SIEMENS

SIPART PS2 6DR400x-xx
SIPART PS2 PA 6DR410x-xx

Electropneumatic Positioner for
Linear and Rotary Actuators

Manual Order No. C79000-G7476-C158-1

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Contents

AG 1198 MG 124 en

Information for the Operator 0

Dear customer,

Before you start work, please read this manual! It contains important information and data that you must observe to ensure the availability of the device and save yourself service costs. This will make it considerably easier to use this control equipment and lead to reliable results.

You have acquired a device that can be set up in different configurations:

- ❑ SIPART PS2 without PROFIBUS PA 6DR400x–xx
- ❑ SIPART PS2 with PROFIBUS PA 6DR401x–xx

This manual takes each of these possibilities into consideration. Any differences between the devices are indicated specially.

0.1 General information

The product described in this manual left the factory in a perfectly safe and tested condition. To maintain this condition and to achieve perfect and reliable operation of this product, it must only be used in the way described by the manufacturer. Successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.

This manual contains the information required for use as intended of the product it describes. It is addressed to technically qualified personnel specially trained or having relevant knowledge of instrumentation and control technology, hereafter called automation technology.

Familiarity with and proper technical observance of the safety notes and warnings contained in this manual are essential for safe installation and commissioning and for safety in operation and maintenance of the product described. Only qualified personnel as defined in Section 0.3 has the necessary specialist knowledge to interpret the general safety notes and warnings given in this document in specific cases and to take the necessary action.

The documentation supplied with the instrument is listed in Section 0.5.

This manual is not a permanent part of the scope of supply. For reasons of clarity, it does not contain every detail about every version of the product described and cannot take every eventuality in installation, operation, maintenance and use in systems into account. If you require further information or if problems occur that have not been dealt with in sufficient detail in this document, please request the required information from your local Siemens office or the office responsible for you.

Functionality, commissioning and operation are described in this manual.

Please pay special attention to the **Warning and Note** texts. These are separated from the remaining text by horizontal lines and specially marked with symbols (see Section 0.2).

0.2 Warning notes

Safety information and warnings are intended to avert danger from the life and health of users and maintenance personnel and to prevent material damage. They are highlighted in this manual by the headings defined here. They are also marked by warning symbols next to where they appear. The headings used have the following meaning for the purposes of this manual and the product labels:

Danger

indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.

Warning

indicates death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution

indicates minor personal injury or property damage can result if proper precautions are not taken.

Note

indicates important information about the product itself or the respective part of the instruction manual which it is essential to highlight.

0.3 Qualified personnel

The result of unqualified intervention in the instrument or nonobservance of the warnings given in this manual or on product labels can be severe personal injury and/or serious material damage. Therefore only properly qualified personnel must make changes and settings in the instrument.

For the purpose of the safety information in this manual and on the product labels, qualified personnel are those who

- if they are configuration personnel, are familiar with the safety concepts of automation technology
- if they are operating personnel, have been instructed in the handling of automation equipment and know the content of this manual relating to operation
- if they are commissioning and/or service personnel, are trained to repair such automation equipment and authorized to energize, de-energize, clear ground and tag circuits and equipment in accordance with established safety practices
- and are trained in first aid
- and, in the case of ex-proof equipment, are trained and authorized to carry out work on electrical circuits of equipment subject to explosion hazard.

Warning

The instrument must only be installed and commissioned by qualified personnel.

The instrument is designed for connection to functional and safety extra low voltage.

Electrical safety depends only on the power supply equipment.

Pneumatic actuators exert considerable positioning forces. The safety precautions of the actuator used must therefore be scrupulously observed during installation and commissioning in order to prevent injuries.
We explicitly draw your attention to the necessity of observing safety regulations regarding operation in zones subject to explosion hazard, if applicable.

0.4 Use as intended

Use as intended for the purpose of this manual means that this product must only be used for the applications described in the technical description (see also Section 3 of this manual).

The product described in this manual has been developed, manufactured, tested and documented observing the relevant safety standards. If the handling rules and safety information for configuration, installation, use as intended and maintenance are observed, there is normally no danger with regard to material damage or for the health of personnel. Extra low voltages that are connected must be fed in by safe isolation.

0.5 Technical documentation

In addition to this manual, the following documentation is also supplied with the instrument:

- Leaflet “Operation – Concise Overview”
  Order No. C73000–B7400–C151 (German) without PROFIBUS PA
  Order No. C73000–B7476–C151 (English) without PROFIBUS PA
  Order No. C79000–B7400–C160 (German) with PROFIBUS PA
  Order No. C79000–B7476–C160 (English) with PROFIBUS PA

  explains in visualized form the principle of operation and parameterization and automatic commissioning.

- “Assembly and Installation Instructions”
  Order No. C79000–M7474–C156 (German/English)

  contains the information required for assembly and installation.

  It is an Instruction Manual as defined in the Directive of the Council of the European Communities dtd. 23 March 1994 (94/9/EC).

0.6 Warranty information

We should like to point out that the content of this manual is not part of and does not modify a previous or current agreement, undertaking or legal relationship. Siemens is bound solely by the contract of sale, which also contains the complete and exclusive warranty. The contractual warranty conditions are neither extended nor restricted by this document.

0.7 Information about delivery

The scope of delivery is listed on the dispatch papers accompanying the delivery in accordance with the valid contract of sale.

When you open the packaging please observe the information on the packaging. Check that the delivery is complete and undamaged. If possible, compare the order number on the rating plates with the ordering data.

For the supply range please see Section 7.

0.8 Standards and regulations

As far as possible, the harmonized European standards were used to specify and manufacture this equipment. If harmonized European standards have not been applied, the standards and regulations of the Federal Republic of Germany apply (see also the Technical Data in Section 6).

If this product is used outside the area of applicability of these standards and regulations, please observe the standards and regulations in force in the country where the product is operated.

Introduction 1

1.1 General information about the device

The SIPART PS2 positioner is used to position and control pneumatic actuators. The instrument operates electropneumatically, compressed air is used as the auxiliary power.

SIPART PS2 PA

In the **SIPART PS2 PA** version, the positioner is used as a component in a digital process automation system. It communicates with the master as a slave via the PROFIBUS PS field bus. The field bus is used not only for communication but also to supply the positioner with electrical power.

Purpose

The positioner can be used to control, for example values with

- ❑ a linear actuator (Fig. 1-3) or
- ❑ a rotary actuator VDI/VDE 3845 (Fig. 1-4).

Different ways of mounting are available for linear actuators

- ❑ NAMUR or IEC 534
- ❑ integrated mounting (ARCA, SAMSON)

so that the positioner can be mounted and used on all common types of actuators.

Models

The instrument is available for

- ❑ double-acting and
- ❑ single-acting

actuators, and for applications

- ❑ subject to explosion hazard or
- ❑ not subject to explosion hazard.

and the variants

- ❑ without PROFIBUS
- ❑ with PROFIBUS.

Housing

The electronics including the display and the position feedback and the valve manifold are integrated in the housing.

The housing is available in two variations:

- ❑ Plastic housing for double-acting actuators
- ❑ Metal housing for single-acting actuators

Degree of protection

The instrument has degree of protection IP65.

Explosion protection

The intrinsically safe version can be operated in hazard area zone 1 or zone 2.

Options

The instrument can be expanded with different option modules (see Section 2.5). The following modules are available and can be operated both singly and in any combination.

- ❑ J_y module: 2–wire current output 4 to 20 mA for position feedback
- ❑ Alarm module: 3 binary outputs and 1 binary input
- ❑ HART module: HART communication **(devices without PROFIBUS PA only**)

Accessories

- ❑ Manometer block: 2 or 3 manometers for single and double-acting positioner
- ❑ Flange (NAMUR) for safety valve block

Environmental protection

Only environmentally compatible materials were used in the packaging system of this instrument.

The manual is printed on paper bleached using a chlorine–free method.

1.2 The PROFIBUS

The PROFIBUS (**Pro**cess **Fi**eld **Bus**)

- ❑ is an open communication system for automation
- ❑ is in use all over the world in thousands of applications
- ❑ is specified in the European standard EN 50170

1.2.1 PROFIBUS DP and PROFIBUS PA

Transmission technology

The PROFIBUS PA (PA = **P**rocess **A**utomation) is a variant of the PROFIBUS DP (**DP** = **D**istributed **P**eripherals) which is widely used in manufacturing.

The PROFIBUS PA makes use of special transmission technology and therefore meets the requirements of process automation and process engineering. This transmission technology is defined in the international standard IEC 1158–2. The low transmission rate reduces the power loss and therefore permits intrinsically safe technology for use in zones subject to explosion hazard.

Topology

Moreover, almost any bus topology can be selected, so that bus, star, tree, and mixed structures are possible. All types of field devices such as transducers, actuators, analyzers, etc. can be connected to the PROFIBUS PA.

The main advantages are:

- ❑ saving in installation costs
- ❑ the option of more detailed diagnostics thus increasing the availability of plant sections
- ❑ the option of automatic correction of plant documentation
- ❑ the option of plant optimization during running operation

In an automation system, several PROFIBUS PA trains are usually connected to the fast PROFIBUS DP via coupling units. The process control system is also connected to the PROFIBUS DP.

Both bus systems make use of a standard protocol layer. That makes the PROFIBUS PA a ”communication compatible” extension of PROFIBUS DP into the field.

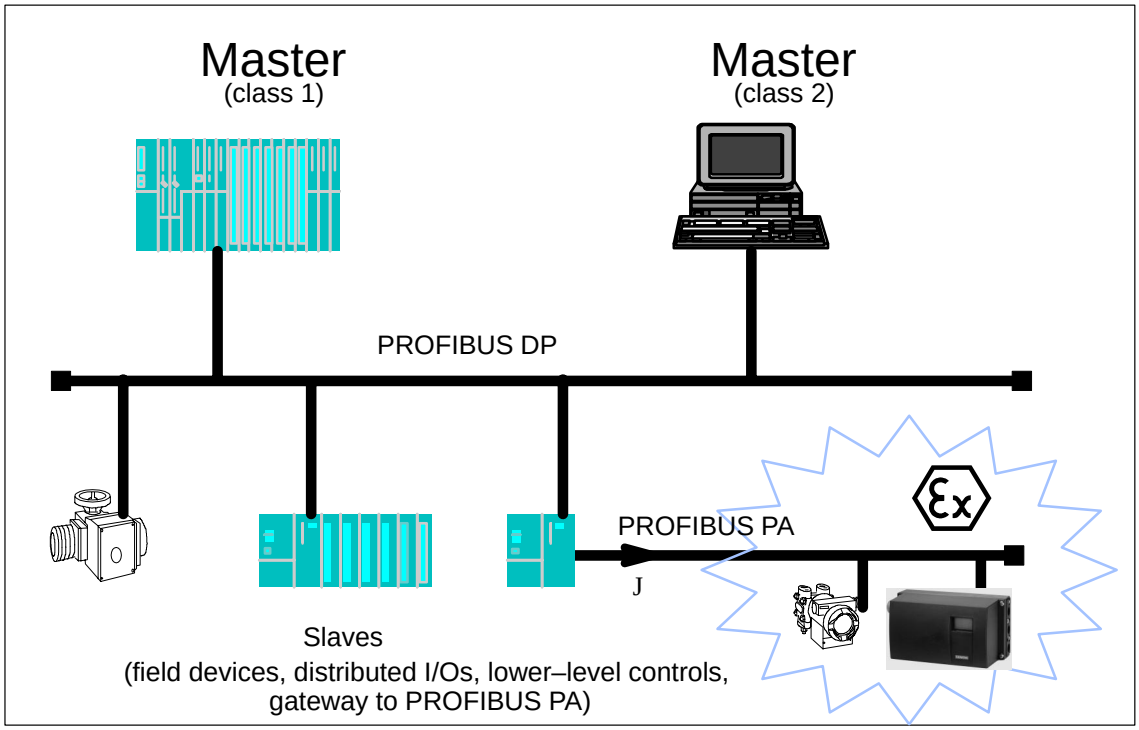


Fig. 1-1 Typical PROFIBUS automation system

Fig. 1-1 shows a section of a typical PROFIBUS automation system. The control system consists of two masters with distributed tasks:

The master class 1 performs open–loop and closed–loop control tasks, master class 2 is used for HMI functions. Exchange of measuring and positioning data is performed cyclically between master 1 and the field devices. Parallel with this data, the status information of the field devices is transmitted and evaluated in master 1. Parameterization of the field devices or reading of further device information is not performed in cyclic operation.

The control system obtains the information required to establish communication from the device–specific device master data files GSD (see Appendix).

In addition to cyclic operation one or more masters of class 2 can access the field devices non–cyclically. By this method of communication, further information can be fetched from the devices or settings made in the devices.

1.2.2 Properties of the PROFIBUS PA

The PROFIBUS PA permits bidirectional communication from a bus master with the field devices via a shielded, twisted pair. At the same time the two–wire field devices are powered via the same lines (current J in Fig. 1-1).

Profiles

In addition to the EN standard 50170, the PNO (PROFIBUS user organization) has defined the functionality of the individual field device types in a profile description. These profiles define minimum functional requirements and optional extensions. The device–internal ”device management” provides the configuration tool of the control system with all basic information necessary to locate the profile parameters. In that way, one parameterizing tool can operate all profile–compliant devices, whatever their type or manufacturer.

The system must be implemented with one or more PROFIBUS PA trains depending on the automation task and therefore the number of field units and the required time response. One PROFIBUS PA train consists of the components shown in Fig. 1-2.

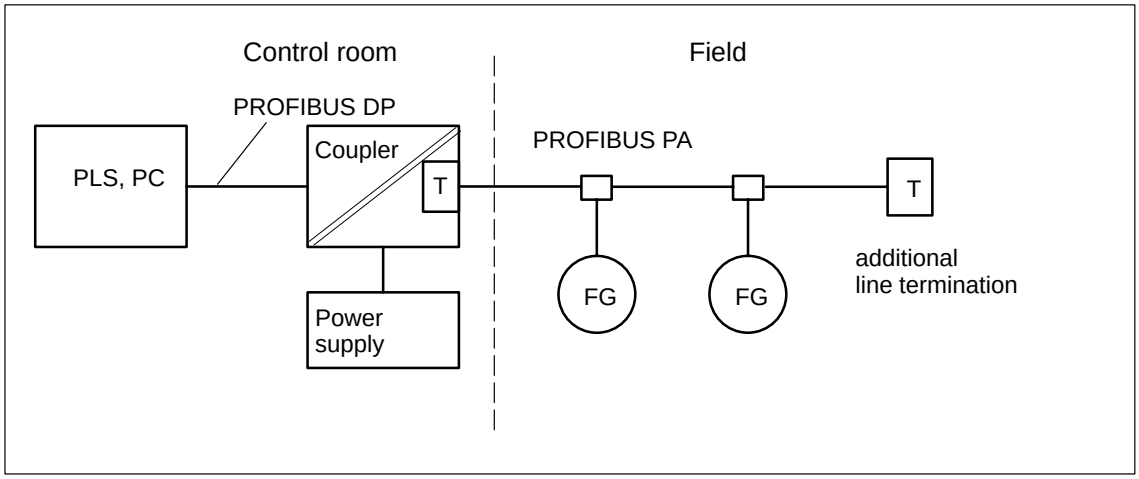


Fig. 1-2 PROFIBUS PA architecture

Link

Control is performed by the central process control system PCS or for low requirements, by a PC. Usually, the functional signal conversion DP–PA, bus feed, and bus termination are combined into one linking module. Depending on the number PROFIBUS PA field devices to be operated in the automation system and the required time response, a DP/PA coupler or for higher requirements, a more powerful DP/PA link is used.

For transmission reasons, the bus must also be fitted with a terminating resistor T at the remote end. If the recommended bus cable is used, the theoretically possible maximum line length (sum of all line sections) is 1900 m.

During configuration, the power requirement of the individual stations and the voltage drop on the cable must also be taken into account. The individual FG field devices can be connected to almost any point in the bus system. For further information see the ”PNO–Leitfaden PROFIBUS PA”/1/.

DP/PA couplers or DP/PA links are powered from a power supply unit with SELV (**s**afety **e**xtra–**l**ow **v**oltage). This power supply unit must have sufficient back–up reserves to provide back–up power during short power interruptions.

The maximum number of devices that you can connect to a bus train depends on the current consumption and the application conditions. During operation in a safe zone, the couplers or links supply up to 400 mA to the bus.

In zones subject to explosion hazard, intrinsic safety is only ensured if the maximum power fed into the bus does not exceed certain voltage and current values.

These are usually:
EEx ia IIC Current I_S < 128 mA, voltage U_0<15V

Warning

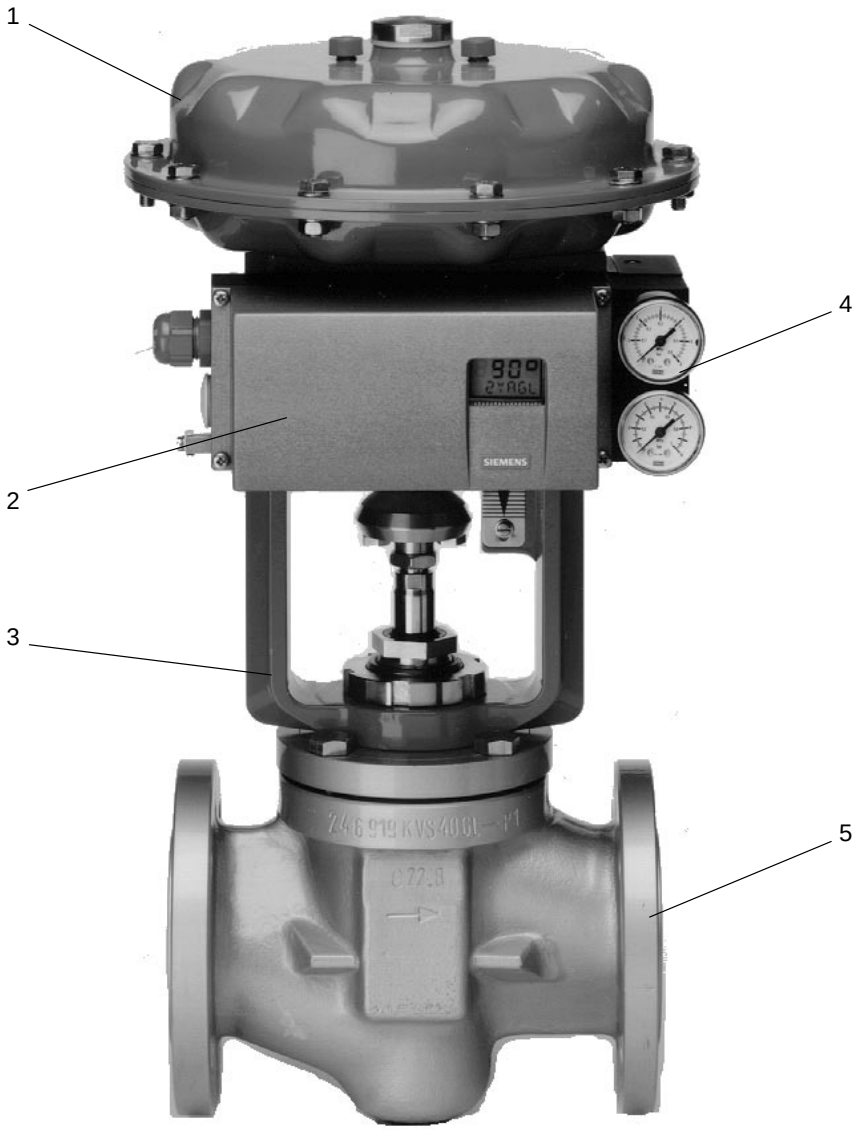
To power the intrinsically safe PROFIBUS only certified power supply units (DP/PA couplers or links) must be used. See the Ex conformity declaration for the requirements (see Assembly and Installation Instructions).

From the sum of the maximum current consumption of the connected devices (acc. to standard = 10 mA per device) and the available current, it is possible to calculate the number of devices that can be connected to a bus train. For safety reasons, a current reserve must be planned because otherwise there is a risk that a defective device could overload the bus by increased current consumption and that therefore the power supply and communication with all the other non–defective stations could collapse. The size of the required reserve depends on the current increase in case of fault stated by the device manufacturer.

The electronic current limitation additionally installed in the **SIPART PS2 with PROFIBUS PA** ensures a maximum increase of the current consumption by 3 mA for a defective device.

In order to distinguish the connected process devices from one another, each device has its own address. The address setting is described in Section 3.6 ”Commissioning”.

For more detailed information about the components, assembly guidelines and configuration, see the technical description of the field technology package /2/.



1 Actuator
2 Positioner, single acting in metal housing
3 Intermediate bracket
4 Manometer block, single acting
5 Valve

Fig. 1-3 Positioner mounted on linear actuator (single acting)

1 Positioner, double acting in plastic housing
2 Rotary actuator
3 Manometer block, double acting

Fig. 1-4 Positioner mounted on rotary actuator (double acting)

Design and Method of Operation 2

This Section describes the mechanical and electrical design, the components of the instrument and the principal method of operation of the instrument.

2.1 Overview

Introduction

The SIPART PS2 electropneumatic positioner forms a closed-loop control system together with an actuator. The current position of the actuator is acquired via a servo-potentiometer and returned as actual value x. The setpoint and actual values are output simultaneously on the display.

Devices without PROFIBUS PA

Setpoint w is formed by a current fed to the SIPART PS2 positioner which is also used to power the instrument in 2-wire operations. In 3/4–wire operation the power supply is taken from a 24V power input.

Devices with PROFIBUS PA

The setpoint is supplied to the positioner by the control system digitally via PROFIBUS PA.

The PROFIBUS PA variant of the SIPART PS differs from previous versions by its bus interface. The basic functions including operation and display have remained almost unchanged. The interface tasks are performed by function blocks 1 to 6 (see Fig. 2-13).

The positioner functions as a predictive 5-step controller, the output quantity $\pm\Delta y$ of which is used to operate the integrated control valves with pulse-width-modulated pulses.

These positioning signals effect differences in pressure in the actuator chamber(s) and consequently adjustment of the actuators until the system deviation is reduced to zero.

Process operation (automatic and manual mode) and configuring (structuring, initialization and parameterization) is performed with the three pushbuttons and the display when the housing cover is removed.

The standard version of the basic instrument also has a binary input (BE1). This input can also be configured individually and is primarily intended for blocking operating levels.

The actuator position can be output as 2–wire signal J_y = 4 to 20 mA using the J_y option module.

The actuator can also be monitored for two programmable limit values. Limit value alarms are output via the alarm option module that can also monitor and signal the function of the positioner and the actuator. In automatic operation the system deviation is monitored as a function of the actuating time. The three binary outputs are implemented as semiconductor outputs and feature self–annunciation, i.e. the outputs respond even if the auxiliary power or the electronics fails.

Depending on how it is configured, the actuator can be blocked, for example, or put into its final position by an external event via the binary input (BE2) which is also located on the alarm module.

Devices without PROFIBUS PA	Via the optional HART module it is possible to communicate with the controller.

2.2 Components

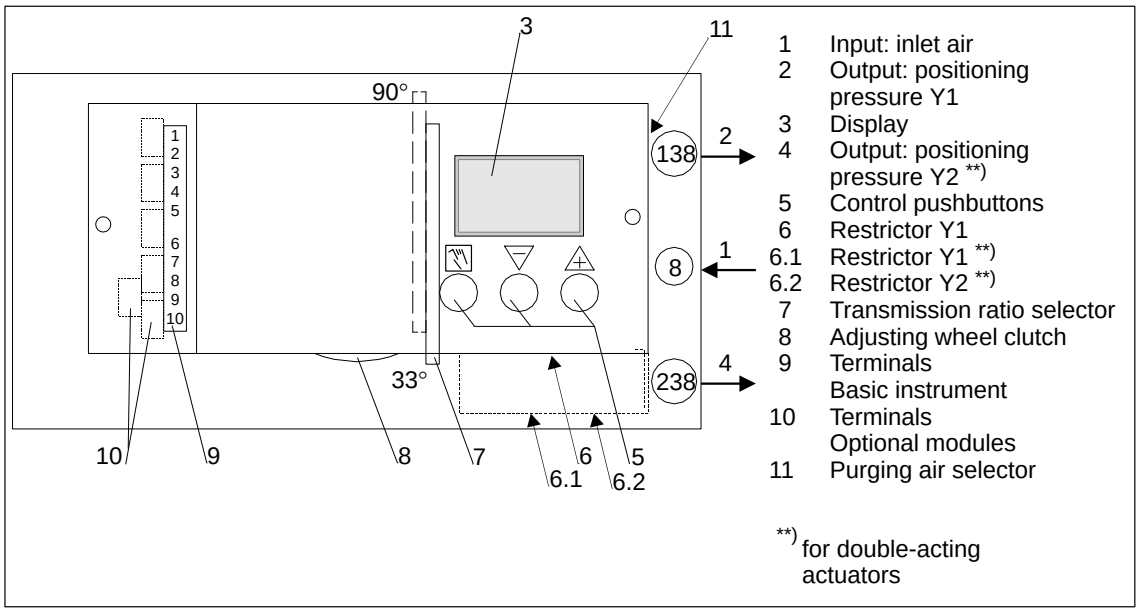


Fig. 2-1 View of the instrument (cover open), **devices without PROFIBUS PA**

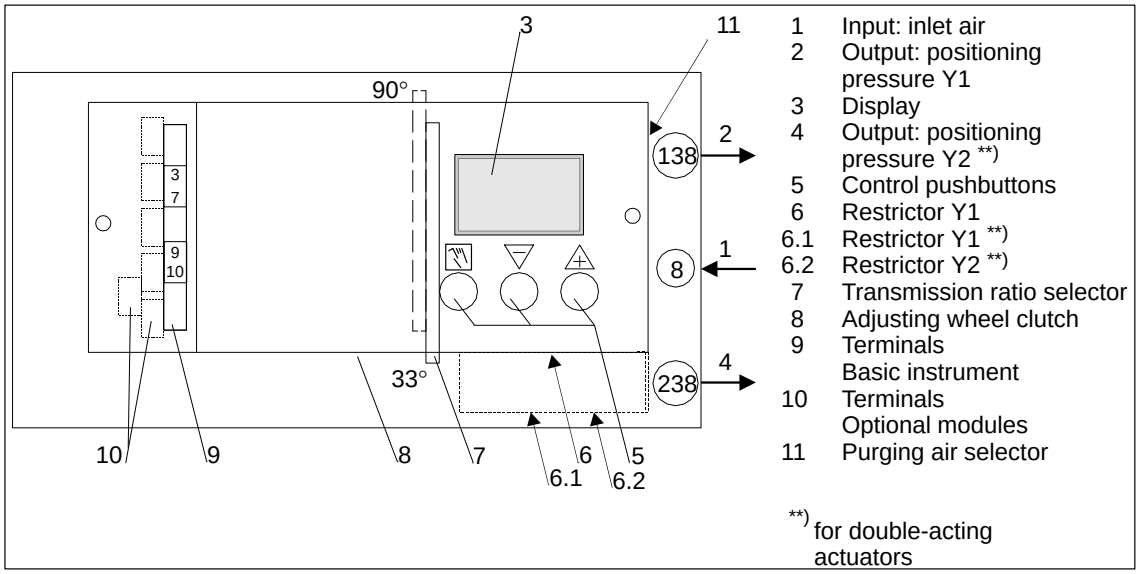


Fig. 2-2 View of the instrument (cover open), **devices with PROFIBUS PA**

2.2.1 Motherboard

The motherboard contains all electronic elements such as CPU, memory, ADC. It also contains the display and the control pushbuttons.

The terminal blocks for connecting the option modules are also located on the motherboard.

2.2.2 Electrical connections

The terminals of the basic instrument, the J_y and the alarm option module are located on the front on the left–hand side and are offset in a step–shaped arrangement.

A cover protects the modules from being pulled out and prevents incorrect installation.

2.2.3 Pneumatic connections

The pneumatic connections (G1/4) are located on the right-hand side of the positioner (Fig. 2-3).

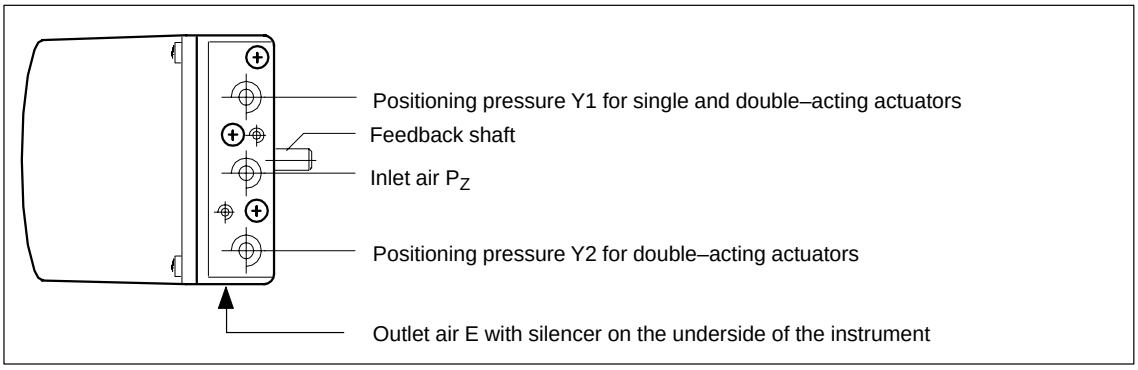


Fig. 2-3 Pneumatic connection

Two pneumatic connections for the integrated installation of single–acting linear actuators are located on the rear of the positioner:

- ❑ Positioning pressure Y1
- ❑ Air outlet E

These connections are locked with screws when supplied (see Fig. 3-2 and Fig. 3-4).

Outlet air E is used to ensure a flow of dry instrument air through the pick–off area and the spring chamber to prevent corrosion.

Fig. 2-4 shows pneumatic connection options for various types of actuators with the positioning action and the safety position after auxiliary power failure.

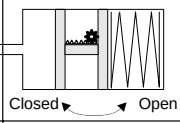
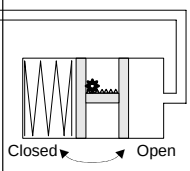
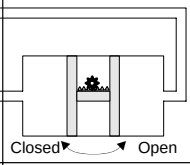
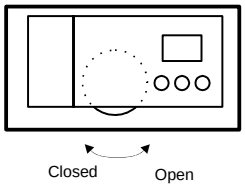
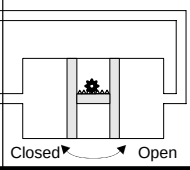
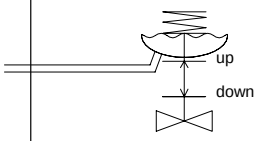
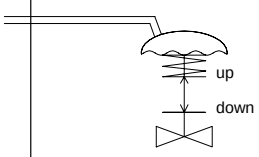
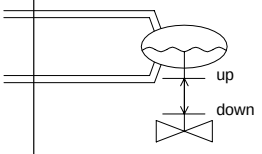
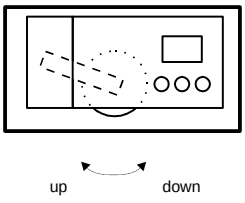
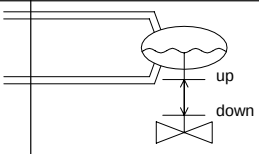
Positioning pressure Connection	Actuator type	Safety position after auxiliary power failure electrical	pneumatic	
Y1		Closed	Closed	On rotary actuators the counter–clockwise direction of rotation – looking at the actuating shaft of the valve – is defined as “open”.
Y1		Open	Open	
Y2 Y1		Open	Undefined	
Y1 Y2		Closed		
Y1		down	down	
Y1		up	up	
Y2 Y1		up	Undefined	
Y1 Y2		down		

Fig. 2-4 Pneumatic connection and positioning action

2.2.4 Mounting kit

The positioner can be mounted on nearly all common types of actuators using the appropriate mounting kit.

2.2.5 Purging air switchover

The purging air changeover switch above the pneumatic terminal block (Fig. 2-5) on the valve manifold can be accessed when the housing is open. When the switch is in position IN the interior of the housing is purged with very small quantities of clean and dry instrument air. In position OUT the purging air is led directly out of the instrument.

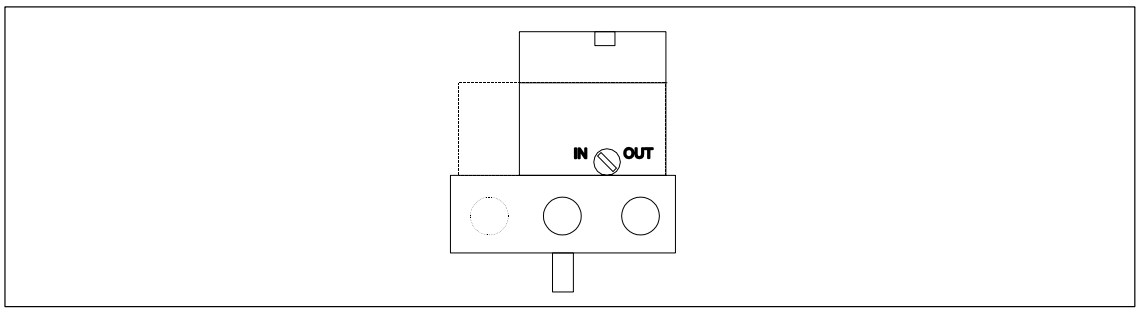


Fig. 2-5 Purging air changeover switch above the pneumatic terminal block, view of the device on the pneumatic connection side with the cover open

2.2.6 Restrictors

The air flow can be reduced with restrictors Y1 and Y2 (Fig. 2-6) to achieve actuating times of > 1.5 s on small actuators. Turning the restrictors in the clockwise direction reduces the air flow until it is shut off. To set the restrictors we recommend closing them first and then opening them again slowly (see Initialization RUN3).

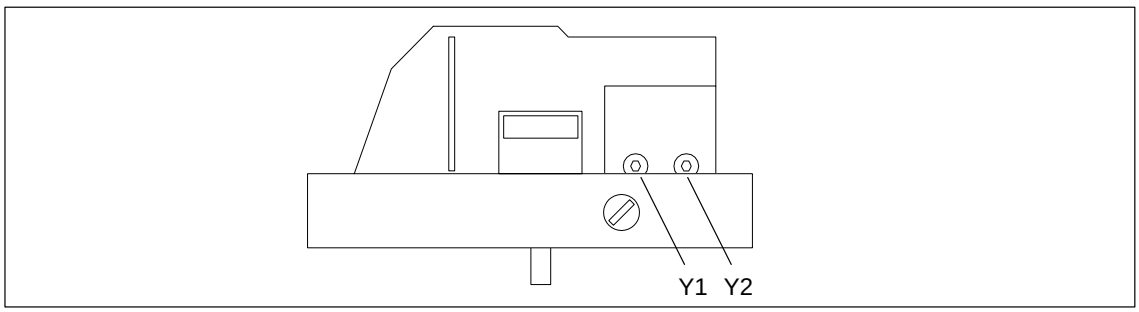


Fig. 2-6 Restrictors

2.3 Method of operation

The electropneumatic positioner SIPART PS together with the pneumatic actuator forms a control loop in which the actual value x is the position of the actuator rod on linear actuators and the position of the actuator shaft on rotary actuators and the reference variable w is the actuating current of a controller or manual control station of between 0/4 and 20 mA.

With **devices with PROFIBUS PA**, the command variable w is set digitally via a bus system.

The stroke or rotational movement of the actuator is transferred to a servopotentiometer via the necessary mounting accessories, the feedback shaft and reversible gear train without play and then sent to the analog input of the microcontroller.

This corrects the angular error of the stroke pick–off, if necessary, compares the potentiometer voltage as an actual value x with the setpoint x fed in via terminals 3 and 7 and calculates the manipulated variable increments $\pm \Delta y$. Depending on the size and the direction of the system deviation (x–w) the piezoelectric pre–controlled air inlet and air outlet valve is opened. The volume of the actuator integrates the correcting increments up to actuating pressure y which moves the actuator rod or the actuator shaft approximately proportionally. These correcting increments continue to change the actuating pressure until the system deviation is zero.

The pneumatic actuators are available as single–acting and double–acting versions. In the single–acting version only one volume is ventilated or vented. The resulting pressure is exerted against a spring. In the double–acting version two volumes act against each other. One volume is ventilated as the other volume is vented. See block diagrams in Fig. 2-7 and 2-9.

The control algorithm is an adaptive predictive five–point controller.

The valves are actuated with a maintained contact for large system deviations (high–speed zone). The valves are actuated with pulse–width–modulated pulses for medium system deviations (short–step zone).

No positioning pulses are output in the zone of low system deviation (self-adjusting dead band). The dead-band adaptation and the continual adaptation of the minimum pulse length in automatic operation allow the best possible control accuracy to be achieved with the minimum switching frequencies. The start parameters are determined during the initialization phase.

Figs. 2-7 to 2-10 show the block diagrams for single and double-acting actuators, in this example on a linear actuator.

Note

When not under power, the air discharge valve is always open.

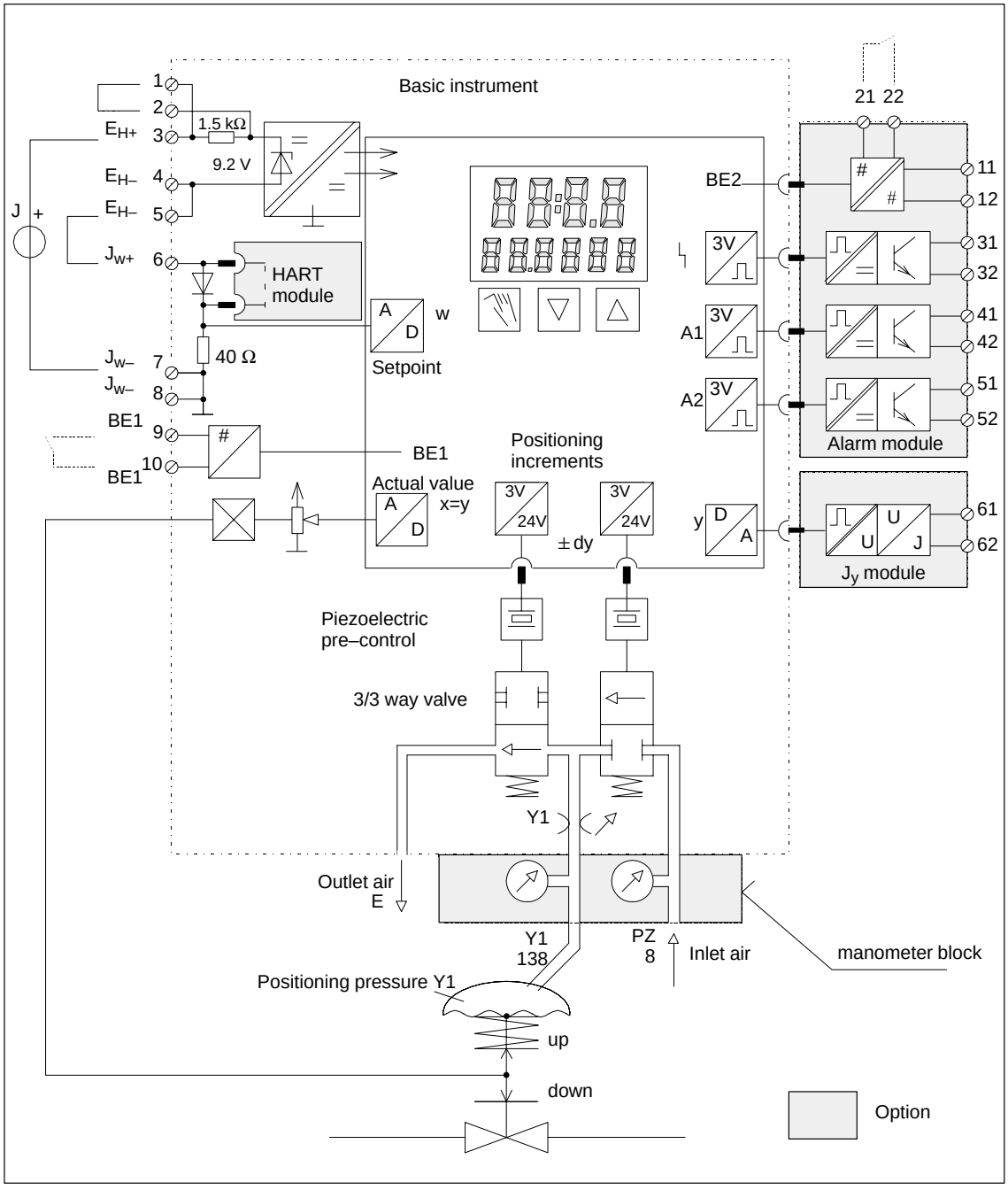


Fig. 2-7 Block diagram diagram for single-acting actuators (2-wire operation, state as supplied), **devices without PROFIBUS PA**

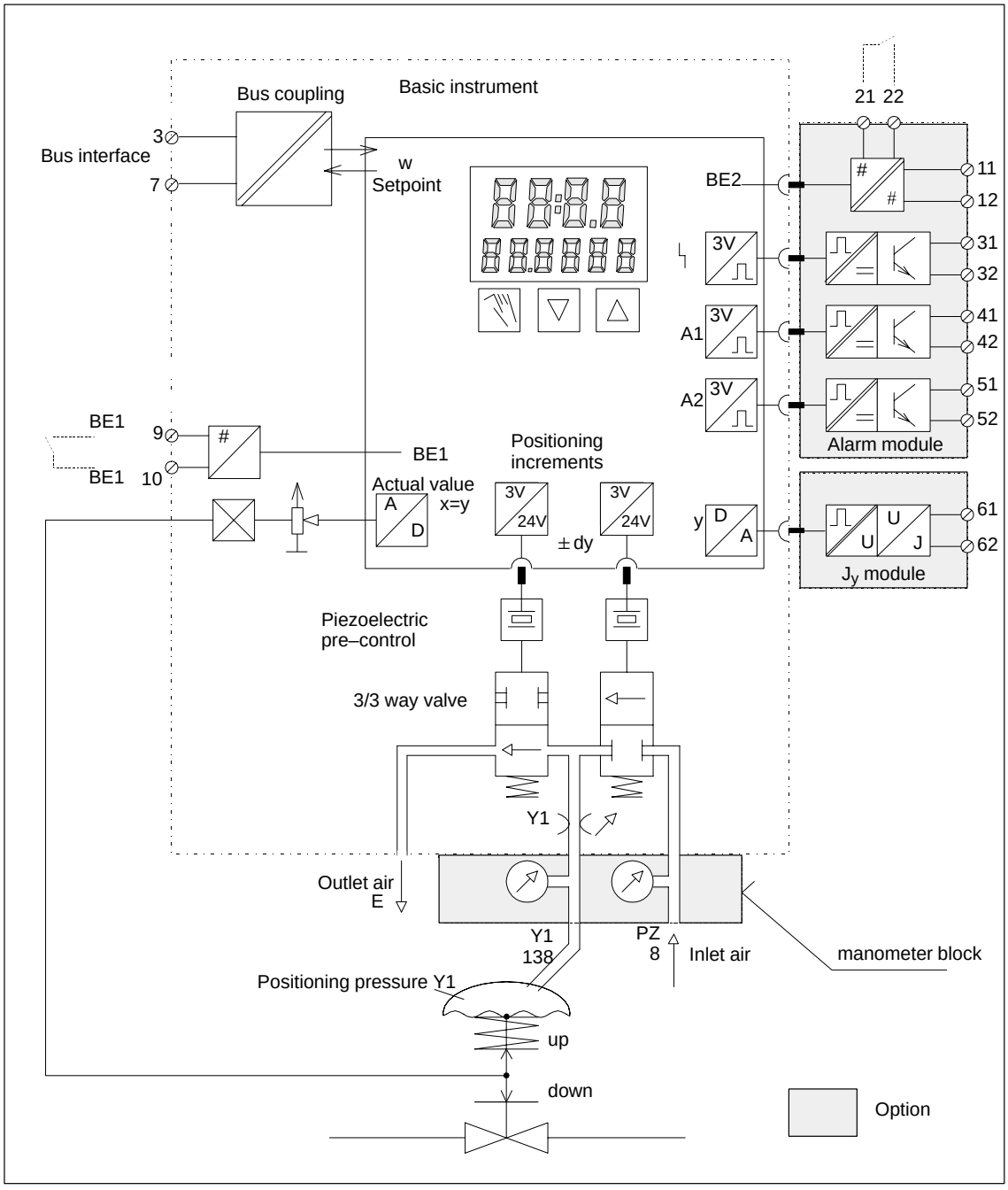


Fig. 2-8 Block diagram diagram for single-acting actuators (2-wire operation, state as supplied), **devices with PROFIBUS PA**

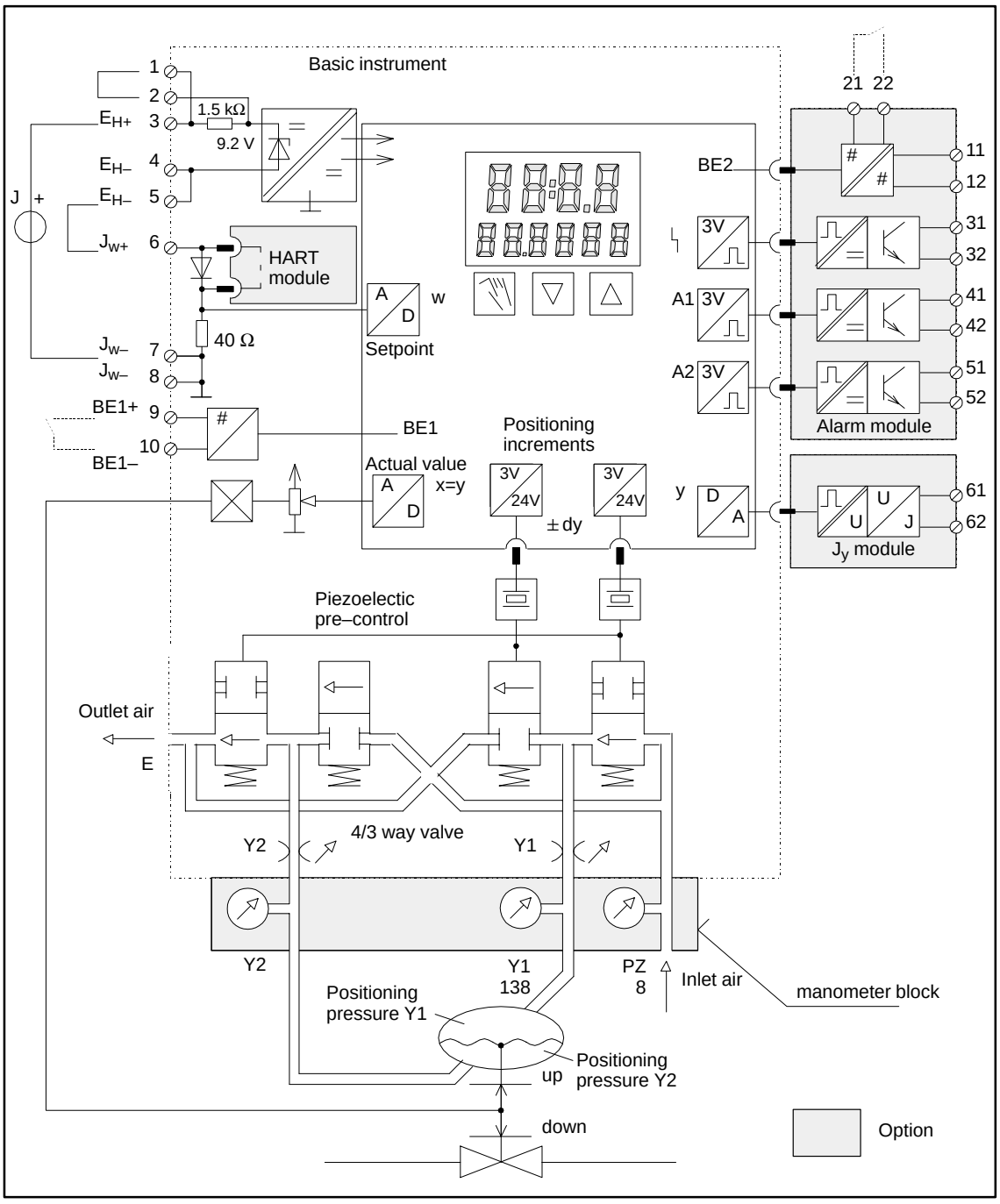


Fig. 2-9 Block diagram for double-acting actuators (2-wire operation, state as supplied), **devices without PROFIBUS PA**

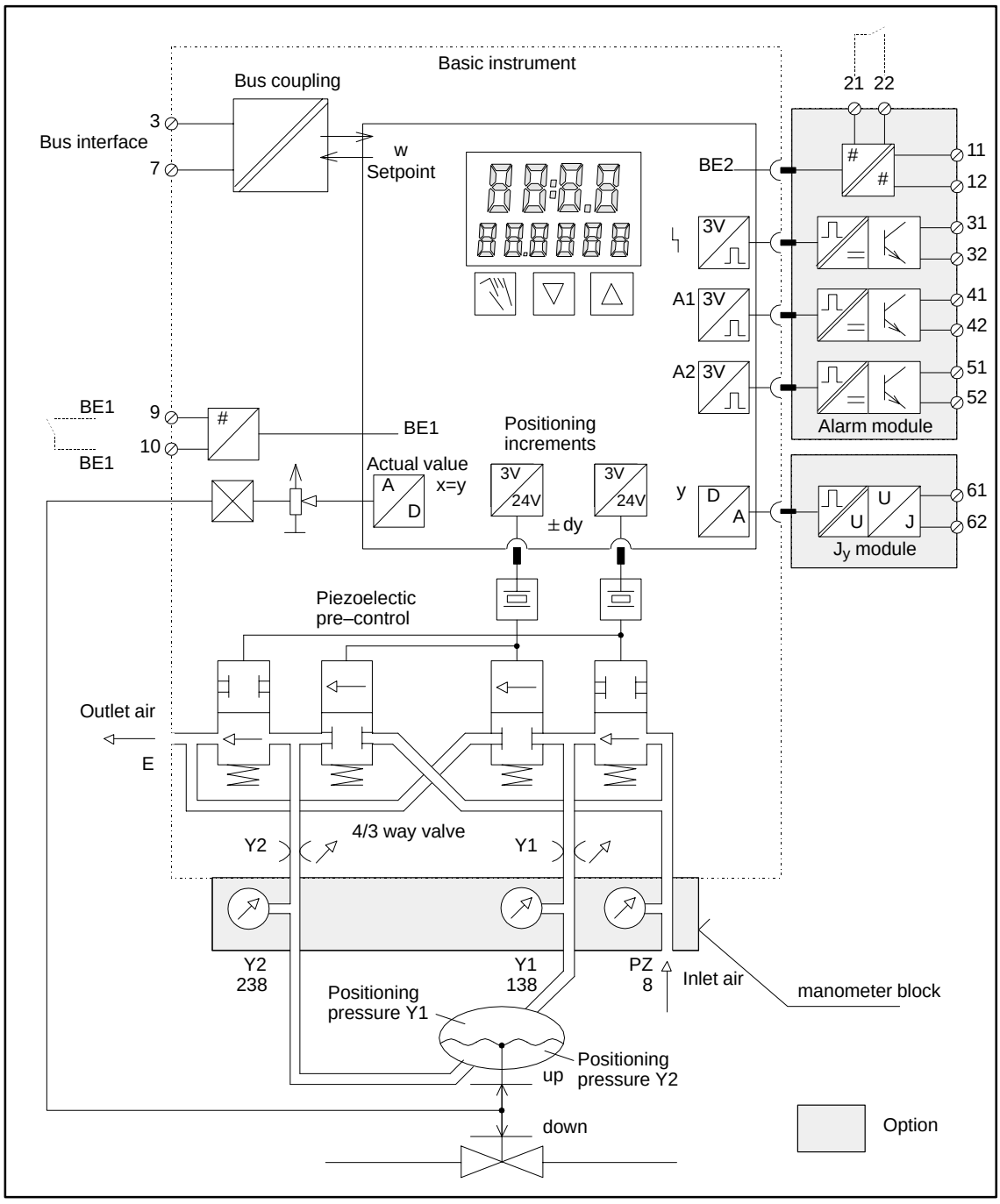


Fig. 2-10 Block diagram for double-acting actuators (2-wire operation, state as supplied), **devices with PROFIBUS PA**

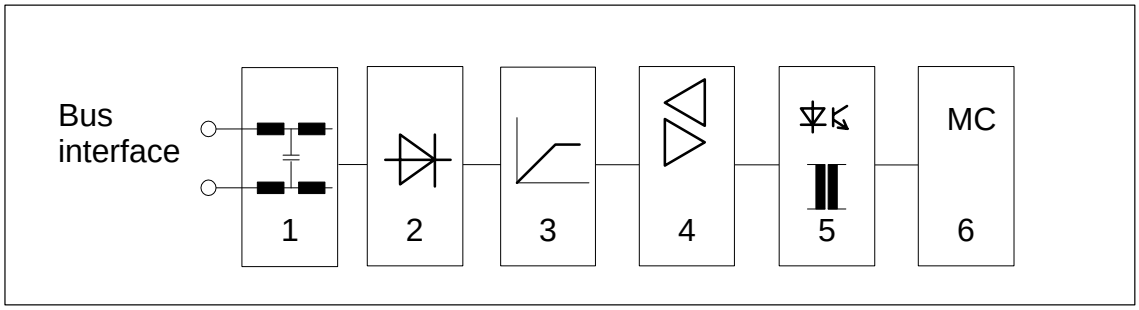


Fig. 2-11 Block diagram of the bus coupling unit, **devices with PROFIBUS PA**

Devices with PROFIBUS PA

1. The EMC filter prevents malfunctions due to electromagnetic interference.
2. The reverse polarity protection permits connection of the bus cables in any way and makes installation errors almost impossible.
3. The electronic protection ensures that no impermissibly high current flows in the event of a fault. That avoids overloading the bus, but data exchange between the remaining stations not subject to interference is still possible.
4. The bus interface contains the transmit and receive circuits for the bus system and the control for the auxiliary power generation.
5. The device internal electronics are isolated by galvanic isolation from the PROFIBUS PA.
6. The microprocessor interprets the bus commands, initiates device internal actions and provides position signals, status, and device data on the bus.

2.4 State as supplied

In the state as supplied no mechanical mounting components are attached to the positioner. These have to be ordered and mounted for the specific application in accordance with the “Assembly and Installation Instructions”.

The connections for single and double-acting versions are prepared in the factory as ordered.

The pneumatic connections on the rear are closed.

2.5 Optional modules

The optional modules are protected and mechanically fixed by a module cover ((1), see Fig. 2-12)

Note

To install the option modules you must first open the housing. As long as the instrument is open, degree of protection IP65 is not ensured.

Opening the instrument

To open the instrument you must first remove the 4 screws of the housing cover using a cross-head screwdriver.

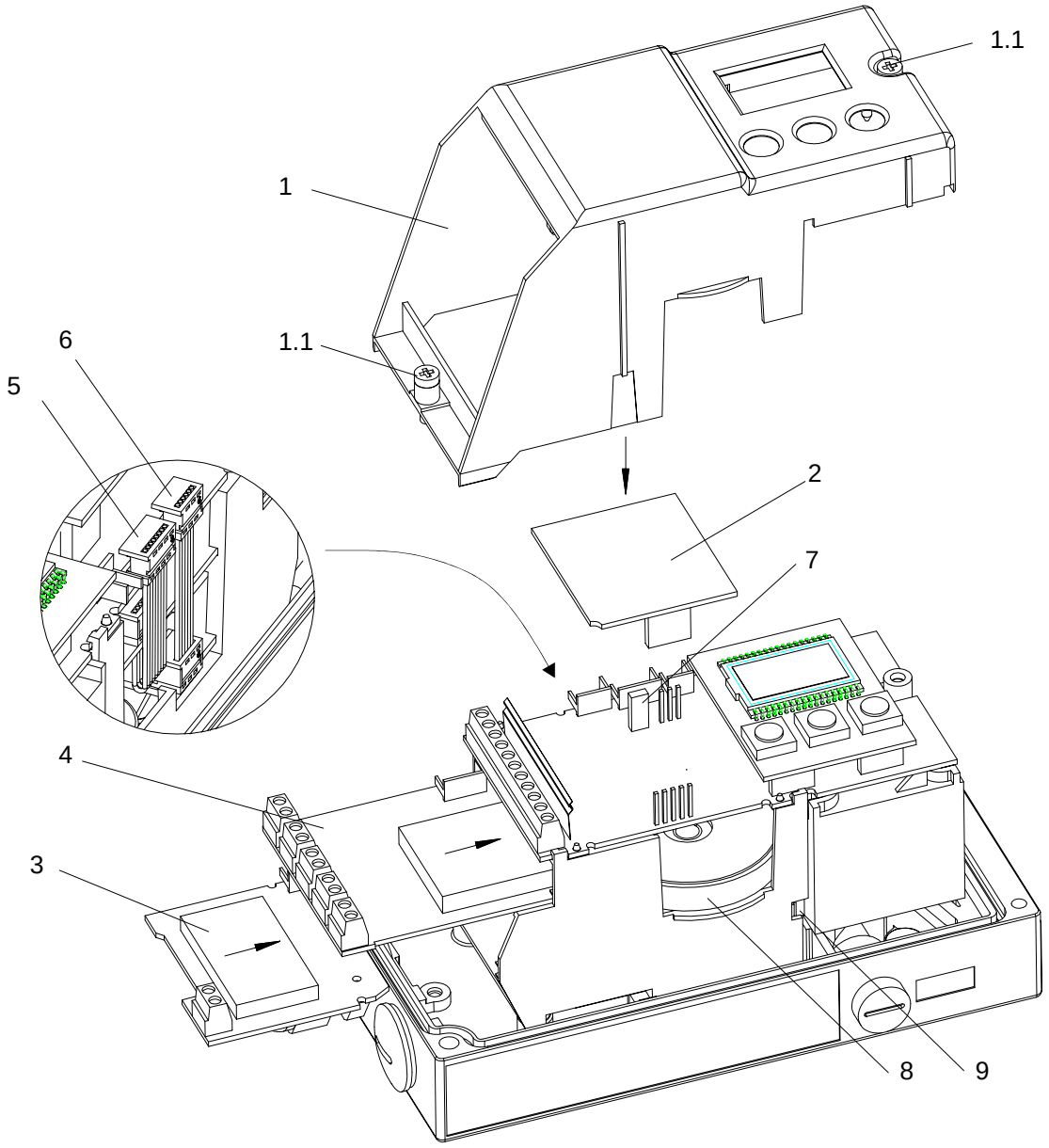
Disconnect the power supply cables.

Remove the module cover (1). To do this you must first remove the 2 screws (9) with a screwdriver.

Note

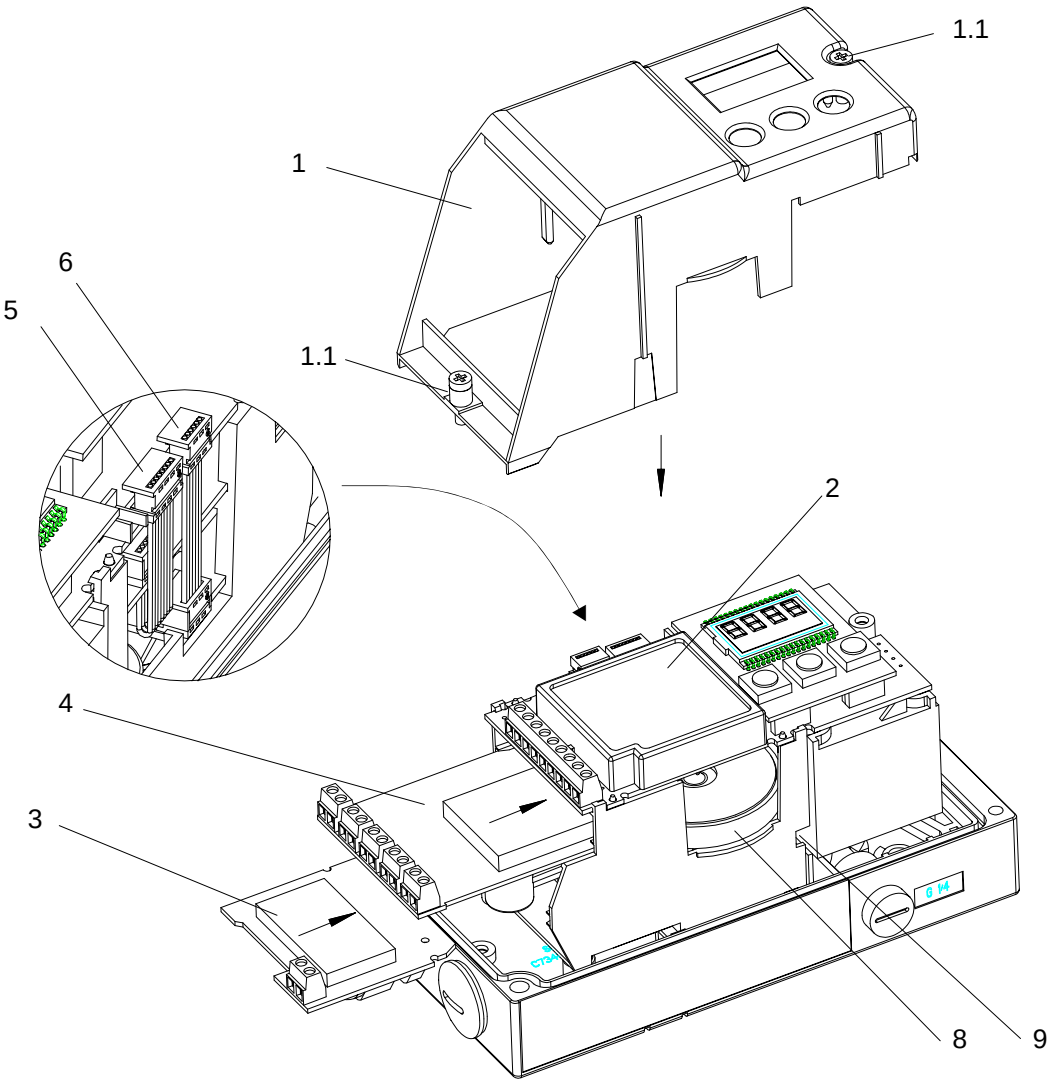
To prevent premature wear to the fixture by the self–tapping screws (1.1) we recommend the following procedure for mounting the module cover (1):

1. Turn the screws in the counter–clockwise direction until you feel them latch tight
2. Now turn both screws carefully in the clockwise direction.



1 Module cover
1.1 Fixing screws
2 HART module
3 J_y module with ribbon cable (6)
4 Alarm module with ribbon cable (5)
7 Plug–in jumper
8 Adjustment wheel for slipping clutch
9 Transmission ratio selector

Fig. 2-12 Installation of options, **devices with PROFIBUS PA**



1 Module cover
1.1 Fixing screws
2 PA unit
3 J_y module with ribbon cable (6)
4 Alarm module with ribbon cable (5)
8 Adjustment wheel for slipping clutch
9 Transmission ratio selector

Fig. 2-13 Installation of options, **devices with PROFIBUS PA**

2.5.1 HART module (devices without PROFIBUS PA only)

Function

The HART interface is used for communication between the instrument and a HART communicator or a PC or notebook.

The HART interface permits the following functions:

- ❑ Remote process operation and monitoring with the option of specified value setting
- ❑ Reading and writing the configuration data
- ❑ Reading the maintenance parameters

With the communication software SIPROM PS2, which can be ordered separately (Order No. see Supply Range Section 7), and the HART modem, which can also be ordered separately, it is also possible to store the data in a file and compare old and new values.

This software was developed on the basis of the GMA user interface and runs under “MS-WINDOWS” in a largely self-explanatory way.

Communication with the HART instrument is indicated in the bottom line of the display by “HRT”.

Note

Operation of the positioner has priority over input via the HART interface.

Communication is broken off if the auxiliary power to the positioner fails.

Installation

The HART module (2) is plugged onto the post connectors on the motherboard to the left of the display (see Fig. 2-12). Before you do this you must first remove the plug-in jumper (7) on the motherboard. When plugging-in the module make sure the connector coding is correct.

The HART communicator or HART modem must be connected to the positioner as shown in Fig. 2-14.

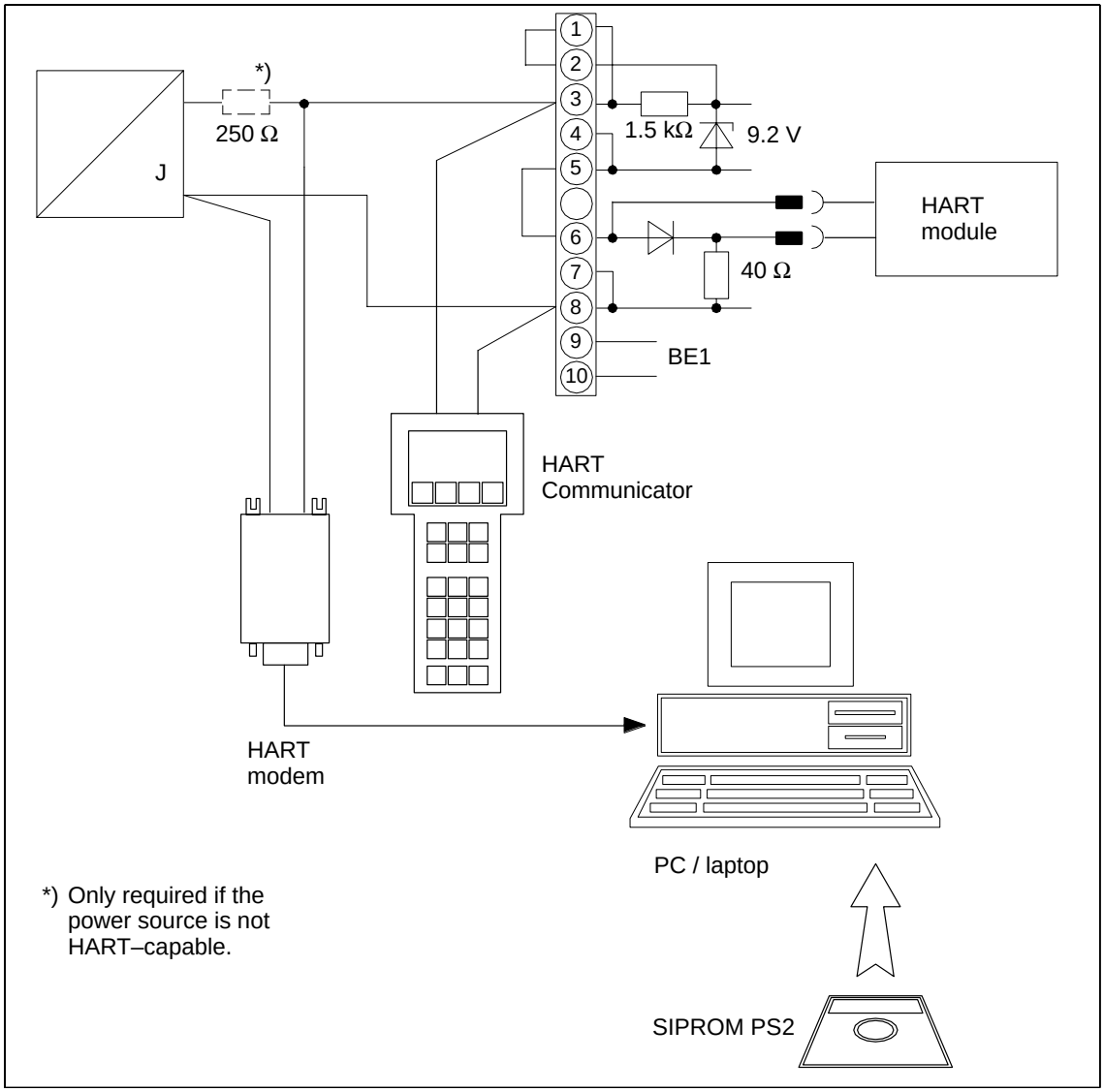


Fig. 2-14 Connection of the HART communicator or HART modem, **devices without PROFIBUS PA**

2.5.2 Alarm module

Function

The alarm module contains

- ❑ 3 binary outputs and
- ❑ 1 binary input

The binary outputs are used to output fault signals and alarms. Configuration is described in Section 4.4 parameters 30 to 35.

An external signal at the binary input (BE2) can cause the actuator either to be blocked or put in its final position, depending on the configuration.

The alarm module is available in two versions

- ❑ Ex–proof for connection to switching amplifiers to DIN 19234
- ❑ Not ex–proof for connection to voltage sources of max. 35 V

The semiconductor outputs of the alarm module output an alarm (signal state low) by switching to high resistance. In the high state (no alarm) they are conductive. Dynamic control makes them self annunciating.

The outputs are isolated from the basic circuit and from each other.

The binary output is double:

- ❑ Isolated for voltage level
- ❑ Non–isolated for floating contacts

These two inputs are implemented as a logical OR operation.

Installation

The alarm module is slotted into the rack under the motherboard as far as it will go and connected to the motherboard via an 8–core ribbon cable (5), which is supplied (see Fig. 2-12).

2.5.3 Jy module

Function

The J_y module is used to output the current position of the actuator as a 2–wire signal 4 to 20 mA.
The current output is isolated from the basic circuit.

Installation

The J_y module is inserted into the slot of the rack as far as it will go and connected to the motherboard using the 6–core ribbon cable (6) supplied (see Fig. 2-12).

2.5.4 Accessories

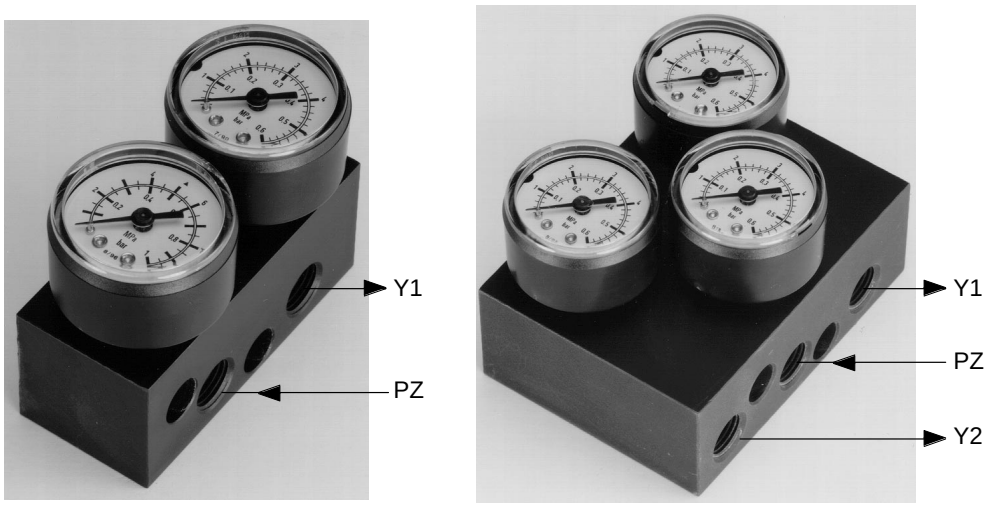


Fig. 2-15 Manometer block (left for single-acting, right for double-acting actuators)

Manometer block

The manometer block for single-acting actuators contains two manometers that are screwed to the lateral pneumatic connection of the positioner using O–rings. The values for input pressure (inlet air PZ) and output pressure (positioning pressure Y1) are displayed.

The manometer block for double-acting actuators contains three manometers that are screwed to the pneumatic connections using O–rings. The values for input pressure (inlet air PZ) and output pressure (positioning pressure Y1 and Y2) are displayed.

Preparing for Operation 3

This Section describes all preparations that are required before the instrument can be opened.

3.1 Instrument identification (type code)

You will find the order number of the instrument on the rating plate (located on the bottom of the instrument) and on the packaging. Compare this number with the order number in Section 7.1.

Note

To simplify matters, there are no special order numbers for positioncontrollers and modules for operation as Ex n in zone 2, they musttherefore be identified with a special rating plate. The procedure isdescribed in Section 8 of the Installation Guide.

Firmware version The current firmware version is displayed when you exit the configuration menu.

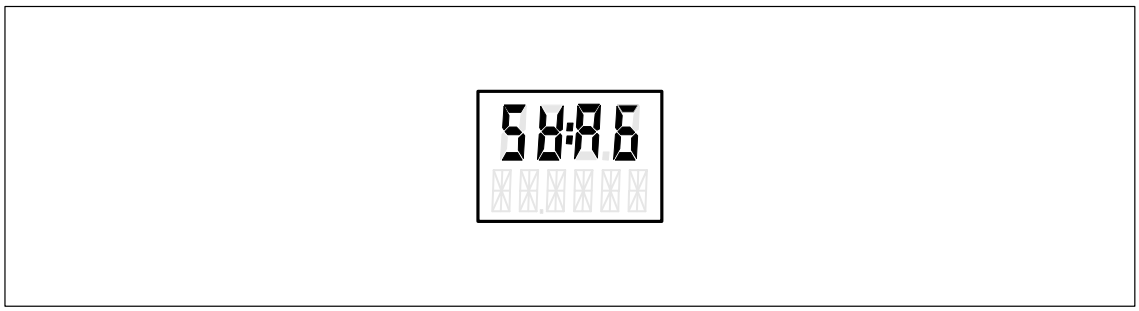


Fig. 3-1 Firmware version (example: A6)

Mounting or any modules that might be required is described in Section 2.5 of this manual.

3.2 Dimension drawings

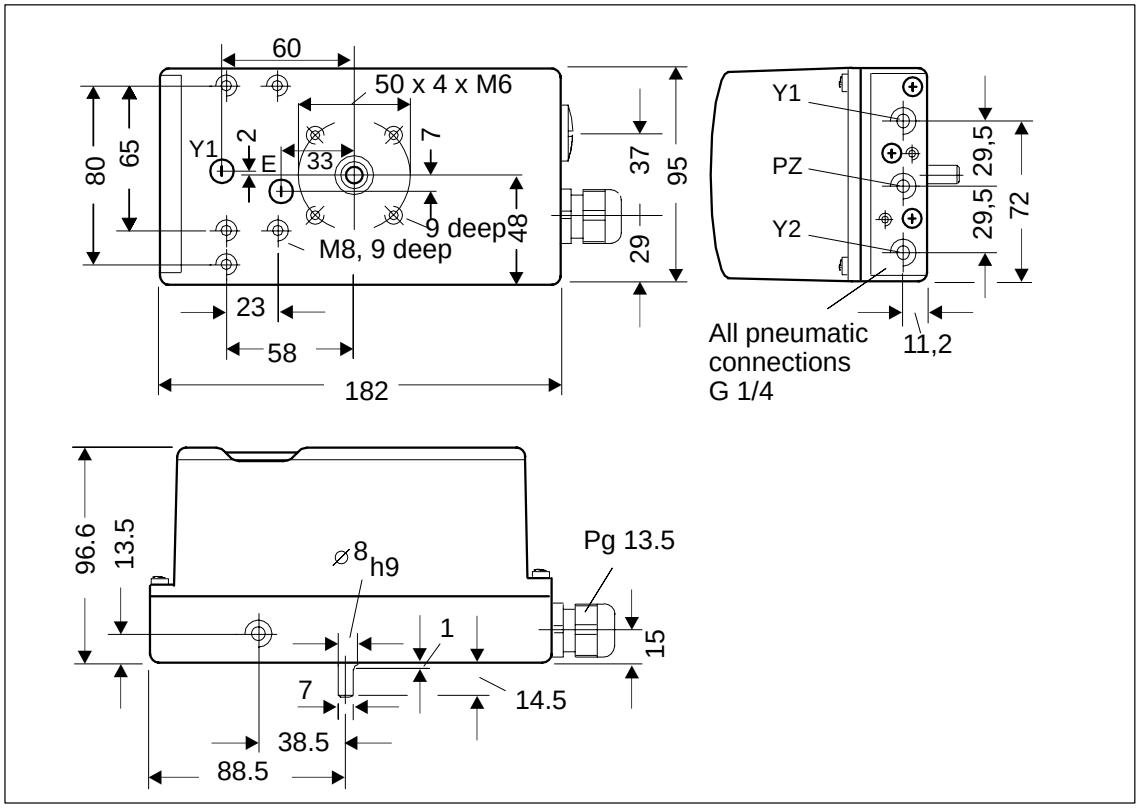


Fig. 3-2 Dimension drawing of plastic housing version 6DR4x00–xx

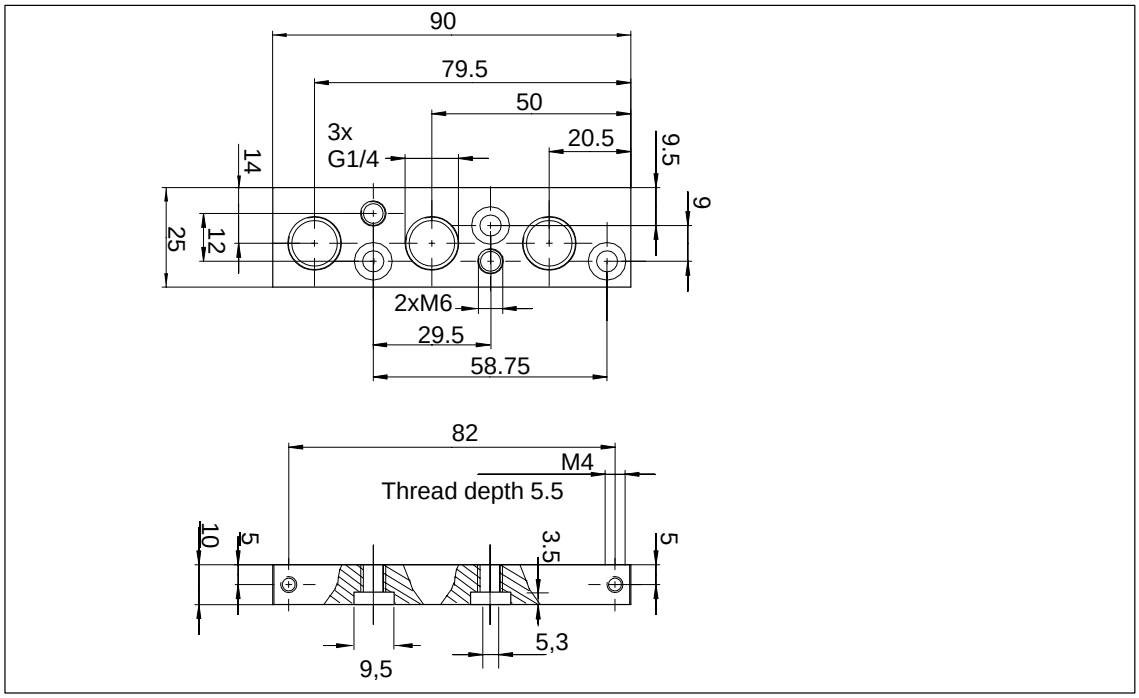


Fig. 3-3 Dimension drawing of terminal block for plastic housing

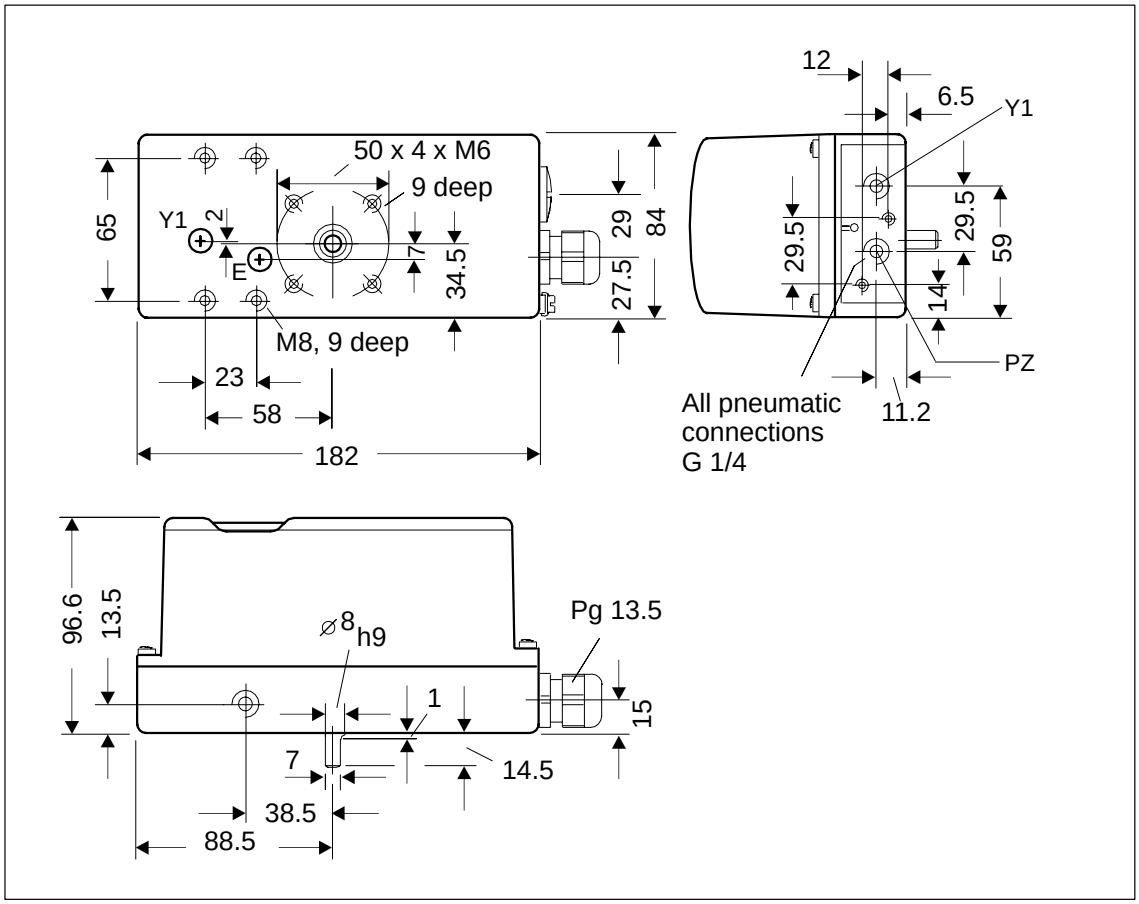


Fig. 3-4 Dimension drawing of metal housing version 6DR4x01–xx

3.3 Assembly

General

Warning

It is essential that you observe the following sequence during assembly to avoid injuries or mechanical damage to the positioner/extension kit:

1.	Mechanical fitting of positioner	this Section
2.	Connection of electric power supply	See Section 3.4
3.	Connection of pneumatic supply	See Section 3.5
4.	Put into operation	See Section 3.6

3.3.1 Mounting kit “Linear Actuator” 6DR4004–8V

The following are included in the *supply of the mounting kit* “Linear actuator IEC 534 (3 to 35 mm)” (see Fig. 3-5 for item Nos.):

Item No.	Quantity	Designation	Remarks
1	1	NAMUR mounting bracket IEC 534	Standardized connection for mounting console with ledge, column or plane surface
2	1	Pick-up bracket	Guides the roll with driver pin and rotates the lever arm
3	2	Clamping assembly	Mounting of pick-up bracket on actuator spindle
4	1	Driver pin	Assembly with roll (5) on lever (6)
5	1	Roll	Assembly with driver pin (4) on lever (6)
6	1	NAMUR lever	For stroke range 3 mm to 35 mm For stroke ranges > 35 mm to 130 mm (special delivery), lever 6DR4004–8L is also required
7	2	U-bolt	Only for actuators with columns
8	4	Hexagon head screw	M8 x 20 DIN 933–A2
9	2	Hexagon head screw	M8 x 16 DIN 933–A2
10	6	Spring washer	A8 – DIN 127–A2
11	6	U-washer	B 5.4 – DIN 125–A2
12	2	U-washer	B 6.4 – DIN 125–A2
13	1	Spring	VD–115E 0.70x11.3x32.7x3.5
14	1	Spring washer	A6 – DIN 137A–A2
15	1	Lock washer	3.2 – DIN 6799–A2
16	3	Spring washer	A6 – DIN 127–A2
17	3	Hexagon head screw	M6 x 25 DIN 933–A2
18	1	Hexagon nut	M6 – DIN 934–A4
19	1	Square nut	M6 – DIN 557–A4
21	4	Hexagon nut	M8 – DIN 934–A4
22	1	Guide washer	6.2x9.9x15x3.5

3.3.2 Assembly Sequence (see Fig. 3-5)

1. Mount clamping assembly (3) with hexagon head screws (17) and spring washers (16) on the actuator spindle.
2. Insert the pick-up bracket (2) into the recesses of the clamping assembly. Set the required length and screw only so tight that the pick-up bracket can still be shifted.
3. Place the roll (5), the spring (13) and guide washer (22) onto the pin (4).
4. Insert pin into lever (6) and assemble with nut (18), spring washer (14) and U-washer (12).
5. The value of the stroke range specified on the actuator is set or, if this is not present as a scale value, the next larger scale value. The center of the pin must be positioned to the scale value. The same value can be set later for 3.YWAY during startup, to display the travel in mm after initialization.
6. Fit the hexagon head screw (17), spring washer (16), U-washer (12) and square nut (19) on the lever.
7. Push the premounted lever onto the positioner axis as far as possible, and secure using the hexagon head screw (17).

8. Fit the mounting bracket (1) with two hexagon head screws (9), spring washer (10) and U-washer (11) on the rear of the positioner.
9. Selection of the row of holes depends on the width of the actuator yoke. The roll (5) should engage in the pick-up bracket (2) as close to the spindle as possible, but must not touch the clamping assembly.
10. Hold the positioner with the mounting bracket on the actuator such that the pin (4) is guided within the pick-up bracket (2).
11. Tighten the pick-up bracket.
12. Position the mounting parts according to the type of actuator.
    – Actuator with ledge: hexagon head screw (8), U-washer (11) and spring washer (10).
    – Actuator with plane surface: four hexagon head screws (8), U-washer (11) and spring washer (10).
    – Actuator with columns: two U-bolts (7), four hexagon nuts (21) with U-washer (11) and spring washer (10).
13. Secure positioner onto the yoke using the previously positioned mounting parts.

Note

Adjust the height of the positioner such that the horizontal lever position is reached as close as possible to the center of the stroke. You can use the stroke scale of the actuator for orientation. It must always be guaranteed that the horizontal lever position is passed through within the stroke range.

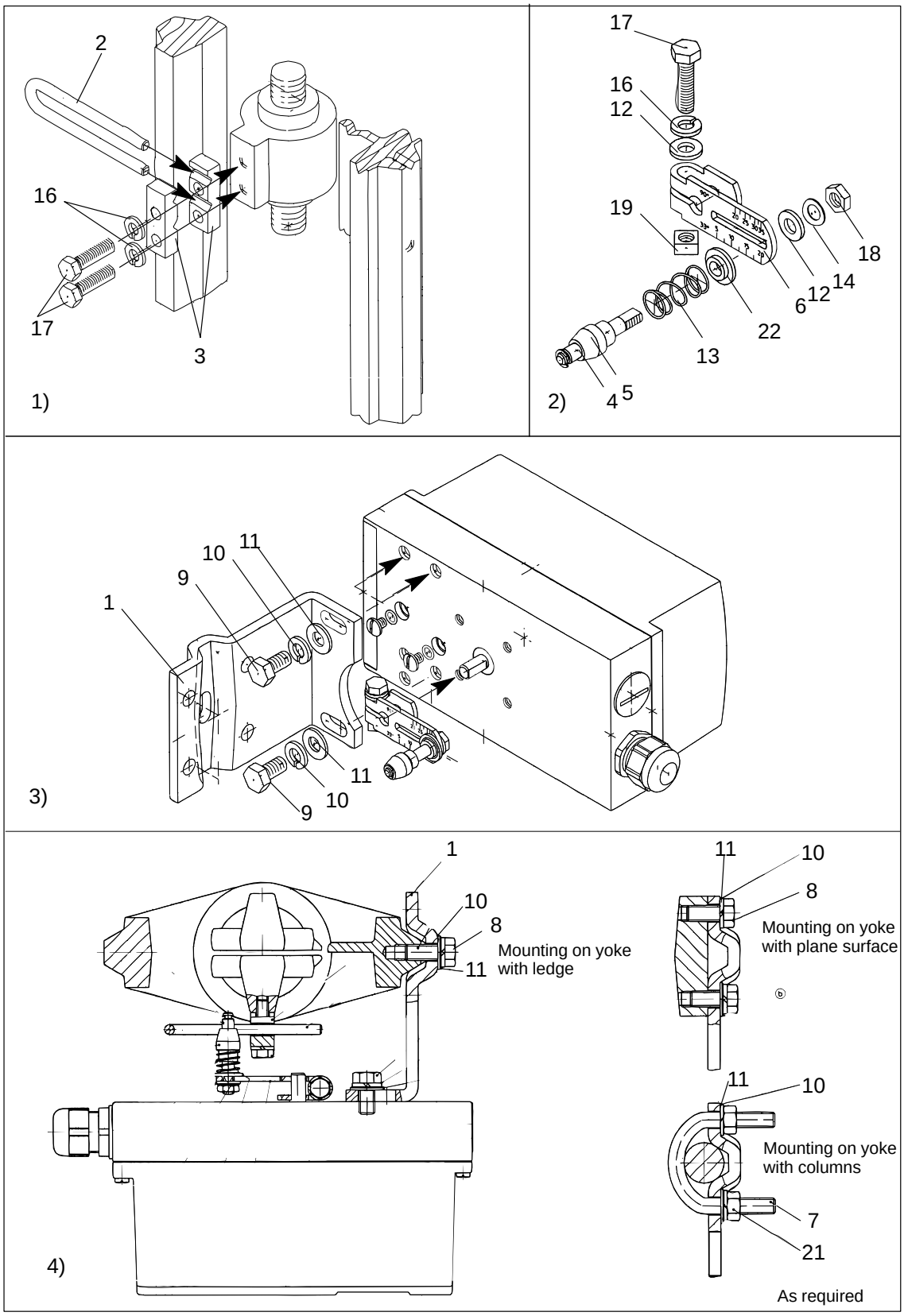


Fig. 3-5 Assembly sequence (linear actuator)

3.3.3 Mounting kit “Rotary Actuator” 6DR4004–8D

The following are included in the *supply of the mounting kit* “Rotary actuator” (see Fig. 3-6 for item Nos.):

Item No.	Quantity	Designation	Remarks
2	1	Coupling wheel	Mounting on position feedback shaft of SIPART PS2
3	1	Driver	Mounting on end of actuator shaft
4	1	Multiple scale	Indication of actuator position, comprising 4.1 and 4.2
4.1	8	Scale	Different divisions
4.2	1	Pointer	Reference point for scale (adhesive label)
14	4	Hexagon head screw	DIN 933 – M6 x 12
15	4	Lock washer	S6
16	1	Fillister head screw	DIN 84 – M6 x 12
17	1	Washer	DIN 125 – 6.4
18	1	Hexagon socket screw	Premounted with coupling wheel
19	1	Allen key	For item 18

3.3.4 Assembly Sequence (see Fig. 3-6)

1. Place VDI/VDE 3845 mounting console ((9), actuator-specific, scope of supply of actuator manufacturer) onto rear of positioner and secure using hexagon head screws (14) and lock washers (15).
2. Adhere pointer (4.2) onto mounting console in the center of the centering hole.
3. Push coupling wheel (2) onto positioner axis as far as possible, pull back by about 1 mm, and tighten hexagon socket screw (18) using the supplied Allen key.
4. Place the driver (3) onto the end of the actuator shaft and secure using Fillister head screw (16) and washer (17).
5. Carefully place positioner with mounting console onto the actuator such that the pin of the coupling wheel engages in the driver.
6. Align the positioner/mounting console assembly in the center of the actuator and screw tight.
   (Screws not included in delivery; they are part of the actuator mounting console!)
7. Following startup as described in Section KEIN MERKER: Drive actuator to end position and adhere scale (4.1) onto the coupling wheel (2) according to the direction of rotation or the turning range.
   The scale is self-adhesive!

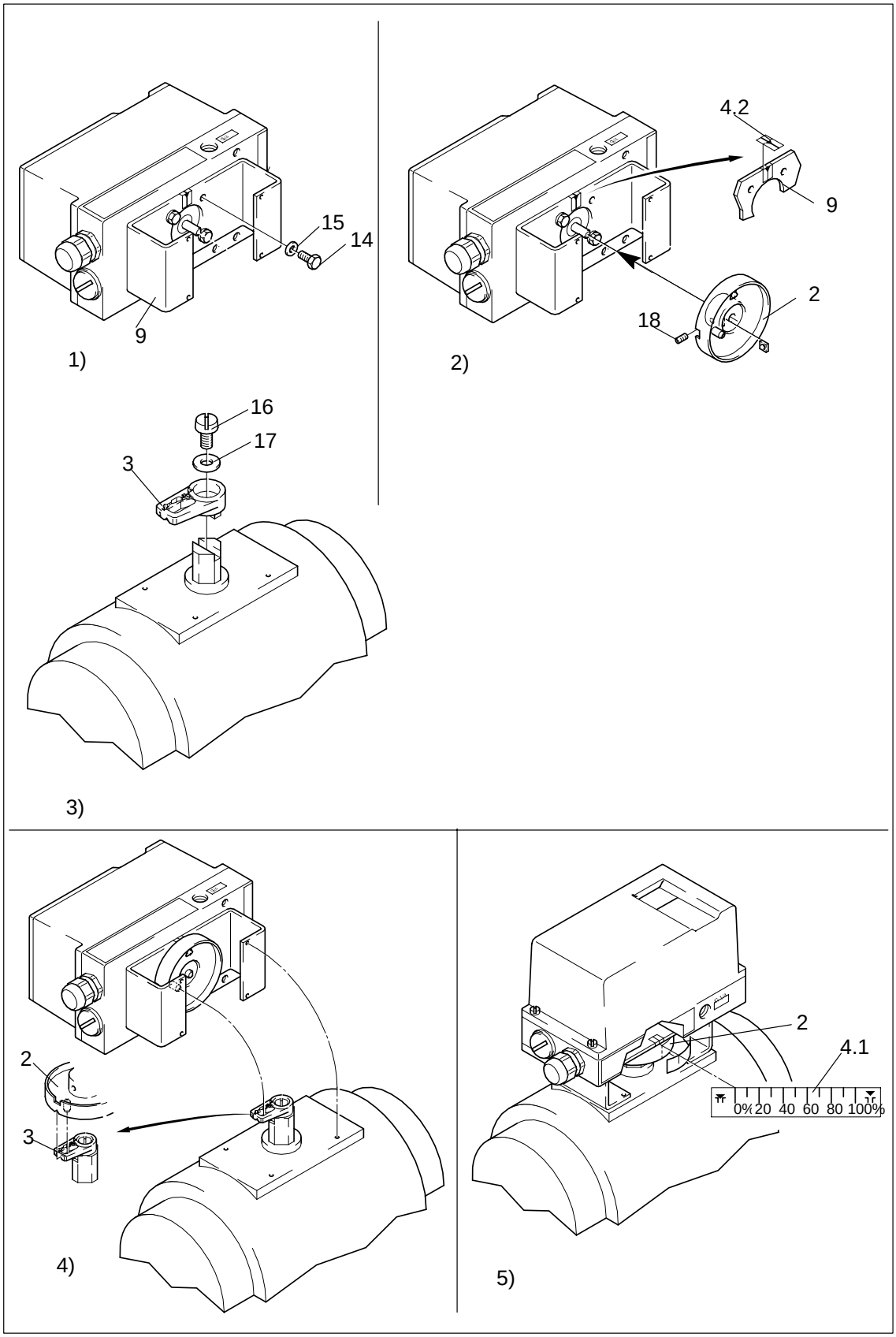
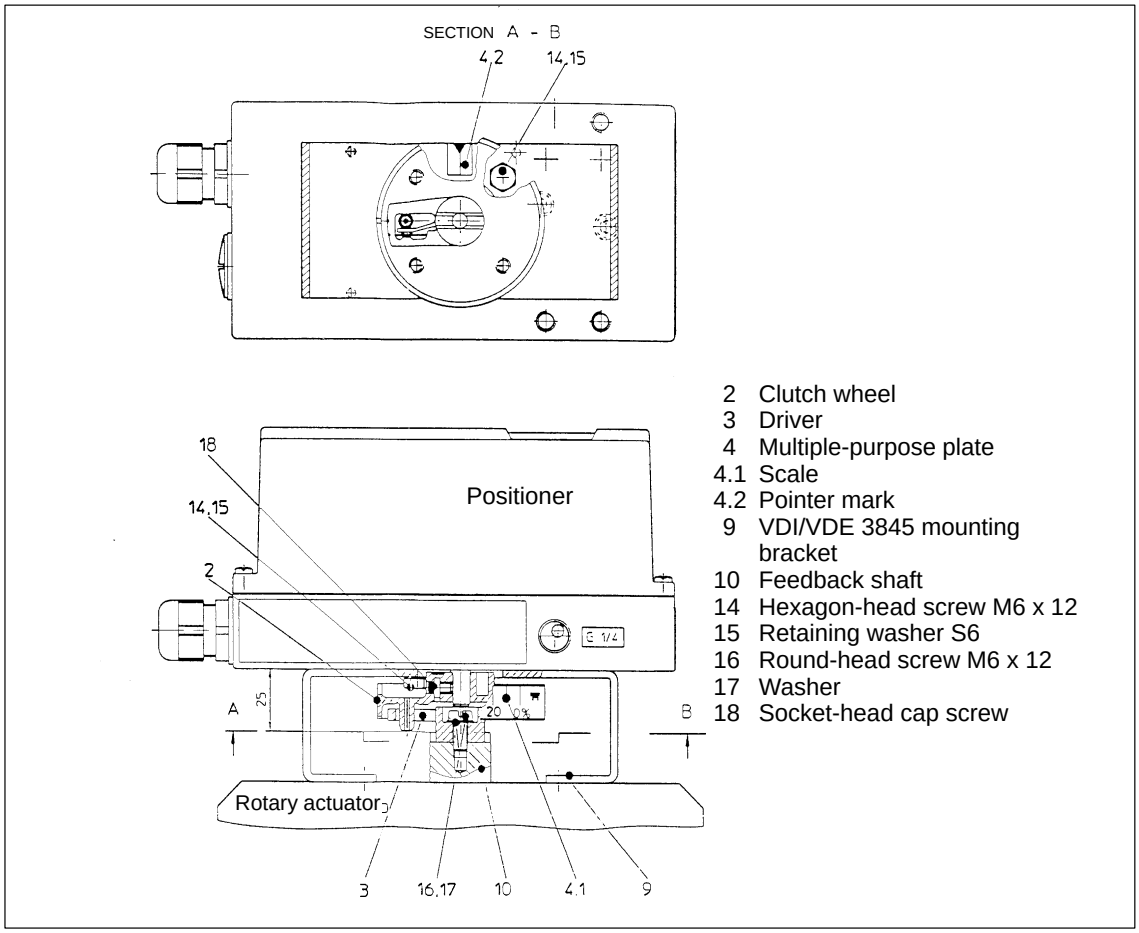


Fig. 3-6 Assembly sequence (rotary actuator)



2 Clutch wheel
3 Driver
4 Multiple-purpose plate
4.1 Scale
4.2 Pointer mark
9 VDI/VDE 3845 mounting bracket
10 Feedback shaft
14 Hexagon-head screw M6 x 12
15 Retaining washer S6
16 Round-head screw M6 x 12
17 Washer
18 Socket-head cap screw

Fig. 3-7 Mounted positioner for rotary actuators

3.4 Electrical connection

Note

If you require optional modules, you must install them before making any electrical connections (see Section 2.5).

3.4.1 Connections variations not ex-proof (devices without PROFIBUS PA)

The electrical connections of the instrument can be made in the following ways:

2-wire connection

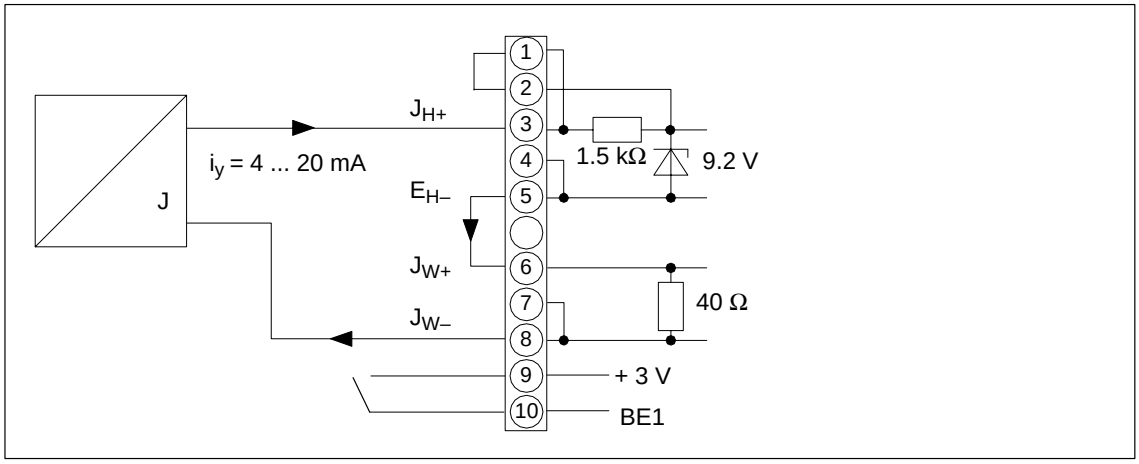


Fig. 3-8 2-wire connection of the 6DR400x–1N/–2N basic instrument (auxiliary power from the signal current), **devices without PROFIBUS PA**

Note

The current must be $i_y \geq 3.6$ mA to maintain the auxiliary power.

3/4-wire connection

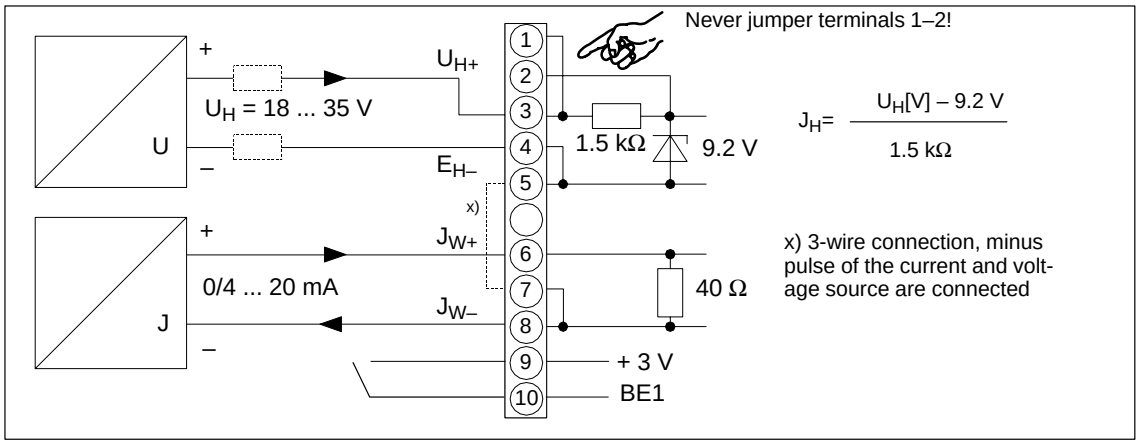


Fig. 3-9 3/4-wire connection of the 6DR400x–1N/–2N basic instrument (auxiliary power fed-in separately) , **devices without PROFIBUS PA**

Note

Before operation with a 3/4-wire connection you must remove the jumper between terminals 1 and 2.

Split range

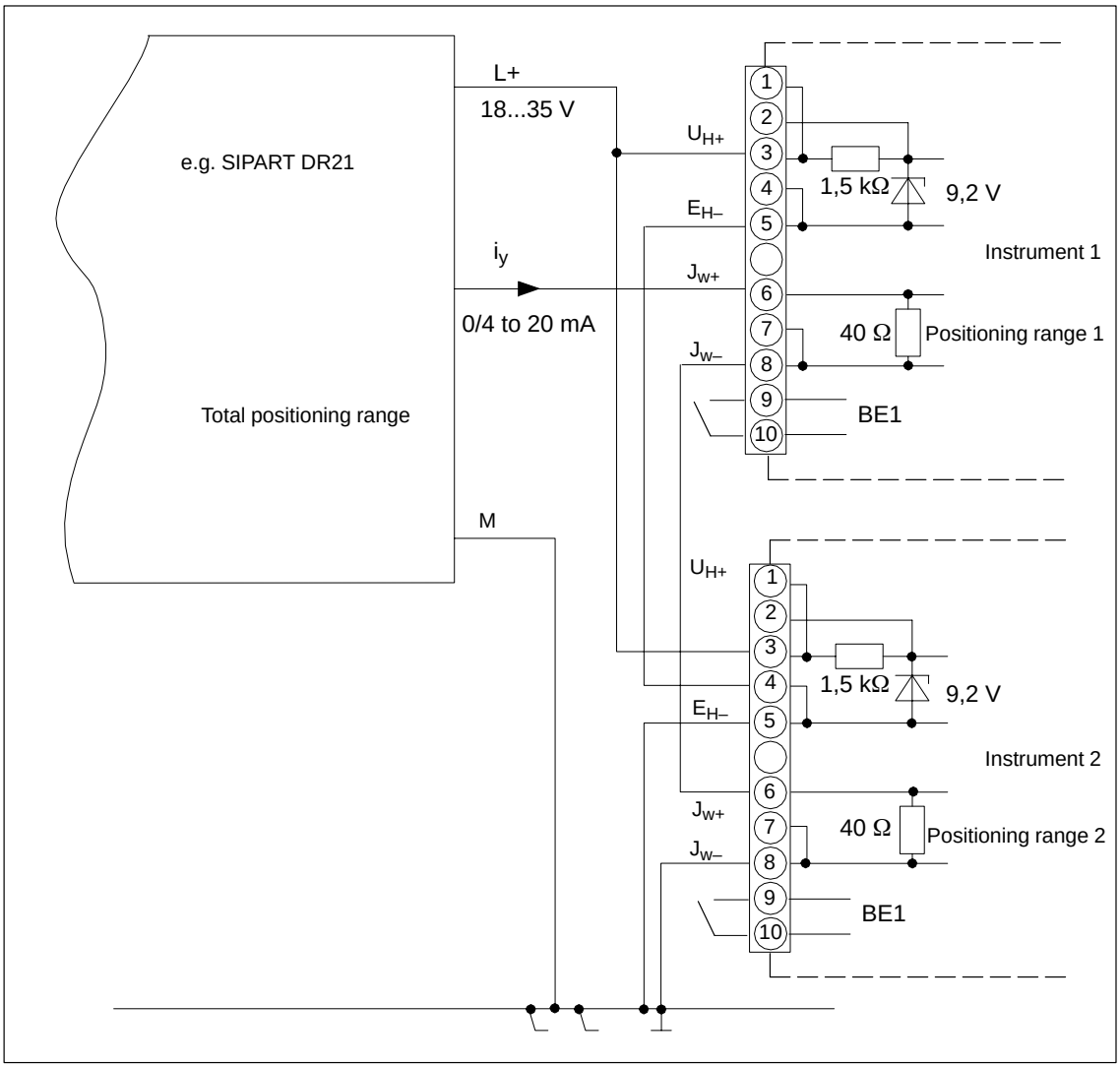


Fig. 3-10 Series connection of 2 positioners, e.g. split range (separate power supplies) , **devices without PROFIBUS PA**

3.4.2 Connection variants not protected from explosion hazard (devices with PROFIBUS PA)

Warning

The applicable regulations for electrical installation must be observed, in particular, in zones subject to explosion hazard

- ❑ the regulation about electrical equipment in zones subject to explosion hazard. The erection guidelines of the country in question must be observed.
- ❑ the regulation about erection of electrical equipment in zones subject to explosion hazard (DIN VDE 0165)
- ❑ the certificate of conformity
- ❑ It is necessary to check whether the auxiliary power supplied by the coupler matches the value specified on the rating plate of the SIPART PS2 PA and in the Ex certification.

If the intrinsically safe version is operated with an operating voltage of more than 24 V by mistake, the device must no longer be used for intrinsically safe applications.

The positioner is powered via the PROFIBUS PA by the DP/PA coupler or DP/PA link. The devices draw their electrical auxiliary power from a power supply unit with SELV (**s**afety **e**xtra–**l**ow **v**oltage).

Note

The following generally applies to laying the bus cable:

- ❑ Lay cables separated from cables carrying > 60 V
- ❑ Avoid the vicinity of large electrical equipment
- ❑ Only use recommended cable types
- ❑ The specifications only apply to properly installed equipment

Only use a shielded, two–conductor cable as the bus cable.
The recommended cable types are:
Ex i applications: Siemens 6XV1 830–5AH01 (color blue)
Non Ex applications: Siemens 6XV1 830–5BH10 (color black)
The mechanical and electrical data of these two cable types are identical.

Assembling the bus cable

1. Strip back the bus cable insulation as shown in Fig.3-11.
2. Open the housing of the positioner by loosening the four screws of the cover.

3. Insert the prepared bus cable through the cable gland.
4. Fix the shield to the housing with the clip and the two screws.
5. Screw the cable gland tight.
6. Connect the red and green conductors as shown in Fig. 3-12 to terminals 3 and 7 of the basic PCB. (The polarity is irrelevant.)

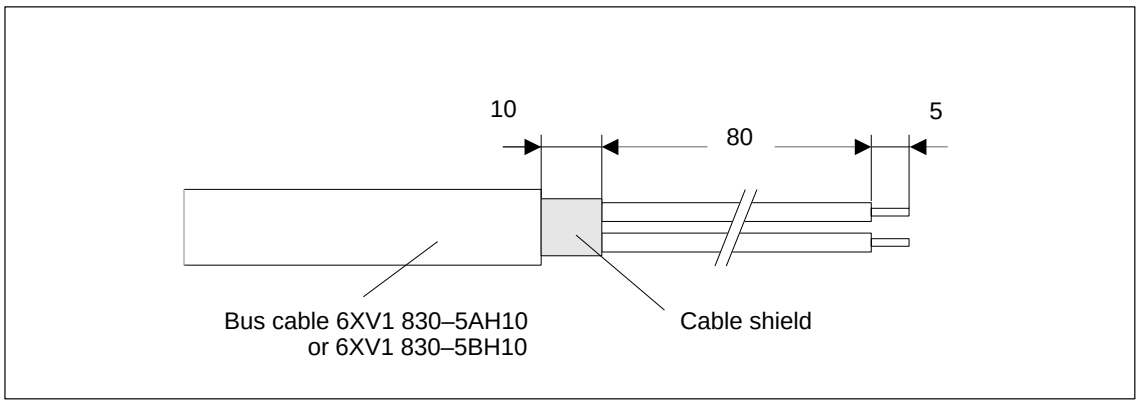


Fig. 3-11 Preparation of the bus cable, **devices with PROFIBUS PA**

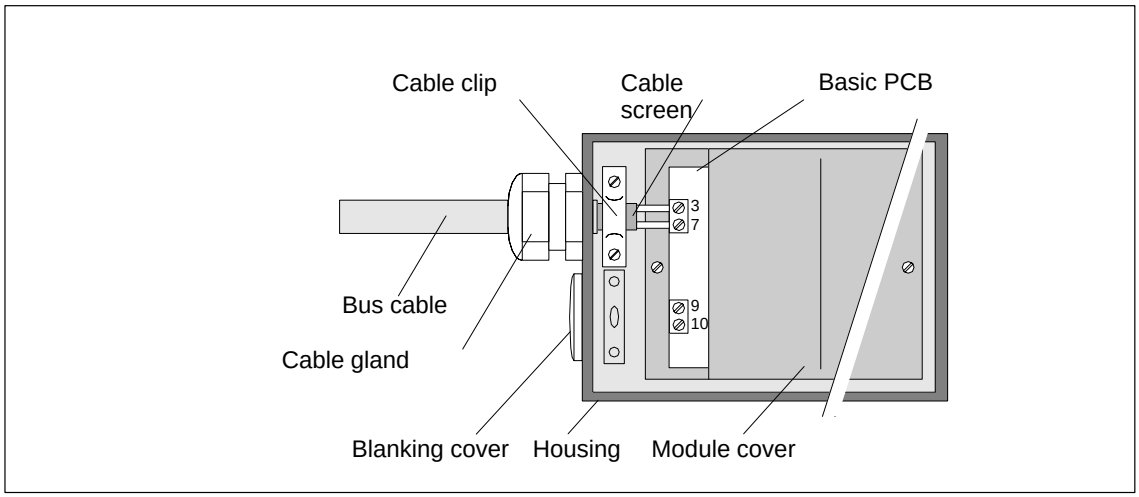


Fig. 3-12 Connection of the bus cable, **devices with PROFIBUS PA**

For fault–free communication the bus must be fitted with terminating resistors at both ends. At the end near to the control system, termination is ensured by the bus terminator already in the coupler or link. At the remote end of the bus, termination must be ensured by an additional terminator.

Warning

In intrinsically safe circuits, only approved bus terminators, splitters, cables etc. must be used.

The specified noise immunity and noise emission are only ensured if the bus shield is fully effective.

This includes connecting the shields with the metallic connections of the **SIPART PS2 with PROFIBUS PA**, but also routing the shields to the terminal boxes, distributors, DP/PA coupler or DP/PA link.

Suitable equipotential bonding must be provided to avoid potential differences between the individual sections of the plant and therefore the associated hazards or function impairment. You will find Information about dimensioning and type in DIN VDE 0100 Part 410 and Part 540.

Note

The shield must not be used for equipotential bonding.

When installing (electrical equipment) in zones subject to explosion hazard, DIN VDE 0165 dated 2/91 must be observed. For more information about PROFIBUS installation see the PNO–Leitfaden /2/

3.4.3 Connection variations options not ex-proof

Current output

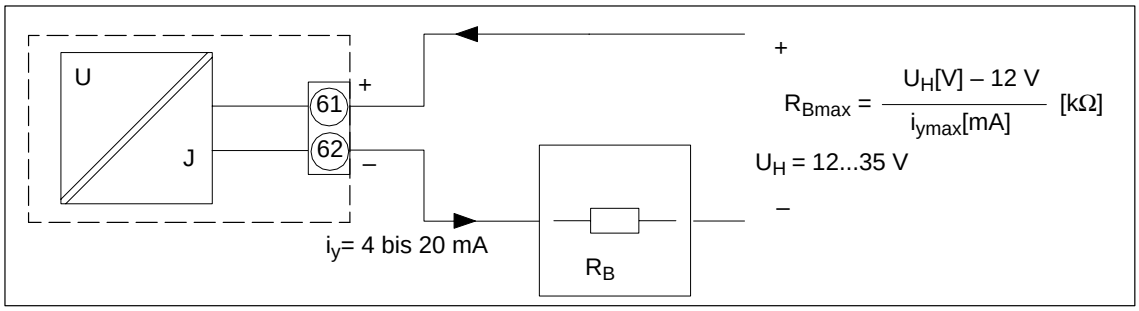


Fig. 3-13 J_y–module 6DR4004–8J

Binary outputs

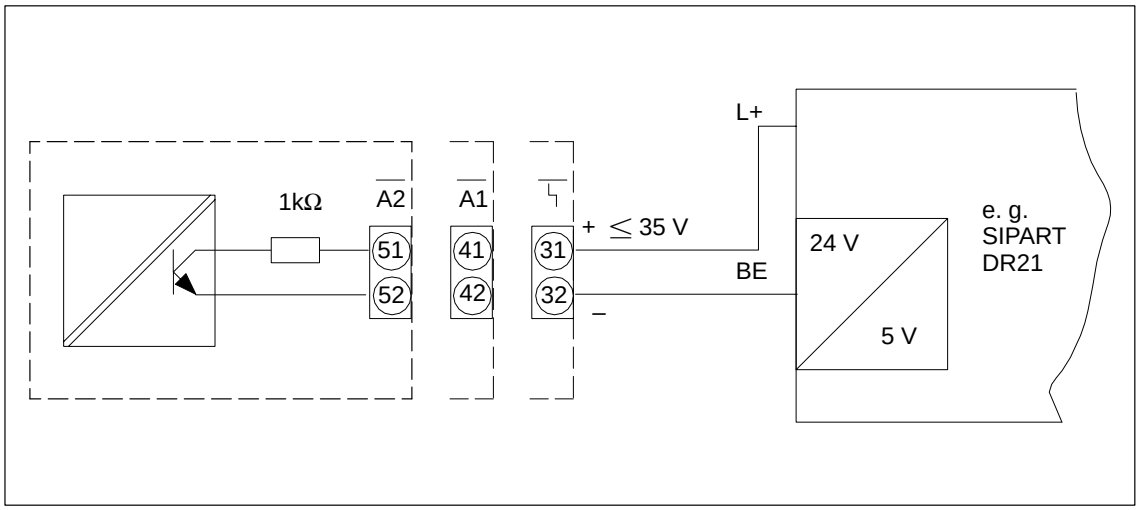


Fig. 3-14 Alarm module 6DR4004–8A

Binary input BE2

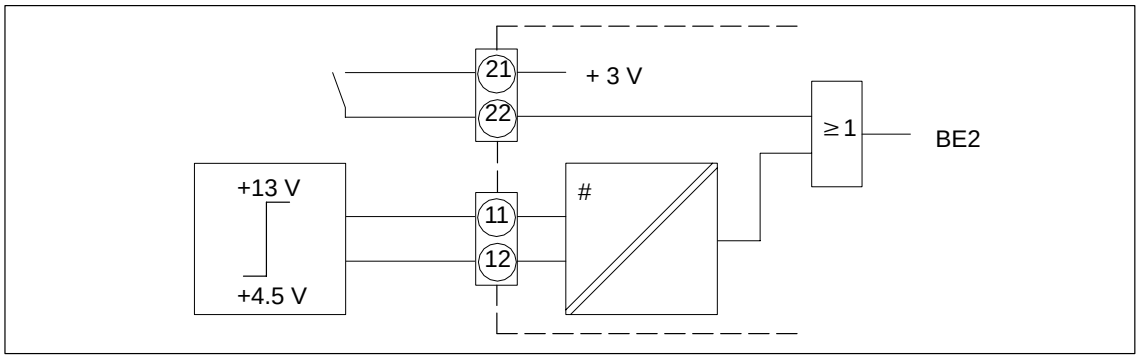


Fig. 3-15 Alarm module 6DR4004–8A

3.4.4 Connection variations ex-proof (devices with PROFIBUS PA)

Note

Only certified, intrinsically safe electric circuits must be connected as auxiliary power, control and signal current circuits.

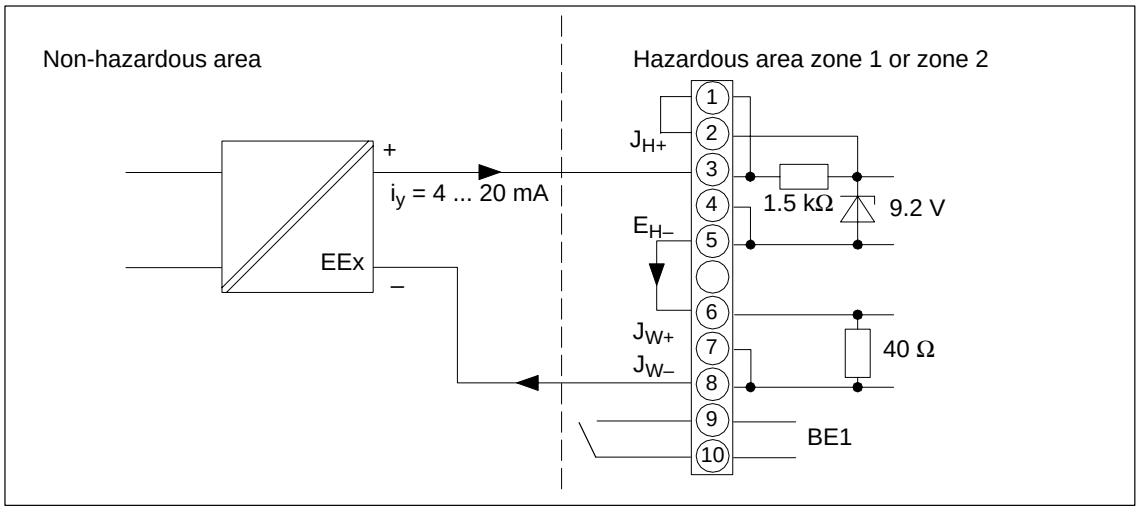


Fig. 3-16 2-wire connection basic instrument 6DR400x–1E/–2E (auxiliary power from the signal current)

Note

The current must be $i_y \geq 3.6$ mA to maintain the auxiliary power.

3.4.5 Connection variations ex-proof (devices with PROFIBUS PA)

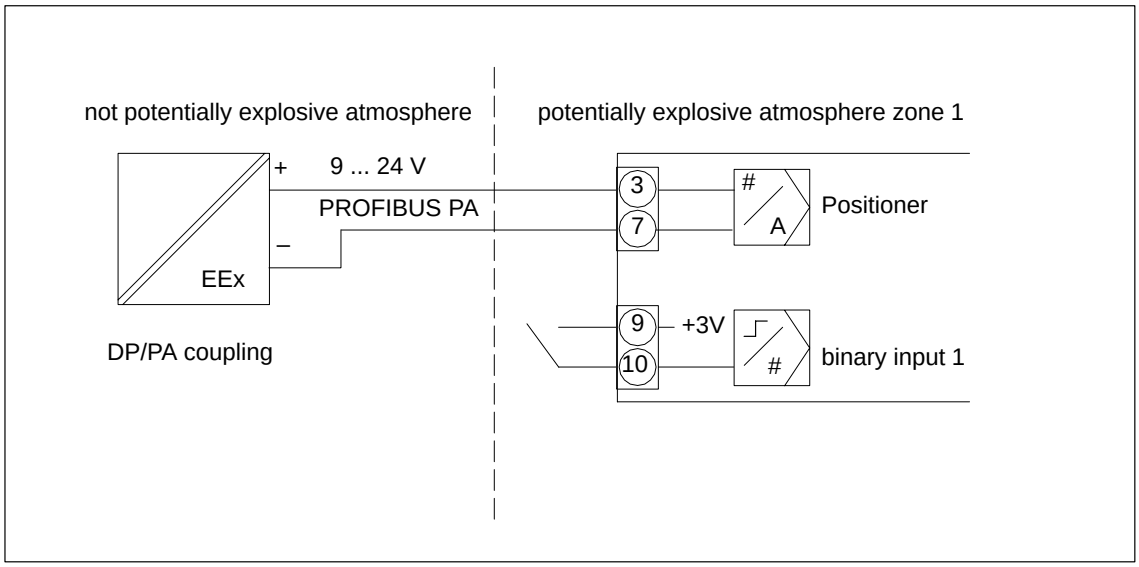


Fig. 3-17 Electric connection of **basic device with PROFIBUS PA** (6DR410x–xE)

3.4.6 Connection variations options ex-proof

Connection output

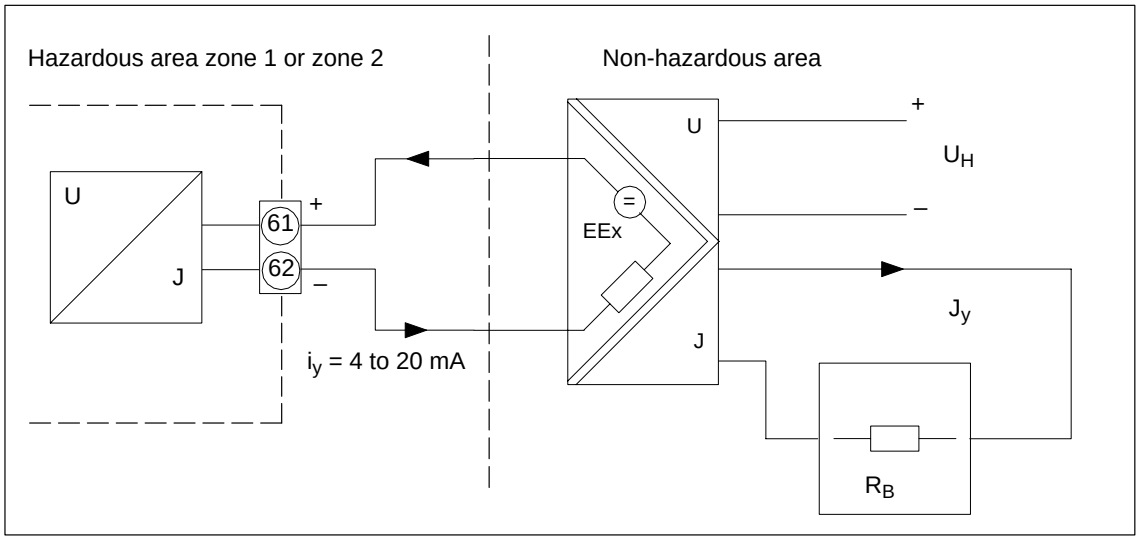


Fig. 3-18 J_y module 6DR4004–6J

Binary outputs

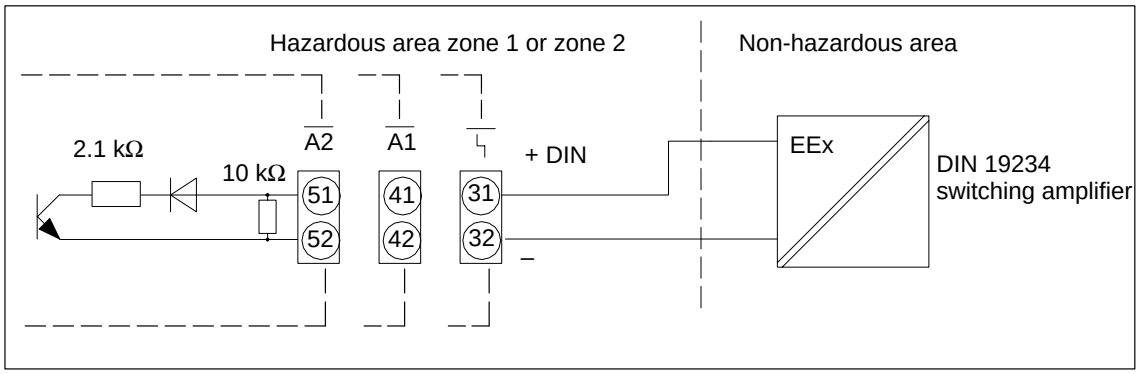


Fig. 3-19 Binary outputs alarm module 6DR4004–6A

Binary input BE2

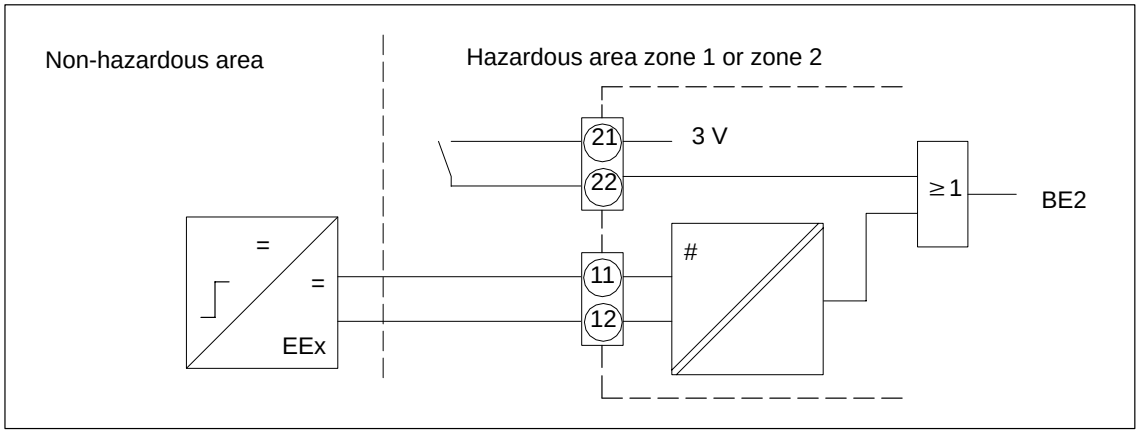


Fig. 3-20 Alarm module 6DR4004–6A

3.5 Pneumatic connection

Warning

For safety reasons the pneumatic power must only be input after installation when the positioner is switched to operating level P manual mode with the electrical signal applied (state of supply, see Fig. 4-2).

Note

Check the air quality! Industrial air, free of oil, solid content < 30 µm, dew point under pressure 20 K below the lowest ambient temperature.

- ❑ If necessary connect the manometer block for inlet air pressure and positioning pressure.
- ❑ Connection using inside thread G 1/4 DIN 45141:

  P_Z inlet air 1.4 to 7 bar
  Y1 positioning pressure 1 for single and double-acting actuators
  Y2 positioning pressure 2 for double-acting actuators
  E air outlet (remove silencer if necessary)

- ❑ Safety position in the event of electrical power failure

single acting:	Y1	vented
double acting:	Y1	max. positioning pressure (inlet air pressure)
	Y2	vented

- ❑ Connect positioning pressures Y1 and Y2 (only for double-acting actuators) in accordance with the required safety position.
- ❑ Connect the inlet air to P_Z.

3.6 Commissioning

After you have mounted the positioner on the actuator and connected the power supply and established the pneumatic connection you must initialize the positioner.

Before it is initialized the positioner is in P manual mode (that can also be set with 36.PRST) – “NO INIT” blinks.

Note

To prepare for initialization please perform the steps described in the Assembly and Installation Instructions Section 7.

Devices with PROFIBUS PA

Before operation make sure that the device addresses of two or more field devices are set on the bus. So that the addresses are unique, each address must only be assigned once. In principle, an address range from 1 to 125 is possible. In its as–supplied state, address 126 is set. The lower addresses are usually assigned to the masters in PROFIBUS systems. We therefore recommend starting address assignment for the devices with 30.

The address setting is made either on the device using operating keys or via the bus with the SIMATIC PDM software. In the latter case, a new device is always connected to the bus and the new address set via software. After that, the next device is connected to the bus and the same procedure followed.

We recommend that you write the set address on the device with a permanent felt–tip pen.

Initialization Initialization is largely automatic.

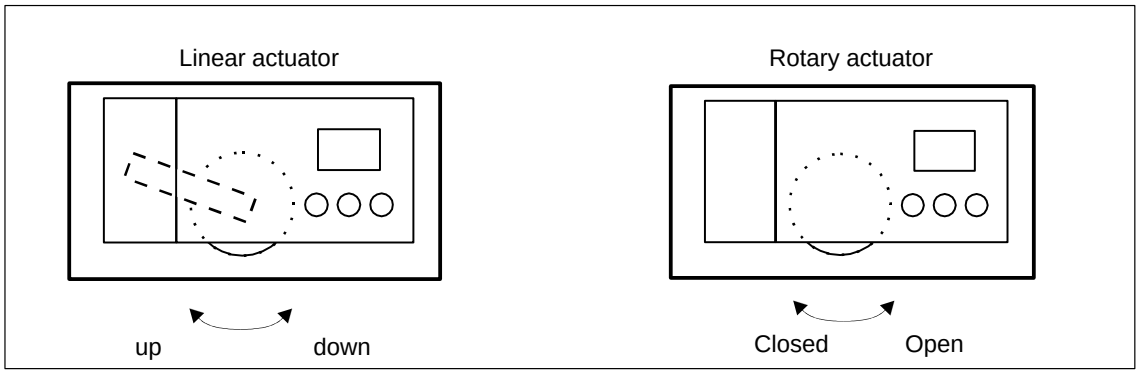


Fig. 3-21 Actuation direction of actuators

The initialization procedure is shown in the following flowchart (Figs. 3-22 to 3-24).

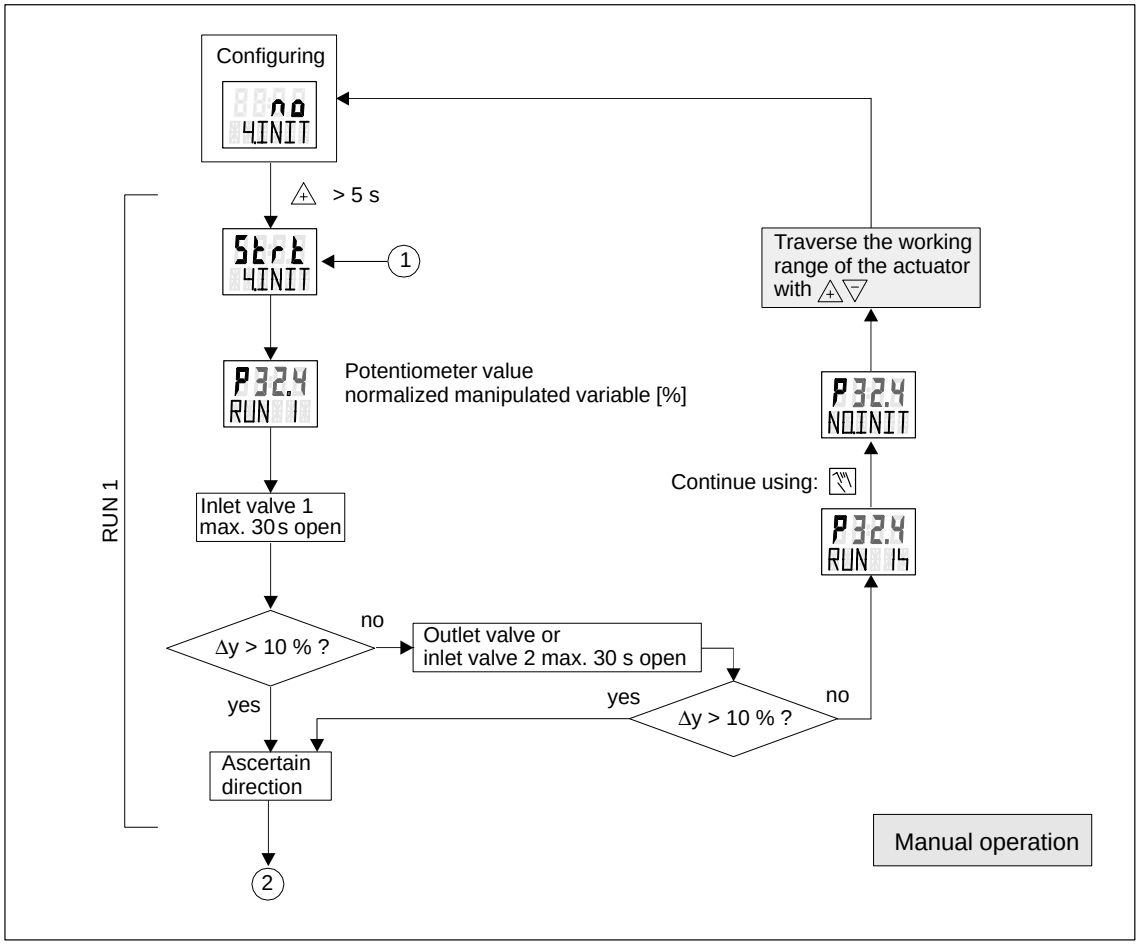


Fig. 3-22 Initialization, part 1

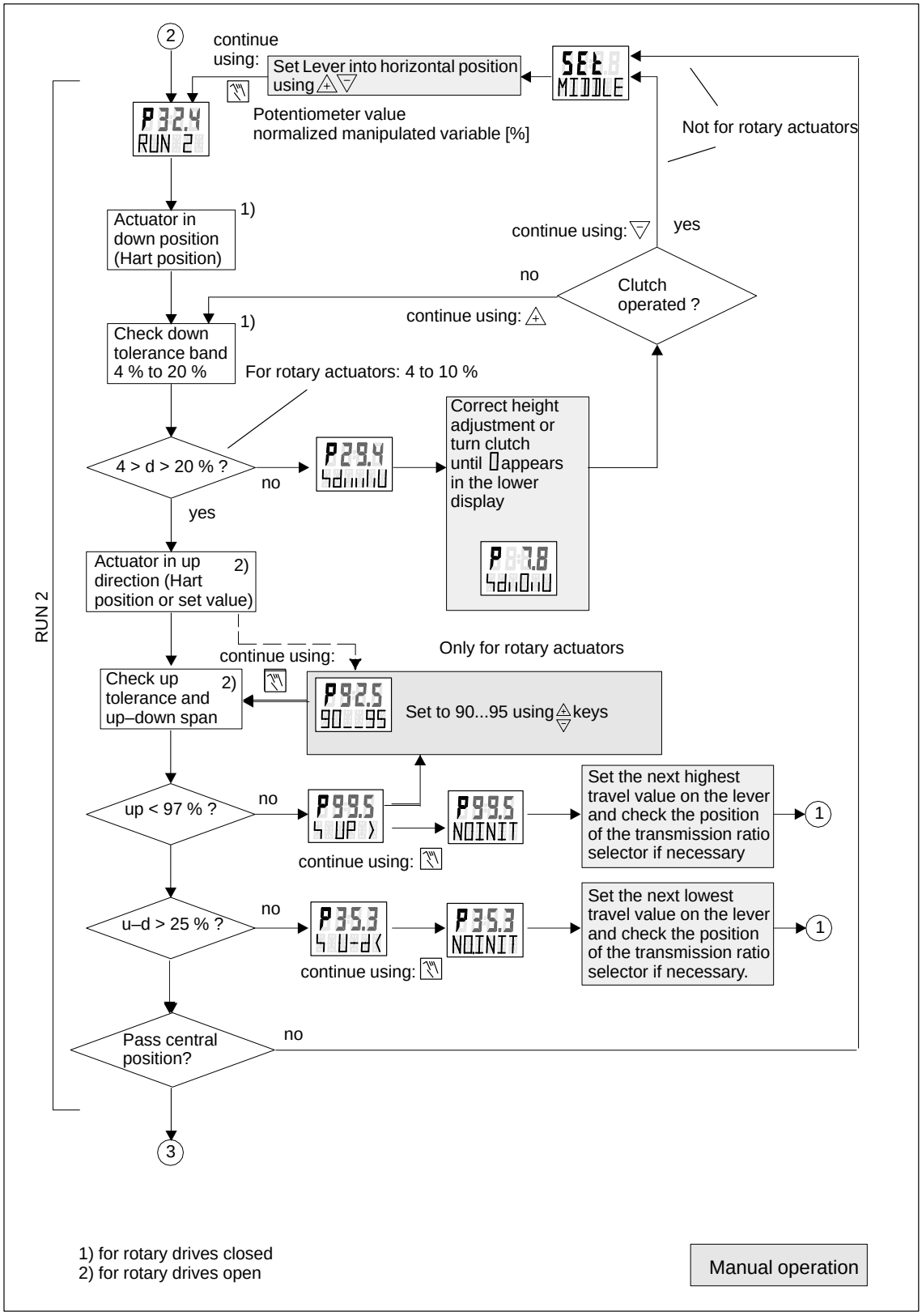


Fig. 3-23 Initialization, part 2

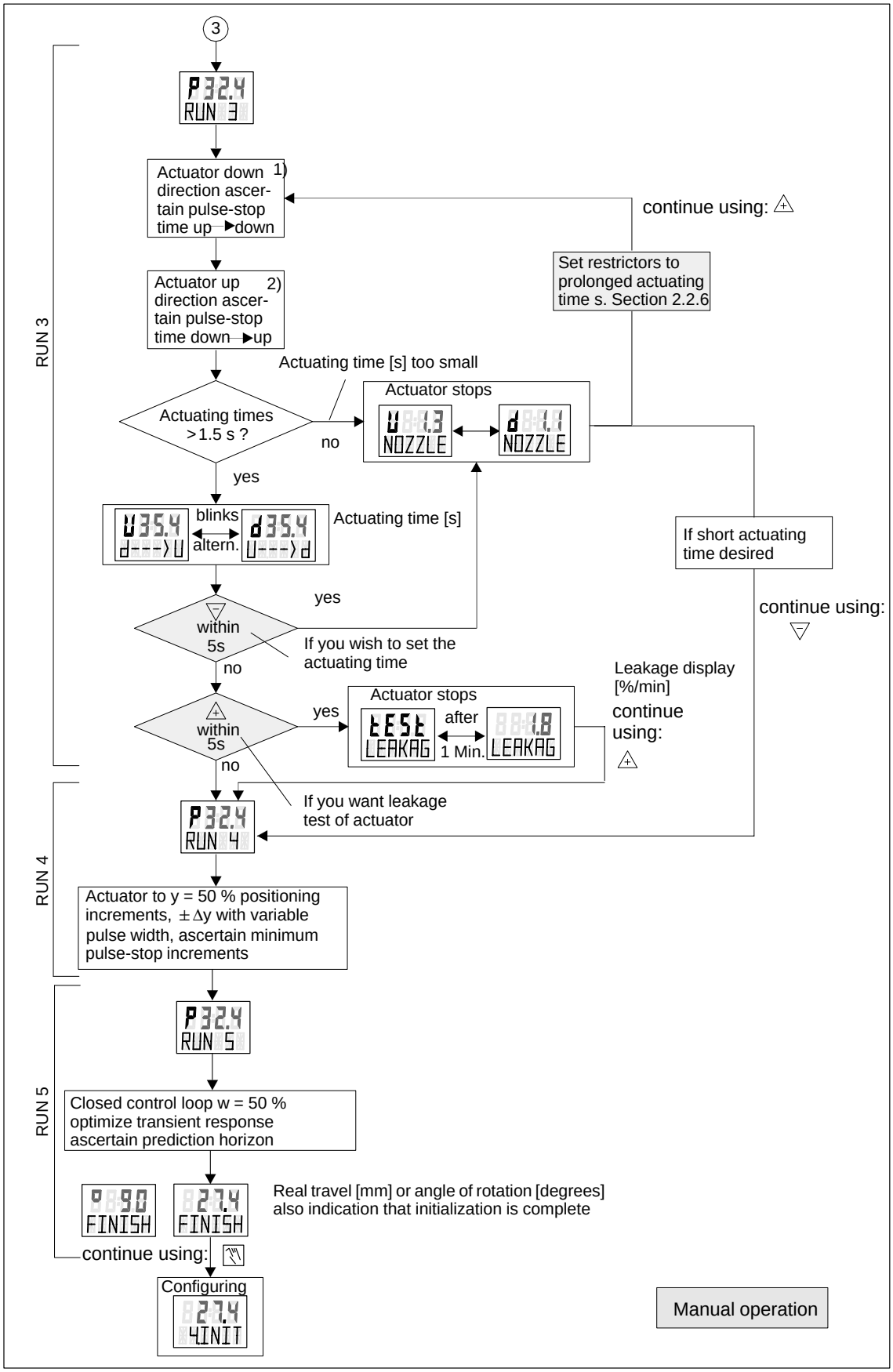


Fig. 3-24 Initialization, part 3

Operation 4

This Section describes operation of the positioner.

4.1 Display

The LC display has two lines of text. Each line is segmented differently; the elements of the upper line consist of 7 and those of the lower line of 14 segments. The display depends on the mode selected (see Section 4.3).

Note

If the positioner is operated in zones with temperatures below –10 °C, the liquid crystal display becomes slow and the refresh rate of the display slows down considerably.

4.2 Control pushbuttons

The instrument is operated using 3 pushbuttons (Fig. 4-1), whose function depends on the mode selected.

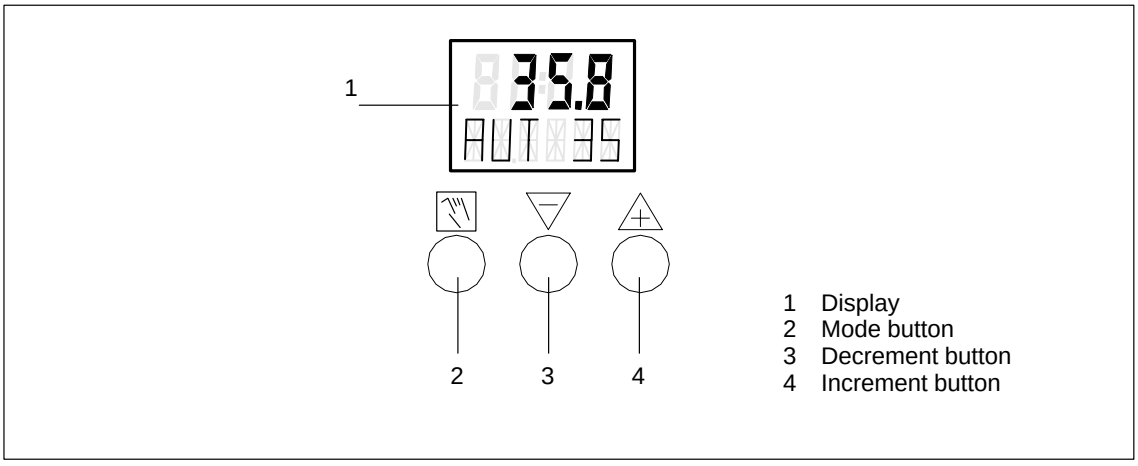


Fig. 4-1 Display and control buttons of the positioner

4.3 Modes

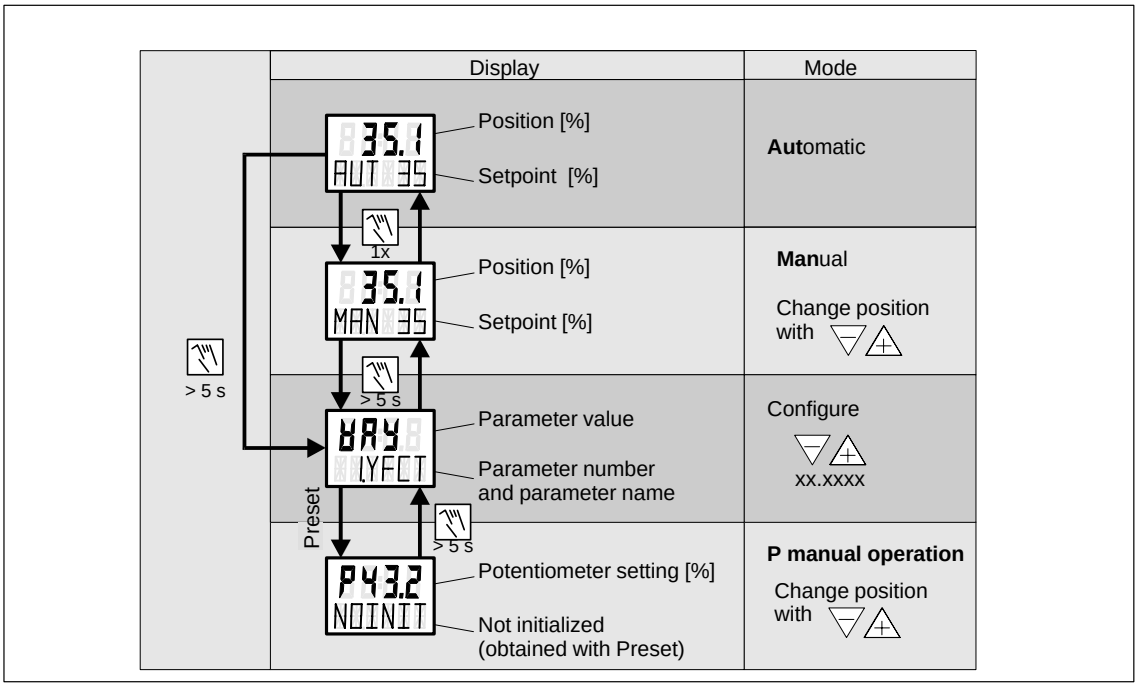


Fig. 4-2 Changing mode

Automatic mode (AUT)

Automatic mode is the normal mode. The initialized (and configured) positioner automatically responds to changes in the setpoint and continuously tries to achieve the lowest possible system deviation.

The decrement and increment buttons have no functions.

At the top of the display the current position is displayed in percent. The lower line shows the selected mode “AUT” on the left and the current setpoint as a percentage on the right.

If you press the mode button briefly the instrument switches from automatic mode to manual mode.

Manual mode (MAN)

It is possible to move through the position range of the actuator manually using the increment and decrement buttons. The actuator is adjusted in progressively longer short steps. If at the same time you press the previously unpressed increment or decrement button the actuator is set with continuous travel.

Once you release the +/– buttons the actuator remains in its current position. The internal setpoint is adjusted to the current manipulated variable. Because the internal control loop is closed in manual mode, the current position is retained even in the event of a leak.

The current position is shown on the display as a percentage. The lower line shows the selected mode “MAN” on the left and the current setpoint on the right.

Configuring

With the mode button you can switch from automatic or manual mode to “Configuring” mode (see Fig. 4-2). To do this press the button for at least 5 seconds until switchover has been completed.

In “Configuring” mode you can change the parameter values of the positioner.
The upper line of the display shows the current parameter value, the lower the parameter name (in abbreviated form) and the parameter number.

You can select the next parameter with the mode button. If you keep the mode button pressed (< 5 s) while at the same time pressing the decrement button you can select parameters in the reverse order.

You can change the parameter value with the decrement and increment buttons.

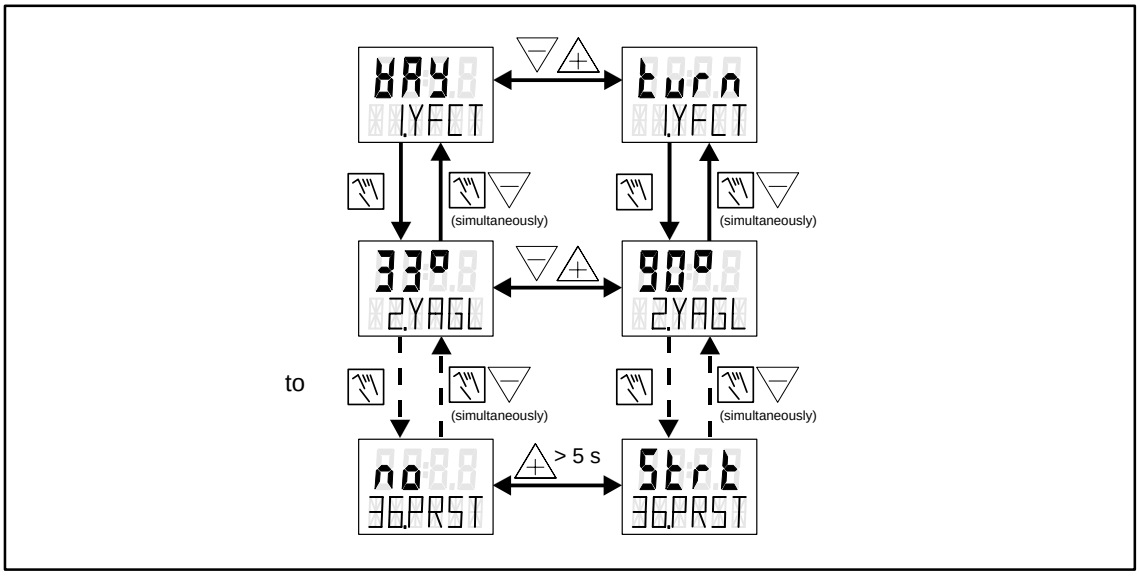


Fig. 4-3 Overview: Configuring

4.4 Parameters

There follows a list of all parameters of the positioner.

- ❑ SIPART PS2: from p. 4-4 on
- ❑ SIPART PS2 PA: from p.4-13 on

The parameter name is shown both as printed text and as shown on the display. In the “Function” column the function of the parameter is described briefly. The possible parameter values, the physical unit and the factory settings of the parameters are also shown.

Parameter name	Display	Function	Parameter values	Unit	Factory setting	Customer setting
1.YFCT	1.YFCT	Type of actuator	turn (part-turn actuator) WAY (linear actuator) LWAY (linear actuator without sine correction)		WAY	
2.YAGL [1]	2.YAGL	Rated angle of rotation of feedback **Set transmission ratio selector (7) appropriately (see view of device)**	90° 33°	Degrees	33°	
3.YWAY [2]	3.YWAY	Leverage ratio (stroke range) must match set leverage ratio on the actuator Driver pin must be set to the value of the actuator travel or, if this value is not scaled, to the next larger scale value.	oFF 5 | 10 | 15 | 20 (short lever 33°) 25 | 30 | 35 (short lever 90°) 40 | 50 | 60 | 70 | 90 | 110 | 130 (long lever 90°)	mm	oFF	
4.INIT	4.INIT	Initialization	no [4] / ##.# Strt		no	
5.SCUR	5.SCUR	Current range of setpoint 0 to 20 mA 4 to 20 mA	0 MA 4 MA	mA	4	
6.SDIR	6.SDIR	Setpoint direction rising falling	riSE FALL		riSE	
7.SPRA	7.SPRA	Setpoint for start of split range	0.0 to 100.0	%	0.0	
8.SPRE	8.SPRE	Setpoint for end of split range	0.0 to 100.0	%	100.0	
9.TS	9.TS	Setpoint ramp	AUto 0 to 400	s	0	
10.SFCT	10.SFCT	Setpoint function Linear Equal-percentage 1 : 25 Equal-percentage 1 : 50 Freely adjustable	Lin 1 : 25 1 : 50 FrEE		Lin	
11.SL0 12.SL1 13.SL2 14.SL3 15.SL4 16.SL5 [3] 17.SL6 18.SL7 19.SL8 20.SL9 21.SL10	11.SL0 (example)	Setpoint turning point at 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%	0.0 to 100.0	%	0.0 28.5 50.0 62.6 71.5 78.5 84.1 88.9 93.1 96.7 100.0	
22.DEBA	22.DEBA	Dead zone of controller	AUto 0.1 to 10.0	%	AUto	
23.YA	23.YA	Start of manipulated variable limiting	0.0 to 100.0	%	0.0	
24.YE	24.YE	End of manipulated variable limiting	0.0 to 100.0	%	100.0	
25.YNRM	25.YNRM	Standardization of manipulated variable To mech. travel To flow	MPoS FLow		MPoS	
26.YCLS	26.YCLS	Tight closing with manipulated variable Without Top only Bottom only Top and bottom	no uP: :dW uP:dW		no	
27.YDIR	27.YDIR	Direction of manipulated variable for display Rising Falling	riSE FALL		riSE	
28.BIN1 [5]	28.BIN1	Function of BI 1 None Only message Block configuring Block configuring and manual Drive valve to position up Drive valve to position down Block movement	oFF on / -on bLc1 bLc2 uP / -uP doW / -doW StoP / -StP		oFF	
29.BIN2 [5]	29.BIN2	Function of BI 2 None Only message Drive valve to position up Drive valve to position down Block movement	oFF on / -on uP / -uP doW / -doW StoP / -StP		oFF	
30.AFCT [6]	30.AFCT	Alarm function Without A1=min. A2=max A1=min. A2=min A1=max. A2=max	oFF normal / inverted		oFF	
31.A1	31.A1	Response threshold of alarm1	0.0 to 100.0	%	10.0	
32.A2	32.A2	Response threshold of alarm 2	0.0 to 100.0	%	90.0	
33.ɅFCT [6]	33.ɅFCT	Function of alarm output on fault Fault + not automatic Fault + not automatic + BI ("+" means logical OR operation)	normal / inverted		Ʌ .	
34.ɅTIM	34.ɅTIM	Monitoring time for setting of alarms	AUto 0 to 100	s	AUto	
35.ɅLIM	35.ɅLIM	Response threshold of alarm	AUto 0.0 to 100.0	%	AUto	
36.PRST	36.PRST	Preset (factory setting) "no" nothing activated "Strt" start of factory setting after pressing key for 5 s "oCAY" display following successful factory setting CAUTION: preset results in "NO INIT"	no Strt oCAY		oCAY	

1) If "turn" is selected, you cannot set 33°
2) Parameter does not appear if 1.YFCT=turn has been selected
3) Turning points only appear wih selection 10.SFCT = FrEE
4) Alternatively "no" if initialization has not yet been carried out
5) NC contact means: action with opened switch or Low level
   NO contact means: action with closed switch or High level
6) Normal means: High level without fault
   Inverted means: Low level without fault

1.YFCT Type of actuator

Selection of the actuator used: linear actuator (WAY), rotary actuator (turn). The non-linearity that occurs on linear drives due to the transmission of the linear to rotary motion is compensated for by the positioner, if 1.YFCT = WAY is selected.

If an external linear potentiometer is used for position acquisition for linear actuators, 1.YFCT must be set to LWAY. After initialization, the position is not displayed.

Special case: Also use this setting with inverse direction of action for rotary actuators.

2.YAGL Rated angle of rotation of feedback shaft (see Fig. 2-3)

On rotary actuators an angle of 90° is set automatically if 1.YFCT = turn (see above) is selected. On linear actuators (1.YFCT = WAY), value 33° or 90° can be set depending on the stroke range.

- ❑ 33° for strokes ≤ 20 mm
- ❑ 90° for strokes > 20 mm

If a lever up to 35 mm stroke is used both angles of rotation (33° and 90°) are possible.

The long lever arm (> 35 mm stroke) is only intended for an angle of rotation setting of 90°. It is not part of the scope of supply of mounting kit 6DR4004–8V but must be ordered separately with Order No. 6DR4004–8L.

☞ **Note**

The setting of the transmission ratio selector (7) on the positioner (see Fig. 2-1) **must correspond to** the selected angle value 2.YAGL.

3.YWAY Leverage ratio

☞ **Note**

The use of this parameter is optional. You only have to set it if you want to have the calculated position displayed in mm at the end of initialization of a linear actuator.

Selection of the lever range: is used to display the real travel after initialization.
This parameter is only relevant for linear drives. If parameter “oFF” is selected here, the real travel is not displayed after initialization.

Note

The setting for YWAY must correspond to the mechanical leverage ratio. The driver must be set to the value of the actuator travel or, if this value is not scaled, to the next largest scaled value.

4.INIT Initialization

Automatic initialization is started when you select “Strt” and press the increment key (> 5 s). Initialization is displayed by “RUN 1” to “RUN 5” (see Fig. 3-22 to Fig. 3-24) as it progresses.

5.SCUR Current range of setpoint

The current range you select depends on the connection type. “OmA” is only possible for a 3/4 wire connection.

6.SDIR Setpoint direction (see Fig. 4-5)

The setpoint direction setting is used to reverse the direction of the setpoint. It is primarily used for split–range operation and single–acting drives with the safety setting “up”.

7.SPRA Setpoint for start of split range (see Fig. 4-5)

and

8.SPRE Setpoint for end of split range (see Fig. 4-5)

Parameters “7.SPRA” and “8.SPRE” used in conjunction with parameter “6.SDIR” are used to limit the active setpoint range. This can be used to solve split–range tasks with the characteristic curves

- ❑ rising / falling
- ❑ falling / rising
- ❑ falling / falling
- ❑ rising / rising

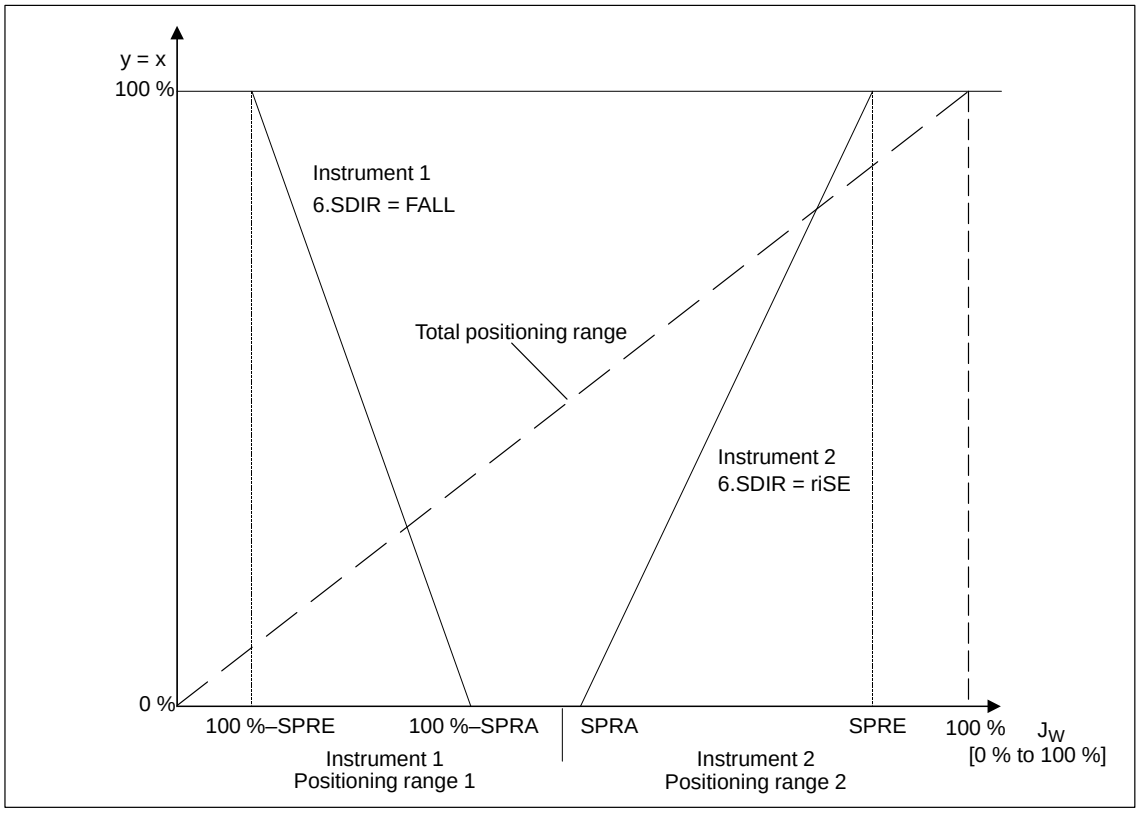


Fig. 4-5 Example: split-range operation with two instruments

9.TS Setpoint ramp

The setpoint ramp takes effect in automatic mode and limits the rate of change of the active setpoint. When the instrument is switched from manual mode to automatic mode the active setpoint is matched to the setpoint on the instrument via the setpoint ramp.

This bumpless changeover between manual and automatic avoids overpressures in long pipes.

In setting TS = Auto the slower of the two actuating times determined during initialization is used for the setpoint ramp.

10.SFCT Setpoint function (see Fig. 4-6)

With this function, non–linear valve characteristic curves can be linearized and on linear valve characteristic curves, any flow characteristics can be emulated.

Three valve characteristic curves are stored in the instrument

- ❑ equal percentage 1 : 25 (10.SFCT = 1:25)
- ❑ equal percentage 1 : 50 (10.SFCT = 1:50)
- ❑ inverse equal percentage 1 : 25 (10.SFCT = FrEE, factory setting)

11.SL0 to 21.SL10 Setpoint turning points (see Fig. 4-6)

Each setpoint turning point can be assigned a flow characteristic value at intervals of 10%. These points produce a polygon consisting of 10 straight lines which results in an image of the valve characteristic curve.

Setpoint turning points can only be entered when 10.SFCT = FrEE.

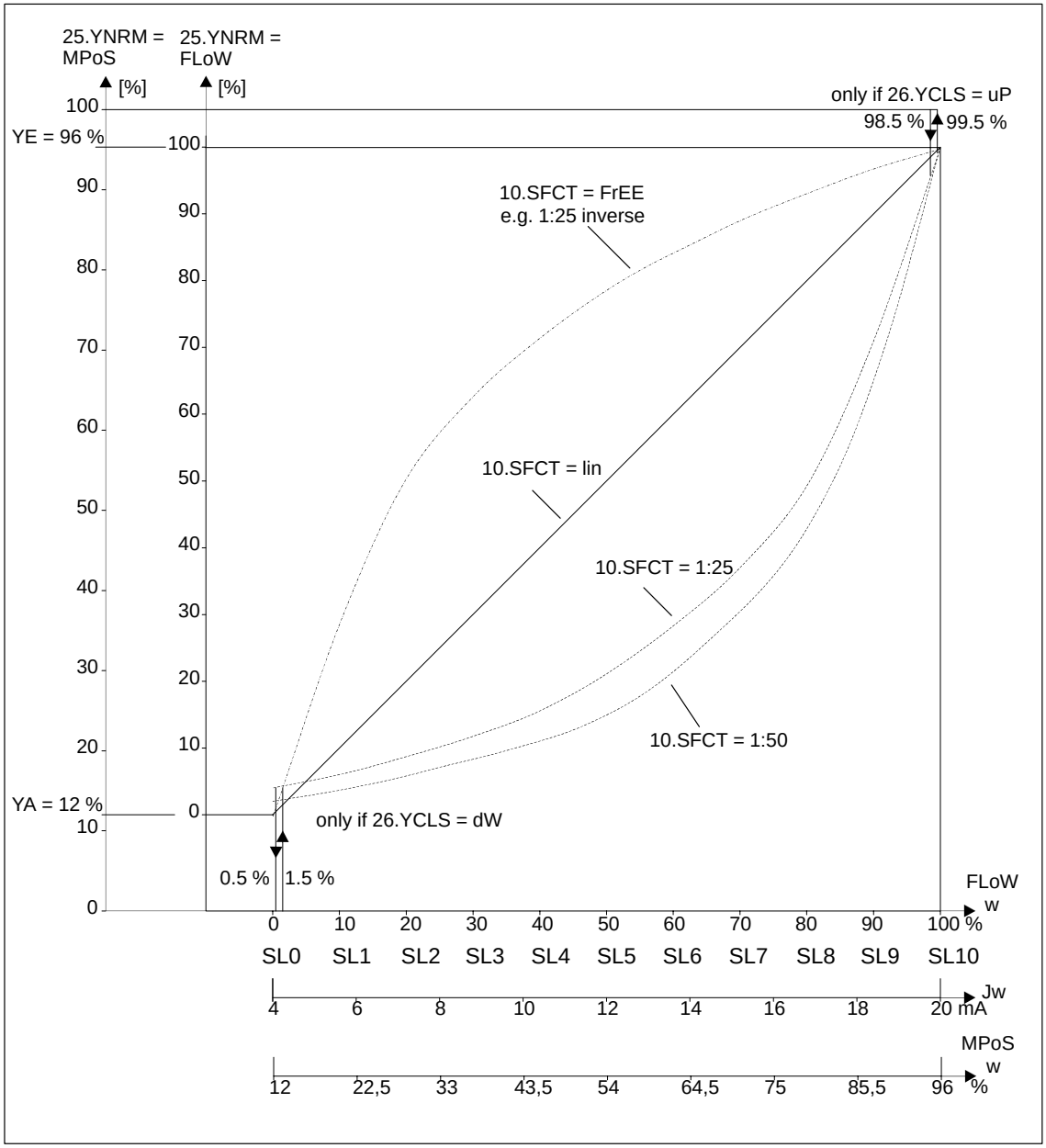


Fig. 4-6 Setpoint characteristics, normalization of the manipulated variables and tight closing function

22.DEBA Dead zone of the controller

when DEBA = AUto the dead zone is constantly adapted to the requirements of the control loop in automatic mode. If control oscillation is detected the dead band is increased step by step. Reverse adaptation is achieved using a time criterion.

In other discrete settings the permanent value for the dead zone is used.

23.YA Start of manipulated variable limiting (see Fig. 4-6 and Fig. 4-7)

and

24.YE End of manipulated variable limiting (see Fig. 4-6 and Fig. 4-7)

With parameters 23.YA and 24.YE the mechanical travel (from stop to stop) is limited to the set values. In this way the mechanical correcting range of the actuator can be limited to the active flow and integral saturation of the leading controller can be avoided.

25.YNRM Normalization of manipulated variable (see Fig. 4-6 and Fig. 4-7)

Limiting the manipulated variable (by YA and YE) produces two different scales (MPOS and FLOW) for the display and the position feedback via the current output.

The MPOS scale shows the mechanical position (0 to 100 %) between the hard stops of initialization. This is not affected by parameters YA and YE. Parameters YA and YE are displayed in MPOS scale.

The FLOW scale is the normalization (0 to 100 %) to the range between YA and YE. The setpoint w (0 to 100 %) always refers to this range. This results in a display and position feedback Jy that are proportional to the flow (even if valve characteristic curves are used).

In order to calculate the system deviation the setpoint is also displayed in the relevant scale.

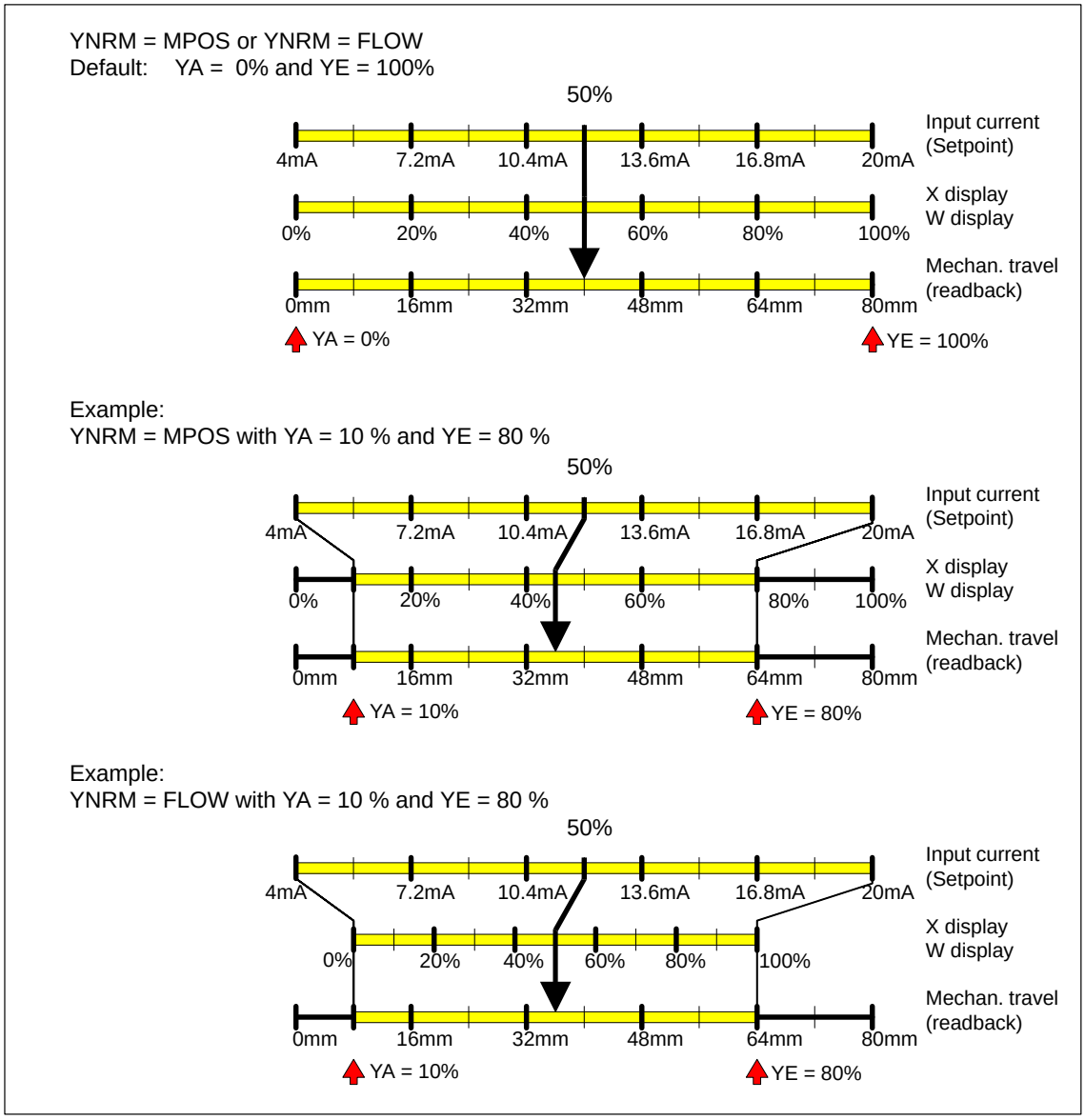


Fig. 4-7 Dependence of travel on normalization and YA and YE as shown by an 80 mm linear actuator.

26.YCLS Tight closing with manipulated variable (see Fig. 4-6)

With this function the valve can be moved to its seat with maximum actuating power (maintained contact of the piezovalves). The tight closing function can be activating on one side only or for both end positions. YCLS is activated when the setpoint is below 0.5 % or above 99.5% of the setpoint flow.

As the setpoint range refers to 0 – 100 % with YA and YE, the activation point of the tight closing function with reference to the flow can be set lower with YA and higher with YE.

27.YDIR Direction of manipulated variable for display

Used to set the direction of action (rising or falling) for the display and position feedback (Jy).

28.BIN1 Function Binary input 1 (see Fig. 4-4)

and

29.BIN2 Function Binary input 2 (see Fig. 4-4)

Parameters 28.BIN1 and 29.BIN2 can be set individually to suit the task:

- ❑ BIN1 or BIN2 = on or –on

  Binary signals from peripheral devices (e.g. pressure or temperature switches) can be read out via the HART interface or trigger the alarm output if logically ORed with other signals.

- ❑ BIN1 = bLc1

  Operating level Configuring is disabled so that it cannot be reset (e.g. by a wire jumper between terminals 9 and 10).

- ❑ BIN1 = bLc2

  If BE1 is activated manual mode is blocked in addition to operating level Configuring

- ❑ BIN1 or BIN2 = uP or doW or –uP or –doW

  The actuator moves the linear actuator to the upper or lower stop when the binary input is activated with maintained contact.

- ❑ BIN1 or BIN2 = StoP or –StP

  When the binary input is activated the piezovalves are blocked and the actuator stops in the final position. This setting can be used to perform leakage measurements without the initialization function.

- ❑ BIN1 = oFF (factory setting)

  If, during P manual operation, binary input 1 is activated by a jumper between 9 and 10, ”NOINIT” and the input current multiplied by 100 in mA are displayed alternately in the bottom line of the display.

30.AFCT Alarm function

Alarm response (limit contacts) refers to the MPOS scaling. Alarm signals are output via the alarm module (Order No. 6DR4004–6A or –8A). The alarms can also be read out via the HART interface (Order No. 6DR4004–6H or –8H)

The direction of action of the binary outputs can be adapted from high active to low active subsequent systems.

31.A1 Response threshold of alarm 1

and

32.A2 Response threshold of alarm 2

The response thresholds refer to the mechanical path (MPOS scale).

33. ↳FCT Function of alarm output on fault

The fault alarm for monitoring the system deviation over time can also be triggered by the following events:

- ❑ Loss of power
- ❑ Process fault
- ❑ Actuator fault
- ❑ Valve fault
- ❑ Loss of pressure

The alarm fault can also be logically ORed with the non–automatic signal (Manual or Configuring) and the binary inputs.

The direction of action of the binary outputs can be adapted from high active to low active subsequent systems.

34. ↳TIM Monitoring time for setting of alarms

The set value (s) defines the time within which the positioner must have reached the corrected state. The corresponding response threshhold is defined with parameter 35.

The alarm output is set if the set time is exceeded.

35. ↳LIM Response threshold of alarm

A value (%) for the permitted system deviation for the purposes of triggering the alarm can be set here.

If parameters 34 and 35 are both set to “Auto” the alarm is set if the short–step zone is not reached within a certain time. This time is 5x the initialization time within 5 to 95 % of the travel and 10x the initialization time outside 10 to 90%.

36.PRST Preset

Restoration of the factory setting and initialization reset

Note

After “Preset” the positioner must be re-initialized. All the maintenance parameters calculated so far are reset.

Parameter name	Display	Function	Parameter values	Unit	Factory setting	Customer setting
1.YFCT	1.YFCT	Type of actuator	turn (part-turn actuator) WAY (linear actuator) LWAY (linear actuator without sine correction)		WAY	
2.YAGL [1]	2.YAGL	Rated angle of rotation of feedback **Set transmission ratio selector (7) appropriately (see view of device)**	90° 33°	Degrees	33°	
3.YWAY [2]	3.YWAY	Stroke range **(Setting optional)** If used, must match set leverage ratio on the actuator Driver pin must be set to the value of the actuator travel or, if this value is not scaled, to the next larger scale value.	oFF 5 | 10 | 15 | 20 (short lever 33°) 25 | 30 | 35 (short lever 90°) 40 | 50 | 60 | 70 | 90 | 110 | 130 (long lever 90°)	mm	oFF	
4.INIT	4.INIT	Initialization	no / ###.# Strt		no	
5.SDIR	5.SDIR	Setpoint direction rising / falling	riSE FALL		riSE	
6.TSI	6.TSI	Setpoint ramp OPEN	AUto 0 to 400	s	0	
7.TSD [3]	7.TSD	Setpoint ramp CLOSE	0 to 400	s	0	
8.SFCT	8.SFCT	Setpoint function Linear Equal-percentage 1: 25, 1:33, 1:50 inverse Equal-percentage 25:1, 33:1, 50:1 Freely adjustable	Lin 1 : 25 1 : 33 1 : 50 n1 : 25 n1 : 33 n1 : 50 FrEE		Lin	
09.SL0 10.SL1 etc. to 28.SL19 29.SL20 [4]	09.SL0 (example)	Setpoint turning point at 0% 5% etc. to 95% 100%	0.0 to 100.0	%	0.0 5.0 etc. to 95.0 100.0	
30.DEBA	30.DEBA	Dead zone of controller	AUto 0.1 to 10.0	%	AUto	
31.YA	31.YA	Start of manipulated variable limiting	0.0 to 100.0	%	0.0	
32.YE	32.YE	End of manipulated variable limiting	0.0 to 100.0	%	100.0	
33.YNRM	33.YNRM	Standardization of manipulated variable To mech. travel / To flow	MPoS FLow		MPoS	
34.YCLS	34.YCLS	Tight closing with manipulated variable Without / Top only / Bottom only / Top and bottom	no uP: :dW uP:dW		no	
35.YCDO	35.YCDO	Value for tight closing below	0.0 to 100.0		0.0	
36.YCUP	36.YCUP	Value for tight closing above	0.0 to 100.0		100.0	
37.BIN1 [5]	37.BIN1	Function of BI 1 None / Only message / Block configuring / Block configuring and manual / Drive valve to position up / Drive valve to position down / Block movement	oFF No contact: on, bLc1, bLc2, uP, doW, StoP NC contact: -on, -uP, -doW, -StP		oFF	
38.BIN2 [5]	38.BIN2	Function of BI 2 None / Only message / Drive valve to position up / Drive valve to position down / Block movement	oFF No contact: on, uP, doW, StoP NC contact: -on, -uP, -doW, -StP		oFF	
39.AFCT [6]	39.AFCT	Alarm function Without / A1=min. A2=max / A1=min. A2=min / A1=max. A2=max	oFF normal: Π1:ΠA, Π1:Π1, ΠA:ΠA inverted: n̄1:n̄A, n̄1:n̄1, n̄A:n̄A		oFF	
40.A1	40.A1	Response threshold of alarm1	0.0 to 100.0	%	10.0	
41.A2	41.A2	Response threshold of alarm 2	0.0 to 100.0	%	90.0	
42.ϟFCT [6]	42.ϟFCT	Function of alarm output on fault / Fault + not automatic / Fault + not automatic + BI ("+" means logical OR operation)	normal: ϟ . / ϟnA. / ϟnA.b inverted: ϟ . / ϟnA. / ϟnA.b		ϟ .	
43.ϟTIM	43.ϟTIM	Monitoring time for setting of alarms	AUto 0 to 100	s	AUto	
44.ϟLIM	44.ϟLIM	Response threshold of alarm	AUto 0.0 to 100.0	%	AUto	
45.PRST	45.PRST	Preset (factory setting) "no" nothing activated "Strt" start of factory setting "oCAY" display after pressing key for 5 s CAUTION: preset results in "NO INIT"	no Strt oCAY		no	
46.FSTY	46.FSTY	Safety position: parameterized safety setpoint last setpoint open venting valve	FSVL FSSP FSAC		FSVL	
47.FSTI	47.FSTI	Monitoring time for setting the safety position	1 bis 100	s	30	
48.FSVL	48.FSVL	Safety setpoint	0.0 bis 100.0	%	0.0	
49.STNR	49.STNR	Station number	0 bis 126		126	

1) If "turn" is selected, you cannot set 33°
2) Parameter does not appear if 1.YFCT=turn has been selected
3) if TSI= AUto not active
4) Turning points only appear wih selection 8.SFCT = FrEE

5) NC contact means: action with opened switch or Low level
NO contact means: action with closed switch or High level
6) normal means: High level without fault
inverted means: Low level without fault

1.YFCT Type of actuator

Selection of the actuator used: linear actuator (WAY), rotary actuator (turn). The non-linearity that occurs on linear drives due to the transmission of the linear to rotary motion is compensated for by the positioner, if 1.YFCT = WAY is selected.

If an external linear potentiometer is used for position acquisition for linear actuators, 1.YFCT must be set to LWAY. After initialization, the position is not displayed.

Special case: Also use this setting with inverse direction of action for rotary actuators.

2.YAGL Rated angle of rotation of feedback shaft (see Fig. 2-3)

On rotary actuators an angle of 90° is set automatically if 1.YFCT = turn (see above) is selected. On linear actuators (1.YFCT = WAY), value 33° or 90° can be set depending on the stroke range.

- ❑ 33° for strokes ≤ 20 mm
- ❑ 90° for strokes > 20 mm

If a lever up to 35 mm stroke is used both angles of rotation (33° and 90°) are possible.

The long lever arm (> 35 mm stroke) is only intended for an angle of rotation setting of 90°. It is not part of the scope of supply of mounting kit 6DR4004–8V but must be ordered separately with Order No. 6DR4004–8L.

☞ **Note**

The setting of the transmission ratio selector (7) on the positioner (see Fig. 2-2) **must correspond to** the selected angle value 2.YAGL.

3.YWAY Leverage ratio

☞ **Note**

The use of this parameter is optional. You only have to set it if you want to have the calculated position displayed in mm at the end of initialization of a linear actuator.

Selection of the lever range: is used to display the real travel after initialization.
This parameter is only relevant for linear drives. If parameter “oFF” is selected here, the real travel is not displayed after initialization.

Note

The setting for YWAY must correspond to the mechanical leverage ratio. The driver must be set to the value of the actuator travel or, if this value is not scaled, to the next largest scaled value.

4.INIT Initialization

Automatic initialization is started when you select “Strt” and press the increment key (> 5 s). Initialization is displayed by “RUN 1” to “RUN 5” (see Fig. 3-22 to Fig. 3-24) as it progresses.

5.SDIR Setpoint direction (see Fig. 4-5)

The setpoint direction setting is used to reverse the direction of the setpoint. It is primarily used for split–range operation and single–acting drives with the safety setting “up”.

6.TSI Setpoint ramp OPEN

and

7.TSD Setpoint ramp CLOSE

The setpoint ramp takes effect in automatic mode and limits the rate of change of the active setpoint. When the instrument is switched from manual mode to automatic mode the active setpoint is matched to the setpoint on the instrument via the setpoint ramp.

This bumpless changeover between manual and automatic avoids overpressures in long pipes.

In setting TSI = Auto the slower of the two actuating times determined during initialization is used for the setpoint ramp. TSD then has no effect.

8.SFCT Setpoint function

With this function, non–linear valve characteristic curves can be linearized and on linear valve characteristic curves, any flow characteristics can be emulated.

Seven valve characteristic curves are stored in the instrument

- ❑ linear (8.SFCT = Lin, factory setting)
- ❑ equal percentage 1 : 25 (8.SFCT = 1:25)
- ❑ equal percentage 1 : 33 (8.SFCT = 1:33)
- ❑ equal percentage 1 : 50 (8.SFCT = 1:50)
- ❑ inverse equal percentage 25 : 1 (8.SFCT = n1:25)
- ❑ inverse equal percentage 33 : 1 (8.SFCT = n1:33)
- ❑ inverse equal percentage 50 : 1 (8.SFCT = n1:50)
- ❑ freely adjustable (8.SFCT = FrEE)

09.SL0 to 29.SL20 Setpoint turning points (see Fig. 4-9)

Each setpoint turning point can be assigned a flow characteristic value at intervals of 5%. These points produce a polygon consisting of 20 straight lines which results in an image of the valve characteristic curve.

Setpoint turning points can only be entered when 8.SFCT = FrEE.

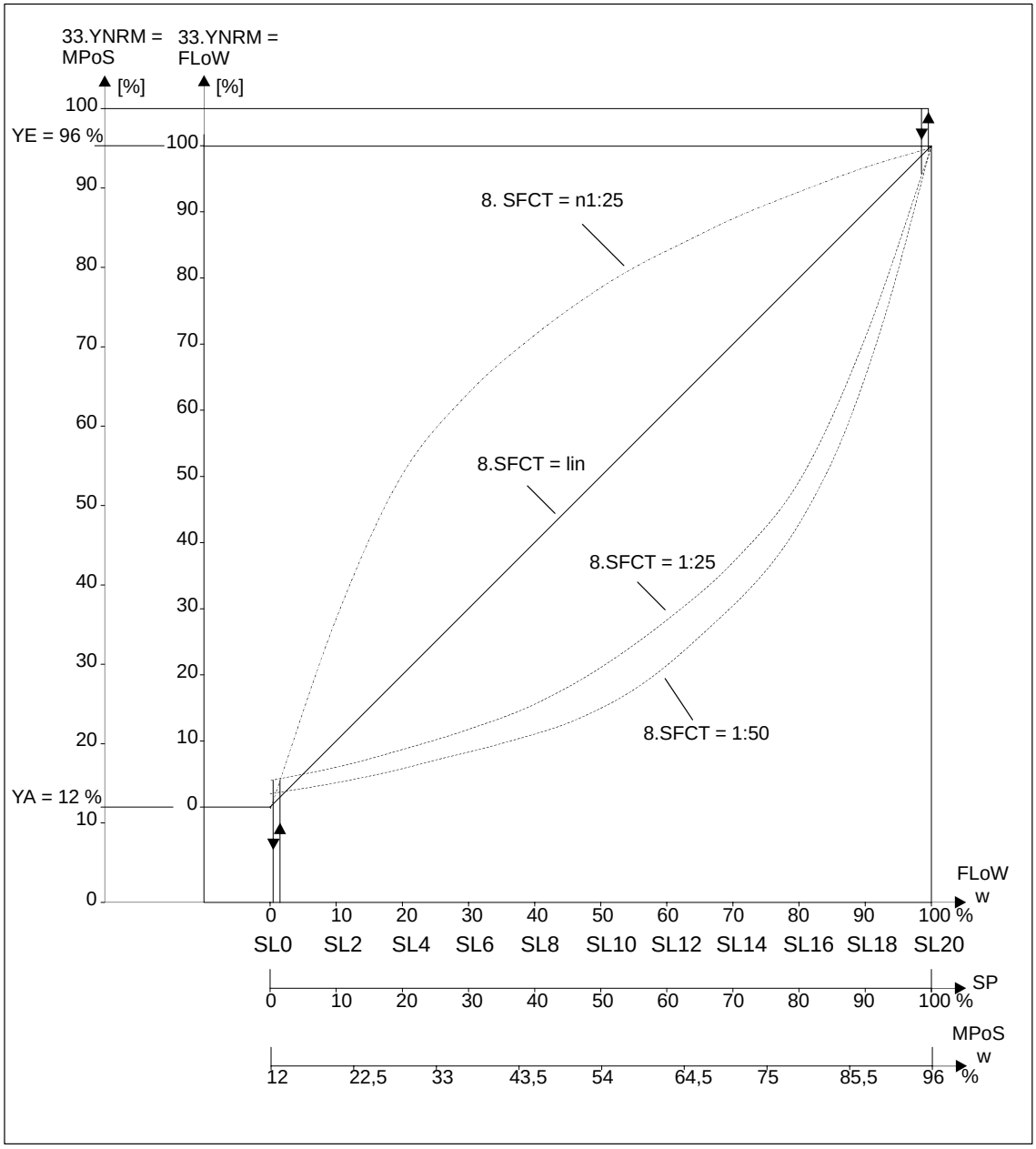


Fig. 4-9 Setpoint characteristics, normalization of the manipulated variables and tight closing function

30.DEBA Dead zone of the controller

when DEBA = AUto the dead zone is constantly adapted to the requirements of the control loop in automatic mode. If control oscillation is detected the dead band is increased step by step. Reverse adaptation is achieved using a time criterion.

In other discrete settings the permanent value for the dead zone is used.

31.YA Start of manipulated variable limiting (see Fig. 4-8)

and

32.YE End of manipulated variable limiting (see Fig. 4-8)

With parameters 31.YA and 32.YE the mechanical travel (from stop to stop) is limited to the set values. In this way the mechanical correcting range of the actuator can be limited to the active flow and integral saturation of the leading controller can be avoided.

33.YNRM Normalization of manipulated variable (see Fig. 4-8)

Limiting the manipulated variable (by YA and YE) produces two different scales (MPOS and FLOW) for the display and the position feedback via the current output.

The MPOS scale shows the mechanical position (0 to 100 %) between the hard stops of initialization. This is not affected by parameters YA and YE. Parameters YA and YE are displayed in MPOS scale.

The FLOW scale is the normalization (0 to 100 %) to the range between YA and YE. The setpoint w (0 to 100 %) always refers to this range. This results in a display and position feedback Jy that are proportional to the flow (even if valve characteristic curves are used).

In order to calculate the system deviation the setpoint is also displayed in the relevant scale.

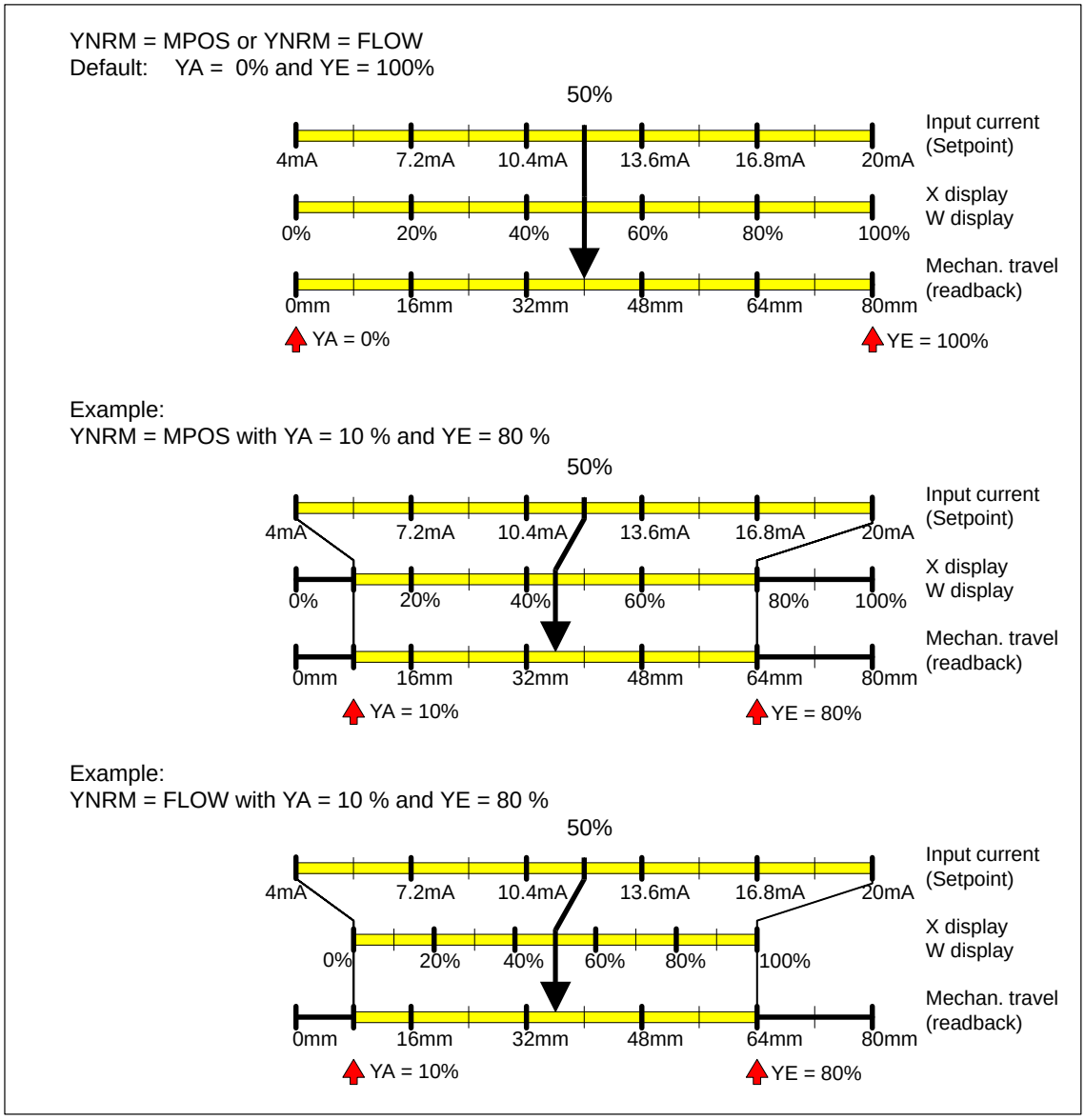


Fig. 4-10 Dependence of travel on normalization and YA and YE as shown by an 80 mm linear actuator.

34.YCLS Tight closing with manipulated variable

With this function the valve can be moved to its seat with maximum actuating power (maintained contact of the piezovalves). The tight closing function can be activating on one side only or for both end positions. YCLS is activated when the setpoint is below 0.5 % or above 99.5% of the setpoint flow.

35.YCDO Wert für Dichtschließen unten

36.YCUP Wert für Dichtschließen oben

37.BIN1 Function Binary input 1 (see Fig. 4-8)

and

38.BIN2 Function Binary input 2 (see Fig. 4-8)

Parameters 28.BIN1 and 29.BIN2 can be set individually to suit the task:

- ❑ BIN1 or BIN2 = on or –on

  Binary signals from peripheral devices (e.g. pressure or temperature switches) can be read out via the HART interface or trigger the alarm output if logically ORed with other signals.

- ❑ BIN1 = bLc1

  Operating level Configuring is disabled so that it cannot be reset (e.g. by a wire jumper between terminals 9 and 10).

- ❑ BIN1 = bLc2

  If BE1 is activated manual mode is blocked in addition to operating level Configuring

- ❑ BIN1 or BIN2 = uP or doW or –uP or –doW

  The actuator moves the linear actuator to the upper or lower stop when the binary input is activated with maintained contact.

- ❑ BIN1 or BIN2 = StoP or –StP

  When the binary input is activated the piezovalves are blocked and the actuator stops in the final position. This setting can be used to perform leakage measurements without the initialization function.

- ❑ BIN1 = oFF (factory setting)

  If, during P manual operation, binary input 1 is activated by a jumper between 9 and 10, ”NOINIT” and the input current multiplied by 100 in mA are displayed alternately in the bottom line of the display.

39.AFCT Alarm function

Alarm response (limit contacts) refers to the MPOS scaling. Alarm signals are output via the alarm module (Order No. 6DR4004–6A or –8A). The alarms can also be read out via the HART interface (Order No. 6DR4004–6H or –8H)
The direction of control action of the binary outputs can be adapted from high–active to low–active following systems.

40.A1 Response threshold of alarm 1

and

41.A2 Response threshold of alarm 2

The response thresholds refer to the mechanical path (MPOS scale).

42. ↳FCT Function of alarm output on fault

The fault alarm for monitoring the system deviation over time can also be triggered by the following events:

- ❑ Loss of power
- ❑ Process fault
- ❑ Actuator fault
- ❑ Valve fault
- ❑ Loss of pressure

The alarm fault can also be logically ORed with the non–automatic signal (Manual or Configuring) and the binary inputs.

43. ↳TIM Monitoring time for setting of alarms

The set value (s) defines the time within which the positioner must have reached the corrected state. The corresponding response threshhold is defined with parameter 44.

The alarm output is set if the set time is exceeded.

44. ↳LIM Response threshold of alarm

A value (%) for the permitted system deviation for the purposes of triggering the alarm can be set here.

If parameters 43 and 44 are both set to “Auto” the alarm is set if the short–step zone is not reached within a certain time. This time is 5x the initialization time within 5 to 95 % of the travel and 10x the initialization time outside 10 to 90%.

45.PRST Preset

Restoration of the factory setting and initialization reset

Note

After “Preset” the positioner must be re-initialized. All the maintenance parameters calculated so far are reset.

46.FSTY Safety position

This parameter is used to move the actuator into a set safety position if communication fails.

Three settings are possible

❑ FSVI

the actuator must continue to control with the parameterized safety set-point

❑ FSSP

the actuator must continue to control with the last effective setpoint

❑ FSAC

Here this outlet air valve is opened and the single–action actuator moves to its final position by spring power.

47.FSTI Monitoring time for setting the safety position

In the event of a failure of communication, the positioner moves to the safety position after the set value has elapsed.

48.FSVL Safety setpoint

Specification for the safety position.

49.STNR Station number

So that the devices on the bus can be addressed separately, a separate station number must be set on each device.

4.5 Operation via PROFIBUS PA

Operation is performed using the SIMATIC PDM software package and a personal computer, programming device (PG), or laptop meeting the following minimum requirements:

Hardware

- ❑ Programming device (PG), laptop, or PC (compatible with industrial standard) with80486 processor (or higher)
- ❑ RAM capacity: at least 32 MB
- ❑ 70 MB required on the hard disk
- ❑ A VGA monitor or other monitor that is supported by Microsoft Windows
- ❑ Keyboard and optional but recommended mouse that is supported by Microsoft Windows
- ❑ A CD–ROM drive
- ❑ A 3.5” diskette drive
- ❑ An optional printer (is recommended)
- ❑ Interface CP5411 or CP5511 or CP5611

Software

- ❑ Windows 95 or Windows NT
- ❑ SIMATIC PDM V4.02 (SIMATIC STEP 7 OEM included)
- ❑ SIMATIC PDM integrated V4.02 (STEP 7 V4.02 required)
- ❑ Operation of SIMATIC PDM is supported by the integrated auxiliary function.

Cyclic services

Control is performed by the master class 1 of the control system.

The control system requires the device–specific Device Master Data File (GSD) to establish a connection with the field devices.

The **SIPART PS2 with PROFIBUS PA** works with the standard GSD in accordance with the device profile for actuators. All profile files and those of the Siemens devices are already stored in the Siemens control system. If the GSD is required nevertheless, it can be downloaded from the Internet as described below; it is also printed in the Appendix.

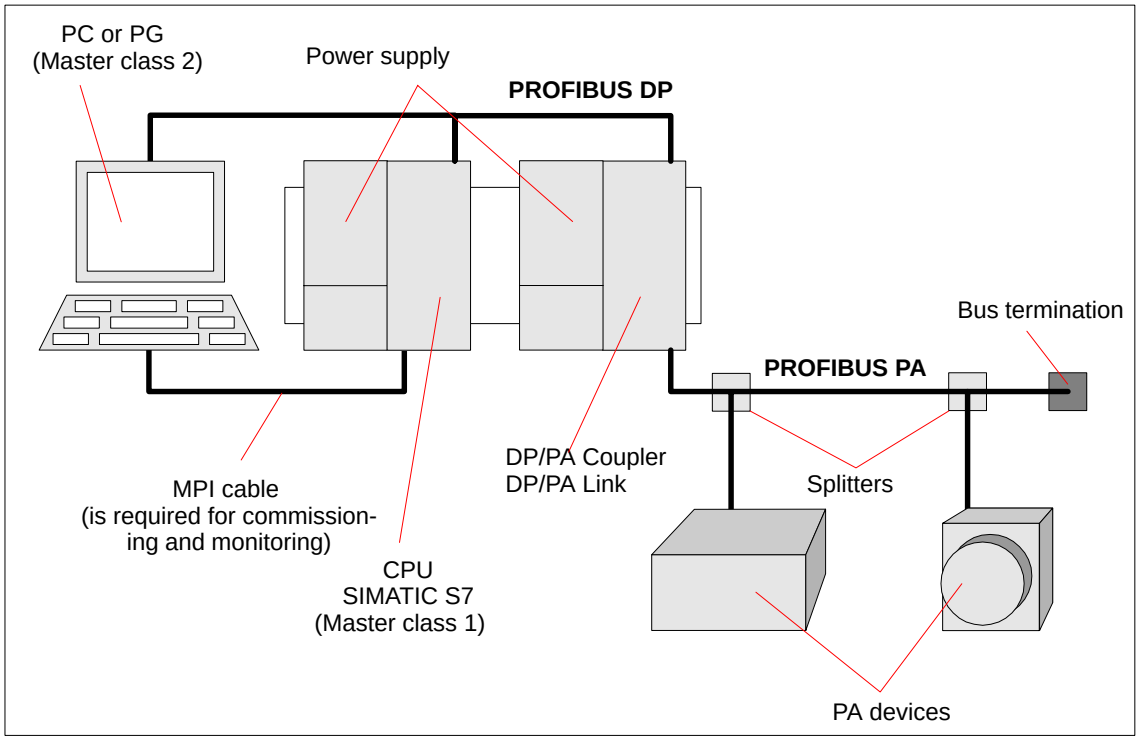


Fig. 4-11 Example of a small PROFIBUS DP/PA system

Here is a small STEP 7 program that establishes cyclic data transmission with the SIPART PS2 PA.

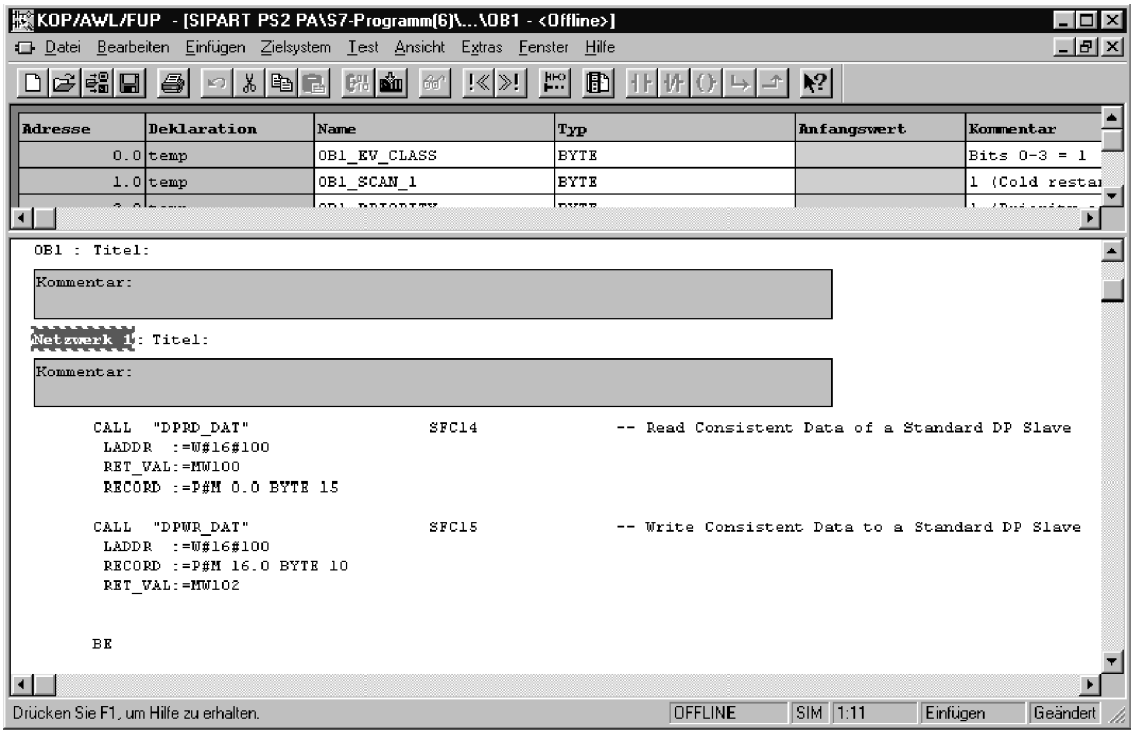


Fig. 4-12 STEP 7 example program

In this example, all files supported by the device are transmitted in the input or output direction. 256 (W#16#100) is selected as the initial I/O address.

Legend

Byte 15

Byte 15

15 bytes of input data consisting of the following:

READBACK	5 bytes
RCAS_OUT	5 bytes
CHECKBACK	3 bytes
POS_D	2 bytes

Byte 10

10 bytes of output data consisting of the following:

SP	5 bytes
RCAS_IN	5 bytes

(see Object table in the Appendix)

4.5.1 Useful data via PROFIBUS

The SIPART PS2 PA positioner can exchange a combination of the following cyclic useful data with the PROFIBUS:

German name	English name	Abbreviation	Direction from the point of view of the SIPART PS2 PA	Length in bytes	Consisting of
Sollwert	Setpoint	SP	Input	5	Value/Status
readback	Readback	RB	Output	5	Value/Status
Diskrete Pos-tion	Position dis-crete	POS_D	Output	2	Value/Status
Aktorzustand	Checkback	CB	Output	3	Value
Fernkaskade Eingang	Remote Ca-scade Input	RCAS_IN	Input	5	Value/Status
Fernkaskade Ausgang	Remote Ca-scade Output	RCAS_OUT	Output	5	Value/Status

Setpoint

The setpoint consists of a floating–point value (4 bytes) and the associated status (1 byte, see below)

Readback

The readback indicates the position of the valve. The readback consists of a floating–point value (4 bytes) and the associated status (1 byte)

Position discrete

The discrete position of the valve is displayed as a value (1 byte) with the following meaning:

0 = not initialized

1 = valve closed

2 = valve open

3 = valve in intermediate state

There is a status for this value too (1 byte)

Checkback

The checkback is displayed bit–coded in 3 bytes:

Byte	Bit	Meaning for ”1”
0	0	Device in failsafe position
	1	Request for local operation
	2	Device is operated locally
	3	Emergency operation active
	4	Deviation of the motion direction
	5	Stop reached (valve not completely open)
	6	Stop reached (valve not completely closed)
	7	Operating timeout
1	0	Valve is opened
	1	Valve is closed
	2	Parameters have been changed
	3	Simulation operation
	4	Fault
	5	Fault in the control
	6	Control inactive
	7	Self–test active
2	0	Path integral exceeded
	1	Additional input active
	2	
	3	
	4	
	5	
	6	
	7	

Remote cascade input

In remote cascade mode (actual mode = remote cascade), the remote cascade input is used as the setpoint. Remote cascade input consists of a floating–point value (4 bytes) and status (1 bytes)

Remote cascade output

This output provides the current setpoint in AUTO mode and remote cascade. The status is used especially for the transition from AUTO to remote cascade.

In conjunction with the parameter input variable (primary value scale) you cannot only set the setpoints to the SIPART PS2 PA positioner as a percentage of the valve position but also in physical quantities such as cubic meters per day or liters per minute. It is also possible to adapt the readback values to this scaling.

Status

The status provides information about the quality of the input or output value.

The format of the status is always

7	6	5	4	3	2	1	0
Quality		Additional information				Limit value bits	

Quality

0: bad

1: uncertain

2: good

3: good (cascade)

Limit value bit

0: good

1: lower limit value reached, exceeded or limited to lower limit value

2: upper limit value reached, exceeded or limited to upper limit value

3: value is fixed, no measured value

Additional information

The additional information depends on the quality.

7	6	5	4	3	2	1	0	Meaning
0	0	0	0	0	0	s. a.		bad
0	0	0	0	1	1	s. a.		device fault
0	0	0	1	0	0	s. a.		sensor fault
0	0	0	1	1	1	s. a.		bad, out of service
0	1	0	0	0	0	s. a.		uncertain
0	1	0	0	0	1	s. a.		uncertain, last useful value
0	1	0	0	1	0	s. a.		uncertain, substituted value
0	1	0	0	1	1	s. a.		uncertain, initial value
1	0	0	0	0	0	s. a.		good
1	0	0	0	0	1	s. a.		good, active block alarm (change of parameters)
1	0	1	0	0	0	s. a.		good, go into failsafe position (command)
1	1	0	0	0	0	s. a.		good (cascade)

1	1	0	0	0	1	s. a.	good (cascade), initialization confirmed
1	1	0	0	1	0	s. a.	good (cascade), initialization requested
1	1	0	0	1	1	s. a.	good (cascade), not requested
1	1	0	1	1	0	s. a.	good (cascade), local operation has priority
1	1	0	1	1	1	s. a.	good (cascade), device is in failsafe position
1	1	1	0	0	0	s. a.	good (cascade), go into failsafe position (command)

Possible combinations of useful data and position in the address space

For communication of cyclic useful data between the master and the SIPART PS2 PA positioner you can select a combination of values during configuration:

SP

Setpoint

Output (master view)		
Initial address	0	
	1	SP –
	2	floating–point number
	3	
	4	SP – status

RCAS_OUT, RCAS_IN

Remote cascade output, remote cascade input

Input (master view)		
Initial address	0	
	1	RCAS_OUT –
	2	floating–point number
	3	
	4	RCAS_OUT – status

Output (master view)		
Initial address	0	
	1	RCAS_IN –
	2	floating–point number
	3	
	4	RCAS_IN – status

READBACK, POS_D, SP

Readback, position discrete, setpoint

Input (master view)		
Initial address	0	READBACK – floating–point number
	1	
	2	
	3	
	4	READBACK – status
	5	POS_D
	6	POS_D – status

Output (master view)		
Initial address	0	SP – floating–point number
	1	
	2	
	3	
	4	SP – status

Checkback, SP

Checkback, setpoint

Input (master view)		
Initial address	0	CHECKBACK
	1	
	2	

Output (master view)		
Initial address	0	SP – floating–point number
	1	
	2	
	3	
	4	SP – status

READBACK, CHECKBACK, POS_D, SP

Readback, position discrete, checkback, setpoint

Input (master view)		
Initial address	0	READBACK – floating–point number
	1	
	2	
	3	
	4	READBACK – status
	5	POS_D
	6	POS_D – Status
	7	CHECKBACK
	8	
	9	

Output (master view)		
Initial address	0	SP – floating–point number
	1	
	2	
	3	
	4	SP – status

RCAS_OUT, CHECKBACK, RCAS_IN

Remote cascade output, checkback, remote cascade input

Input (master view)		
Initial address	0	RCAS_OUT – floating–point number
	1	
	2	
	3	
	4	RCAS_OUT – Status
	5	CHECKBACK
	6	
	7	

Output (master view)		
Initial address	0	RCAS_IN – floating–point number
	1	
	2	
	3	
	4	RCAS_IN – status

READBACK, RCAS_OUT, POS_D, CHECK-BACK, SP, RCAS_IN

Readback, remote cascade output, position discrete, checkback, set-point, remote cascade input

Input (master view)		
Initial address	0	READBACK – floating–point number
	1	
	2	
	3	
	4	READBACK – status
	5	RCAS_OUT – floating–point number
	6	
	7	
	8	
	9	RCAS_OUT – Status
	10	POS_D
	11	POS_D – Status
	12	CHECKBACK
	13	
	14	

Output (master view)		
Initial address	0	SP – floating–point number
	1	
	2	
	3	
	4	SP – status
	5	RCAS_IN – floating–point number
	6	
	7	
	8	
	9	RCAS_IN – Status

4.5.2 Diagnostics acc. to PROFIBUS DP (DDLM_Slave_Diag)

The SIPART PS2 PA positioner provides diagnostic data in the following form:

Input (master view)			
Initial address	0	Station_status_1	
	1	Station_status_2	
	2	Station_status_3	Standard DP – diagnostics
	3	Diag_Master_Add	
	4	Ident_Number	
	5	Ident_Number	
	6	Header	
	7	Status_Type	Status coding
	8	Slot_Number	acc. to DP/V1
	9	Specifier	
	10	Diagnostics (0)	
	11	Diagnostics (1)	Diagnostics object
	12	Diagnostics (2)	of the physical block
	13	Diagnostics (3)	

Specifier

1: raised event

2: cleared event

Diagnostics

Byte	Bit	Meaning for ”1”
0	0	Electronics defective
	1	Mechanics defective
	2	–
	3	–
	4	Memory error
	5	–
	6	Device not initialized
	7	Self–calibration failed
1	0	Zero–point error
	1	–
	2	Invalid configuration
	3	–
	4	–
	5	–
	6	Characteristic invalid
	7	–
2		–
3		–

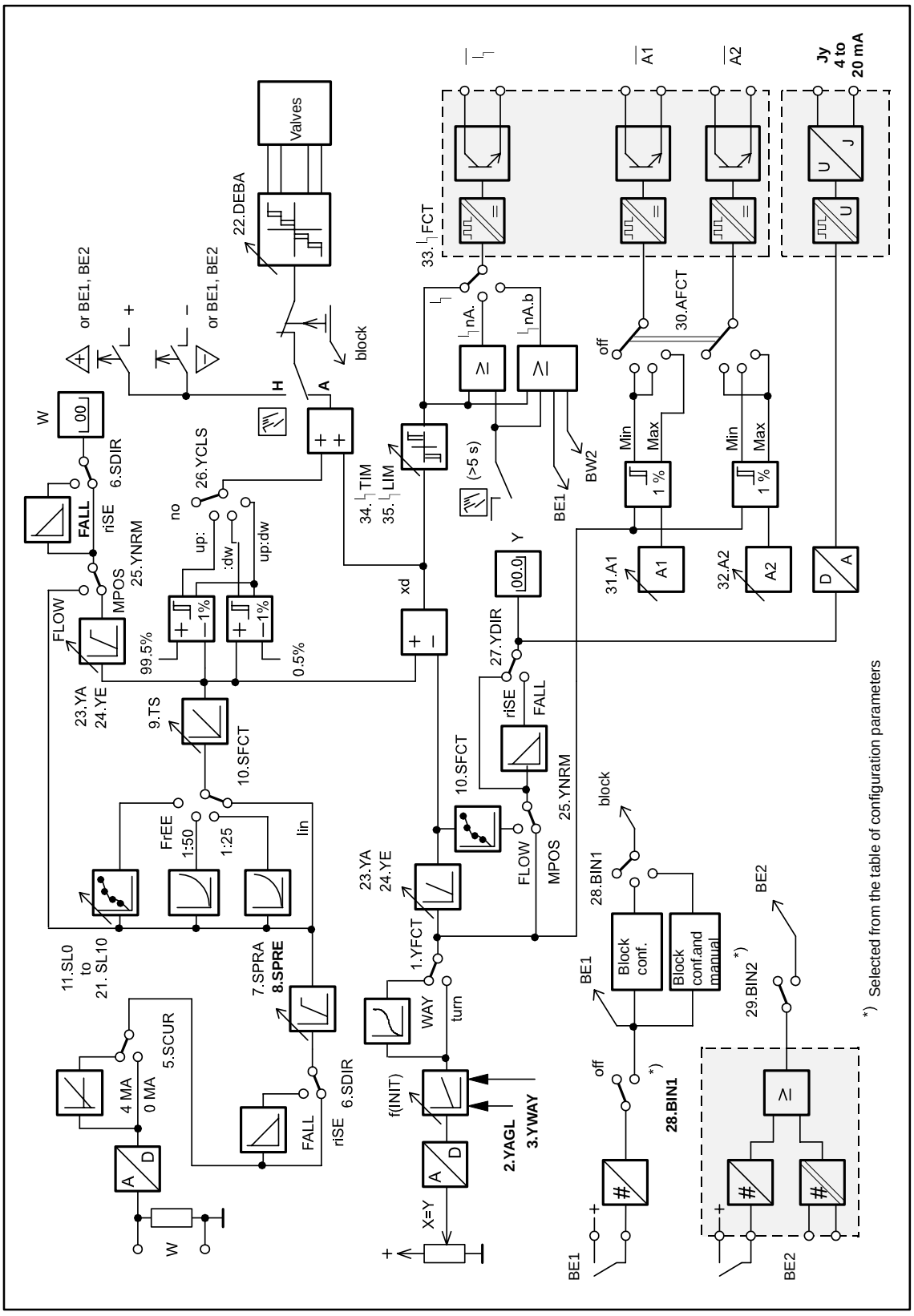


Fig. 4-13 Configuration block diagram **(devices without PROFIBUS PA)**

Service and Maintenance

5

To a great extent the instrument requires no maintenance. However, if the valves fail due to the use of unsuitable compressed air, they can be replaced. Please contact your local Siemens office.

Danger

Avoid electrostatic charges in zones subject to explosion hazard. Electrostatic charges can be caused when the instrument is cleaned with a dry cloth.

Technical Data

6

General data: basic instrument 6DR400x–xx (without PROFIBUS PA) and 6DR410x–xx (with PROFIBUS PA)

Climatic category IEC 721			
	Storage		1K5 but – 40 °C to + 80 °C [1]
	Transport		2K4 but – 40 °C to + 80 °C [1]
	Operation without purging air		3K3 but – 30 °C [3] to + 80 °C [2]
	with purging air		3K4 but – 30 °C [3] to + 80 °C [2]
Degree of protection			IP65 acc. to EN60529
Dimensions	plastic housing		see Fig. 3-2
	metal housing		see Fig. 3-4
Weight	basic instrument	plastic	approx 0.9 kg
		metal	approx. 1.3 kg
Resistance to vibration			5 g acc. to IEC 48–2–6 with NAMUR mounting 8 g (10 g) acc. to IEC 48–2–6 with ARCA mounting or “rotary actuator” [4]
Termination system			
	electrical signals		screw terminals 1.5 AWG14 cable gland PG 13
	pneumatic signals		internal thread G 1/4 DIN 45141
Mounting position			any, outlet air opening and controller output axis not upwards
Material	housing	plastic	fibre–glass reinforced polyester
		metal	anodized Gk–Al Si 7Mg
	pneumatic connection block for plastic housing		anodized Al Mg Si < 6
CE symbol			conforms to EMC directive 89/336 EEC in accordance with the following standards
	Emitted interference		EN 50 081–1
	Immunity to interference		EN 50 082–2 and NAMUR NE21 May 93

[1] When commissioning at ≤ 0 °C, ensure the valves are purged with the dry medium for a sufficiently long period
[2] See technical data for basic instrument and option for ex-proof instruments
[3] Reduced refresh rate of the LCD display below –10 °C
[4] To 100 Hz

General data: basic instrument 6DR400x–xx and 6DR410x–xx

AD converter	
Sampling time	12.5 ms
Resolution	≤ 0.05 %
Transmission error	≤ 0.2 %
Temperature influence	≤ 0.1 % / 10 K
Controller data	
5–step switch	adaptive
Dead zone dEbA = Auto	adaptive or
dEbA = 0.1 to 10 %	fixed setting
Controllable actuating times	≥ 1.5 s

Pneumatic and mechanical data: basic instrument 6DR400x–xx and 6DR410x–xx

Power supply (inlet air)	
Medium	Instrument air, free of oil, water, and dust
Pressure	1.4 to 7 bar
Solids content	< 30 µm
Dewpoint	20 K below the lowest ambient temperature
Unrestricted flow	
Inlet air valve	5.5 Nm^3/h with a drop in pressure from 6 to 5 bar
Valve leakage	< $6 \cdot 10^{-4}$ Nm^3/h
Restrictor ratio	adjustable up to ∞ : 1
Air consumption in settled state	< $3.6 \cdot 10^{-2}$ Nm^3/h
Types of actuators	Single and double acting (not with 6DR4001–xx)
Positioning times	1.5 to 150 s
Linear actuators	
Mounting kit 6DR4004–8V and –8L	acc. to IEC 534–6 (NAMUR)
Linear range	3 to 130 mm (rotation angle on the controller output axis from 16° to 90°)
Rotary actuators	
Mounting kit 6DR4004–8D	
Angle of rotation	30° to 100°

Electrical data: basic instrument without PROFIBUS PA

	6DR4000–1N/–2N and 6DR4001–1N	**6DR4000–1E/–2E and 6DR4001–1E**
Degree of protection acc. to EN 50014 and EN 50020	–	II2G EEx ib II C T4/T5/T6
Place of installation	–	zone 1 + 2
Ambient temperature	– 30 to + 80 °C	T4 – 30 to + 80 °C T5 – 30 to + 65 °C T6 – 30 to + 50 °C

2-wire circuit		Fig. 3-8	Fig. 3-16
Nominal signal range		4 to 20 mA	
Current for maintenance of power supply		≥ 3.6 mA	
Required load voltage		$U_B \geq 10$ V without HART module $U_B \geq 11.5$ V with HART module	
Static destruction limit		± 40 mA	–
Internal capacitance	C_i	–	19 nF
Internal inductance	L_i	–	0.22 mH
For connection to intrinsically safe current sources with	U_i	–	≤ 30 V
	J_i	–	≤ 100 mA
	P_i	–	≤ 1 W

3/4-wire circuit		Fig. 3-9	
Power supply U_H			
Range		+ 18 to 35 V	+ 18 to 30 V
Power consumption J_H		$J_H = \frac{U_H - 9.2\ V}{1.5\ k\Omega}$ [mA]	
Static destruction limit		± 35 V	–
Internal capacitance	C_i	–	19 nF
Internal inductance	L_i	–	0.22 mH
For connection to intrinsically safe current sources with	U_i	–	≤ 30 V
	J_i	–	≤ 100 mA
	P_i	–	≤ 1 W

		6DR4000–1N/–2N and 6DR4001–1N	6DR4000–1E/–2E and 6DR4001–1E
Current input i_w			
Nominal signal range		0 or 4 to 20 mA	
Load voltage at 20 mA		≤ 0.85 V without HART module ≤ 2.4 V with HART module	
Static destruction limit		± 40 mA	–
Internal capacitance	C_i	–	19 nF
Internal inductance	L_i	–	0.22 mH
For connection to intrinsically safe current sources with	U_i	–	≤ 30 V
	J_i	–	≤ 100 mA
	P_i	–	≤ 1 W

Electrical isolation	between U_H and J_w	between U_H and J_w (2 intrinsically safe circuits)
Test voltage 50 Hz 1 min	500 V_{rms}	
Binary input BE1 (electrically connected with J_w circuit)	can be used for isolated contact max. contact load ≤ 5 µA at 3 V	

Electrical data: basic instrument with PROFIBUS PA

	6DR4100–1N 6DR4100–2N 6DR4101–1N	**6DR4100–1E 6DR4100–2E 6DR4101–1E**
Degree of protection acc. to EN 50014 and EN 50020		EEx ia IIC T4/T5/T6
Ambient temperature		T4 –30 to +80 °C T5 –30 to +65 °C T6 –30 to +50 °C
Place of installation		zone 1
Power supply	conducted on bus	
Bus voltage	9 to 32 V	9 to 24 V
Power consumption	12 mA ± 10 %	
Electronic current limitation	I_{max} = ≤ 16 mA in case of fault	
Effective internal inductance		L_i ≤ 7.2 mH
Effective internal capacitance		C_i ≤ 550 pF
Connection		certified intrinsically safe circuit
Power supply unit	U_S = 24 V; J_S = 128 mA	

Electrical isolation	Between BUS and secondary circuit	Between BUS and secondary circuit (2 intrinsically safe circuits)
Test voltage 50 Hz 1 min	500 V_{rms}	
Binary input BE1 (electrically connected with secondary circuit)	can be used for isolated contact max. contact load ≤ 5 µA at 3 V	

Communication function	Layer 1+2 acc. to PROFIBUS PA, transmission technology acc. to IEC 1158–2; slave Layer 7 (protocol layer) acc. to PROFIBUS DP, standard EN 50 170 with the extended PROFIBUS func tionality (all data non–cyclic, value of manipulated variable, feedback signals and status also cyclic)
C2_Connections after communication interruption.	4 connections with master class 2 are supported, automatic connection breakdown 60 s
Device profile	PROFIBUS PA profile B, version 3.0; more than 150 objects
Response time to master telegram	Typ. 10 ms
Device address	126 (in the as–supplied state)
PC parameterization software	SIMATIC PDM executable on Windows 95 or Windows NT; supports all device objects The software is not contained in the scope of supply.

Electrical data: options

	6DR4004–8x	**6DR4004–6x**
Acc. to EN 50014 and EN 50020	–	II2G EEx ib II C T4/T5/T6 [2]
Place of installation	–	zone 1
Ambient temperature	– 30 to + 80 °C	T4 – 30 to + 80 °C T5 – 30 to + 65 °C T6 – 30 to + 50 °C

Alarm module	**6DR4004–8A**	**6DR4004–6A**
Binary outputs, $\overline{A1}$, $\overline{A2}$, ⏚		
Signal state High (not available)	+ 3 % conductive R = 1 kΩ – 1 %	≥ 2.1 mA [1]
Signal state Low (available) [3]	blocked I_R < 60 µA	≤ 1.2 mA [1]
Internal capacitance C_i	–	4.7 nF
Internal inductance L_i	–	negligible
Power supply U_H	≤ + 35 V	
For connection to intrinsically safe switching amplifiers to DIN 19234 with U_i	–	+30 V
Binary input BE2		
Terminal 21/22 (electrically connected with basic instrument)		
Signal state 0	isolated contact open	
Signal state 1	isolated contact closed	
Contact load	3 V, 5 µA	
Terminal 11/12 (electrically isolated)		
Signal state 0	≤ 4.5 V or open	
Signal state 1	≥ 13 V	
Input resistance	≥ 25 kΩ	
Internal capacitance Ci	negligible	
Internal inductance Li	negligible	
For connection to intrinsically safe voltage sources with U_i	≤ 30 V	
Electrical isolation	to the basic instrument and the 4 outputs among themselves	$\overline{A1}$, $\overline{A2}$, ⏚ , BE2 (T. 11/12) and the basic instrument are isolated intrinsically safe circuits
Test voltage 50 Hz 1 min	500 V_{rms}	

J_y module		**6DR4004–8J**	**6DR4004–6J**
		2-wire circuit	
Nominal signal range	i	4 to 20 mA short circuit proof	
Control range		3.6 to 20.5 mA	
Power supply	U_H	+ 12 to 35 V	+ 12 to 30 V
External load		R_B [kΩ] ≤ (U_H [V] – 12 V) / i [mA]	
Transfer error		≤ 0.3 %	
Effect of temperature		≤ 0.1 % / 10 K	
Resolution		≤ 0.1 %	
Residual ripple		≤ 1 %	
Internal capacitance	C_i	–	≤10 nF
Internal inductance	L_i	–	0.2 mH
For connection to intrinsically safe voltage sources with	U_i	–	≤ 30 V
	J_i	–	≤ 100 mA
	P_i	–	≤ 1 W
Electrical isolation		to the basic instrument	J_y (Kl. 61/62) and the basic instrument are isolated intrinsically safe circuits
Test voltage 50 Hz 1 min		500 V_{rms}	

1) Operating points with supply to DIN 19234 U_H = 8.2 V; R_i = 1 kΩ

2) Only with the basic instrument 6DR4000–1E/–2E

3) The status is also Low if the basic instrument is faulty or without auxiliary power supply

Supply Range

7

The positioner and its option modules are supplied as separate units and in different versions. Positioners and option modules are available for operation in zones with and without an explosion hazard. These versions are marked by a special rating plate.

Warning

When combining components, make sure that only positioners and option modules can be combined that are approved for the zone where they will be used. This especially applies to safe operation of the positioner in zone in which the atmosphere might be subject to an explosion hazard (Zones 1 and 2). In that case it is imperative to use categories (2 and 3) both of the device itself and its options.

7.1 Supply range of basic instrument

Model	**SIPART PS2 Order no.**	**SIPART PS2 PA Order no.**
Single–action, not explosion–proof, plastic housing	6DR4000–1N	6DR4100–1N
Double–action, not explosion–proof, plastic housing	6DR4000–2N	6DR4100–2N
Single–action, explosion–proof, plastic housing	6DR4000–1E (PTB) 6DR4000–1F (FM)	6DR4100–1E (PTB)
Double–action, explosion–proof, plastic housing	6DR4000–2E (PTB) 6DR4000–2F (FM)	6DR4100–2E (PTB)
Single–action, not explosion–proof, metal housing	6DR4001–1N	6DR4101–1N
Single–action, explosion–proof, metal housing	6DR4001–1E (PTB) 6DR4001–1F (FM)	6DR4101–1E (PTB)

7.2 Supply range of options

Option	Order number
HART module not ex-proof **(devices without PROFIBUS PA only)**	6DR4004–8H
HART module exi **(devices without PROFIBUS PA only)**	6DR4004–6H
Alarm module not ex-proof	6DR4004–8A
Alarm module exi (PTB) Alarm module exi (FM)	6DR4004–6A 6DR4004–7A
Jy module not ex-proof (PTB)	6DR4004–8J
Jy module exi Jy module exi (FM)	6DR4004–6J 6DR4004–7J

7.3 Supply range of accessories

Accessory	Order number
Mounting kit for linear actuators IEC 534 – 6 including lever arm for 3 to 35 mm	6DR4004–8V
Lever arm for > 35 to 130 mm	6DR4004–8L
Mounting kit rotary actuators VDI/VDE 3845	6DR4004–8D
Solenoid valve block for SAMSON actuator (integrated mounting)	6DR4004–1C
Manometer block, single acting	6DR4004–1M
Manometer block, double acting	6DR4004–2M
Solenoid valve block, single acting	6DR4004–1B
Mounting set for SAMSON actuator (integrated mounting)	6DR4004–8S
HART–modem **(devices without PROFIBUS PA only)**	7MF4997–1DA
Operator software SIPROM PS2 (German)	6DR1127–2PS00
Operator software SIPROM PS2 (English)	6DR1127–2PS01
Operating software SIMATIC PDM	on request
Set of type plates for use in zone 2 as Ex n **(devices without PROFIBUS PA only)**	C73451–A430–D55

Appendix

A

A 1 Index

A 2 Device master data file (GSD)

Device master data file of the SIPART PS2/PS positioner:

The device master data file (GSD) is necessary to be able to communicate with the SIPART PS2 PA positioner. It essentially describes the data formats supported.

This file will soon be available in the Internet:

Homepage: www.ad.siemens.de,

click on Support,

click on Simatic,

search for GSD

The following pages show a printout of the GSD

See following pages for an example.

```
;*********************************************************
;**       GSD Datei fuer SIPART PS 2 PA, SIEMENS AG      **
;**       MLFB:  6DR410x-xx                              **
;**       Stand: 30.10.98                                **
;**       Datei: SIS18079.GSD                            **
;*********************************************************
;
#Profibus_DP
GSD_Revision        = 1
Vendor_Name         = "SIEMENS AG"
Model_Name          = "SIPART PS 2"
Revision            = "V1.0"
Ident_Number        = 0x8079
Protocol_Ident      = 0
Station_Type        = 0
FMS_supp            = 0
Hardware_Release    = "A01"
Software_Release    = "Z01"
31.25_supp          = 1
45.45_supp          = 1
93.75_supp          = 1
MaxTsdr_31.25       = 100
MaxTsdr_45.45       = 250
MaxTsdr_93.75       = 1000
Redundancy          = 0
Repeater_Ctrl_Sig   = 0
24V_Pins            = 0
Bitmap_Device       = "SIS8079n"
Freeze_Mode_supp    = 0
Sync_Mode_supp      = 0
Auto_Baud_supp      = 0
Set_Slave_Add_supp  = 1
Min_Slave_Intervall = 250

Modular_Station     = 0
Max_Module          = 1
Fail_Safe           = 0
Slave_Family        = 12
Max_Diag_Data_Len   = 14
Implementation_Type = "SPC41/ITEC"

;------- Bedeutung der geraetebezogenen Diagnosebits: ---------
;
Unit_Diag_Bit(24)   = "Hardware failure electronics"
Unit_Diag_Bit(25)   = "Hardware failure mechanics"
Unit_Diag_Bit(28)   = "Memory error"
Unit_Diag_Bit(29)   = "Measurement failure"
Unit_Diag_Bit(30)   = "Device not initialized"
Unit_Diag_Bit(31)   = "Device initialization failed"
Unit_Diag_Bit(32)   = "Zero point error"
Unit_Diag_Bit(33)   = "Power supply failed"
Unit_Diag_Bit(34)   = "Configuration invalid"
Unit_Diag_Bit(35)   = "Restart"
Unit_Diag_Bit(36)   = "Coldstart"
Unit_Diag_Bit(37)   = "Maintenance required"
Unit_Diag_Bit(38)   = "Characteristics invalid"
Unit_Diag_Bit(39)   = "Ident_Number violation"
;-------------------------------------------------------------
```

```
User_Prm_Data_Len   = 3
User_Prm_Data       = 0x00,0x00,0x00

;Modules for Analog Output
;
; RB = READBACK, CB = CHECKBACK, RC_OUT = RCAS_OUT, RC_IN = RCAS_IN
;
Module      = ”SP                                ”        0xA4
EndModule
Module      = ”RC_OUT, RC_IN                     ”        0xB4
EndModule
Module      = ”READBACK + POS_D, SP              ”  0x96, 0xA4
EndModule
Module      = ”CHECKBACK, SP                     ”  0x92, 0xA4
EndModule
Module      = ”READBACK+CHECKBACK+POS_D, SP      ”  0x99, 0xA4
EndModule
Module      = ”RC_OUT + CHECKBACK, RC_IN         ”  0x97, 0xA4
EndModule
Module      = ”RB+ RC_OUT+CB+ POS_D, SP+RC_IN    ”  0x9E, 0xA9
EndModule
;
Module    = ”AO_X SP”                          0x82,0x84,0x08,0x05
EndModule
Module    = ”AO_X SP/RB/POS_D”                 0xC6,0x84,0x86,0x08,0x05,\
                                               0x08,0x05,0x05,0x05
EndModule
Module    = ”AO_X SP/CB”                       0xC3,0x84,0x82,0x08,0x05,\
                                               0x0A
EndModule
Module    = ”AO_X SP/RB/CB/POS_D”              0xC7,0x84,0x89,0x08,0x05,\
                                               0x08,0x05,0x05,0x05,0x0A
EndModule
Module    = ”AO_X RIN/ROUT”                    0xC4,0x84,0x84,0x08,0x05,\
                                               0x08,0x05
EndModule
Module    = ”AO_X RIN/ROUT/CB”                 0xC5,0x84,0x87,0x08,0x05,\
                                               0x08,0x05,0x0A
EndModule
Module    = ”AO_X SP/RB/RIN/ROUT/CB/POS_D”     0xCB,0x89,0x8E,0x08,0x05,\
                                               0x08,0x05,0x08,0x05,0x08,\
                                               0x05,0x05,0x05,0x0A
EndModule
```

A 3 SIMATIC object table

On the following pages you will find a table of all SIMATIC object parameters of the SIPART PS2 PA.

Slot	Index abs	Index rel	Ele–ment	Default Value	Object	Parameter Description	Data Type	Anzahl	cyclic	read write
					Device Management					
1	0	1			HEADER		unsigned16	6		r
			1	0x0000	Dir_ID	Directory ID (reserved)				
			2	0x0001	Num_Dir_Rev	Directory Revision Number				
			3	0x0001	Num_Dir_Obj	Number of Directory Objects (Directories)				
			4	0x0006	Num_Dir_Entries	Total Number of Directory Entries				
			5	0x0001	First_Comp_Dir_Entry	Entry number of first Composite List Dir Entry				
			6	0x0003	Num_Comp_Dir_Entry	Number of Composite List Directory Entries				
1	1	2			COMPOSITE_LIST_DIRECTORY_ENTRY		unsigned16	12		r
			1	0x0104	Start_PB_Ref	Directory Index Physical Block (Resource Block)				
				0x0001	Num_PB	Number of Physical Blocks (1)				
			2	0x0105	Start_First_TB_Ref	Directory Index for first Transducer Block				
				0x0001	Num_TB	Number of Transducer Blocks				
			3	0x0106	Start_First_FB_Ref	Directory Index for first Function Block				
				0x0001	Num_FB	Number of Function Blocks				
			4	0x010E	Slot_Index_PB	Communication related address index to PB				
				0x004c	Num_PB_Param	(Incl. reserved cells)				
			5	0x0197	Slot_Index_TB	(Absolute index)				
				0x0065	Num_TB_Param	(Incl. reserved cells)				
			6	0x015a	Slot_Index_FB	(Absolute index)				
				0x003d	Num_FB_Param	(Incl. reserved cells)				
					Physical Block					
1	14	0			BLOCK_OBJECT	Block characteristic	ds32	1		r
			1	250	Reserved					
			2	0x01	Block Object	Block type (physical)				
			3	0x02	Parent Class					
			4	250	Class					
			5	0x00000000	DD–Reference (reserved)					
			6	0	DD–Revision (reserved)					
			7	0x4002	Profile	PA profile number assigned by PNO for PROFIBUS – PA = 64, Compact Class B				
			8	0x0300	Profile Revision					
			9	0x00	Execution Time	for future use				
			10	0x004c	Number of Parameters					
			11	0x004B	Index of VIEW 1					
			12	0x01	Number of View Lists					
					Standard Parameters					
	15	1		0	ST_REV	Counter that is incremented on every change of configuration parameters	unsigned16	1		r
	16	2			TAG_DESC	Unique tag in the system that the user can specify	visible_string	32		r, w
	17	3		0	STRATEGY	Strategy	unsigned16	1		r, w
	18	4		0	ALERT_KEY	Value can be written to by user for alarm processing	unsigned8	1		r, w
	19	5		0x08	TARGET_MODE	Target mode of the PB = Auto	unsigned8	1		r, w
	20	6			MODE_BLK	Set block mode	ds37	1		r
			1	0x08	Actual	Auto				
			2	0x08	Permitted	Auto				
			3	0x08	Normal	Auto				
	21	7			ALARM_SUM	Alarm status	ds42	1		r
			1	0x0000	Current_Alarm					
			2	0x0000	Unacknowledged					
			3	0x0000	Unreported					

			4	0x0000	Disabled					
						Parameters of the Physical Block (mandatory and optional)				
	22	8		t1	SOFTWARE_REVISION	Software Revision	octet_string	16		r
	23	9			HARDWARE_REVISION	Hardware Revision	octet_string	16		r
	24	10		42	DEVICE_MAN_ID	Manufacturer	unsigned16	1		r
	25	11			DEVICE_ID	Device identification (unique)	visible_string	16		r
	26	12			DEVICE_SER_NUM	Device service number	visible_string	16		r
	27	13		0x00000000	DIAGNOSIS	Detailed device info (bit–coded)	octet_string	4		r
	29	15		0xD0530000	DIAGNOSIS_MASK	Bits supported by DIAGNOSIS	octet_string	4		r
	31	17			DEVICE_CERTIFICATION	Degrees of protection complied with	octet_string	32		r
	32	18		0x2457	WRITE_LOCKING	Password	unsigned16	1		r, w
	33	19		0	FACTORY_RESET	Reset to default values	unsigned16	1		w
	34	20			DESCRIPTOR		octet_string	32		r, w
	35	21			DEVICE_MESSAGE		octet_string	32		r, w
	36	22			DEVICE_INSTAL_DATE	Date of device installation	octet_string	16		r, w
	37	23		1	LOCAL_OP_ENA	Enable of local operation	unsigned8	1		r, w
	38	24		0x0	IDENT_NUMBER	Switch: Profile ID / Manufacturer ID	unsigned8	1		r, w
						Additional physical block Parameters for actuators				
	47	33			VALVE_MAN	Valve manufacturer	octet_string	16		r, w
	48	34			ACTUATOR_MAN	Actuator manufacturer	octet_string	16		r, w
	49	35		0	VALVE_TYPE	Valve type	unsigned8	1		r, w
	50	36		0	ACTUATOR_TYPE	Actuator type (always electropneumatic)	unsigned8	1		r
	51	37		0	ACTUATOR_ACTION	Safety position of the valve	unsigned8	1		r, w
	52	38			VALVE_SER_NUM	Serial No. of the valve	octet_string	16		r, w
	53	39			ACTUATOR_SER_NUM	Serial No. of the actuator	octet_string	16		r, w
	54	40			ADD_GEAR_SER_NUM	Serial No. of the gearing	octet_string	16		r, w
	55	41			ADD_GEAR_MAN	Gearing manufacturer	octet_string	16		r, w
	56	42			ADD_GEAR_ID	Gearing identification	octet_string	16		r, w
	57	43			ADD_GEAR_INST_DATE	Date of installation of gearing	octet_string	16		r, w
	68	54		0	TRANSM_ANGLE	Nominal angle of rotation of feedback	unsigned8	1		r, w
	69	55		0	TRANSM_LENGTH	Leverage ratio	unsigned8	1		r, w
	70	56		0	ATTACHMENT	Definition of the attachment	unsigned8	1		r, w
	71	57		0	ACTUATOR_VERSION	Actuator with or without spring reset	unsigned8	1		r, w
	72	58		0	IDENT_BINARY_INPUT	Presence of option binary input/output	unsigned8	1		r, w
	73	59		0	IDENT_CURRENT_OUTPUT	Presence of option current output	unsigned8	1		r, w
	74	60			CALIBRATION_DATE	Test dates of the PCB	record	2		r
			1		CAL_DATE	Test date (formerly data type: date)	octet_string	8		
			2		CAL_WHO	Who did the test	visible_string	24		
	75	61			PRODUCT_CODE	Product code (MLFB)	visible_string	30		r
	89	75			**VIEW_1**		void	4		r
			1		1	ST_REV				
			2		6	MODE_BLK				
			3		7	ALARM_SUM				
			4		13	DIAGNOSIS				

						Actuator Function Block AO (Analog Out)				
1	90	0			BLOCK_OBJECT	Block characteristic	ds32	1		r
			1	250	Reserved					
			2	0x02	Block Object	Block type (function)				
			3	0x02	Parent Class	Output				
			4	0x01	Class	Analog output				
			5	0x00000000	DD–Reference (reserved)					
			6	0x0000	DD–Revision (reserved)					
			7	0x4002	Profile	PA profile number assigned by PNO for PROFIBUS – PA = 64, compact class B = 2				
			8	0x0300	Profile Revision					
			9	0x00	Execution Time	for future use				
			10	0x003d	Number of Parameters					
			11	0x003c	Index of VIEW 1					
			12	0x01	Number of View Lists					
	91	1		0	ST_REV	Counter that is incremented on every change of configuration parameters	unsigned16	1		r
	92	2			TAG_DESC	Unique tag in the system that the user can specify	visible_string	32		r, w
	93	3		0	STRATEGY	Strategy	unsigned16	1		r, w
	94	4		0	ALERT_KEY	Value can be written to by the user for alarm processing	unsigned8	1		r, w
	95	5		0x08	TARGET_MODE	Target mode of the PB = Auto	unsigned8	1		r, w
	96	6			MODE_BLK	Set block mode	ds37	1		r
			1	0x08	Actual	Auto				
			2	0xba	Permitted	Permitted modes				
			3	0x08	Normal	Auto				
	97	7			ALARM_SUM	Alarm status	ds42	1		r
			1	0x0000	Current_Alarm					
			2	0x0000	Unacknowledged					
			3	0x0000	Unreported					
			4	0x0000	Disabled					
						Parameters of the Actuator Function Blocks AO (mandatory and optional)				
	98	8			BATCH_INFORMATION	Stored information for batch processes	record	4		r, w
			1	0	Batch_ID		unsigned32	1		
			2	0	Equipment		unsigned16	1		
			3	0	Operation		unsigned16	1		
			4	0	Phase		unsigned16	1		
	99	9			SP	Setpoint in per cent, with ref. to PV_SCALE	ds33	1	x	r, w
			1	0	Value					
			2	0x80	Status	Status good, otherwise ev. Fail–Safe in the RCAS				
	101	11			PV_SCALE	Scaling of the setpoint	ds36	1		r, w
			1	100	EU at 100%					
			2	0	EU at 0%					
			3	1342	Units Index					
			4	0	Decimal Point					
	102	12			READBACK	Readback in per cent, with ref. to PV_SCALE	ds33	1	x	r
			1	0	Value					
			2	0x4f	Status					
	104	14			RCAS_IN	Setpoint in Remote Cascade mode	ds33	1	x	r, w
			1	0	Value					
			2	0x80	Status	Status good, otherwise ev. Fail–Safe in AUTO				
	111	21		0x13A	IN_CHANNEL	Assignment to the transducer block (feedback)	unsigned16	1		r, w

	112	22		0x139	OUT_CHANNEL	Assignment to the transducer block (positioning)	unsigned16	1		r, w
	113	23		30	FSAVE_TIME	Response time after communication failure	float	1		r, w
	114	24		0	FSAVE_TYPE	Type of response to communication failure	unsigned8	1		r, w
	115	25		0	FSAVE_VALUE	Setpoint on communication failure	float	1		r, w
	117	27			RCAS_OUT	Readback in Remote Cascade mode	ds33	1	x	r
			1	0	Value					
			2	0x4f	Status					
	121	31			POS_D	Position of the valve actuator	ds34	1	x	r
			1	0	Value					
			2	0x4f	Status					
	122	32			SETP_DEVIATION	System deviation in %	float	1		r
	123	33		0x000000	CHECK_BACK	Device information	octet_string	3	x	r
	124	34		0x9FFF03	CHECK_BACK_MASK	Mask for device information	octet_string	3		r
	125	35			SIMULATE	Simulation of the readback	ds50	1		r, w
			1	0x4b	Simulate_Status					
			2	0	Simulate_Value					
			3	0	Simulate_En / Disable					
	126	36		0	INCREASE_CLOSE	Positioning direction	unsigned8	1		r, w
	127	37			OUT	Setpoint in per cent, with ref. to OUT_SCALE	ds33	1		r
			1	0	Value					
			2	0x4f	Status					
	128	38			OUT_SCALE	Scaling of the output value	ds36	1		r, w
			1	100	EU at 100%					
			2	0	EU at 0%					
			3	1342	Units Index					
			4	0	Decimal Point					
	150	60			**VIEW_1**		void	6		r
			1		1	ST_REV				
			2		6	MODE_BLK				
			3		7	ALARM_SUM				
			4		12	READBACK				
			5		31	POS_D				
			6		33	CHECK_BACK				
					Transducer Block					
1	151	0			BLOCK_OBJECT	Block characteristic	ds32	1		r
			1	0x0	Reserved					
			2	0x03	Block Object	Block type (transducer)				
			3	0x05	Parent Class					
			4	0x02	Class					
			5	0x00000000	DD–Reference (reserved)					
			6	0	DD–Revision (reserved)					
			7	0x4002	Profile	PA profile number assigned by PNO for PROFIBUS – PA = 64				
			8	0x0300	Profile Revision					
			9	0x00	Execution Time	for future use				
			10	0x0065	Number of Parameters					
			11	0x0064	Index of VIEW 1					
			12	0x00	Number of View Lists					
	152	1		0	ST_REV	Counter that is incremented on every change of configuration parameters	unsigned16	1		r
	153	2			TAG_DESC	Unique tag in the system that the user can specify	visible_string	32		r, w
	154	3		0	STRATEGY	Strategy	unsigned16	1		r, w

	155	4		0	ALERT_KEY	Value can be written to by the user for alarm processing	unsigned8	1		r, w
	156	5		0x08	TARGET_MODE	Target mode of the PB = Auto	unsigned8	1		r, w
	157	6			MODE_BLK	Set block mode	ds37	1		r
			1	0x08	Actual	Auto				
			2	0x98	Permitted Auto, O/S, LO	Auto				
			3	0x08	Normal	Auto				
	158	7			ALARM_SUM	Alarm status	ds42	1		r
			1	0x0000	Current_Alarm					
			2	0x0000	Unacknowledged					
			3	0x0000	Unreported					
			4	0x0000	Disabled					
						Parameter of the Transducer Block (mandatory and optional)				
	160	9		0.0	ACT_STROKE_TIME_DEC	Calculated stroke time for OPENING	float	1		r
	161	10		0.0	ACT_STROKE_TIME_INC	Calculated stroke time for CLOSING	float	1		r
	168	17		1	TAB_ENTRY	Index	unsigned8	1		r, w
	169	18			TAB_X_Y_VALUE	Tab position	float	2		r, w
			1		X_Value					
			2		Y_Value					
	170	19		21	TAB_MIN_NUMBER	Min. possible tabs	unsigned8	1		r
	171	20		21	TAB_MAX_NUMBER	Max. possible tabs	unsigned8	1		r
	172	21		21	TAB_ACTUAL_NUMBER	Number of tabs currently stored	unsigned8	1		r
	173	22		1	DEADBAND	Deadband of the controller	float	1		r, w
	174	23			DEVICE_CALIB_DATE	Calibration date of the device	octet_string	8		r, w
	175	24			DEVICE_CONFIG_DATE	Configuration date of the device	octet_string	8		r, w
	176	25		0	LIN_TYPE	Linearization type	unsigned8	1		r, w
	183	32			RATED_TRAVEL	Rated travel of the valve	ds33	1		r
			1	0	Value					
			2	0	Status					
	184	33		0	SELF_CALIB_CMD	Calibration start	unsigned8	1		w
	185	34		0	SELF_CALIB_STATUS	Status of calibration	unsigned8	1		r
	189	38		0.0	SETP_CUTOFF_DEC	Tight closure if less than	float	1		r, w
	190	39		100.0	SETP_CUTOFF_INC	Tight closure if greater than	float	1		r, w
	196	45		0	TOTAL_VALVE_TRAVEL	Absolute travel integral	float	1		r, w
	197	46		0	TOTAL_VALVE_TRAVEL_LIMIT	Limit value for the absolute travel integral	float	1		r, w
	198	47		0	TRAVEL_LIMIT_LOW	Manipulated variable limitation	ds33	1		r, w
			1	0	Value					
			2	0	Status					
	199	48		0	TRAVEL_LIMIT_UP	Manipulated variable limitation	ds33	1		r, w
			1	100.0	Value					
			2	0	Status					
	200	49		0	TRAVEL_RATE_DEC	Required travel rate for OPENING	float	1		r, w
	201	50		0	TRAVEL_RATE_INC	Required travel rate for CLOSING	float	1		r, w
	202	51			VALVE_MAINT_DATE	Date of valve maintenance	octet_string	8		r, w
	206	55		0	TAB_OP_CODE	Operation code	unsigned8	1		r, w
	207	56		0	TAB_STATUS		unsigned8	1		x
	208	57			POSITIONING_VALUE	Positioning value	ds33	1		r, w
			1	0	Value					
			2	0x4f	Status					

	209	58			FEEDBACK	Current position	ds33	1		r
			1	0	Value					
			2	0x4f	Status					
	221	70		0	BIN_IN_1_FUNCT	Function of binary input 1	unsigned8	1		r, w
	222	71		0	BIN_IN_2_FUNCT	Function of binary input 2	unsigned8	1		r, w
	223	72		0	ALARM_FUNCT	Function of the alarm outputs	unsigned8	1		r, w
	224	73		10.0	ALARM_1	Alarm value 1, with ref. to OUT_SCALE	float	1		r, w
	225	74		90.0	ALARM_2	Alarm value 2, with ref. to OUT_SCALE	float	1		r, w
	226	75		0	FAULT_FUNCT	Function of the fault signaling output	unsigned8	1		r, w
	227	76		1	DELAY_TIME	Monitoring time for setting the fault signal	float	1		r, w
	228	77		0.1	TOLERANCE_BAND	Response threshold of the fault signal	float	1		r, w
	229	78		1	TRAVEL_RATE_AUTO	Travel rate CLOSE automatic / manual	unsigned8	1		r, w
	230	79		1	TRAVEL_RATE_INC_AUTO	Travel rate OPEN automatic / manual	unsigned8	1		r, w
	231	80		1	DEADBAND_AUTO	Deadband automatic / manual	unsigned8	1		r, w
	232	81		1	DELAY_TIME_AUTO	Monitoring time automatic / manual	unsigned8	1		r, w
	233	82		1	TOLERANCE_BAND_AUTO	Response threshold automatic / manual	unsigned8	1		r, w
	234	83		0	SETP_CUTOFF_ENA	Enable / disable tight closing	unsigned8	1		r, w
	235	84		0	BINARY_STATUS	Status of the binary signals	unsigned8	1		r
	236	85		0	TEST_ACTIVATE	Activate test functions	unsigned8	1		w
	237	86			TEST_FUNCTION	Execute test functions	record	3		w
			1		Command		unsigned8	1		
			2		Change_Flag		unsigned8	1		
			3		Parameter		octet_string	30		
	238	87		0	TEST_READ	Read test information	octet_string	32		r
	239	88			DIAG1		float	3		r
			1	0.0	Zero point_P0	Value of the pot voltage in % stop top				
			2	0.0	Final value_P100	Value of the pot voltage in % stop bottom				
			3	0.0	Leckage	in % / min				
	240	89		0	DIRECTION_CHANGE	Number of direction changes	unsigned32	1		r, w
	251	100			VIEW_1		void	3		r
			1		1	ST_REV				
			2		6	MODE_BLK				
			3		7	ALARM_SUM				

A 4 References and catalogs

No.	Title	Publisher	Order number
/1/	PNO– Leitfaden PROFIBUS PA	PNO– Geschäftstelle 76131 Karlsruhe	20191
/2/	SIMATIC Paket Feldtechnik	Siemens AG	C79000–G7000–Cxxx–xx
/3/	PROFIBUS & AS– Interface, Komponenten am Feldbus, Katalog ST PI	Siemens AG	E86060–K4660–A101–A2
/4/	Speicherprogrammierbare Steuerungen, SIMATIC S5, Katalog ST50	Siemens AG	E86060–K4650–A101–A7
/5/	SIMATIC Automatisierungssysteme, SIMATIC S7/M7/C7, Katalog ST70	Siemens AG	E86060–K4670–A101–A2
/6/	SIMATIC HMI Bedien– und Beobachtungsprodukte/–systeme, Katalog ST 80	Siemens AG	E86060–K4680–A101–A2
/7/	SIMATIC NET Industrielle Kommunikationsnetze Katalog IK 10	Siemens AG	E86060–K4710–A101–A6
/8/	SINEC Industrielle Kommunikationsnetze Katalog IK 19	Siemens AG	E86060–K4710–A101–A5
/9/	SIMATIC Prozeßleitsystem SIMATIC PCS 7, Katalog ST PCS 7	Siemens AG	E86060–K4678–A111–A1

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