K (≤ 0.1 %/18 °F) for -20 to +90 °C (-4 to +194 °F) ≤ 0.2%/10 K (≤ 0.2%/18 °F) for -40 to -20 °C (-40 to -4 °F)		
Climate class	According to IEC/EN 60721-3		
• Storage	1K5, but -40 to +90 °C (-40 to +194 °F)		
• Transport	2K4, but -40 to +90 °C (-40 to +194 °F)		
Vibration resistance			
• Harmonic oscillations (sine) according to IEC 60068-2-6	3.5 mm (0.14"), 2 to 27 Hz, 3 cycles/axis 98.1 m/s ² (321.84 ft/s ²), 27 to 300 Hz, 3 cycles/axis		
• Bumping according to IEC 60068-2-29	300 m/s ² (984 ft/s ²), 6 ms, 4000 shocks/axis		

7.4 Option modules

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec"
	6DR4004-8N	6DR4004-6N	6DR4004-6N
Torque for cable gland nut made of	Plastic 2.5 Nm (1.8 ft lb)		Metal 4.2 Nm (3.1 ft lb)
Torque of hexagon socket-head screw M6x12 (shaft end or mounting bracket)		4 Nm (3 ft lb)	
Torque of hexagon socket head screw M6x25 (mounting console or mounting plate)		4 Nm (3 ft lb)	
Torque of hexagon socket head screw M3x12 (clamping ring)		1 Nm (0.7 ft lb)	
Degree of protection	IP68 according to IEC/EN 60529; Type 4X according to UL 50E		
For connecting to circuits with the following peak values		$U_i \leq 5\text{ V}$ $I_i \leq 160\text{ mA}$ $P_i \leq 120\text{ mW}$	$U_i \leq 5\text{ V}$
Effective internal capacitance	-	$C_i = 110\text{ nF} + 110\text{ nF per meter of connecting cable}$	
Effective internal inductance	-	$L_i = 270\text{ }\mu\text{H} + 6.53\text{ }\mu\text{H per meter of connecting cable}$	

7.4.7.3 Position Transmitter (Potentiometer) 6DR4004-1ES

Additional modules	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec", "tb"
Degree of protection	IP66 according to IEC/EN 60529; Type 4X according to UL 50E	
For connecting to circuits with the following peak values	$U_i \leq 5\text{ V}$	$U_i \leq 5\text{ V}$
Effective internal capacitance	$C_i \leq 10\text{ nF}$	-
Effective internal inductance	$L_i \leq 240\text{ }\mu\text{H}$	-

7.4.7.4 Position Transmitter (NCS) 6DR4004-2ES

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec", "tb"
Travel range			
• Linear actuator		3 to 14 mm (0.12 to 0.55") 10 to 130 mm (0.39 to 5.12"); up to 200 mm (7.87") on request	
• Part-turn actuator		30 to 100°	
Linearity (after corrections made by positioner)		$\pm 1\%$	
Hysteresis		$\pm 0.2\%$	

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec", "tb"
Temperature influence (range: rotation angle 120° or stroke 14 mm)	$\leq 0.1 \%/10 \text{ K}$ ($\leq 0.1 \%/18 \text{ }^\circ\text{F}$) for -20 to +90 °C (-4 to +194 °F) $\leq 0.2\%/10 \text{ K}$ ($\leq 0.2\%/18 \text{ }^\circ\text{F}$) for -40 to -20 °C (-40 to -4 °F)		
Climate class	According to IEC/EN 60721-3		
• Storage	1K5, but -40 to +90 °C (-40 to +194 °F)		
• Transport	2K4, but -40 to +90 °C (-40 to +194 °F)		
Vibration resistance			
• Harmonic oscillations (sine) according to IEC 60068-2-6	3.5 mm (0.14"), 2 to 27 Hz, 3 cycles/axis 98.1 m/s ² (321.84 ft/s ²), 27 to 300 Hz, 3 cycles/axis		
• Bumping according to IEC 60068-2-29	300 m/s ² (984 ft/s ²), 6 ms, 4000 shocks/axis		
Torque for cable gland nut made of	Plastic	Metal	
	2.5 Nm (1.8 ft lb)	4.2 Nm (3.1 ft lb)	
Torque of hexagon socket-head screw M6x12 (shaft end or mounting bracket)	4 Nm (3 ft lb)		
Torque of hexagon socket head screw M6x25 (mounting console or mounting plate)	4 Nm (3 ft lb)		
Torque of hexagon socket head screw M3x12 (clamping ring)	1 Nm (0.7 ft lb)		
Degree of protection provided by enclosure	IP66 according to IEC/EN 60529; Type 4X according to UL 50E		
For connecting to circuits with the following peak values	-	$U_i \leq 5 \text{ V}$ $I_i \leq 160 \text{ mA}$ $P_i \leq 120 \text{ mW}$	$U_i \leq 5 \text{ V}$
Effective internal capacitance	-	$C_i = 110 \text{ nF} + 110 \text{ nF}$ per meter of connecting cable	
Effective internal inductance	-	$L_i = 270 \text{ } \mu\text{H} + 6.53 \text{ } \mu\text{H}$ per meter of connecting cable	

7.4.7.5 Position Transmitter (NCS, ILS) 6DR4004-3ES

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec", "tb"
Degree of protection provided by enclosure	IP66 according to IEC/EN 60529; type 4X according to UL 50E		
NCS module (NCS)	6DR4004-5L	6DR4004-5LE	6DR4004-5LE
• For connecting to circuits with the following peak values	-	$U_i \leq 5 \text{ V}$ $I_i \leq 160 \text{ mA}$ $P_i \leq 120 \text{ mW}$	$U_i \leq 5 \text{ V}$ $I_i \leq 160 \text{ mA}$
• Effective internal capacitance	-	$C_i = 110 \text{ nF} + 690 \text{ pF/m}$ Connecting cable	-
• Effective internal inductance	-	$L_i = 270 \text{ } \mu\text{H} + 6,53 \text{ } \mu\text{H/m}$ Connecting cable	-
Inductive Limit Switches (ILS)	6DR4004-8G	6DR4004-6G	6DR4004-6G

7.4 Option modules

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec", "tb"
2 slotted initiators			
• Digital output (slot-type initiators) A1: Terminals 41 and 42			
• Digital output (slot-type initiators) A2: Terminals 51 and 52			
• Connection	2-wire system according to EN 60947-5-6 (NAMUR), for switching amplifier connected on load side		
• Signal state High (not triggered)		> 2.1 mA	
• Signal state Low (triggered)		< 1.2 mA	
• 2 slotted initiators		Type SJ2-SN	
• Function		NC (normally closed)	
• Connecting to circuits with the following peak values	Rated voltage 8 V, power consumption: ≥ 3 mA (limit not activated), ≤ 1 mA (limit activated)	$U_i \leq$ DC 15 V $I_i \leq$ 25 mA $P_i \leq$ 64 mW	$U_n \leq$ DC 15 V $I_n \leq$ 25 mA
Effective internal capacitance	-	$C_i \leq$ 161 nF	-
Effective internal inductance	-	$L_i \leq$ 120 μ H	-
1 fault message output			
• Digital output: Terminals 31 and 32			
• Connection	At switching amplifier in accordance with EN 60947-5-6: (NAMUR), $U_{Aux} = 8.2$ V, $R_i = 1$ k Ω)		
• Signal state High (not triggered)	$R = 1.1$ k Ω	> 2.1 mA	> 2.1 mA
• Signal state Low (triggered)	$R = 10$ k Ω	< 1.2 mA	< 1.2 mA
• Auxiliary power U_{Aux}	$U_{Aux} \leq$ DC 35 V $I \leq$ 20 mA	-	-
• Connecting to circuits with the following peak values	-	$U_i \leq$ DC 15 V $I_i \leq$ 25 mA $P_i \leq$ 64 mW	$U_i \leq$ 15 V $I_i \leq$ 25 mA
Effective internal capacitance	-	$C_i = 5.2$ nF	-
Effective internal inductance	-	$L_i =$ negligibly small	$L_i =$ negligibly small
Galvanic isolation	The 3 digital outputs are galvanically isolated from the basic unit.		
Test voltage	DC 840 V, 1 s		

7.4.7.6 Position Transmitter (NCS, MLS) 6DR4004-4ES

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec", "tb"
Degree of protection provided by enclosure	IP66 according to IEC/EN 60529; type 4X according to UL 50E		
NCS module (NCS)	6DR4004-5L	6DR4004-5LE	6DR4004-5LE

	Without explosion protection	With explosion protection Ex "ia", "db ia", "ic"	With explosion protection Ex "ec", "tb"
• For connecting to circuits with the following peak values		$U_i \leq 5 \text{ V}$ $I_i \leq 160 \text{ mA}$ $P_i \leq 120 \text{ mW}$	$U_i \leq 5 \text{ V}$ $I_i \leq 160 \text{ mA}$
• Effective internal capacitance		$C_i = 110 \text{ nF} + 690 \text{ pF/m}$ Connecting cable	-
• Effective internal inductance		$L_i = 270 \text{ }\mu\text{H} + 6,53 \text{ }\mu\text{H/m}$ Connecting cable	-
Mechanic Limit Switches (MLS), 6DR4004-6K			
2 limit contacts			
• Digital output (switching contact) A1: Terminals 41 and 42			
• Digital output (switching contact) A2: Terminals 51 and 52			
• Max. switching current AC/DC	100 mA	-	-
• For connecting to circuits with the following peak values	-	$U_i \leq 30 \text{ V}$ $I_i \leq 100 \text{ mA}$ $P_i \leq 750 \text{ mW}$	$U_n \leq 30 \text{ V}$ $I_n \leq 100 \text{ mA}$
Effective internal capacitance	-	$C_i = \text{negligibly small}$	-
Effective internal inductance	-	$L_i = \text{negligibly small}$	-
• Max. switching voltage AC/DC	DC 30 V	DC 30 V	DC 30 V
1 fault message output			
• Digital output: Terminals 31 and 32			
• Connection	On switching amplifier according to EN 60947-5-6: (NAMUR), $U_{Aux} = 8.2 \text{ V}$, $R_i = 1 \text{ k}\Omega$		
• Signal state High (not triggered)	$R = 1.1 \text{ k}\Omega$	$> 2.1 \text{ mA}$	$> 2.1 \text{ mA}$
• Signal state Low (triggered)	$R = 10 \text{ k}\Omega$	$< 1.2 \text{ mA}$	$< 1.2 \text{ mA}$
• Auxiliary power	$U_{Aux} \leq \text{DC } 35 \text{ V}$ $I \leq 20 \text{ mA}$	-	-
• Connecting to circuits with the following peak values	-	$U_i \leq 15 \text{ V}$ $I_i \leq 25 \text{ mA}$ $P_i \leq 64 \text{ mW}$	$U_n \leq 15 \text{ V}$ $I_n \leq 25 \text{ mA}$
Effective internal capacitance	-	$C_i = 5.2 \text{ nF}$	$C_i = 5.2 \text{ nF}$
Effective internal inductance	-	$L_i = \text{negligibly small}$	
Galvanic isolation	The 3 digital outputs are galvanically isolated from the basic unit		
Test voltage	3150 V DC, 2 s		
Rated condition height	Max. 2 000 m above sea level. At altitudes greater than 2 000 m above sea level, use a suitable power supply.	-	-

Product documentation and support

A.1 Product documentation

Process instrumentation product documentation is available in the following formats:

- Certificates (<http://www.siemens.com/processinstrumentation/certificates>)
- Downloads (firmware, EDDs, software) (<http://www.siemens.com/processinstrumentation/downloads>)
- Catalog and catalog sheets (<http://www.siemens.com/processinstrumentation/catalogs>)
- Manuals (<http://www.siemens.com/processinstrumentation/documentation>)
You have the option to show, open, save, or configure the manual.
 - "Display": Open the manual in HTML5 format
 - "Configure": Register and configure the documentation specific to your plant
 - "Download": Open or save the manual in PDF format
 - "Download as html5, only PC": Open or save the manual in the HTML5 view on your PC

You can also find manuals with the Mobile app at Industry Online Support (<https://support.industry.siemens.com/cs/ww/de/sc/2067>). Download the app to your mobile device and scan the device QR code.

Product documentation by serial number

Using the PIA Life Cycle Portal, you can access the serial number-specific product information including technical specifications, spare parts, calibration data, or factory certificates.

Entering a serial number

1. Open the PIA Life Cycle Portal (<https://www.pia-portal.automation.siemens.com>).
2. Select the desired language.
3. Enter the serial number of your device. The product documentation relevant for your device is displayed and can be downloaded.

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

Scanning a QR code

1. Scan the QR code on your device with a mobile device.
2. Click "PIA Portal".

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

A.2 Technical support

Technical support

If this documentation does not completely answer your technical questions, you can enter a Support Request (<http://www.siemens.com/automation/support-request>).

For help creating a support request, view this video here (www.siemens.com/opensr).

Additional information on our technical support can be found at Technical Support (<http://www.siemens.com/automation/csi/service>).

Service & support on the Internet

In addition to our technical support, Siemens offers comprehensive online services at Service & Support (<http://www.siemens.com/automation/serviceandsupport>).

Contact

If you have further questions about the device, contact your local Siemens representative at Personal Contact (<http://www.automation.siemens.com/partner>).

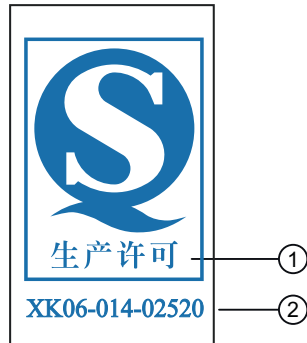
To find the contact for your product, go to "all products and branches" and select "Products & Services > Industrial automation > Process instrumentation".

Contact address for business unit:

Siemens AG
Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

A.3 Chinese production license for explosion proof electrical products

防爆电气产品生产许可证标志




- ① 生产许可
- ② 生产许可证书编号

Accessory part sealing plug / thread adapter

B.1 Intended use of accessory part

The sealing plug and the thread adapter (components) can be used for installation in electrical equipment of flameproof "Ex d" type of protection of groups IIA, IIB, IIC as well as dust protection by enclosure "Ex t" type of protection.

B.2 Safety instructions for accessory part

<p> WARNING</p> <p>Incorrect assembly</p> <ul style="list-style-type: none"> The component can be damaged or destroyed or its functionality impaired through incorrect assembly. <ul style="list-style-type: none"> Mount the component using a suitable tool. Refer to the information in Chapter "Technical specifications of accessory part (Page 86)", for example, torques for installation. For "Explosion-proof Ex d" type of protection: To ensure an engagement depth of 8 mm, the enclosure must have a wall thickness of at least 10 mm. <p>Improper modifications</p> <p>Danger to personnel, system and environment can result from modifications and repairs of the component, particularly in hazardous areas.</p> <ul style="list-style-type: none"> Any modification which deviates from the delivery state is not permitted. <p>Loss of enclosure type of protection</p> <p>IP protection is not guaranteed without sealant.</p> <ul style="list-style-type: none"> Use a suitable thread sealant. If you are using the component in type of protection dust protection by enclosure "Ex t", use the supplied sealing ring (①, figure in Chapter "Dimensional drawings for accessory part (Page 87)"). <p>Unsuitable fluids in the environment</p> <p>Danger of injury or damage to device.</p> <p>Aggressive media in the environment can damage the sealing ring. Type of protection and device protection may no longer be guaranteed.</p> <ul style="list-style-type: none"> Make sure that the sealing material is suitable for the area of use.

Note

Loss of type of protection

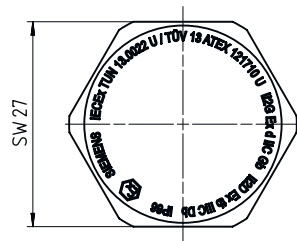
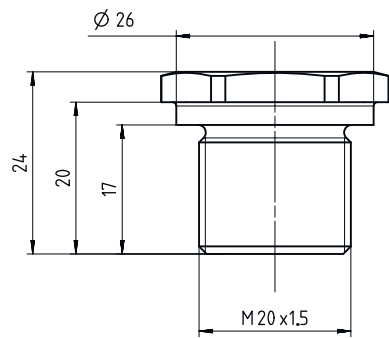
Changes in the ambient conditions can loosen the component.

- As part of the recommended maintenance intervals: Check the compression fitting for tight fit and tighten, if necessary.

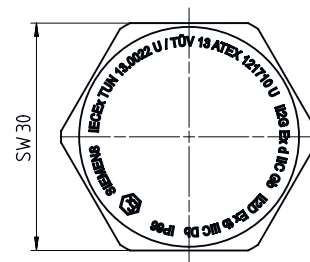
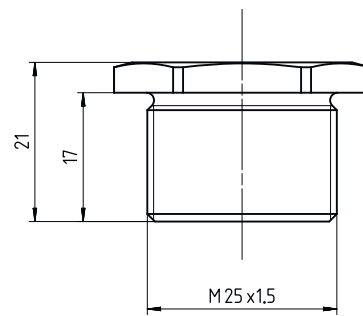
B.3 Technical specifications of accessory part

Technical specifications sealing plug and thread adapter	
Sealing plug suitable for types of protection	Explosion-proof enclosure "db" of groups IIA, IIB, IIC Dust protection by enclosure "ta"
Standard compliance	The components meet Directive 2014/34/EU. They meet the requirements of standards IEC/EN 60079-0; IEC/EN 60079-1; IEC/EN 60079-31.
Explosion protection	
• Gas explosion protection	II2G Ex db IIC Gb
• Dust explosion protection	II1D Ex ta IIIC Da
Certificates	IECEX TUN 13.0022 U TÜV 13 ATEX 121710 U
Material for sealing plug / thread adapter	Stainless steel
Material for seal	AFM 30
Ambient temperature range	-40 ... +100 °C (-40 ... +212 °F)
For "Ex d" type of protection: Required wall thickness for tapings	10 mm
Torque	
• For thread size M20 x 1.5	40 Nm
• For thread size M25 x 1.5	55 Nm
• For thread size ½-14 NPT	95 Nm
Width A/F for thread size M20 x 1.5	27
Width A/F for thread size M25 x 1.5	30
Key size for thread size ½-14 NPT	10

B.4 Dimensional drawings for accessory part

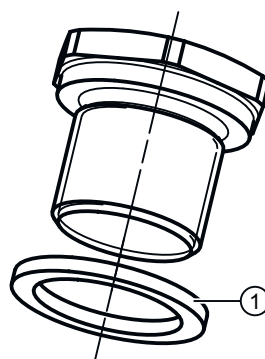
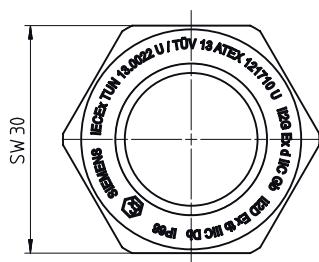
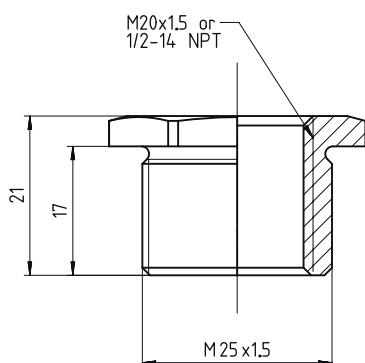


Sealing plug Ex d, M20 x 1.5, dimensions in mm



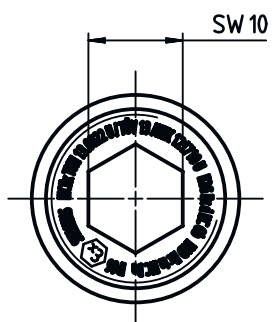
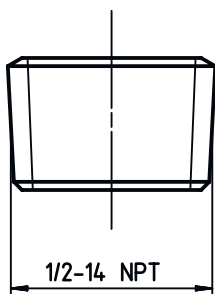
Sealing plug Ex d, M25 x 1.5, dimensions in mm

B.4 Dimensional drawings for accessory part



① Sealing ring: Use for dust protection "Ex t" type of protection.

Thread adapter Ex d, M25 x 1.5 on M20 x 1.5 and M25 x 1.5 on 1/2-14 NPT, dimensions in mm



Sealing plug Ex d 1/2 -14 NPT

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