

auma[®]

Actuator controls

AUMA MATIC
AM 01.1/ AM 02.1
AMExB 01.1/ AMExC 01.1
Profibus DP



Certificate Registration No.
12 100 4269
12 104 4269

Operation instructions

Scope of these instructions These instructions are valid for multi-turn actuators of type ranges SA(R) 07.1 – SA(R) 16.1 and SA(R)ExC 07.1 – SA(R)ExC 16.1 and for part-turn actuators of type ranges SG(R) 05.1 – SG(R) 12.1 and SGExC 05.1 – SGExC 12.1 with the controls AUMA MATIC AM 01.1/ AM 02.1 or AMExB 01.1 and AMExC 01.1 and Profibus DP interface.

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1. Safety instructions

1.1 Range of application

AUMA actuators are designed for the operation of industrial valves, e.g. globe valves, gate valves, butterfly valves and ball valves. For other applications, please consult us. The manufacturer is not liable for any possible damage resulting from use in other than the designated applications. Such risk lies entirely with the user. Observance of these operation instructions is considered as part of the controls' designated use.

1.2 Commissioning (electrical connection)

During electrical operation, certain parts inevitably carry lethal voltages. Work on the electrical system or equipment must only be carried out by a skilled electrician himself or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.

1.3 Maintenance

The maintenance instructions must be strictly observed, otherwise a safe operation of the multi-turn actuator/ the controls is no longer guaranteed.

1.4 Warnings and notes

Non-observance of the warnings and notes may lead to serious injuries or damage. Qualified personnel must be thoroughly familiar with all warnings and notes in these operation instructions.

Correct transport, proper storage, mounting, and installation, as well as careful commissioning are essential to ensure a trouble-free and safe operation.

The following references draw special attention to safety-relevant procedures in these operation instructions. Each is marked by the appropriate pictograph.



This pictograph means: Note!

"Note" marks activities or procedures which have major influence on the correct operation. Non-observance of these notes may lead to consequential damage.



This pictograph means: Electrostatically endangered parts!

If this pictograph is attached to a printed circuit board, it contains parts which may be damaged or destroyed by electrostatic discharges. If the boards need to be touched during setting, measurement, or for exchange, it must be assured that immediately before a discharge through contact with an earthed metallic surface (e.g. the housing) has taken place.



This pictograph means: Warning!

"Warning" marks activities or procedures which, if not carried out correctly, can affect the safety of persons or material.

2. Short description

AUMA actuators have a modular design. Motor and gearing are mounted in a common housing.

The actuators are driven by an electric motor and controlled via the electronic controls AUMA MATIC Profibus DP. The electronic controls are included in the scope of delivery.

3. Transport and storage

- Transport to place of installation in sturdy packing.
- Do not attach ropes or hooks to the handwheel for the purpose of lifting by hoist.
- Store in well-ventilated, dry room.
- Protect against floor dampness by storage on a shelf or on a wooden pallet.
- Cover to protect against dust and dirt.
- Apply suitable corrosion protection agent to bright surfaces.

4. General information about Profibus DP

For the exchange of information among automation systems and between automation systems and the connected decentral field devices, serial fieldbuses are mainly used today as the communication system. Thousands of applications have proved impressively that cost savings of up to 40 % in wiring, commissioning, and maintenance are achieved by using fieldbus technology. While in the past the fieldbuses used were often manufacturer specific and incompatible with other bus systems, the systems employed today are almost exclusively open and standardized. This means that the user does not depend on individual suppliers and can choose the best product at the most competitive price.

Profibus DP is the leading open fieldbus system in Europe, which is also used successfully throughout the world. The application range includes automation in the areas of manufacturing, processing and building. Profibus DP is an international, open fieldbus which has been standardized in the fieldbus standard EN 50 170. This standardization ensures that the investments of manufacturers and users are protected to the best possible degree and the independence of the manufacturer is guaranteed.

These operation instructions cannot provide a general introduction into Profibus DP. For more information, please refer to the literature references in appendix D.

4.1 Basic characteristics

Profibus DP defines the technical and functional features of a serial fieldbus system allowing the interconnection of distributed, digital automation devices. Profibus DP distinguishes between master and slave devices. Profibus DP is designed for fast data transmission on the field level. Here, central control devices, such as a PLC or PC, communicate via a fast serial connection with peripheral field devices such as input/ output devices, valves, and actuators.

The interchange of data among the field devices is realised on a cyclic basis. The respectively necessary communication functions are established by the Profibus DP basic functions according to EN 50 170.

Master devices control the data traffic on the bus. A master is allowed to send messages without an external request. Masters are also called 'active devices' in the Profibus protocol.

Slave devices such as AUMA Profibus DP actuators are peripheral devices. Typical slave devices are input/ output devices, valves, actuators and measuring transmitters. They do not have bus access, i.e. they may only acknowledge received messages or, at the request of a master, transmit messages to that master. Slaves are also called 'passive devices'.

4.2 Basic functions of Profibus DP

The master reads the input information from the slaves cyclically and writes the output information cyclically to the slaves. In addition to this cyclic data transfer of the process representation, Profibus DP also provides powerful functions for diagnostics and commissioning purposes. The data traffic is monitored through the monitoring functions on the master and slave side.

4.3 Transfer mode

- RS-485 twisted pair cable or fibre optic cable.
- AUMA actuators support baud rates up to 1.5 MBits/s

4.4 Bus access

- Token-passing between the masters and polling between master and slave.
- Mono-master or multi-master systems are possible.
- Master and slave devices: max. 126 devices connected to one bus

4.5 Communication

- Peer-to-peer (process data exchange [DATA EX]) or Multicast (control commands to all slaves).
- Cyclic master-slave process data exchange (DATA EX) or acyclic master-master data transfer. Cyclic master-slave process data exchange (DATA EX) or acyclic master-master data transfer.

4.6 Functionality

- Cyclic process data exchange (DATA EX) between DP master and DP slaves.
- Dynamic activation or de-activation of individual DP slaves.
- Checking the configuration of the DP slaves
- Synchronisation of inputs and/ or outputs.

4.7 Protection functions

- All messages are transmitted with Hamming Distance HD=4.
- Watchdog timer at DP slaves.
- Access protection for the inputs/ outputs of the DP slaves
- Process data exchange (DATA EX) monitoring with configurable timer interval at the master.
- Adjustable failure behaviour.

4.8 Device types

- DP master class 2 (DPM2), e.g. programming/ configuration tools.
- DP master class 1 (DPM1), e.g. central controllers such as PLC, PC.
- DP slave, e.g. AUMA Profibus DP devices. Devices with binary or analogue inputs/ outputs, actuators, valves.

5. Technical data

Table 1: Profibus DP interface for actuator controls AM/ AMExB/ AMExC																																										
Features and functions																																										
Power supply	Standard voltages:																																									
	<table border="1"> <thead> <tr> <th colspan="10">3-phase AC voltages/ frequencies</th> <th colspan="3">1-phase AC ¹⁾ voltages/ frequencies</th> </tr> </thead> <tbody> <tr> <td>Volt</td> <td>220</td> <td>230</td> <td>240</td> <td>380</td> <td>400</td> <td>415</td> <td>440</td> <td>460</td> <td>480</td> <td>500</td> <td>Volt</td> <td>110,115,120</td> <td>220,230,240</td> </tr> <tr> <td>Hz</td> <td>50</td> <td>50</td> <td>50</td> <td>50</td> <td>50</td> <td>50</td> <td>60</td> <td>60</td> <td>60</td> <td>50</td> <td>Hz</td> <td>50/60</td> <td>50/60</td> </tr> </tbody> </table>	3-phase AC voltages/ frequencies										1-phase AC ¹⁾ voltages/ frequencies			Volt	220	230	240	380	400	415	440	460	480	500	Volt	110,115,120	220,230,240	Hz	50	50	50	50	50	50	60	60	60	50	Hz	50/60	50/60
	3-phase AC voltages/ frequencies										1-phase AC ¹⁾ voltages/ frequencies																															
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Hz	50	50	50	50	50	50	60	60	60	50	Hz	50/60	50/60																													
Special voltages:																																										
	<table border="1"> <thead> <tr> <th colspan="5">3-phase AC voltages/ frequencies</th> <th colspan="2">1-phase AC ¹⁾ voltages/ frequencies</th> </tr> </thead> <tbody> <tr> <td>Volts</td> <td>525</td> <td>575</td> <td>660</td> <td>690</td> <td colspan="2">208</td> </tr> <tr> <td>Hz</td> <td>50</td> <td>50</td> <td>50</td> <td>50</td> <td colspan="2">60</td> </tr> </tbody> </table>	3-phase AC voltages/ frequencies					1-phase AC ¹⁾ voltages/ frequencies		Volts	525	575	660	690	208		Hz	50	50	50	50	60																					
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Volts	525	575	660	690	208																																					
Hz	50	50	50	50	60																																					
External supply of the electronics (option)	24 V DC + 20 % / - 15 %, Current consumption: Basic version approx. 200 mA, with options up to 500 mA																																									
Switchgear	Standard: Reversing contactors ²⁾ (mechanically and electrically interlocked) for motor power up to 1.5 kW																																									
	Options: Reversing contactors ²⁾ (mechanically and electrically interlocked) for motor power up to 7.5 kW Thyristor unit ³⁾ (recommended for modulating actuators) for motor power up to 1.5 kW, 500 V AC with internal fuses for motor power up to 5.5 kW, 500 V AC, external fuses required																																									
Control and output signals	via Profibus DP interface																																									
Profibus DP interface with additional inputs (option)	Profibus DP interface with 4 free 24 V DC inputs and 2 free 0/4 – 20 mA inputs. Signal transmission via fieldbus interface.																																									
Local controls	Standard: Selector switch LOCAL – OFF – REMOTE (lockable in all three positions) Push buttons OPEN – STOP – CLOSE 3 indication lights: End position CLOSED (yellow), collective fault signal (red), End position open (green)																																									
	Option: Protection cover, lockable																																									
Functions	Standard: Switch-off mode adjustable Limit or torque seating for end position CLOSED Overload protection against excessive torque over the whole travel Phase failure monitoring with automatic phase correction Push-to-run operation or self-retaining in LOCAL Positioner ⁴⁾ : Nominal position value via Profibus DP interface Adjustable behaviour on loss of signal Adjustable sensitivity (dead band) and pause time																																									
	Options: Additional thermal overload relay in the controls in combination with thermoswitches within the actuator PTC tripping device in combination with PTC thermistors in the actuator motor																																									
Motor protection evaluation	Standard: For AM: Monitoring of the motor temperature in combination with thermoswitches in the actuator motor For AMExB/ AMExC: Monitoring of the motor temperature with PTC tripping device in combination with PTC thermistors in the actuator motor																																									
	Options: Additional thermal overload relay in the controls in combination with thermoswitches within the actuator PTC tripping device in combination with PTC thermistors in the actuator motor																																									
Electrical connection	Standard: For AM: AUMA plug/ socket connector with screw type connection For AMExB/ AMExC: Ex-plug/ socket connector with terminal board For further options and threads for cable entries, please refer to separate technical data sheets Special threads, other than standard mentioned above, possible Control plug gold plated ³⁾ (sockets and pins) Parking frame for wall mounting of the disconnected plug Protection cover for plug compartment (when plug is removed)																																									
	Options: Additional thermal overload relay in the controls in combination with thermoswitches within the actuator PTC tripping device in combination with PTC thermistors in the actuator motor																																									
Overvoltage protection ³⁾ (option)	Protection of the actuator and controls electronics against overvoltages on the fieldbus cables of up to 4 kV																																									
Wiring diagram (basic version)	MSP 1B1-00-1-F18E1 KMS TP102/001																																									
<p>1) AC current only with AM 01.1/ AM 02.1 and AMExC 01.1 in combination with actuator SGExC</p> <p>2) The lifetime guaranteed by the manufacturer amounts to min. 2 million cycles. If a higher number of switching cycles is to be expected, thyristor units with virtually unlimited lifetime should be used</p> <p>3) Only in combination with AM 01.1 and AM 02.1</p> <p>4) Requires position transmitter (potentiometer or RWG) in actuator</p>																																										

Settings/ programming of the Profibus DP interface			
Setting of the baud rate	Automatic baud rate recognition		
Setting of the Profibus DP address	The Profibus DP address is set via rotary switches		
Commands and signals of the Profibus DP interface			
Process representation output (command signals)	OPEN, STOP, CLOSED Nominal position value ⁴⁾		
Process representation input (feedback signals)	End position OPEN, CLOSE Actual position value ⁴⁾ Selector switch in position LOCAL/ REMOTE Running indication ⁴⁾ (directional) Torque switch OPEN, CLOSED Limit switch OPEN, CLOSED Manual operation by handwheel ⁴⁾ or via local controls		
Process representation input (fault signals)	Motor protection tripped Torque switch tripped in mid-travel One phase missing		
Behaviour on loss of communication	The behaviour of the actuator is programmable: – running to end position OPEN or CLOSED – running to any intermediate position ⁴⁾		
General data Profibus DP			
Communication protocol	Profibus DP according to EN 50 170-2 or DIN 19 245		
Network topology	Linear (BUS) structure. When using repeaters, tree structures can also be realised. Coupling and uncoupling of devices during operation without affecting other devices is possible.		
Transmission medium	Twisted, shielded copper cable according to EN 50 170		
Profibus DP interface	EIA-485 (RS485)		
Transmission speed/ cable length	Baud rate (kbit/s)	Max. cable length (segment length) without repeater	Possible cable length with repeater (total network cable length)
	9.6 19.2 45.45 93.75 187.5 500 1,500	1,200 m 1,200 m 1,200 m 1,200 m 1,000 m 400 m 200 m	approx. 10 km approx. 10 km approx. 10 km approx. 10 km approx. 10 km approx. 4 km approx. 2 km
Device types	DP master class 1, e.g. central controllers such as PLC, PC, ... DP master class 2, e.g. programming/ configuration tools DP slave, e.g. devices with digital and/ or analog inputs/ outputs such as actuators, sensors		
Number of devices	32 devices without repeater, with repeater expandable to 126		
Bus access	Token-passing between the masters and polling for slaves. Mono-master or multi-master systems are possible.		
Supported Profibus DP functions	Cyclic data exchange, sync mode, freeze mode, fail-safe mode		
Service conditions			
Enclosure protection according to EN 60 529	Standard:	IP 67 (when mounted)	
	Options:	IP 68 ⁵⁾ DS ³⁾ Terminal compartment additionally sealed against interior (double sealed)	
Corrosion protection	Standard:	KN	Suitable for installation in industrial units, in water or power plants with a low pollutant concentration
	Options:	KS	Suitable for installation in occasionally or permanently aggressive atmosphere with a moderate pollutant concentration (e.g. wastewater treatment plants, chemical industry)
		KX	Suitable for installation in extremely aggressive atmosphere with high humidity and high pollutant concentration
		KX-G	Same as KX, however aluminium-free version (outer parts)
<p>3) Only in combination with AM 01.1 and AM 02.1</p> <p>4) Requires position transmitter (potentiometer or RWG) in actuator</p> <p>5) For version in enclosure protection IP 68, higher corrosion protection KS or KX is strongly recommended</p>			

Finish coating	Standard: Two-component iron-mica combination
	Option: Special primer/ special finish coat (customer's choice)
Colour	Standard: Silver-grey (DB 701, similar to RAL 9007)
	Option: Other colours than standard colour are possible on request
Ambient temperature	AM 01.1/ AM 02.1: Standard: – 25 °C to + 70 °C Options: – 40 °C to + 70 °C, low temperature version – 50 °C to + 70 °C, extreme low temperature version incl. heating system – 60 °C to + 70 °C, extreme low temperature version incl. heating system
	AMExB/ AMExC: Standard: – 20 °C to + 40 °C Options: – 40 °C to + 40 °C, low temperature version – 50 °C to + 40 °C, extreme low temperature version incl. heating system
Vibration resistance ⁶⁾ according to IEC 60 068-2-6	1 g, from 10 Hz to 200 Hz (Only actuator with controls. Not valid in combination with gearboxes)
Gewicht	approx. 7 kg (with AUMA plug/ socket connector) approx. 12 kg (including Ex-plug/ socket connector with terminal board)
Accessories	
Wall bracket ⁷⁾	AUMA MATIC mounted separately from the actuator, including plug/ socket connector. Connecting cables on request. Recommended for high ambient temperatures, difficult access, or in case of heavy vibrations during service.
Other information	
EU Directives	Electromagnetic Compatibility (EMC): (89/336/EEC) Low Voltage Directive: (73/23/EEC) Machinery Directive: (98/37/EC)
Reference documents	Product description "Actuator controls AUMA MATIC" Dimension sheets Multi-turn actuators/ part-turn actuators with integral controls AUMA MATIC"

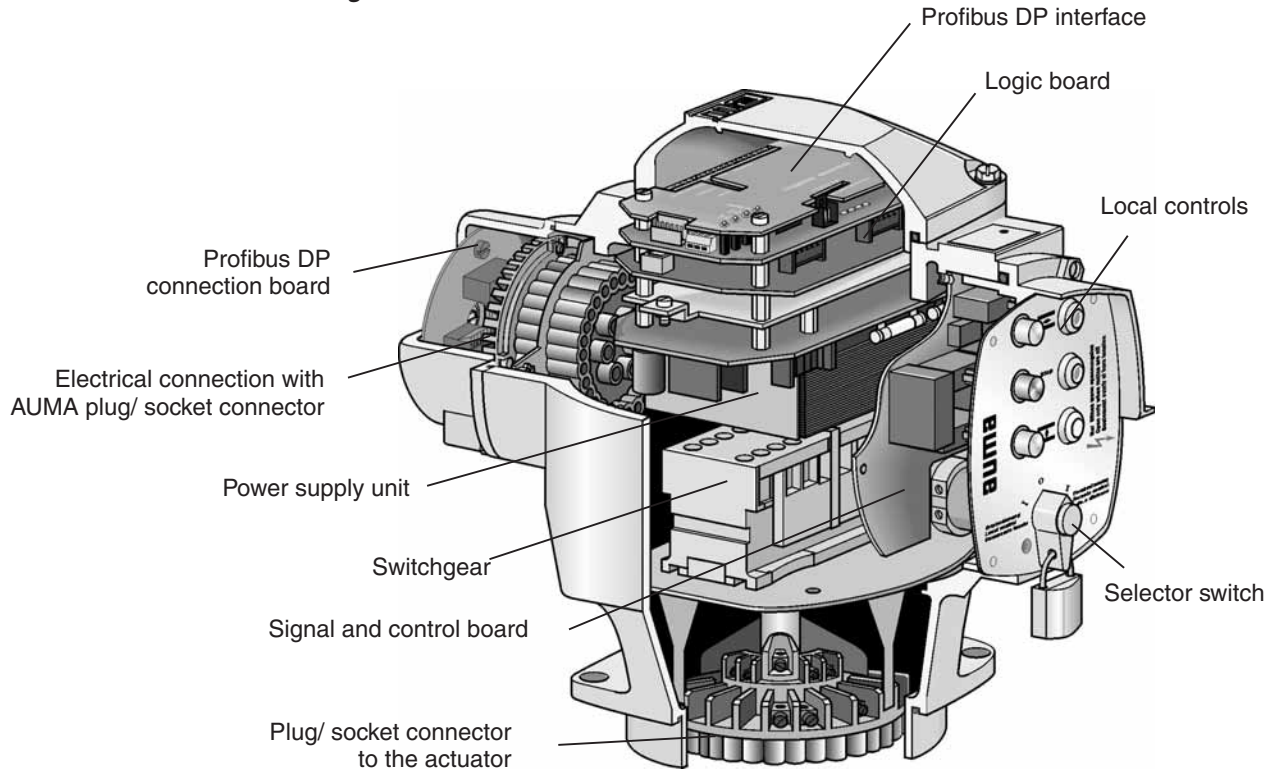
6) Resistant to vibrations during start-up or for failures of the plant. However, a fatigue strength may not be derived from this

7) Cable length between actuator and AUMA MATIC max. 100 m. Not suitable for version with potentiometer in the actuator. Instead of the potentiometer, an RWG has to be used in the actuator



6. Design AUMA MATIC Profibus DP

The AUMA MATIC Profibus DP by AUMA represents the ideal controls for connecting multi-turn actuators of the SA range and part-turn actuators of the SG range to Profibus DP.

Figure A: AUMA MATIC Profibus DP



The integral controls AUMA MATIC Profibus DP consist of the following modules:

- Profibus DP interface. The interface links the Profibus DP data with the internal electronics.
- The logic board links the signals of the actuator with the local controls and the Profibus DP interface and controls the reversing contactors or the thyristors.
- Local controls with selector switch, push buttons, and indication lights. The selector switch is used to select the control devices for local control **LOCAL – 0 – REMOTE** for remote control. The push buttons  (OPEN) – **Stop** –  (CLOSE) are used for the electric operation of the actuator on site.
- Plug/ socket connectors for easy mounting of the AUMA MATIC Profibus DP on the actuators.
- Signal and control board with primary fuses, relays for conversion of the local control commands into electrical signals, and indication lights as an option.
- Switchgear: Reversing contactors or thyristors for motor controls.
- Profibus DP connection board with terminals for the Profibus DP cable and the termination resistor for bus termination.

Actuators which have already been installed can be retrofitted for Profibus DP by exchanging the controls AUMA MATIC for controls AUMA MATIC Profibus DP.

7. Electrical connection



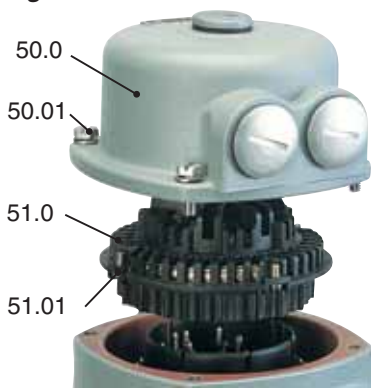
- **Work on the electrical system or equipment must only be carried out by a skilled electrician himself or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.**
- **Installation regulations for Profibus DP must be observed for the wiring.**
(For literature references, please refer to appendix D)

Make sure to respect electromagnetic compatibility (EMC) when installing cables: Signal and bus cables are susceptible to interference. Electric power cables, in particular motor cables, are interference sources.

- Lay cables being susceptible to interference or sources of interference at the highest possible distance from each other.
- The interference immunity of signal and bus cables increases if the cables are laid close to the ground potential.
- If possible, avoid laying long cables and make sure that they are installed in areas being subject to low interference.
- Avoid long parallel paths with cables being either susceptible to interference or interference sources.

7.1 Power supply (standard)

Figure B-1: Connection

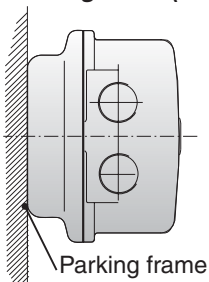


For explosion-proof version (type designation: AMExB/ AMExC), please refer to page 15 or page 17.

- Check whether type of current, supply voltage, and frequency comply with motor data (refer to name plate at motor).
- Loosen bolts (50.01) (figure B-1) and remove connection housing.
- Loosen screws (51.01) and remove socket carrier (51.0) from plug cover (50.0).
- Insert cable glands suitable for connecting cables.
(The enclosure protection stated on the name plate is only ensured if suitable cable glands are used).
- Seal cable entries which are not used with suitable plugs.
- Connect cables according to order-related wiring diagram.

The wiring diagram applicable to the actuator is attached to the hand-wheel in a weather-proof bag, together with the operation instructions. In case the wiring diagram is not available, it can be obtained from AUMA (state commission no., refer to name plate) or downloaded directly from the Internet (www.auma.com).

Figure B-2: Parking frame (accessory)



A special parking frame (figure B-2) for protection against touching the bare contacts and against environmental influences, in case the electrical connection has been removed, is available.

Technical data	Motor power connections ¹⁾	Protective earth	Control terminals
No. of contacts max.	6 (3 are used)	1 (leading contact)	50 pins / sockets
Marking	U1, V1, W1, U2, V2, W2	according to VDE	1 to 50
Connecting voltage max.	750 V	–	250 V
Nominal current max.	25 A	–	16 A
Type of customer connection	Screws	Screw for ring lug	Screws
Cross section max.	6 mm ²	6 mm ²	2.5 mm ²
Material: Pin/ socket carrier	Polyamide	Polyamide	Polyamide
Contacts	Brass (Ms)	Brass (Ms)	Brass, tin plated or gold plated (option)

¹⁾Suitable for copper wires. For aluminium wires, please contact AUMA

7.2 Bus connection (standard)

For explosion-proof version (type designation: AMExB/ AMExC), please refer to page 15 or page 17.

For version with FO (fibre optics), please refer to separate operation instructions "AUMA MATIC AM 01.1/ AM 02.1 FO connection".

- Connect bus cable. Refer to figures C-1 and C2.

The termination resistors for channel 1 and channel 2 (options) are switched in via switches (S1) and (S2). Both switches are supplied in position 'OFF'. Only switch on the termination resistors (position 'ON') if the actuator is the final device in the Profibus segment.



Only switch on the termination resistors (position 'ON') if the actuator is the final device within the Profibus DP segment.

Table 3: Switch positions of S1 and S2

S1	ON	Bus termination channel 1 ON
	OFF	Bus termination channel 1 OFF
S2	ON	Bus termination channel 2 ON (option)
	OFF	Bus termination channel 2 OFF (option)

Figure C-1: Connection board (standard)

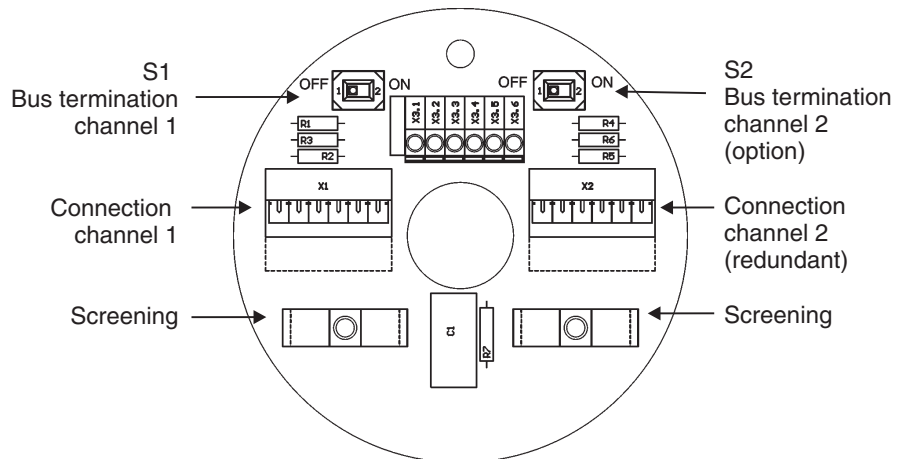


Figure C-2: Connection (standard)

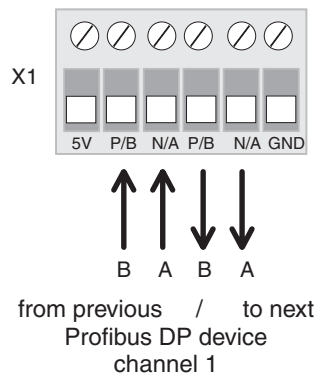


Figure C-3: Connection board (for overvoltage protection)

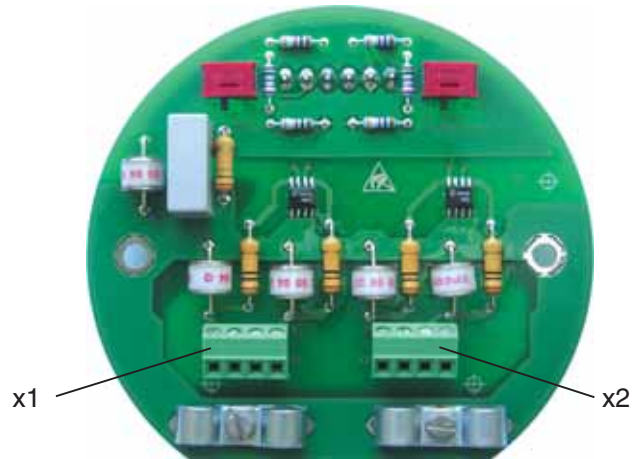


Figure C-4: Connection for overvoltage protection

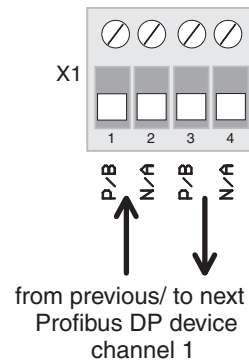


Table 4: Assignment of Profibus cable

Profibus cable	AUMA labelling at the connection	SUB-D 9 plug pin (for other Profibus devices)	Colour
A	N/A	8	green
B	P/B	3	red

7.3 Fitting the cover

After connection:

- Insert the socket carrier (51.0) into the plug cover (50.0) and fasten it with screws (51.01).
- Clean sealing faces at the plug cover and the housing.
- Check whether O-ring is in good condition.
- Apply a thin film of non-acidic grease (e.g. Vaseline) to the sealing faces.
- Replace plug cover (50.0) and fasten bolts (50.01) evenly crosswise.
- Fasten cable glands with the specified torque to ensure the required enclosure protection.

- 7.4 Remote position transmitter** For the connection of remote position transmitters (potentiometer, RWG) screened cables must be used.

7.5 AUMA MATIC on wall bracket

Figure C-5: AM on wall bracket



Connecting cable to actuator

The AUMA MATIC can also be mounted separately from the actuator on a wall bracket.

- For the connection of actuator and AUMA MATIC on wall bracket, use suitable flexible and screened connecting cables. (Preconfectioned cables can be obtained from AUMA on request)
- Permissible cable distance between actuator and AUMA MATIC amounts to a max. of 100 m.
- Versions with potentiometer in the actuator are not suitable. Instead of the potentiometer, an RWG has to be used in the actuator.
- Connect the wires in correct phase sequence. Check direction of rotation before switching on.

7.6 Test run

Perform test run. Please refer to the operation instructions pertaining to the actuator (multi-turn actuator SA(R) ... / part-turn actuator SG ...).

Check limit and torque switching:

Check limit and torque switching, electronic position transmitter RWG or potentiometer (option) and re-set where appropriate.

The settings are described in the operation instructions pertaining to the actuator (multi-turn actuator SA(R) ... part-turn actuator SG ...).

For actuators with feedback signal (RWG, potentiometer), a reference operation has to be performed after having changed the setting.

Perform reference operation:

- Run actuator electrically (via the push buttons OPEN and CLOSE of the local controls) once to the end position OPEN and once to the end position CLOSED.
- If no reference operation is performed after changing the limit switching, the feedback signal via the bus is not correct. The bus signals the missing reference operation as warning (see page 32).

7.7 Mains and bus connection for Ex-version with plug/ socket connector/ terminal board (KP)



When working in potentially explosive areas, observe the European Standards EN 60079-14 “Electrical installations in hazardous areas” and EN 60079-17 “Inspection and maintenance of electrical installations in hazardous areas”.

Figure D-1: Connection



For the Ex-plug/ socket connector (figure D-1), the electrical mains connection is made after removing the plug cover (50.0) at the EEx e terminals of the terminal board (51.0). The flameproof compartment (type of protection EEx d) remains hereby closed.

- Check whether type of current, supply voltage, and frequency correspond to motor data (refer to name plate at motor).
- Loosen bolts (50.01) (figure D-1) and remove plug cover.



- **Insert cable glands with “EEx e” approval and of size suitable for connecting cables. For the recommended cable glands refer to appendix E, page 54. (The enclosure protection stated on the name plate is only ensured if suitable cable glands are used).**
- **Seal cable entries which are not used with suitable plugs.**
- **Maximum 2 wires with the same cross section may be connected to one terminal.**

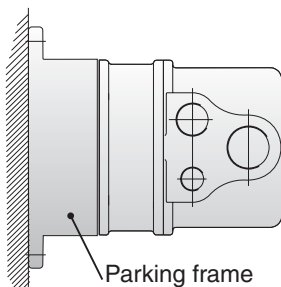
Figure D-2: Disconnection from the mains



- Remove cable sheathing in a length of 120 – 140 mm. Strip wires: Controls max. 8 mm, motor max. 12 mm. For stranded wires use end-sleeves according to DIN 46228.
- Connect bus cable. Refer to figures (D-4 or D-5). The termination resistor for channel 1 is connected through linking the terminals 1 – 4 and 3 – 2 (standard). Only connect the termination resistor if the actuator is the final device in the Profibus segment.
- Connect screen largely to the cable glands. For the recommended cable glands refer to appendix E, page 54.

If the actuator must be taken from the valve, e.g. for service purposes, it can be separated from the mains without having to remove the wiring (figure D-2). For this purpose, the screws (51.02) are removed and the plug/ socket connector is pulled off. Plug cover (50.0) and terminal board (51.0) remain together.

Figure D-3: Parking frame (accessory)



Flameproof enclosure! Before opening, ensure that no explosive gas and no voltage is present.

A special parking frame (figure D-3) for protection against touching the bare contacts and against environmental influences is available.

Figure D-4: Bus connection for channel 1 (standard)

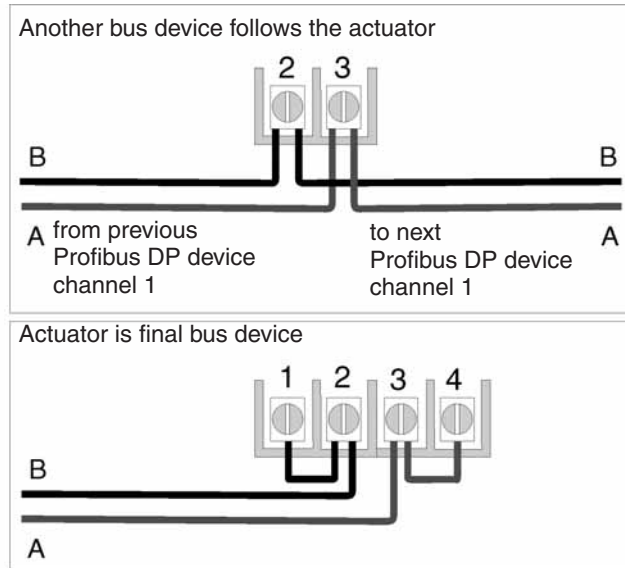


Table 5: Technical data Ex plug/socket connector with terminal board for explosion-proof actuators

Technical data	Motor power connections ¹⁾	Protective earth	Control terminals
No. of contacts max.	3	1 (leading contact)	38 pins/ sockets
Marking	U1, V1, W1	⊥	1 to 24, 31 to 50
Connecting voltage max.	550 V	–	250 V
Nominal current max.	25 A	–	10 A
Type of customer connection	Screws	Screws	Screws
Cross section max.	6 mm ²	6 mm ²	1.5 mm ²
Material: Pin/ socket carrier	Araldite/ Polyamide	Araldite/ Polyamide	Araldite/ Polyamide
Contacts	Brass (Ms)	Brass (Ms)	Brass (Ms) tin-plated

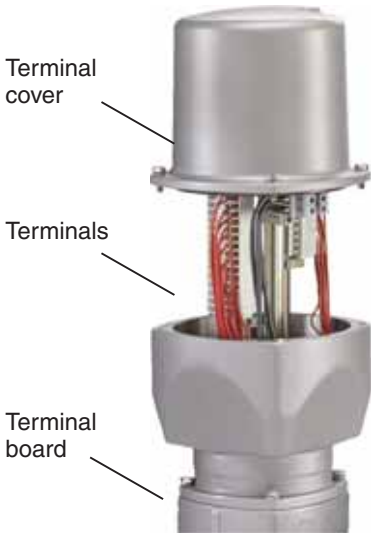
1) Suitable for copper wires. For aluminium wires, please contact AUMA.

7.8 Mains and bus connection for Ex-version with plug-in terminal connection (KES)



When working in potentially explosive areas, observe the European Standards EN 60079-14 “Electrical installations in hazardous areas” and EN 60079-17 “Inspection and maintenance of electrical installations in hazardous areas”.

Figure E-1: Plug-in terminal connection



The bus connection is realised via terminals (figure E-1) The terminal compartment is designed for explosion protection “EEx e” (increased safety). The controls AUMA MATIC (type of protection EEx d) remain closed.

- Loosen bolts (1) (figure E-1) and remove terminal cover.



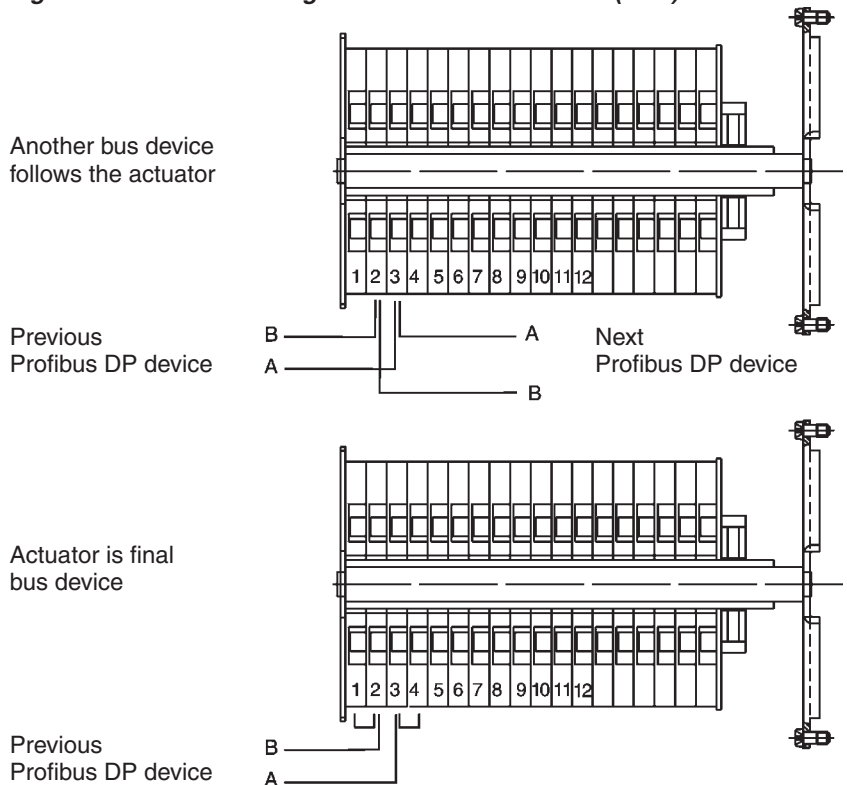
- Insert cable glands with “EEx e” approval and of size suitable for connecting cables. For the recommended cable glands refer to appendix E, page 54. (The enclosure protection stated on the name plate is only ensured if suitable cable glands are used).
- Seal cable entries which are not used with suitable plugs.

Cross sections for connection:

Control cables: max. 2.5 mm²
 Motor connection: max. 10 mm²,
 Suitable bus cables, see page 19.

- Connect bus cable to channel 1 according to configuration of the terminals (figure E-2).
 The termination resistor for channel 1 is connected through linking the terminals 1 – 2 and 3 – 4.
- Only connect the termination resistors if the actuator is the final device in the Profibus segment.

Figure E-2: Terminal configuration for Ex connection (KES)



7.9 Redundant bus connection

AUMA Profibus DP devices can be connected with a second (redundant) Profibus cable. If the bus on channel 1 fails, e. g. through cable break, the slave automatically switches to channel 2.



This cable redundancy may only be applied after previous integration test using the desired process control system!

- **For versions with AUMA plug/ socket connector (subclause 7.2):**
Connect redundant bus cable to channel 2 in the same way as channel 1 (refer to connection diagram figure C-2).
- **For Ex-version with plug/ socket connector / terminal board (KP) (subclause 7.7):**
Connect cable B to terminal 6, cable A to terminal 7.
The termination resistor for channel 2 is connected through linking the terminals 5 – 6 and 7 – 8.
- **For Ex-version with plug-in terminal connection KES) (subclause 7.8):**
Connect cable B to terminal 6, cable A to terminal 7 (figure E-2).
The termination resistor for channel 2 is connected through linking the terminals 5 – 6 and 7 – 8.

The setting of the redundant bus connection is realised via the parameters 4 and 5 (see page 23).

7.10 Bus cables

Only cables according to standard DIN 19245 or EN 50170-2, cable type A, may be used for Profibus DP wiring.

A maximum of up to 32 Profibus devices may be connected in one segment. If more devices are to be connected to one Profibus network, several segments must be connected with repeaters. The bus cable must be laid at a distance of at least 20 cm from other cables. It should be laid in a separate, conductive and earthed cable trunking. It must be ensured that there are no potential differences between the individual devices on the Profibus (perform a potential compensation).

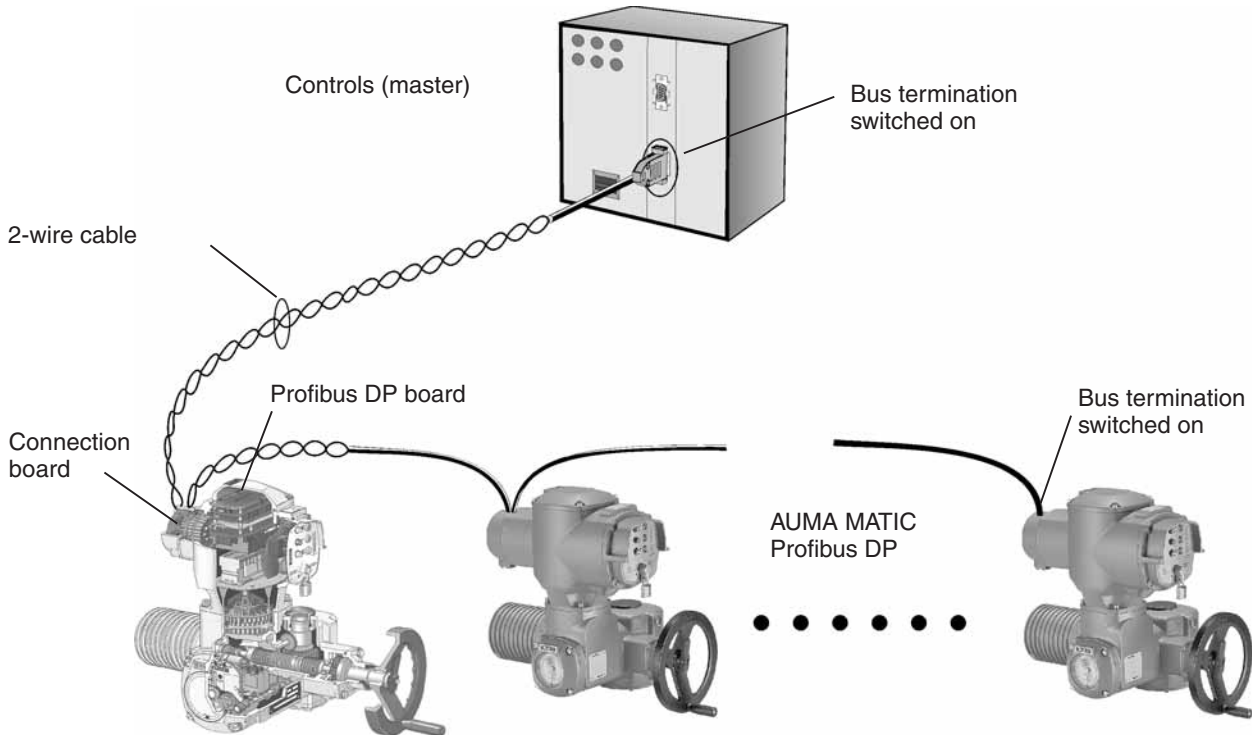
Table 6

Transmission rate in kBit/s	≤ 93.75	187,5	500	1500
Maximum segment length in m	1200	1000	400	200

Cable specification cable type A for Profibus DP

Characteristic impedance: 135 to 165 Ohm, at a frequency of 3 to 20 Mhz.
 Cable capacity: < 30 pF per meter
 Core diameter > 0.64 mm
 Core cross section: > 0.34 mm², corresponds to AWG 22
 Loop resistance: < 110 Ohm per km
 Screening: Copper shielding braid or shielding braid and shielding foil

Figure F: Example: Profibus with one segment

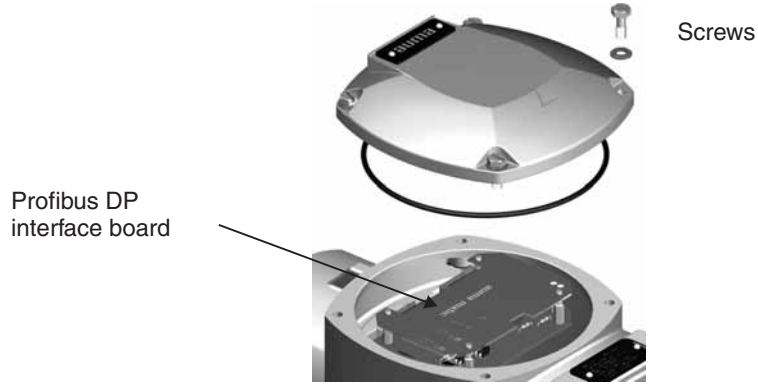


7.11 Setting the Profibus DP address

The bus address is set on the Profibus DP interface board.

- Loosen screws and remove cover (figure G-1)

Figure G-1



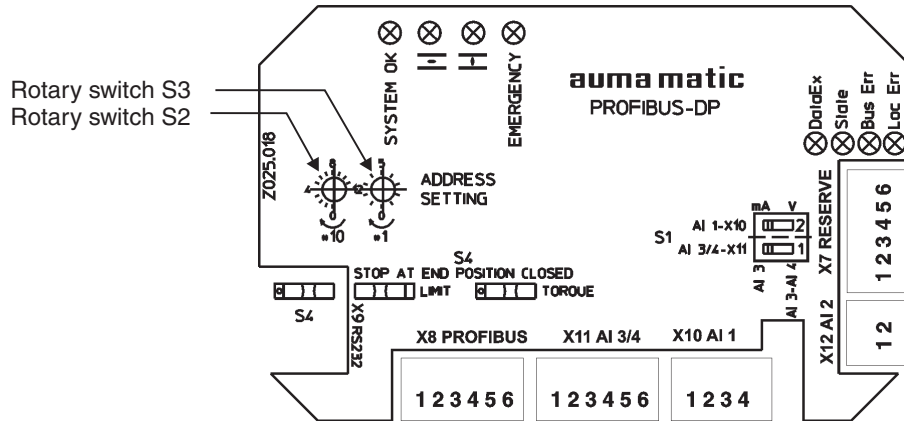
- Set the required bus address using rotary switches S2 and S3 (figure G-2). (Factory setting: slave address 2)

Switch (S2) for setting the units digit.
 Switch (S3) for setting the tens digit.

Example: The address '65' is set as follows:

- (S2) to position 5 = (5 * 1 = 5)
- (S3) to position 6 = (6 * 10 = 60)

Figure G-2: Profibus DP interface board



8. Commissioning with controls

8.1 Introduction

When commissioning a Profibus DP network, the devices on the Profibus DP must be parameterized and configured with the programming software of the controls (Profibus configurator).

The programming software first reads the GSD file (**General Station Data**) of the individual actuators. The GSD file contains information about the properties of the device which are needed by the master. The GSD file can be downloaded from the Internet website www.auma.com.

Afterwards, the user can configure and program the instrument at the Profibus DP for the programming software of the process control system. This information is then stored in the controls (DP master) and sent to the actuators (DP slaves) each time communication is started.

The control is executed via the process representation input and output bytes.

If a configuration with consistent data is chosen, special functional elements for the control of the Profibus DP slaves must be used with some PLCs.

8.2 Programming

The parameterization is partly determined in the Profibus standard, e.g. a bit for switching bus monitoring on and off (watchdog).

The AUMA Profibus DP control can additionally receive up to 100 bytes of 'user parameters', in which AUMA specific parameters can be set. The AUMA specific parameters are divided into 50 parameters with 2 bytes each per parameter. The parameters can be changed via the programming software of the controls. New programming software supports the setting of the parameters via text and a menu selection. When using older software, the values of the parameters must be entered using hexadecimal numbers. The meaning of the individual AUMA specific parameters is explained in subclause 8.5.

8.3 Configuration of the Profibus DP interface of the AUMA MATIC

During configuration, selection is made of how many input and output bytes for each device are reserved in the controls' memory. Additionally it is determined if the data is processed consistently or non-consistently.



Only the number of bytes determined in the configuration is transferred between DP master and DP slave.

The following configurations are possible with AUMA Profibus DP actuators:

Table 7:

Number of input bytes	Number of output bytes
1	1
2	1
2	2
4	4
6	1
6	2
6	4
8	4
12	4
16	8

All these configurations (except 1 In, 1 Out) can be selected as consistent or non-consistent

The number of input bytes states how many of the maximum 16 bytes the DP slave sends to the DP master.

The number of output bytes states how many of the maximum 8 bytes the DP master sends to the DP slave.

If, for example, the configuration with 8 bytes input is selected, only the first 8 bytes are sent from the DP slave to the DP master. In this case, the master does not have access to bytes 9 to 12.

This way, the DP master saves memory space since it only has to reserve 8 input bytes for the actuator.

The data of the AUMA actuators should be consistently processed by the DP master. This ensures that the value of a 2 byte variable (position transmitter, analogue customer input) does not change after the reading out of the first byte and, thus, does not distort the value.

If a master does not offer the possibility to use consistent configurations by means of the process control system, a non-consistent configuration can be chosen. The values for the position transmitter and the analogue customer inputs can then be transferred in 1 byte format (parameter 2 = 0).

8.4 Communication start-up

When the DP master is switched on, it first sends a parameter and configuration telegram to each DP slave. If parameters and configuration are correct, the DP slave enters the 'Data Exchange' mode to exchange process data between the controls and the slave. Then, the DP master can control the DP slave and read its current state via the process representation.

If communication is interrupted (e.g. due to switching off the slave or the breaking of the Profibus cable), it is automatically resumed by the DP master, once the origin of the fault has been eliminated.

8.5 Description of AUMA user parameters

The AUMA specific parameters are set by means of the GSD file.

Parameter 1 "Position transmitter" [Stellungsgeber]

Default value (standard setting): 1

0: The actuator is not equipped with a position transmitter.

1: Actuator is equipped with a potentiometer without RWG.

2: Actuator is equipped with an RWG 0 – 20 mA.

For this position transmitter, the signal interruption monitoring is not activated.

3: Actuator is equipped with an RWG 4 – 20 mA.

For this position transmitter, the signal interruption monitoring is activated.

Parameter 2 "Measured data coding position transmitter" [Messwertkodierung Stellungsgeber]

Default value: 0

0: 0 to 100 percent, resolution amounts to 1 %

The position transmitter value is indicated in process representation input in byte 4. Byte 3 is fixed to the value 0.

The setpoint is realised via byte 4 of process representation output.

Byte 3 must be set to 0.

1: 0 to 1000 per mil, resolution amounts to 0.1 %

The position transmitter value is read using bytes 3 and 4 of process representation input.

The setpoint is realised via bytes 3 (high byte) and 4 (low byte) of process representation output.

Parameter 3 "Reversing prevention in ms" [Reversiersperre in ms]

Parameter for setting the pause time in between a change of direction. If necessary, adjust the value to the mechanics to prevent destruction caused by excessively fast changes of direction.

Default value: 200

lowest value: 100 (0.1s)

maximum value: 1000 (1 s)

Parameter 4 “Redundancy” [Redundanz]

Default value: 0

0: no cable redundancy (only the first channel is used for communication).

1: cable redundancy switched on (first and second channel cabled)

The watchdog must be activated, otherwise the parameter record is rejected by the DP slave.

Parameter 5 “Time for channel changing in 0.1 s”**[Zeit für Kanalwechsel in 0,1 s]**

Indicates the time after which the channel is changed if no process data exchange (DATA EX) takes place (no ‘Data Exchange’ or DP-Fail-Safe state).

This parameter is only effective if the cable redundancy (parameter 4) is switched on.

Default value: 50

lowest value: 50 (5 s)

maximum value: 6000 (10 min)

Parameter 6 “Failure behaviour” [Sicherheitsverhalten]

Failure operation on failure of connection (no status Data_Exchange or DP fail-safe).

The parameters set in the most recent connection also apply to the failure behaviour after an interruption in the voltage supply. If the parameter is set to the values 1 or 2, the watchdog must be activated, otherwise the parameter record is rejected by the DP slave.

Default value: 0

0: Failure behaviour switched off (parameters 7, 8, 9 are insignificant)

1: Simple failure behaviour switched on.

A failure operation will only be started if a connection to the master (process data exchange [DATA EX]) has already been available.

2: Extended failure behaviour switched on.

**If extended failure behaviour is switched on, a failure operation can be initiated immediately after the actuator has been switched on.****Parameter 7 “Delay time for failure operation 0.1s”****[AusloesZeitSicherheitsfahrt 0,1 s]**

Delay time for failure operation in 0.1 s.

Indicates the down time of process data exchange after which a failure operation will be started. If the exchange is restored during this time, no failure operation will be performed.

Default value: 30

lowest value: 0 (actuator reacts immediately)

maximum value: 12,000 (actuator reacts after 20 minutes)

Parameter 8 “Failure operation” [Sicherheitsfahrt]

Default value: 0

0: Actuator remains in its position (STOP).

1: Actuator runs CLOSE.

2: Actuator runs OPEN.

3: Actuator runs to failure position (refer to parameter 9).

If no position transmitter is installed (Parameter 1 = 0), value 3 is not permitted. In this case, the parameter record is rejected.

Parameter 9 “Failure position in per mil”

[Sicherheitsposition in Promille]

Actuator runs to the pre-set failure position.

This parameter is only effective if parameter 8 (failure operation) is set to value 3, and if parameter 6 (failure behaviour) is not 0.

Default value: 0

lowest value: 0 (end position CLOSED)

maximum value: 1000 (end position OPEN)

Parameter 10 “Output speed failure operation percentage”

[Drehzahl Sicherheitsfahrt Proz]

Running speed applied to approach failure position.

Only effective in combination with variable speed AUMA actuators, type AS, ASR.

Only effective if parameter 8 (failure operation) and parameter 6 (failure behaviour) are not set to 0.

Default value: 100

lowest value: 0 (minimum output speed)

maximum value: 100 (maximum output speed)

For detailed descriptions of parameters 11 to 14, please refer to subclause 11.2

Parameter 11 “Dead time positioner in 0.1 s”

[Totzeit Stellungsregler in 0,1 s]

Indicates the dead time which has to be maintained between two motor starts. In case the Profibus DP Master issues a command before that time, the AUMA MATIC delays the actuator reaction until dead time has expired.



The controls must ensure that the maximum number of motor starts of the actuator is not exceeded.

Default value: 0

minimum value: 0 (actuator reacts immediately)

maximum value: 600 (actuator delays reaction by 1 minute max.)

Parameter 12 “Overrun direction OPEN in per mil”

[Nachlauf Richtg AUF in Promille]

The motor is switched off as soon as the distance between the actuator position and the nominal position reaches this value. This is only valid for operations in direction OPEN. This parameter must be smaller than the value in parameter 14 (max. error in per mil).

Default value: 5

minimum value: 0 (no overrun in direction OPEN)

maximum value: 100 (10 % overrun in direction OPEN)

Parameter 13 “Overrun direction CLOSE in per mil”

[Nachlauf Richtg ZU in Promille]

The motor is switched off as soon as the distance between the actuator position and the nominal position reaches this value. This is only valid for operations in direction CLOSE.

This parameter must be smaller than the value in parameter 14 (max. error in per mil).

Default value: 5

minimum value: 0 (no overrun in direction CLOSE)

maximum value: 100 (10 % overrun in direction CLOSE)

Parameter 14 “Max. error in per mil”**[max. Regelabweichung in Promille]**

The actuator will only be restarted if the distance between the nominal position and the actual position is higher than this value.

Corresponds to the outer dead band.

This parameter must be higher than the values of parameter 12 (overrun in direction OPEN) and parameter 13 (overrun in direction CLOSE).



The parameter must be set sufficiently high to ensure a stable function of the positioner. If the value is set too low, the actuator moves continuously around the nominal value which will result in reducing the life time of the actuator.

Default value: 10

minimum value: 1 (0.1 % error).

maximum value: 100 (10 % error).

Parameter 15 "Proportional operation active" [Proportionalfahrt aktiv]

Soft start/ soft stop is only possible together with variable speed actuators (type AS, ASR). This parameter has no influence on non-variable speed actuators.

Default value: 0

0: no soft start/ soft stop (proportional operation)

1: soft start/ soft stop (proportional operation)



Parameter 15 – 19 reserved for variable output speed actuators of types AS, ASR with motor controls AUMA VARIOMATIC.

Parameter 16 “Proportional range Stop in per mil”**[ProportBereich Stop in Promille]**

Proportional range of the nominal position in per mil (soft stop).

If the difference between nominal and actual actuator position is smaller than this value, the running speed will decrease proportionally to the difference in nominal/ actual position. This allows the nominal position to be “gently” reached. Only effective if parameter 15 (proportional operation active) and parameter 1 (position transmitter) are not set to 0.

Default value: 100

minimum value: 0 (soft stop ineffective)

maximum value: 1000 (soft stop over the whole travel)

Parameter 17 “Stop speed in percent” [Stopgeschwindigkeit in Prozent]

Default value: 0

minimum value: 0 (actuator moves to nominal position with min. speed)

maximum value: 100 (actuator moves to nominal position with max speed).

Running speed with which the nominal position will be approached.

Only effective if parameter 15 (proportional operation active) and parameter 1 (position transmitter) are not set to 0.

Parameter 18 "Proportional range start in per mil" [ProportBereich Start in Promille]

Proportional range of the start position in per mil (soft start)

If the difference between start position and actual actuator position is smaller than this value the running speed will increase proportionally to the difference in nominal/ actual position. This causes the actuator to “gently” leave the start position. Only effective if parameter 15 (proportional operation active) and parameter 1 (position transmitter) are not set to 0.

Default value: 40

minimum value: 0 (soft start ineffective)

maximum value: 1000 (soft start over the whole travel)

Parameter 19 “Starting speed in percent”

[Startgeschwindigkeit in Prozent]

Running speed used to leave the start position.

Only effective if parameter 15 (proportional operation active) and parameter 1 (position transmitter) are not set to 0.

Default value: 50

minimum value: 0 (minimum starting speed)

maximum value: 100 (maximum starting speed)

Parameter 20 “Start analogue 2 in 0.1 mA” [Anfang Analog 2 in 0,1 mA]

Current value at which the measuring range of analogue 2 input (option) begins.

This value must be smaller than the value in parameter 21

(end analogue 2 in 0.1 mA). If a sensor with a 4..20 mA signal is connected to analogue 2, the value must be set to 40.

Default value: 0

minimum value: 0 (value for sensor with 0-20 mA output)

maximum value: 150

Parameter 21 “End analogue 2 in 0.1 mA” [Ende Analog 2 in 0,1 mA]

Current value at which the measuring range of analogue 2 input (option) ends.

This value must be higher than the value in parameter 20 (start analogue 2 in 0.1 mA).

Default value: 200

minimum value: 50

maximum value: 200 (value for sensor with 0 – 20 mA or 4 – 20 mA output)

Parameter 22 “Coding analogue 2” [Kodierung Analog 2]

Default value: 0

0: 0 to 100 percent

1: 0 to 1000 per mil

2: 0 to 1023 (raw value of analogue-digital converter, not standardised)

Parameter 23 “Start analogue 3/4 in 0.1 mA” [Anfang Analog 3/4 in 0,1 mA]

Default value: 0

minimum value: 0 (value for sensor with 0 – 20 mA output)

maximum value: 150

Current value at which the measuring range of analogue 3/4 input begins.

This value must be smaller than the value in parameter 24

(end analogue 3/4).

If a sensor with a 4..20 mA signal is connected to analogue 3/4, the value must be set to 40.

Parameter 24 “End analogue 3/4 in 0.1 mA” [Ende Analog 3/4 in 0.1 mA]

Default value: 200

minimum value: 50

maximum value: 200 (value for sensor with 0 – 20 mA or 4 – 20 mA output)

Current value at which the measuring range of analogue 3/4 input ends.

This value must exceed the value in parameter 23

(start analogue 3/4).

Parameter 25 “Coding analogue 3/4” [Kodierung analog 3/4]

Default value: 0

0: 0 to 100 percent

1: 0 to 1000 per mil

2: 0 to 1023 (raw value of analogue-digital converter, not standardised)



The stepping mode increases the number of starts of the actuator. It must be ensured that the maximum number of starts will equally not be exceeded when operating in stepping mode.

Parameter 26 "Stepping direction OPEN active"

[Takt Richtung AUF aktiv]

This parameter is only effective if parameter 1 (position transmitter) is not 0. Otherwise the parameter record will be rejected.

Default value: 0

0: Stepping mode in direction OPEN switched off

1: Stepping mode in direction OPEN switched on

Parameter 27 "Stepping operating time OPEN in 0.1 s"

[Takt Fahrzeit AUF in 0,1 s]

Stepping operating time direction OPEN in 0.1 s

This parameter is only effective if parameter 26 (stepping direction OPEN active) is not 0.

Default value: 10

minimum value: 1 (actuator runs 0.1 s per stepping period)

maximum value: 36,000 (actuator runs 1 hour per stepping period)

Parameter 28 "Stepping pause time OPEN in 0.1 s"

[Takt Pausenzeit AUF in 0,1 s]

Stepping pause time direction OPEN in 0.1 s

This parameter is only effective if parameter 26 (stepping direction OPEN active) is not 0.

Default value: 50

minimum value: 1 (actuator stationary 0.1 s per stepping period)

maximum value: 36,000 (actuator stationary 1 hour per stepping period)

Parameter 29 "Stepping start OPEN in per mil"

[Takt Anfang AUF in Promille]

Start of stepping distance in direction OPEN. Indication of position in per mil

This value must be smaller than the value in parameter 30 (stepping end OPEN in per mil). Otherwise, the parameter record will be rejected. This parameter is only effective if parameter 26 (stepping direction OPEN active) is not 0.

Default value: 0

minimum value: 0 (stepping mode in direction OPEN begins at 0, end position CLOSED)

maximum value: 999

Parameter 30 "Stepping end OPEN in per mil" [Takt Ende AUF in Promille]

End of stepping distance in direction OPEN. Indication of position in per mil

This value must be higher than the value in parameter 29 (stepping start OPEN in per mil). Otherwise, the parameter record will be rejected. This parameter is only effective if parameter 26 (stepping direction OPEN active) is not 0.

Default value: 1000

minimum value: 1

maximum value: 1000 (Stepping mode in direction OPEN ends at position 1000, end position OPEN)

Parameter 31 "Stepping direction CLOSE active"

[Takt Richtung ZU aktiv]

This parameter is only effective if parameter 1 (position transmitter) is not 0. Otherwise, the parameter record will be rejected.

Default value: 0

0: Stepping mode in direction CLOSE switched off

1: Stepping mode in direction CLOSE switched on

Parameter 32 “Stepping operating time CLOSE in 0.1 s”

[Takt Fahrzeit ZU in 0,1 s]

Operating time for stepping mode in direction CLOSE. Indication in 0.1 seconds. This parameter is only effective if parameter 31 (stepping direction CLOSE active) is not 0.

Default value: 10

minimum value: 1 (actuator runs 0.1 s per stepping period)

maximum value: 36000 (actuator runs 1 hour per stepping period)

Parameter 33 “Stepping pause time CLOSE in 0.1 s”

[Takt Pausenzeit ZU in 0,1 s]

Pause time for stepping mode in direction CLOSE. Indication in 0.1 seconds. This parameter is only effective if parameter 31 (stepping direction CLOSE active) is not 0. Otherwise, the parameter record will be rejected.

Default value: 50

minimum value: 1 (actuator stationary 0.1 s per stepping period)

maximum value: 36,000 (actuator stationary 1 hour per stepping period)

Parameter 34 “Stepping start CLOSE in per mil”

[Takt Anfang ZU in Promille]

Default value: 1000

minimum value: 1

maximum value: 1000 (Stepping mode in direction CLOSE starts at position 1000, end position OPEN)

Start of stepping distance in direction CLOSE.

Indication of position in per mil.

This value must be higher than the value in parameter 35 (stepping end CLOSE in per mil). Otherwise, the parameter record will be rejected.

This parameter is only effective if parameter 31 (stepping direction CLOSE active) is not 0.

Parameter 35 “Stepping end CLOSE in per mil”

[Takt Ende ZU in Promille]

End of stepping distance in direction CLOSE. Indication of position in per mil.

This value must be higher than the value in parameter 34 (stepping start CLOSE in per mil). This parameter is only effective if parameter 31 (stepping direction CLOSE active) is not 0. Otherwise, the total parameter record will be rejected.

Default value: 0

minimum value: 0 (stepping mode in direction CLOSE ends at position 0, end position CLOSED)

maximum value: 999

Parameters 36 to 50 are spare parameters [Reserveparameter]

They are reserved for extensions.

Default value: 0

Value range: 0 to 65535

9. Process representation input

Via the process representation input, the master (controls) can read the state of the slave (actuator).

Grey bits are collective signals. They contain the results of a disjunction (OR operation) of other information.

Byte1: Logical signals

Fault ind.	Warning ind.	Running CLOSE	Running OPEN	-	Setpoint reached	CLOSED position	OPEN position
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 2: Actuator signals

TSC (DSR)	TSO (DOEL)	LSC (WSR)	LSO (WOEL)	Local sw. position	Remote sw. position	Mains failure	Thermal fault
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 3: E2 Actual position

Actual position (high byte) (position transmitter)

Byte 4: E2 Actual position

Actual position (low byte) (position transmitter)
--

Byte 5: Fault signals

-	Clear state	Torque fault OPEN	Torque fault CLOSE	Mains failure	Thermal fault	Selector not remote	Wrong command
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 6: Warning signals

-	-	No reference operation	Hardware fault	Potentiometer fault	Loss of transm. signal	Channel 2 active	Failure 24 V supply
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 7: Physical operation

Local CLOSE	Local OPEN	Remote CLOSE	Remote OPEN	Start stepping mode	Operation pause	Proport. operation	Rev.prev./ dead time
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 8: Options

-	Analog 3/4 loss	Analog 2 loss	-	Dig. input 3	Dig. input 2	Dig. input 1	Dig. input 0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 9: 1st analog input

High byte 1 st customer analog input (wiring diagram design. analog 2)

Byte 10: 1st analog input

Low byte 1 st customer analog input (wiring diagram design. analog 2)
--

Byte 11: 2nd analog input

High byte 2 nd customer analog input (wiring diagram design. analog 3/4)

Byte12: 2nd analog input

Low byte 2 nd customer analog input (wiring diagram design. analog 3/4)
--

Byte13

Spare

Byte14

Spare

Byte15

Spare

Byte16

Spare



To ensure that the actuator gives a correct end position signal after power failure in end position CLOSED/ OPEN, we recommend to evaluate the information LSC (WSR)/ LSO (WOEL) (bit 5/4 in byte 2) for the end position signal CLOSED/ OPEN.

9.1 Process representation input (default process representation)

Byte 1: Logical signals

Important signals from the actuator concerning errors, warnings, operations:

Bit	Designation	Value	Description
0	OPEN position Limit seating in end position OPEN	1	Limit switch in direction OPEN operated.
		0	other
1	CLOSED position Limit seating in end position CLOSED	1	Limit switch in direction CLOSE operated
		0	other
	CLOSED position Torque seating in end position CLOSED	1	Torque switch and limit switch in direction CLOSE operated.
0		other	
2	Setpoint reached	1	The setpoint is within max. error variable (outer dead band). Signal occurs only if Profibus DP master has set the Setpoint reached bit.
		0	other
3	—	1	(reserved for extensions)
		0	
4	Running OPEN	1	Operation command (OPEN or SETPOINT) from Profibus DP in direction OPEN is executed. For operation in stepping mode, this signal is also active during an off-time, the dead time, and the reversing prevention.
		0	No operation is carried out via Profibus DP.
5	Running CLOSE	1	Operation command (CLOSE or SETPOINT) from Profibus DP in direction CLOSE is executed. For operation in stepping mode, this signal is also active during an off-time, the dead time, and the reversing prevention.
		0	No operation is carried out via Profibus DP.
6	Warning ind.	1	One or several warnings have occurred. Collective signal: Contains the result of a disjunction (OR operation) of all bits of the byte "Warning signals" (page 33).
		0	No warnings are active (all bits of the warnings cancelled).
7	Fault ind.	1	One or several faults have occurred so that the actuator can no longer be controlled via Profibus DP (at least one bit set in fault byte). Collective signal: Contains the result of a disjunction (OR operation) of all bits of the byte "Fault signals" (page 31 cont'd)
		0	No faults are active (all bits are cancelled in fault byte).

Byte 2: Actuator signals

Basic signals originating from the logic

Bit	Designation	Value	Description
0	Thermal fault	1	A thermal fault (motor protection) has occurred.
		0	No thermal fault has occurred.
1	Mains failure	1	A mains failure has occurred, e.g. phase error.
		0	No mains failure has occurred.
2	Remote sw. position	1	Selector switch in position REMOTE.
		0	Selector switch not in position REMOTE.
3	Local sw. position	1	Selector switch in position LOCAL.
		0	Selector switch not in position LOCAL.
4	LSO (WOEL)	1	Limit switch OPEN left operated.
		0	Limit switch OPEN left not operated.
5	LSC (WSR)	1	Limit switch CLOSE right operated.
		0	Limit switch CLOSE right not operated.
6	TSO (DOEL)	1	Torque switch OPEN left operated (storing).
		0	Torque switch OPEN left not operated.
7	TSC (DSR)	1	Torque switch CLOSE right operated (storing).
		0	Torque switch CLOSE right not operated.

Byte 3: E2 Actual position (high byte) (position transmitter)

Byte 4: E2 Actual position (low byte) (position transmitter)

Bytes 3 and 4 are used to transmit the actual actuator position (requires position transmitter within actuator). The actual position can be transmitted either as a value between 0 – 100 (percent) or 0 – 1000 (per mil). For 0 – 100 (per cent), the consistency does not have to be regarded in the transmission and only the low byte must be regarded. The change-over between 0 – 100 and 0 – 1000 is realised via a parameter in the GSD file (default setting: transmission in 0 – 100 format).

Byte 5: Fault signals

The actuator is not ready for remote operation. As soon as one of these signals is set, bit 7 of byte 1 will also be set)

Bit	Designation	Value	Description
0	Wrong command	1	Indicates the fact that several operation commands were received simultaneously via Profibus DP (e.g. Remote OPEN and Remote CLOSE simultaneously or Remote CLOSE/ Remote OPEN and Remote SETPOINT (nominal) simultaneously) or that the max. value for a nominal position has been exceeded (setpoint > 1000).
		0	Operation commands correct
1	Selector not remote	1	Selector switch: position LOCAL or OFF
		0	Selector switch: position REMOTE
2	Thermal fault	1	Motor protection has tripped; remedy: resetting local controls via selector switch position RESET after the motor has cooled off.
		0	other
3	Mains failure	1	Loss of one phase or incorrect phase sequence.
		0	other
4	Torque fault CLOSE	1	Torque fault OPEN occurred (only torque or torque before limit, according to type of seating); remedy: resetting using counter command
		0	other
5	Torque fault OPEN	1	Torque fault CLOSED occurred (only torque or torque before limit, according to type of seating); remedy: resetting using counter command
		0	other

Bit	Designation	Value	Description
6	Clear state	1	Indicates that a telegram Global Control Clear was sent via the Profibus DP (the bit can only be deleted with a telegram Global Control Operate). In this state, the actuator can not be operated from REMOTE.
		0	
7	—	1	not assigned (reserved for extensions)
		0	

Byte 6: Warning signals

Warning signals serve only information purposes and do not interrupt or cancel an operation (as opposed to faults). As soon as one of these signals is set, bit 6 of byte 1 will be set simultaneously.

Bit	Designation	Value	Description
0	Failure 24 V supply	1	Failure 24 V supply voltage.
		0	other
1	Channel 2 active	1	Actuator uses channel 2 for communication.
		0	other
2	Loss of transm. signal	1	Signal interrupted at position transmitter RWG: For recognition purpose, parameter 1 must be set to value 3 (RWG 4 – 20 mA).
		0	other
3	Potentiometer fault	1	Potentiometer fault: in end position CLOSED a value is measured being higher than the one in end position OPEN.
		0	other
4	Hardware fault	1	Hardware fault: If this bit is set, the Profibus board must be checked/ replaced.
		0	other
5	No reference operation	1	No reference operation: The values of the position transmitter cannot be used as long as the reference operation (end position OPEN, end position CLOSED) has not been performed. A nominal operation is not possible.
		0	other
6	—	1	Not assigned (reserved for extensions)
		0	
7	—	1	Not assigned (reserved for extensions)
		0	

Byte 7: Physical operation

Bit	Designation	Value	Description
0	Rev.prev./ dead time	1	Reversing prevention/ dead time warning: The actuator does not start as long as reversing prevention or dead time is still active. The bit is set if a run command is available which cannot be executed immediately. The bit is cancelled as soon as the actuator starts.
		0	other
1	Proport. operation	1	Proportional section reached (soft start or soft stop) active. Only possible together with adjustable output speed actuators of the type ranges AS, ASR with AUMA VARIOMATIC Profibus DP.
		0	other
2	Operation pause	1	Operation pause
		0	other
3	Start stepping mode	1	Indicates that the actuator is within the stepping range during active stepping mode. Conditions: position transmitter is provided, stepping mode is active, remote operation is being performed.
		0	other

4	Remote OPEN	1	Remote operation via Profibus in direction OPEN (remote operation bit for logic board set and movement of potentiometer detected). Signalling of this bit requires a position transmitter.
		0	other
5	Remote CLOSE	1	Remote operation via Profibus in direction CLOSE (remote operation bit for logic board set and movement of potentiometer detected). Signalling of this bit requires a position transmitter.
		0	other
6	Local OPEN	1	Actuator runs locally in direction OPEN (local controls or handwheel). Signalling of this bit requires a position transmitter.
		0	other
7	Local CLOSE	1	Actuator runs locally in direction CLOSE (local controls or handwheel). Signalling of this bit requires a position transmitter.
		0	other

Byte 8: Options

Digital inputs and loss of signal at analogue inputs

Bit	Designation	Value	Description
0	Dig. input 0	1	Digital input no. 1 = 1 (switch closed)
		0	Digital input no. 1 = 0 (switch open)
1	Dig. input 1	1	Digital input no. 2 = 1 (switch closed)
		0	Digital input no. 2 = 0 (switch open)
2	Dig. input 2	1	Digital input no. 3 = 1 (switch closed)
		0	Digital input no. 3 = 0 (switch open)
3	Dig input 3	1	Digital input no. 4 = 1 (switch closed)
		0	Digital input no. 4 = 0 (switch open)
4	—	1	not assigned (reserved for extensions)
		0	
5	Analog 2 loss	1	Signal interrupted at analogue input 2 (first free analogue input) i.e. the measured value is more than 0.2 mA lower than the set minimum value.
		0	no signal interruption analogue input 2 detected
6	Analog 3/4 loss	1	Signal interrupted at analogue input 3/4 (second free analogue input) i.e. the measured value is more than 0.2 mA lower than the set minimum value.
		0	no signal interruption analogue input 3/4 detected
7	—	1	not assigned (reserved for extensions)
		0	

Byte 9: High byte first analogue customer input (wiring diagram designation analogue 2)

Byte 10: Low byte first analogue customer input (wiring diagram designation analogue 2)

The data content of bytes 9 and 10 depends on parameter 22; with the default value (0 – 100 percent), only the low byte is used.

Byte 11: High byte second analogue customer input (wiring diagram designation analogue 3/4)

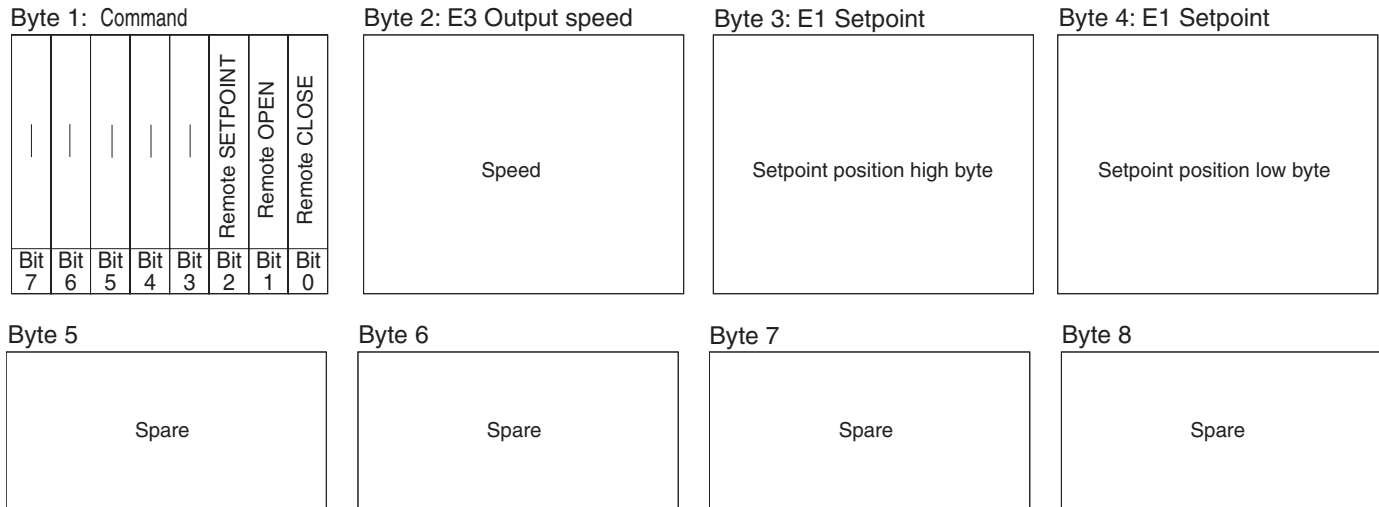
Byte 12: Low byte second analogue customer input (wiring diagram designation analogue 3/4)

The data content of bytes 11 and 12 depends on parameter 25; with the default value (0 – 100 percent), only the low byte is used.

Byte 13 to 16: reserved for extensions

10. Process representation output

Via the process representation output, the master (controls) can control the slave (actuator).



In order to perform remote operations, the selector switch of local controls must be set to 'Remote control'.

Only one operation bit may be set at byte 1.
If several operation bits are set at the same time, the actuator stops and signals the fault "Wrong command".

10.1 Description of the output data

Byte 1: Commands

Bits 0 – 2 are used to transmit operation commands to actuator. Only one of these bits may be set at any given time. If Remote SETPOINT is set, the value of the nominal position (byte 3 and byte 4) is used. Bits 3 – 7 are reserved for future extensions and must remain set to 0.

Bit	Designation	Value	Description
0	Remote OPEN	1	Running OPEN
		0	Not running OPEN
1	Remote CLOSED	1	Running CLOSE
		0	Not running CLOSE
2	Remote SETPOINT	1	Running to setpoint Can only be set if a position transmitter e.g. potentiometer/ RWG (options) is available.
		0	Not running to setpoint.
3	--	1	Not assigned (reserved for extensions)
		0	
4	--	1	Not assigned (reserved for extensions)
		0	
5	--	1	Not assigned (reserved for extensions)
		0	
6	--	1	Not assigned (reserved for extensions)
		0	
7	--	1	Not assigned (reserved for extensions)
		0	

Byte 2: E3 Output speed:

This byte is only effective in combination with variable output speed actuators type AS and ASR.

Value range: 0..100:

Minimum output speed: 0 (actuator runs with min. set output speed)

Maximum output speed: 100 (actuator runs with max. set output speed)

Byte 3: E1 Setpoint (high byte)

Byte 4: E1 Setpoint (low byte)

The setpoint can be transmitted either as a value between 0 – 100 (percent) or 0 – 1000 (per mil). For the 0 – 100 scaling, the consistency does not have to be considered in the transmission and only the low byte must be evaluated. The change-over between 0 – 100 and 0 – 1000 is realised via a parameter in the GSD file via parameter 2 “Measured data coding position transmitter”. According to this programming, different maximum values apply. When these limits are exceeded, the actuator stops and signals the fault “Wrong command”.

Byte 3: High Byte of setpoint position 0...1000

Condition	Value
Parameter 2 (measured data coding position transmitter) = 0	This byte must be set to 0.
Parameter 2 (measured data coding position transmitter) = 1	This byte indicates the low byte of the setpoint (0...1000 per mil).

Byte 4: Low Byte of setpoint position 0...100 or position 0...1000

Condition	Value
Parameter 2 (measured data coding position transmitter) = 0	Setpoint position 0...100
Parameter 2 (measured data coding position transmitter) = 1	This byte indicates the low byte of the setpoint (0...1000 per mil).

Bytes 5 to 8: reserved for extensions, must be set to 0.

11. Description of actuator functions

11.1 Operation commands for OPEN/ CLOSE operation

Operation commands are determined by the operation command bits and the nominal value (setpoint) of the Profibus process representation output. Only one command bit may be set at any given time. If several command bits are set, no operation is performed and the fault signal 'Wrong command' is given.

To avoid placing too much strain on the mechanics the actuator is equipped with a (programmable) delay when changing direction (reversing prevention).

The following operation command bits are required for OPEN/ CLOSE operation:

Remote OPEN
Remote CLOSE

Remote operation OPEN/ STOP

Remote OPEN = 1
Remote OPEN = 0

The actuator runs in direction OPEN.

The actuator stops.

The actuator is switched off automatically if the end position OPEN (limit switch LSO [WOEL] is reached.

Occurring faults (thermal failure, phase failure, torque failure) stop the operation.

Remote operation CLOSE/ STOP

Remote CLOSED = 1
Remote CLOSED = 0

The actuator runs to position CLOSED.

The actuator stops.

The actuator is switched off automatically if the end position CLOSED is reached (limit switch LSC [WSR] for limit seating or LSC [WSR] and TSC [DSR] for torque seating). Occurring faults (thermal failure, phase failure, torque failure) stop the operation.

Remote operation to setpoint position/ STOP

The positioner can only function if the actuator is equipped with a position transmitter, e.g. potentiometer/ RWG (option).

Remote SETPOINT = 1
Remote SETPOINT = 0

The actuator moves to the set nominal value.

The actuator stops.

The setpoint must be indicated in % or in ‰ (depending on the AUMA user parameter 2 "Measured data coding position transmitter" within the GSD file).

Occurring faults (thermal failure, phase failure, torque failure) stop the operation via the positioner.

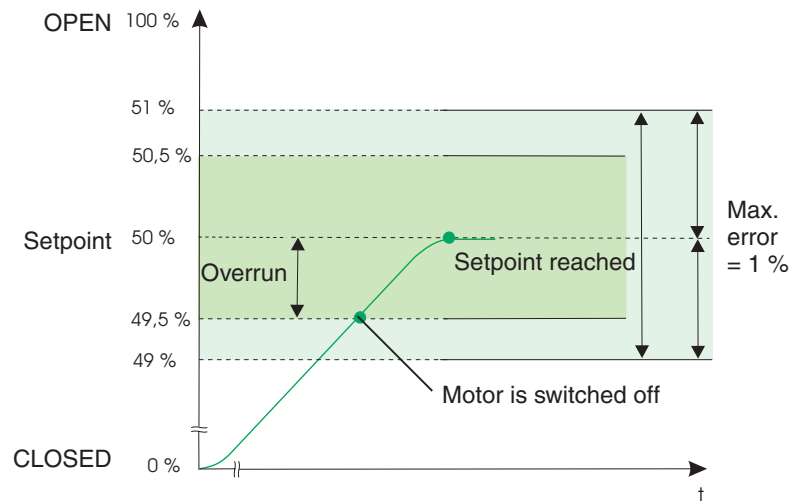
With a setpoint of 0 % (0 ‰), the actuator runs to the end position CLOSED. With a setpoint of 100 % (1000 ‰) the actuator runs to the end position OPEN. In case the setpoint is more than 100 % (1000 ‰), no operation is performed and the fault signal "Wrong command" is given.

11.2 Positioner

The positioner is activated via the bit 'Remote SETPOINT'. The positioner is a three-position-controller. Via the 'SETPOINT' position in the process representation input, the nominal value of the position is transmitted cyclically to the actuator as nominal variable (cycle time = bus cycle time DP). The positioner integrated in the actuator controls AUMA MATIC provides the position signal for controlling the motor depending on the nominal and actual position value. The feedback signal (actual value of actuator position) is produced internally within the actuator.

The position transmitter compares the nominal value of the position set in the controls to the locally measured actual value of the position. If the difference between nominal value and actual value is higher than the max. error (parameter 14), the positioner drives the motor, depending on the error, either in direction OPEN or direction CLOSE.

Figure H: Modulating duty: nominal operation to 50 %



Overrun (inner dead band)

The inner dead band determines the switching-off point of the actuator. The tripping point in both directions can be set via the parameters 12 and 13 (page 24), so that the actuator stops as close as possible to the nominal value.

Max. error (outer dead band)

The outer dead band determines the switching-on point of the actuator. If the actual position or a change of the nominal value is higher than the max. permissible error set with parameter 14 (page 25), the motor is started.



The parameter must be set sufficiently high to ensure a stable function of the positioner. If the value is set too low, the number of starts is likely to be increased. Thus, the end of the lifetime of the actuator and valve will be reached sooner.

Dead time

The dead time prevents the operation to a new nominal position within a pre-determined time. The time can be between 0 and 1 minute and is set in parameter 11.



The controls must ensure that the maximum number of motor starts of the actuator is not exceeded. This can be achieved by setting the parameter 11 to a sufficiently high value.

For further information on the positioner, please refer to the operation instructions pertaining to the actuator (multi-turn actuator SA(R).../ part-turn actuator SG... with AUMA MATIC AM...).

11.3 Stepping mode

Stepping mode requires a position transmitter (option).
The stepping mode lengthens the operating time for part of or for the whole travel.

Setting operation and pause times

The operation and pause times (stepping times) in opening or closing direction are set with the parameters 27 to 33. An individual operation and pause time can be set for each direction.

Indication of operation in stepping mode

The states of the operation in stepping mode are indicated by the bits 2 and 3 in byte 7 of the process representation output.

12. Failure function

The failure function allows the start of failure operations in case of special events, e.g. when the communication between the actuator and the master is interrupted. This function is set with the parameters 6 to 10.

The failure function can only be set off when the watchdog function is activated within the master.

If the actuator is in the failure function, the set failure position is approached via a failure operation.

If the actuator is then moved to another position (e.g. by manual operation), it will try to perform the set failure action while the selector switch is in position REMOTE.



To prevent a new approach to the failure position during manual operation, the selector switch (local controls) must be switched to position 'LOCAL' or 'OFF' before operating the handwheel.

The following events can trigger the failure function:

- The connection to the master is interrupted.
- The master enters the Clear state and sends:

either a) global control telegrams with the content Clear.
or b) data telegrams with the length 0 (DP fail safe mode).

As soon as the cause for triggering the failure mode is eliminated (connection restored, master in Operate state), the operation commands from the master can be executed again.

13. Description Profibus DP interface

Figure J: Profibus DP interface board

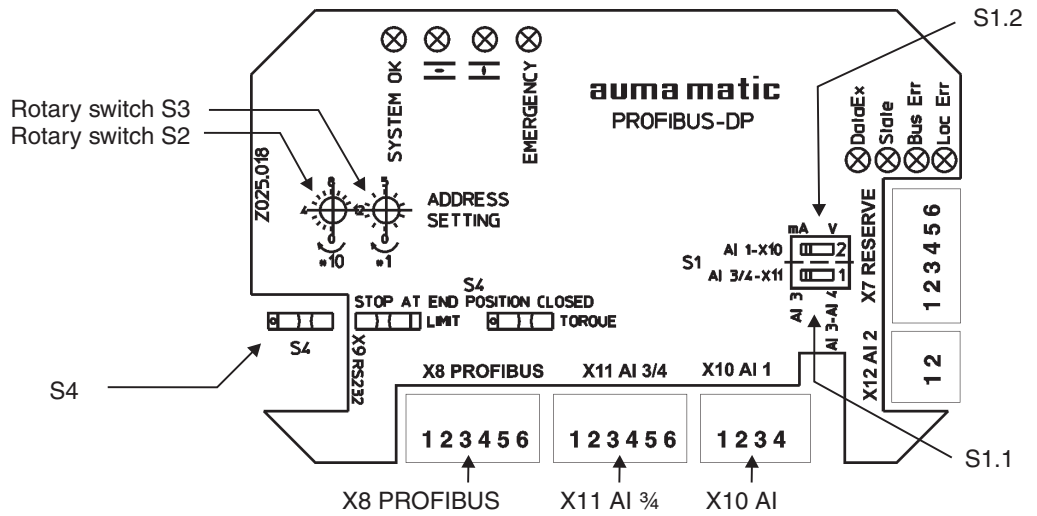


Table 8: Standard setting of Profibus DP interface board

S1.1	S1.2		S2	S3
AI 3	V (with Potentiometer)	mA (with RWG)	0	2

S1.1 When using the external analogue input X11 AI 3/4, the switch S1.1 must be in position AI 3.

S1.2 Switch for setting the position feedback via position transmitter potentiometers/ RWG (option).

S1.2 = V: If the actuator is equipped with a potentiometer without RWG, this switch must be in position 'V'.

S1.2 = mA: Switch may only be in this position if an RWG is installed in the actuator.

If the actuator is equipped with an RWG (0– 20 mA or 4 – 20 mA), this switch must be in position 'mA'.

S2/S3 Rotary switches for Profibus address setting. These two switches are used to set the address of the actuator within the Profibus DP network. Only addresses from 0 to 125 may be allocated.

S2 Rotary switch for setting the unit digit.

S3 Rotary switch for setting the tens digit.

S4 Switch for setting the end position seating in end position CLOSED. (In end position OPEN, switching off is always via limit seating) This switch is used to inform the Profibus DP board about the type of seating is to be used to operate the actuator in end position CLOSED (limit seating or torque seating). The end position seating is set in the factory according to the details given in the order.



The setting of the end position seating in end position CLOSED must be the same on the Profibus DP board (switch S4) and on the logic board (switch S1-2, figure J, page 42).

S4 = LIMIT: If the switch is in position 'LIMIT' (left, no dot visible), the actuator is in limit seating for end position CLOSED.

S4 = TORQUE: If the switch is in position 'TORQUE' (right, dot visible), the actuator is in torque seating for end position CLOSED.

13.1 Assignment of the customer inputs of the Profibus DP interface (option)

X7 spare This plug provides pins for 4 digital customer inputs.

Table 9: Digital inputs (galvanically isolated)

Pin	Description
1	R1: digital input 1
2	R2: digital input 2
3	R3: digital input 3
4	R4: digital input 4
5	+ 24 V
6	+ 24 V

These signals are freely available inputs, which the micro-controller transmits into the process representation input (byte 8, bits 0 – 3). The inputs are galvanically isolated and internally connected to 0 V via pull-down resistors. In an unconnected state, a logical zero is transmitted. To set an input to logical one, 24 V DC must be applied (pins 5 or 6).



- **Proposed external wiring diagrams (appendix B of the operation instructions) for these signals must be observed.**
- **The bounce time of the connected switches should not be more than 1 ms.**

X12 First analogue customer input (analogue 2).
An external 0/4- 20mA sensor for transmitting the measured values via the Profibus can be connected to this input.

Table 10: Analogue inputs at plug X12 AI 2

Pin	Description
1	AN 2: analogue signal 0 – 20 mA
2	GND (system ground)

X11 Second analogue customer input (analogue 3/4)
A 0/4-20mA sensor for transmitting the measured values via the Profibus can be connected to this input.

Table 11: analogue inputs at plug X11 AI 3/4

Pin	Description
1	+ 24 V
2	GND (system ground)
3	GND (system ground)
4	AN 3+: analogue signal 0 – 20 mA (plus)
5	AN 4–: analogue signal 0 – 20 mA (minus)
6	GND (system ground)

If the switch S1.1 is on the left side in position AI 3, the pin 5 (AN 4) is connected to GND. Input AN 3 can be used in the same way as AN 2. If the switch is on the right side in position AI 3-AI 4, a differential measurement between AN 3 and AN 4 can be performed.



- **Potential-free differential measurement is not possible.**
- **There is always a GND connection.**
- **Proposed external wiring diagrams (appendix B) observed.**
- **The inputs AN2, AN3, and AN4 do not have galvanic isolation via opto-isolator. The maximum load of the 24 V through the sensors must not exceed 40 mA.**

13.2 Assignment Profibus DP connection

X8 PROFIBUS The bus signals and the galvanically isolated voltage supply for the bus termination, as well as the bus termination resistors located on the Profibus DP board are connected on this plug.

Table 12: Plug assignment X8

Pin	Description
1	Channel 1: B cable bus termination
2	Channel 1: A cable bus termination
3	Channel 2: A cable Profibus (redundant channel)
4	Channel 2: A cable Profibus (redundant channel)
5	GND float (Profibus ground)
6	+ 5 V float (Profibus + 5 V)

13.3 Assignment positioner connections

X10 AI 1 The signals required for the position transmitter potentiometer/ potentiometer with RWG are connected on this plug.

Table 13: Plug assignment X10 AI 1

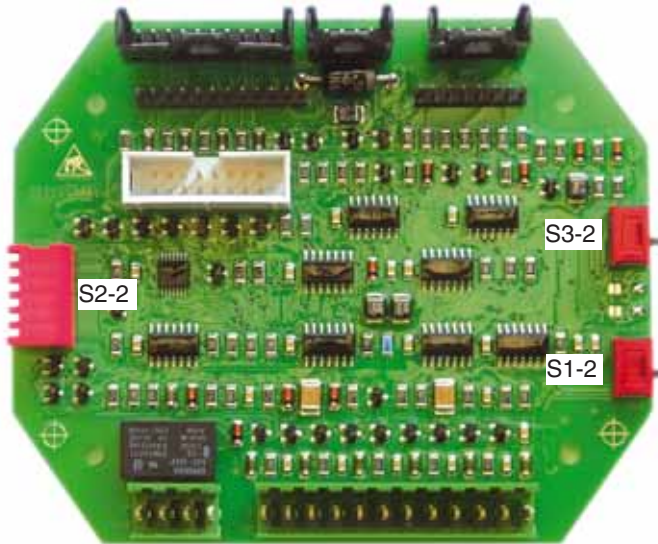
Pin	Description
1	+ 5 V for potentiometer
2	AN 1: analogue signal from position transmitter
3	GND (system ground)
4	+ 24V for RWG





13.4 Checking/ setting the switches on the logic board



The settings on the logic board are already made in the factory, according to the order details.
The logic board is located below the Profibus DP board.

Figure K : Logic board

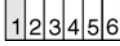
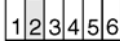
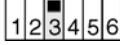
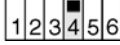
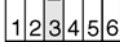
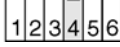

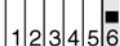
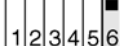


- S3-2  S3-2: Switching-off in end position OPEN. Switch position has no influence. When controlling via Profibus DP, switching-off is always realised by limit seating in end position OPEN
- S3-2  S3-2: Switching-off in end position OPEN. Switch position has no influence. When controlling via Profibus DP, switching-off is always realised by limit seating in end position OPEN
- S1-2  S1-2: Position 1: Switching-off by limit seating in end position CLOSED
- S1-2  S1-2: Position 2: Switching-off by torque seating in end position CLOSED



The setting of the end position seating in end position CLOSED must be the same on the Profibus DP board (switch S4, figure H, page 39) and on the logic board (switch S1-2).

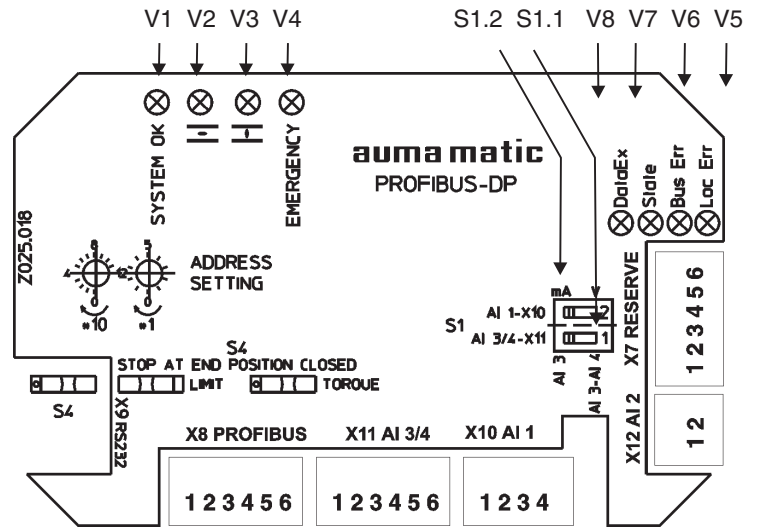
Table 14



DIP switch S2-2	Programming (ON = pressed)	
	Direction CLOSE	Direction OPEN
Self-retaining REMOTE	Self-retaining REMOTE may not be used	
Push-to-run operation REMOTE	OFF ON 	OFF ON 
Self-retaining LOCAL	OFF ON 	OFF ON 
Push-to-run operation LOCAL	OFF ON 	OFF ON 
Blinker transmitter (option)	Blinker transmitter must be deactivated!	Blinker transmitter deactivated OFF ON 
Torque error: torque switch tripping (in mid-travel) contained in collective fault signal (insignificant for fieldbus interface)	included	not included
	OFF ON 	OFF ON 

14. Troubleshooting and corrective actions

14.1 Optical signals during operation

Figure L: Profibus DP interface board



- LED 'SYSTEM OK' (V1)** This LED shows the correct voltage supply to the Profibus DP board.
 Is continuously illuminated: Voltage supply connected to Profibus interface.
 Is blinking: No Eprom used or Eprom defective.
 Is not illuminated: No voltage at the DP interface.
- LED  (V2)** This LED indicates a run command in direction OPEN.
 Is continuously illuminated: Run command in direction OPEN is executed.
 Is not illuminated: No run command in direction OPEN active.
- LED  (V3)** This LED indicates a run command in direction CLOSE.
 Is continuously illuminated: Run command in direction CLOSE is being executed.
 Is not illuminated: No run command in direction CLOSE active.
- LED 'LocErr' (V5)** This LED indicates local faults in the actuator.
 A fault with higher blinking frequency prevails over a fault with lower blinking frequency.
- Blinking once: TH fault (Thermal fault) actuator has stopped, motor overheating (motor protection).
- Blinking 2 times: STE fault (electrical fault) phase failure
- Blinking 3 times: TSO (DOEL) fault (torque switch opening left) Unexpected torque in direction OPEN.
- Blinking 4 times: TSC (DSR) fault (torque switch closing right) Unexpected torque in direction CLOSE.
- Blinking 5 times: Supply voltage failure (24V) Supply voltage of Profibus DP board is higher than 30 V or smaller than 18 V.
- Blinking 6 times: Slave is in CLEAR state

LED 'Data Ex' (V8) When LED is illuminated, the Profibus DP board has entered the 'Data Exchange' state. Only in this state, the actuator can be controlled by the DP master and the state of actuator can be read.

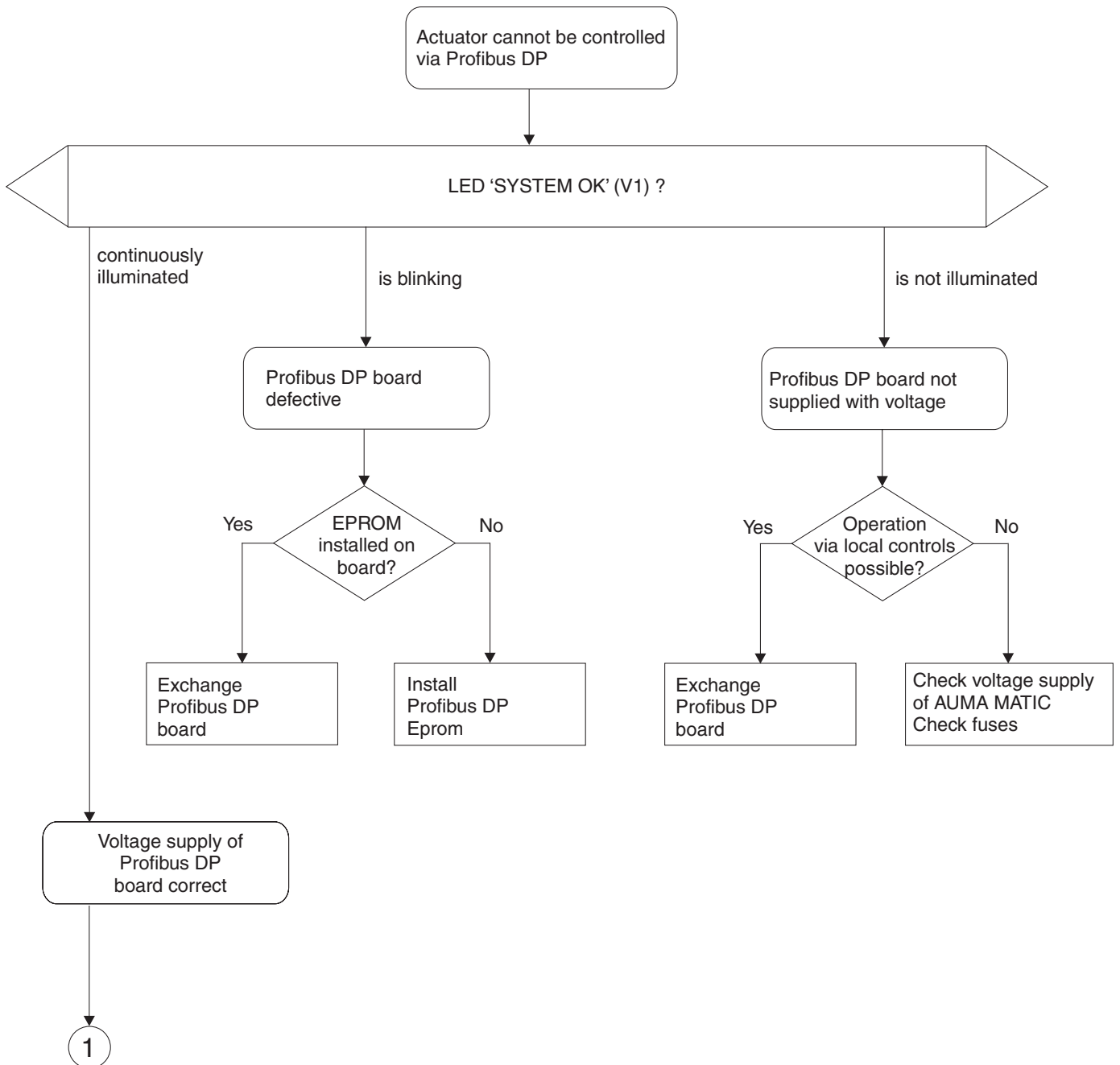
LED 'State' (V7) Is illuminated or not illuminated: Profibus DP board is not operational
Blinking once: Program on the Profibus DP board is being executed.
Blinking twice: Actuator is in failure mode.

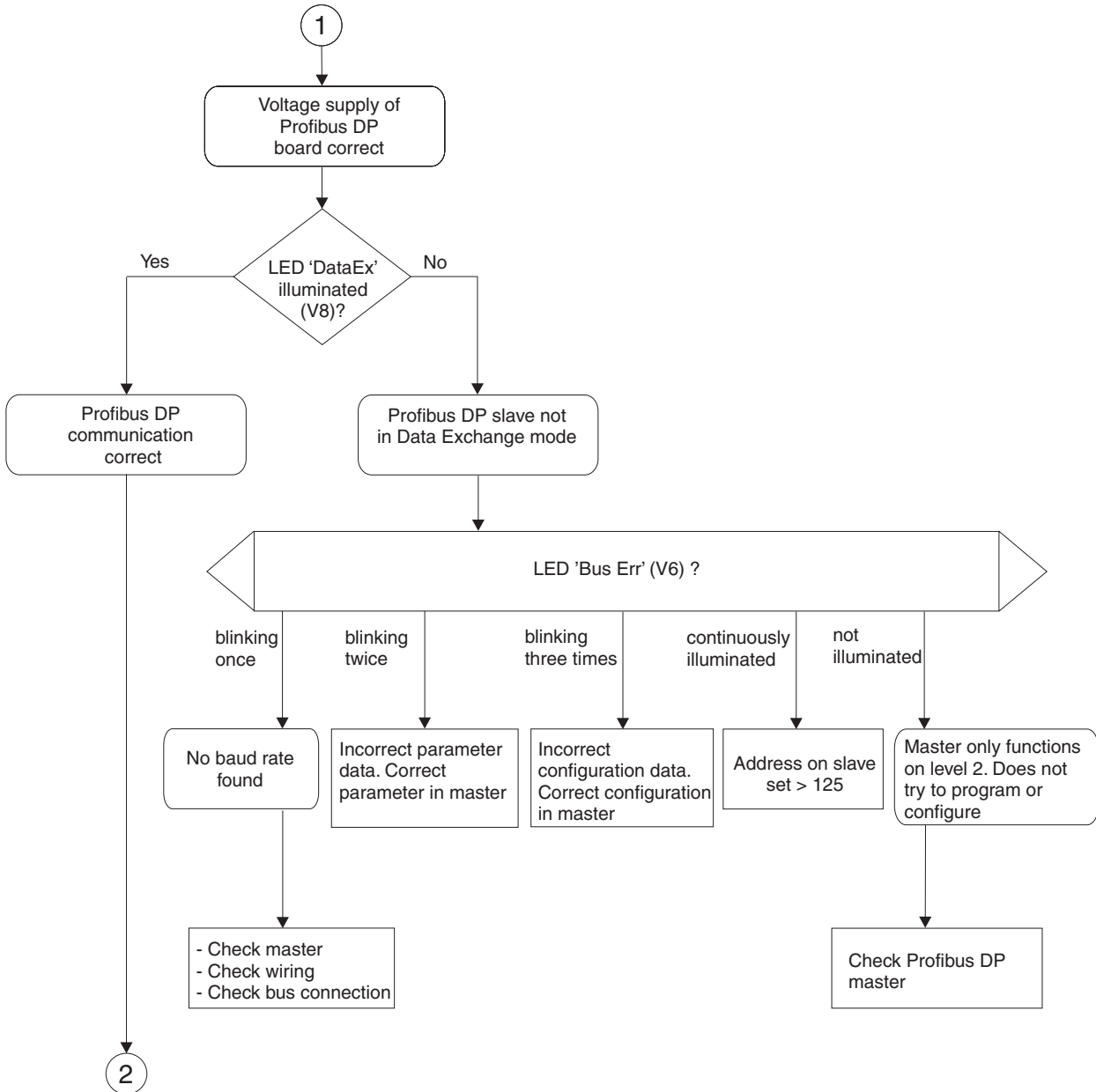
Regular blinking of the LED during operation indicates correct operation of the DP board.

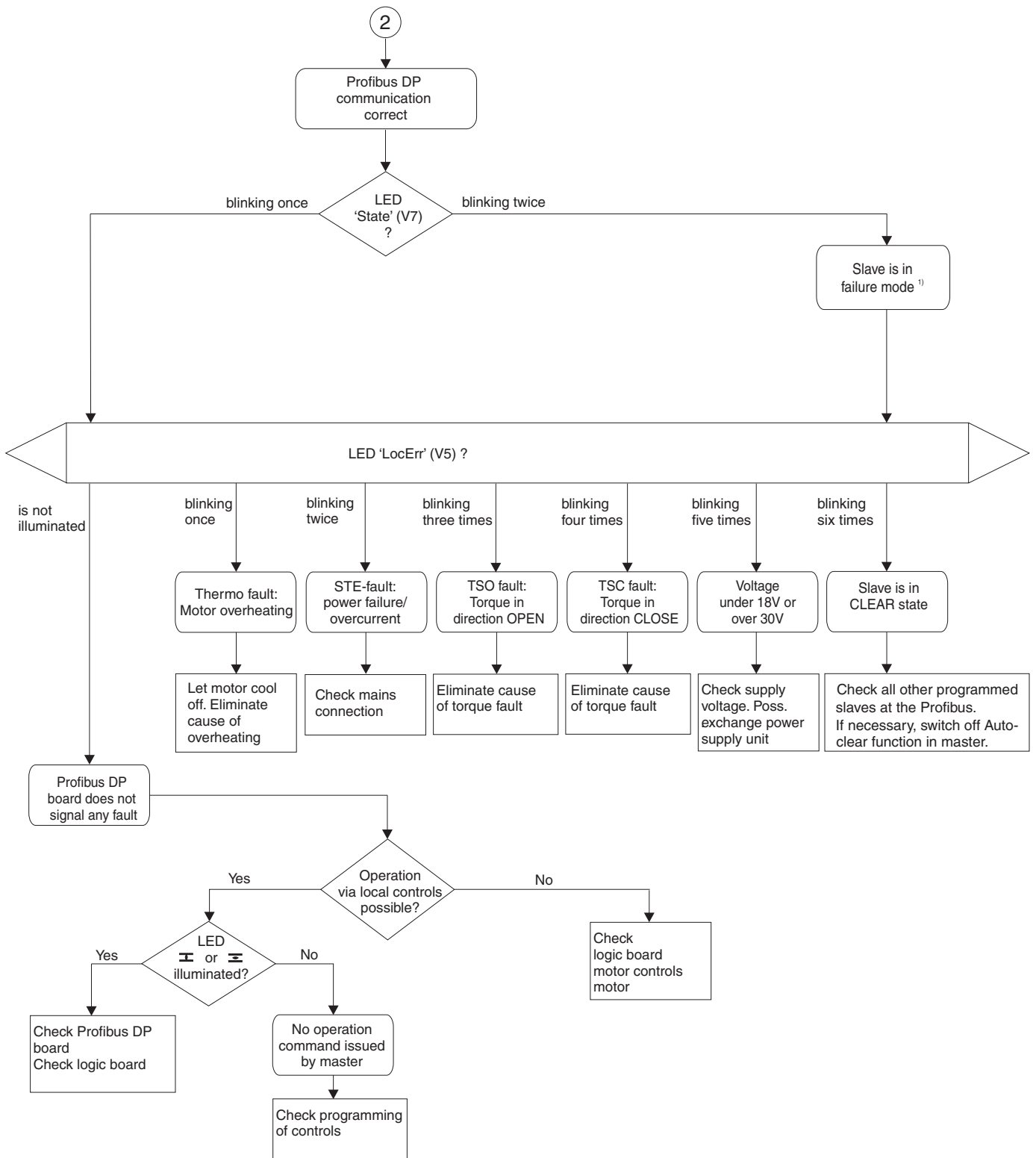
LED 'BusErr' (V6) This LED shows bus related faults.
A fault with higher blinking frequency prevails over a fault with lower blinking frequency, continuous illumination covers all blinking signals.

Is continuously illuminated: setting of invalid address (higher than 125).
Blinking once: No baud rate on bus.
Blinking twice: Incorrect parameter data.
Blinking 3 times: Incorrect configuration data.

14.2 Actuator can not be controlled via Profibus DP







1) see setting of AUMA user parameters 6, 7, 8, 9, and 10

14.3 Position feedback does not function

- Check, whether the voltage at plug (X10 AI1) on the Profibus DP board, pin 3 (-) and pin 2 (+) rises linearly when operating to OPEN position and falls linearly when operating to CLOSED position. The value for position CLOSED should be within the range 0 to 2 V. The value for position OPEN should be within the range 3 to 5 V. The voltage difference between CLOSED and OPEN should be more than 3V.

14.4 Actuator is not switched off by the limit switch in direction CLOSE

The actuator is set to torque seating.

Set actuator to limit seating:

- Set switch S4 (see figure H, page 39) on the Profibus DP board to position 'LIMIT'.
- Set switch S1-2 on the logic board (see page 42) to position 1.

14.5 Actuator stops immediately after start

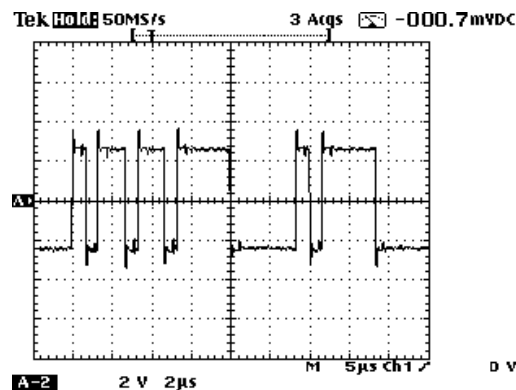
- Set switch S2-2 (blinker transmitter) on the logic board to position 'ON'.

14.6 Measuring the Profibus signals using an oscilloscope

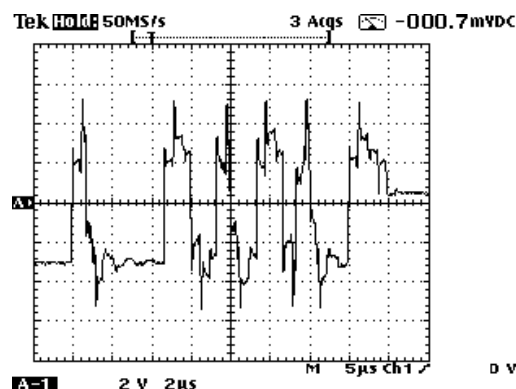
On the Profibus board, the signal from Profibus channel 1 on plug (X8 Profibus, refer to page 41) pin 1 (P/B) and pin 2 (N/A) can be checked using a digital oscilloscope.

The off-load voltage between pin 1 (+) and pin 2 (-) must be positive and within the range of 0.8 V and 1.4 V.

Example for correct Profibus signal:



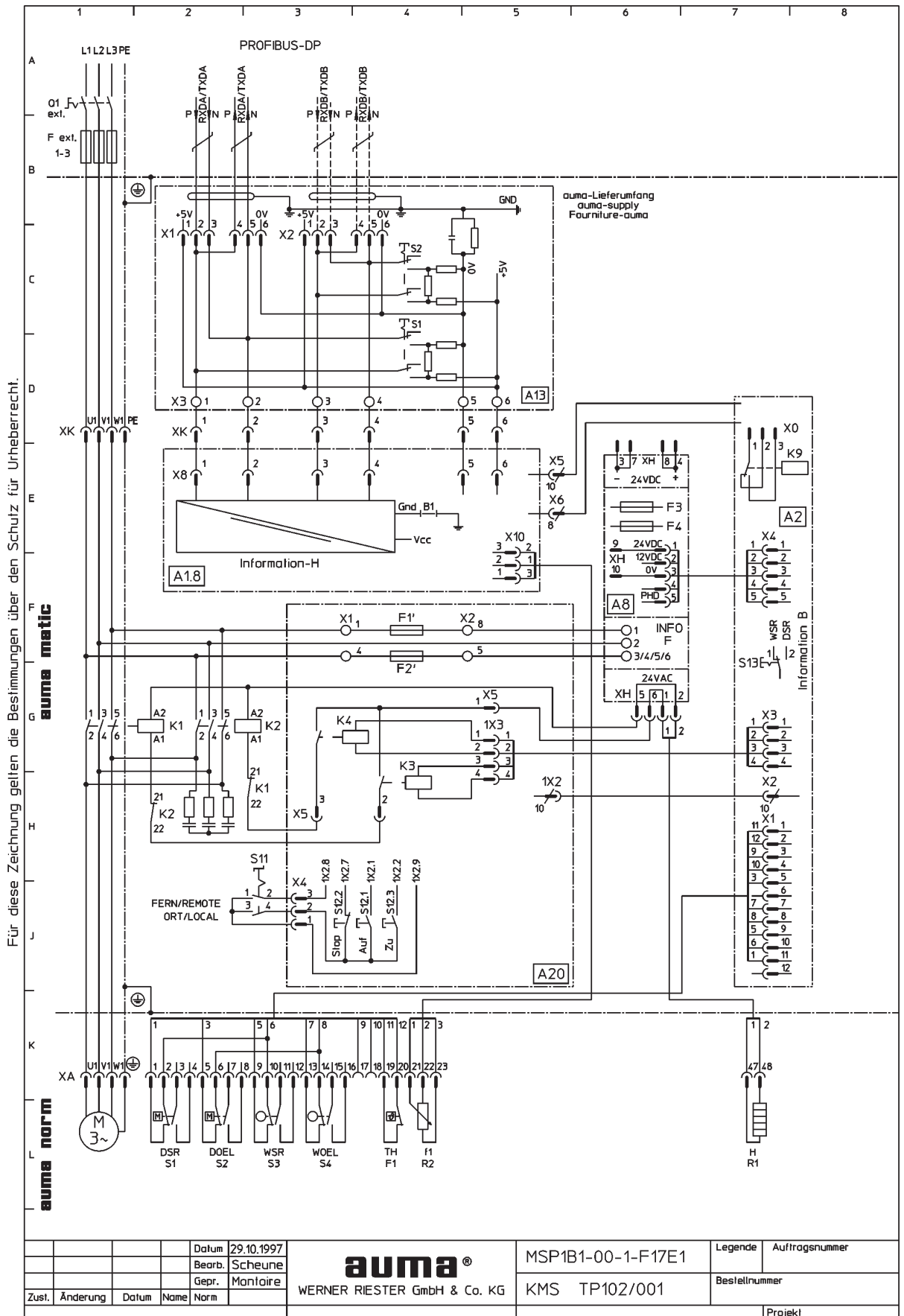
*Example for incorrect Profibus Signal
(Bus only terminated on one side):*



15. Appendix A Standard wiring diagram

Legend page 50

Original wiring diagram and legend are delivered together with the actuator.



15.1 Legend for standard wiring diagram

S 1	TSC	Torque switch, closing, clockwise rotation
S 2	TSO (DOEL)	Torque switch, opening, counterclockwise rotation
S 3	LSC (WSR)	Limit switch, closing, clockwise rotation
S 4	LSO (WOEL)	Limit switch, opening, counterclockwise rotation
R 2		Potentiometer
F 1	Th	Thermoswitch (motor protection)
R 1	H	Heater
A 1.8		Profibus DP board
A 2		Logic board
A 8		Power supply board
A 13		Bus connection board
A 20		Signal and control board
F 1, F 2		Primary fuses for power supply unit
F 3, F 4		Secondary fuses
H 1		Indication light end position CLOSED
H 2		Indication light end position OPEN
H 3		Indication light FAULT
K 1, K 2		Reversing contactors
K 3, K4		Control relays for reversing contactors
S 11		Selector switch LOCAL – OFF – REMOTE
S 12.1		Push button OPEN
S 12.2		Push button STOP
S 12.3		Push button CLOSE

15.2 Additional information to the wiring diagram legend

Information B:

Local controls

Information F:

Power supply board

Information H:

Profibus DP board

16. Appendix B Proposed external wiring diagram

Digital and analogue inputs are optional.

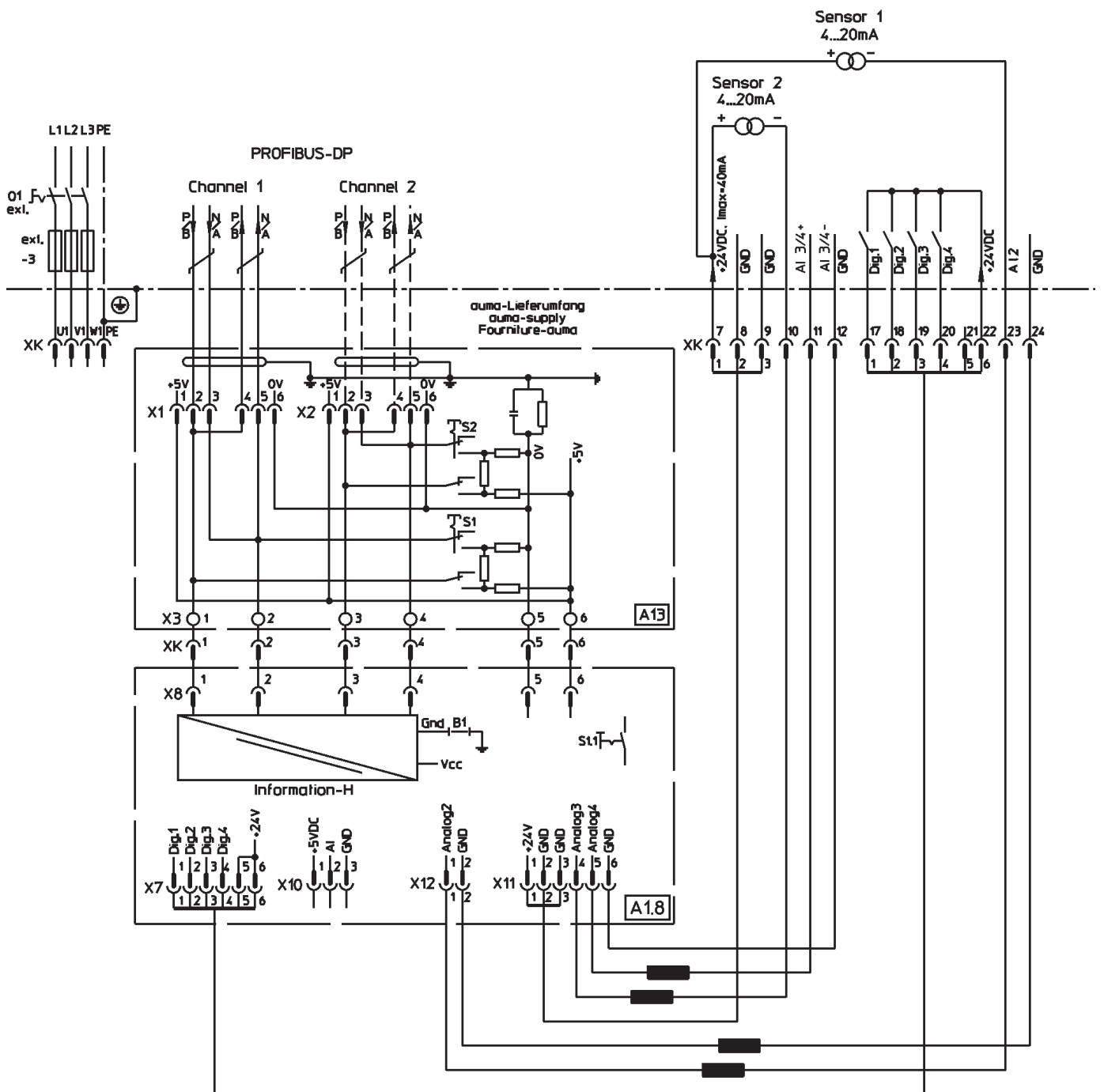
The two customer analogue connections (AI 3/4 and AI 2) as well as the four digital customer inputs (Dig 1 ...4) are only provided (wired) by the factory if explicitly mentioned on the order.

The 5th digit of the MSP number (refer to name plate) indicates if analogue connections are available.

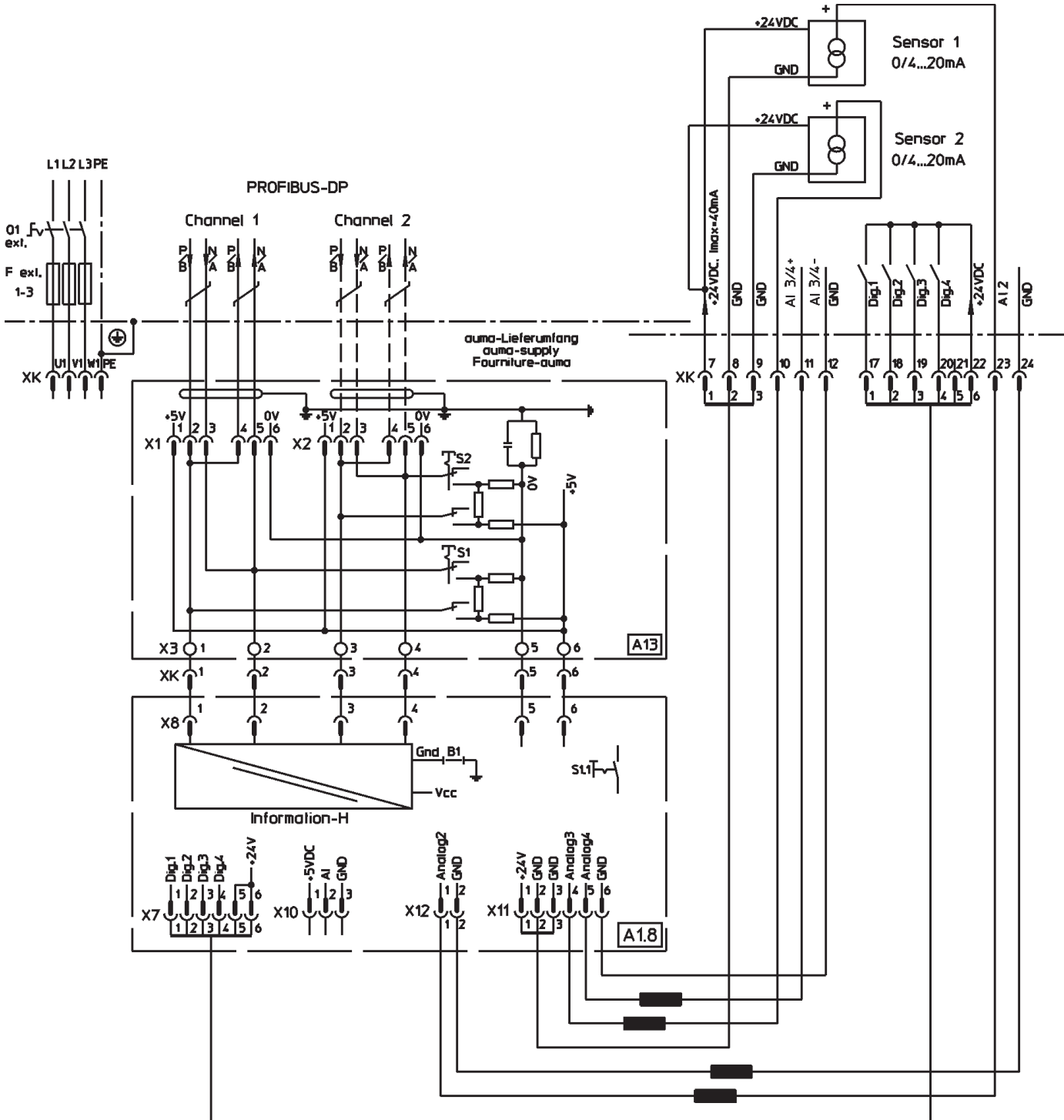
If the 5th digit is assigned to '0', no external connections are available.

If the 5th digit is assigned to 'L', the connections are provided.

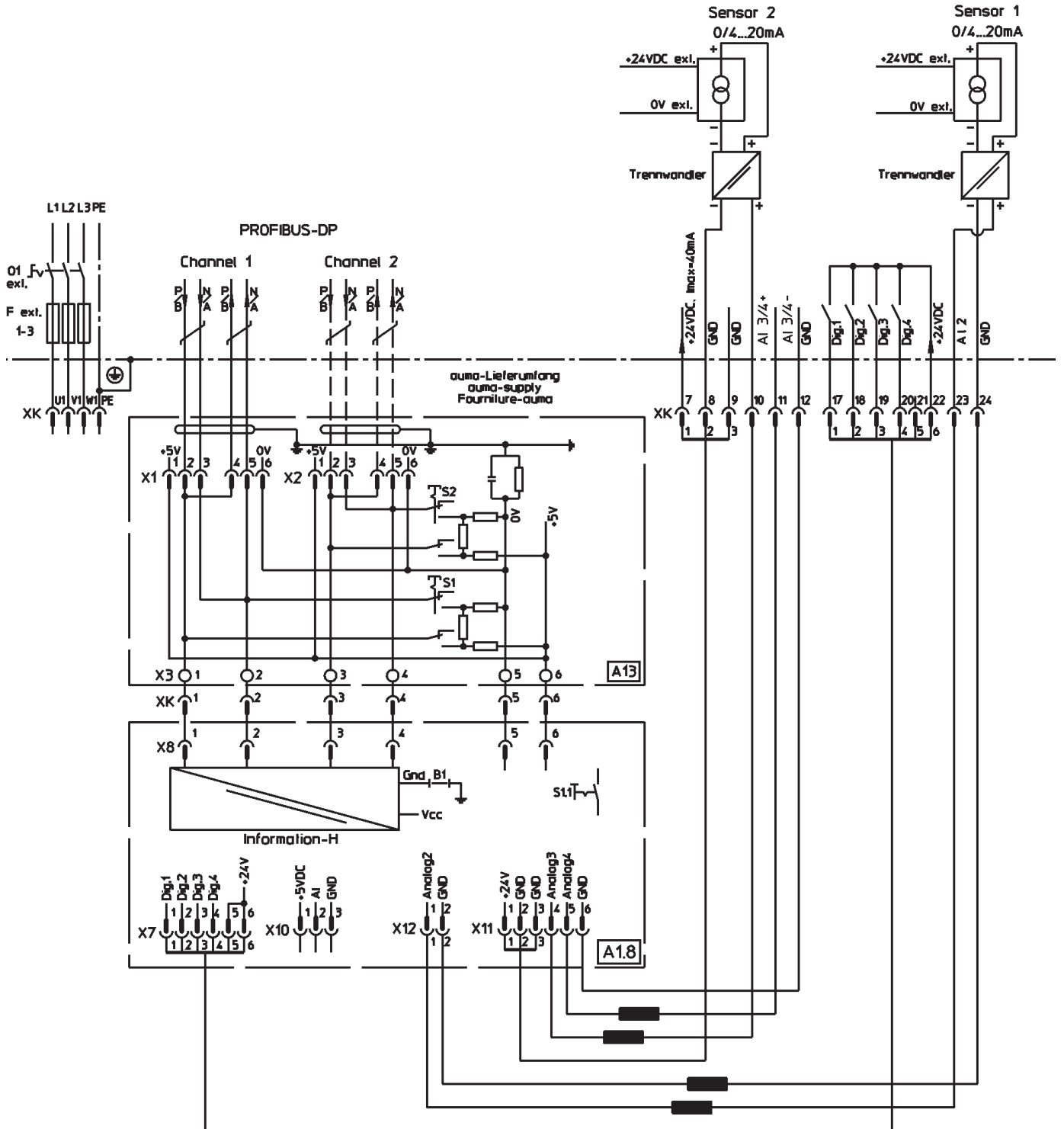
Connection of external sensors, 2-wire technology



Connection of external sensors, 3-wire technology

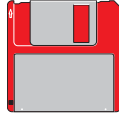


Connection of external sensors, 4-wire technology



17. Appendix C GSD file

GSD [Gerätstammdatei] stands for device master file. GSD is the so-called device data sheet for Profibus devices. The GSD file, supplied by AUMA, contains a description of the Profibus DP interface. The descriptions and characteristics contained within the GSD file facilitate easy configuration of the actuator controls.



The GSD file can be downloaded from Internet
www.auma.com

18. Appendix D Literature references

1. As an introduction into Profibus DP:
Manfred Popp: Profibus DP, Grundlagen, Tips und Tricks für Anwender.
Hüthig Verlag, ISBN 3-7785-2676-6
2. Guidelines for the electrician:
Aufbaurichtlinien Profibus DP/FMS Order No. 2.111
Available from:
Profibus Nutzerorganisation Haid-und Neu-Str. 7
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Phone +49-721 / 96 58 590
Fax +49-721 / 96 58 589
Http:/ www.profibus.com

19. Appendix E Connecting the cable shield for the AUMA MATIC AMExB/ AMExC 01.1

The shield of the fieldbus cable should be largely connected with the respective threads.

Recommended threads e.g. WAZU-EMV/EX supplied by Hugro
(refer to www.hugro-gmbh.de).



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Informationen also available on the Internet:

Wiring diagram, GSD file, test records and further actuator information can be downloaded directly from the Internet by entering the order no. or Com. No. (see name plate).
Our website: <http://www.auma.com>

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