

auma[®]

Actuator controls

AUMA MATIC
AM 01.1/AM 02.1
AMExB 01.1/AMExC 01.1
Modbus



Certificate Registration No.
12 100/104 4269

Short instructions bus connection

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 Modbus interface.

Table of contents

| | |
|---|-----------|
| 1. Safety instructions | 3 |
| 1.1 Range of application | 3 |
| 1.2 Commissioning (electrical connection) | 3 |
| 1.3 Maintenance | 3 |
| 1.4 Warnings and notes | 3 |
| 2. Short description | 3 |
| 3. Electrical connection | 4 |
| 3.1 Power supply (standard) | 4 |
| 3.2 Bus connection (standard) | 5 |
| 3.3 Fitting the cover | 6 |
| 3.4 Remote position transmitter | 7 |
| 3.5 AUMA MATIC on wall bracket | 7 |
| 3.6 Test run | 7 |
| 3.7 Mains and bus connection for Ex-version with plug/socket connector/terminal board (KP) | 8 |
| 3.8 Mains and bus connection for Ex-version with plug-in terminal connection (KES) | 10 |
| 3.9 Redundant bus connection | 11 |
| 3.10 Bus cables | 12 |
| 3.11 Setting the Modbus interface | 13 |
| 3.12 Setting the communication parameters | 14 |
| 3.13 Setting parameter seating mode in end position CLOSED, parity bits and number of stop bits | 14 |
| 3.14 Setting the Modbus address | 14 |
| 3.15 Setting the baud rate | 15 |
| 4. Description Modbus interface | 16 |
| 4.1 Indication during system start-up: | 16 |
| 4.1.1 Indications of operation LEDs 7 to 0 | 16 |
| 4.1.2 System displays LEDs L1 to L4 | 17 |
| 4.2 Checking/setting the switches on the logic board | 18 |
| 5. Appendix A Literature references | 19 |
| 6. Appendix B Connecting the cable shield for AUMA MATIC AMExB/AMExC 01.1 | 19 |
| Index | 19 |
| Addresses of AUMA offices and representatives | 20 |

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!

The printed circuit boards are equipped with 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 with the electronic controls AUMA MATIC Modbus. The electronic controls are included in the scope of delivery.

3. 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 Modbus must be observed for the wiring.
(For literature references, please refer to appendix A)

Make sure to respect electromagnetic compatibility (EMC) when installing cables:

Signal and bus cables are susceptible to interference.

Electric power 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.
- Avoid long cables, if possible, or make sure that they are laid in locations with low susceptibility to interference.
- Avoid long parallel paths with cables being either interference sources or susceptible to interference.

3.1 Power supply (standard)

Figure A-1: Connection

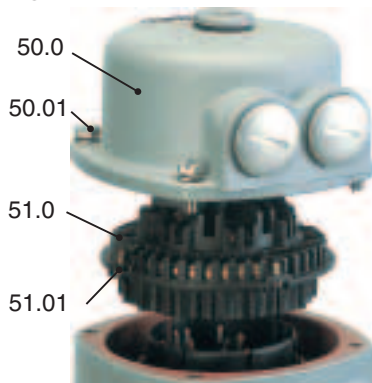
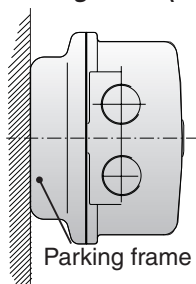


Figure A-2: Parking frame (accessories)



For explosion-proof version (type designation: AMExB/AMExC), please refer to page 8 or page 10.

- Check whether type of current, supply voltage, and frequency comply with motor data (refer to name plate at motor).
- Loosen bolts (50.01) (figure A-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 handwheel 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).

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.

Table 1: Technical data AUMA plug/socket connector for bus connection

| 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 | | 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

3.2 Bus connection (standard)

For explosion-proof version (type designation: AMExB/AMExC), please refer to page 8 or page 10.
 For version with FO (fibre optics), refer to separate operation instructions “AUMA MATIC AM 01.1/AM 02.1 FO connection”.

- Connect bus cable. Refer to figures B-1 to B-4.

The termination resistors for channel 1 and channel 2 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 Modbus segment.

Table 2: Switch position 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 B-1: Connection board (standard)

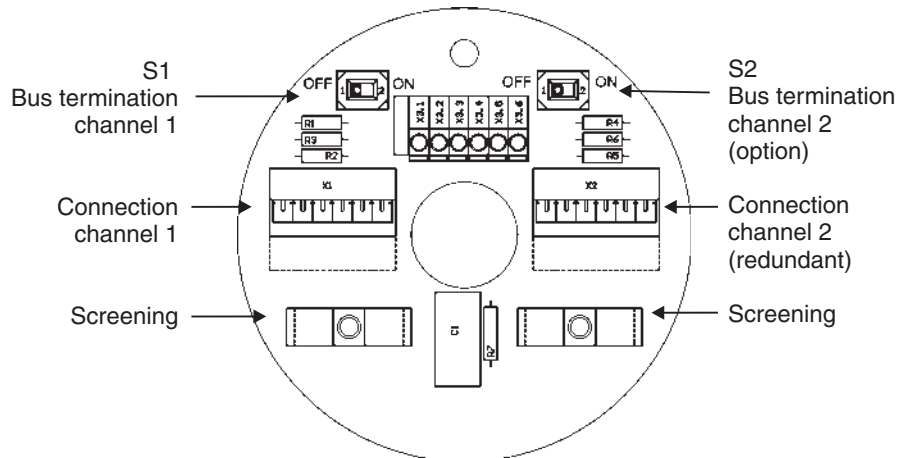


Figure B-2: Connection (standard)

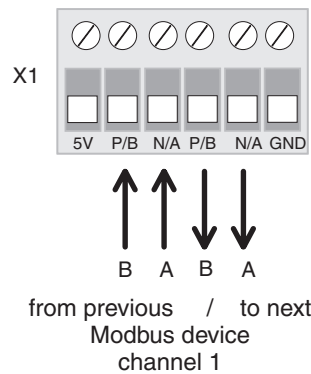


Figure B-3: Connection board (for overvoltage protection)

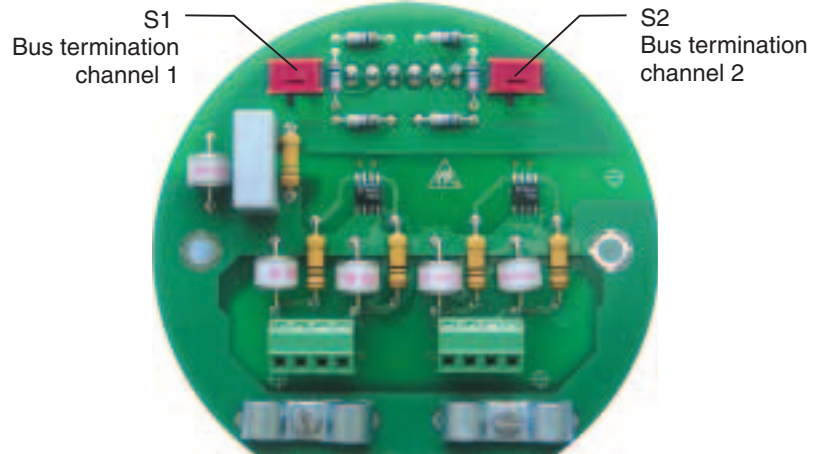


Figure B-4: Connection for overvoltage protection

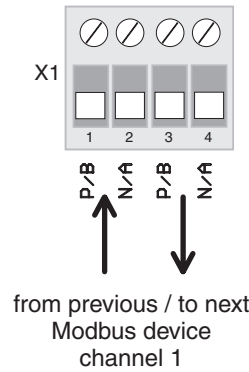


Table 3: Assignment of Modbus cable

| Modbus cable | AUMA labelling at the connection |
|--------------|----------------------------------|
| A | N/A |
| B | P/B |

3.3 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.

3.4 Remote position transmitter

For the connection of remote position transmitters (potentiometer, RWG) screened cables must be used.

3.5 AUMA MATIC on wall bracket

Figure B-5: AM on wall bracket



Connection 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.

The plug connection on the wall bracket is made as crimp version. Use a suitable four indent crimp tool for crimping.

Cross sections for flexible wires:

| | |
|-----------------|----------------------------------|
| Control cables: | max. 0.75 to 1.5 mm ² |
| Power supply: | max. 2.5 to 4 mm ² |

The connector at the actuator is equipped with screw type connections. Wire end sleeves have to be used.

3.6 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:

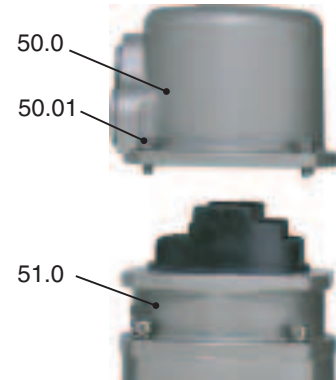
- Operate actuator electrically (via the push buttons OPEN and CLOSE of the local controls) once to the end position OPEN and once to the end position CLOSED.
- If no reference operation is performed after changing the limit switching, the feedback signal via the bus is not correct. The bus signals the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

3.7 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 C-1: Connection



For the Ex-plug/socket connector (figure C-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 C-1) and remove plug cover.

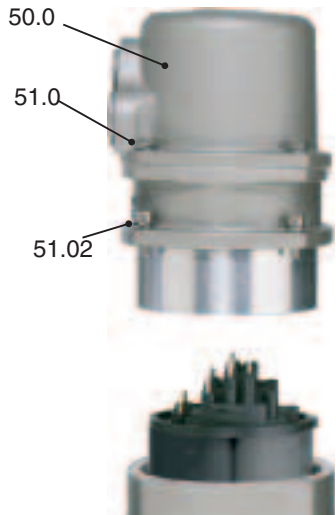


- Insert cable glands with “EEx e” approval and of size suitable for connecting cables. For the recommended cable glands refer to appendix B, page 19.

(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.
- No more than max. 2 wires with the same cross section may be connected to one terminal.

Figure C-2: Disconnection from the mains



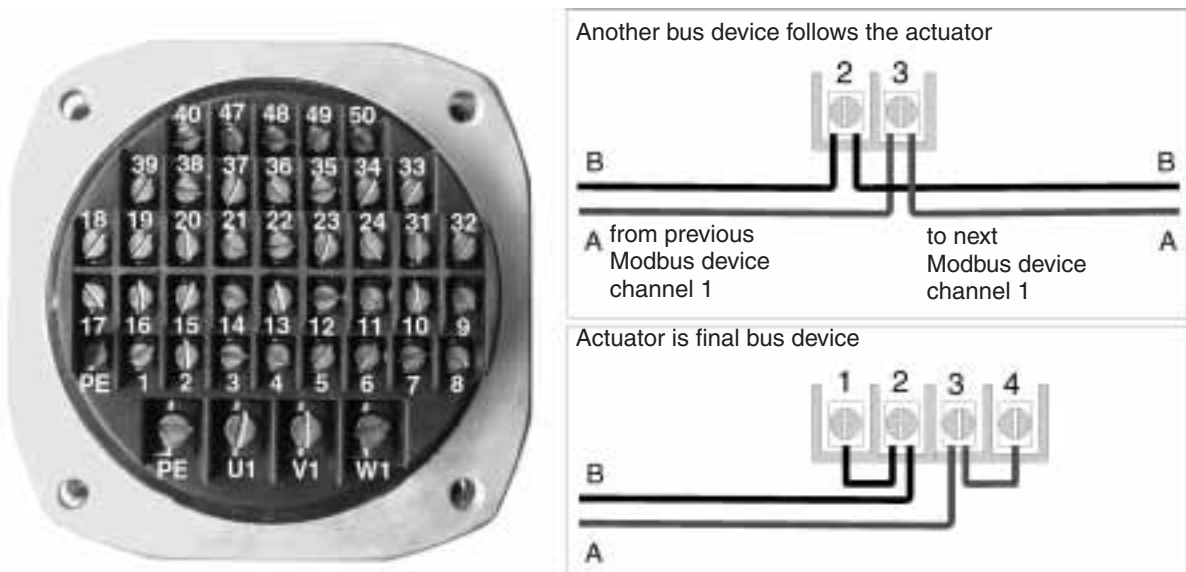
- Remove cable sheathing in a length of 120 – 140 mm. Strip wires: Controls max. 8 mm, motor max. 12 mm. For stranded wires use end-sleeves according to DIN 46228.
- Connect bus cable. Refer to figure (C-3). The termination resistor for channel 1 is connected through linking the terminals 1 – 4 and 3 – 2 (standard).
- Only connect the termination resistor if the actuator is the final device in the Modbus segment.
- Connect screen largely to the cable glands. For the recommended cable glands refer to appendix B, page 19.

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 C-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.



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

A special parking frame (figure C-2) for protection against touching the bare contacts and against environmental influences is available.

Figure C-3: Bus connection for channel 1 (standard)**Table 4: 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. | | | |

3.8 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”.

The bus connection is realised via terminals (figure D-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 D-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 B, page 19. (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 12.

- Connect bus cable to channel 1 according to configuration of the terminals (figure D-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 Modbus segment.

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

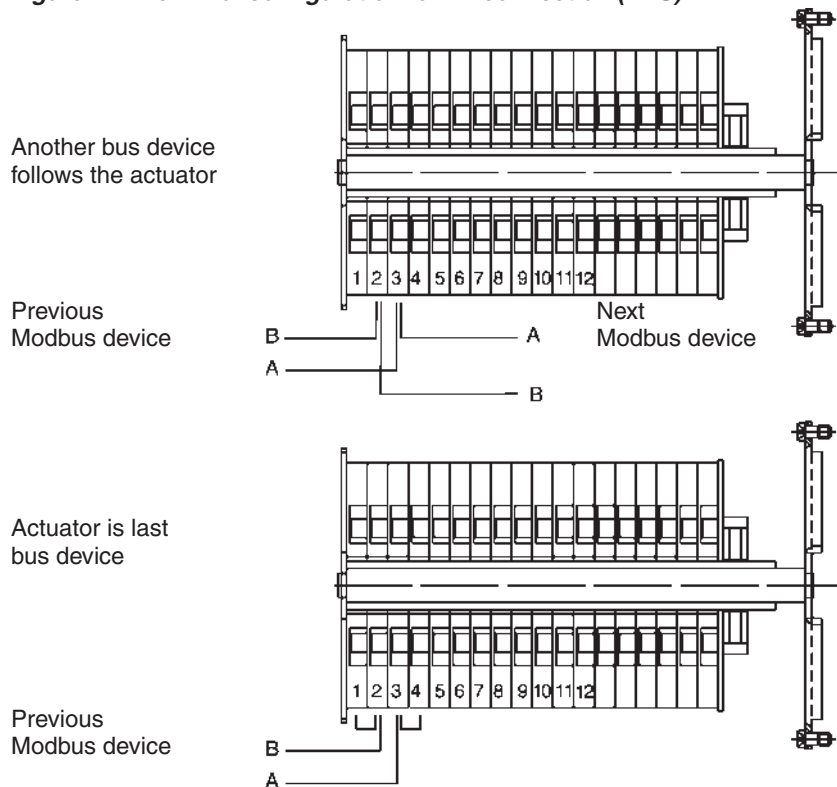
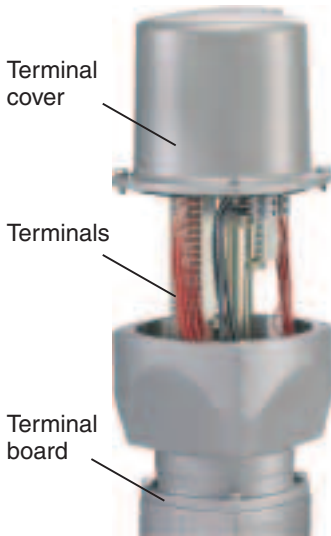


Figure D-1: Plug in terminal connection



3.9 Redundant bus connection

AUMA Modbus devices can be connected with a second (redundant) Modbus cable. If the bus on channel 1 fails, e. g. through cable break, the slave automatically switches to channel 2 after a waiting time. Thus, the change-over is realised with a time delay (see parameter 5 “Time for channel changing in 0.1s).

Additionally, the communication cannot be carried out on both channels simultaneously.

If the redundancy is activated (see parameter 4 “Redundancy”), the AUMA MATIC transmits its data using both channels but receives the data only using the active channel.



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 3.2):**
Connect redundant bus cable to channel 2 in the same way as channel 1 (figure B-2).
- **For Ex-version with plug/socket connector/terminal board (KP) (subclause 3.7):**
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 3.8):**
Connect cable B to terminal 6, cable A to terminal 7 (figure D-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 (refer to operation instructions).

3.10 Bus cables

Only cables according to the recommendations of EIA 485 standard may be used for Modbus wiring.

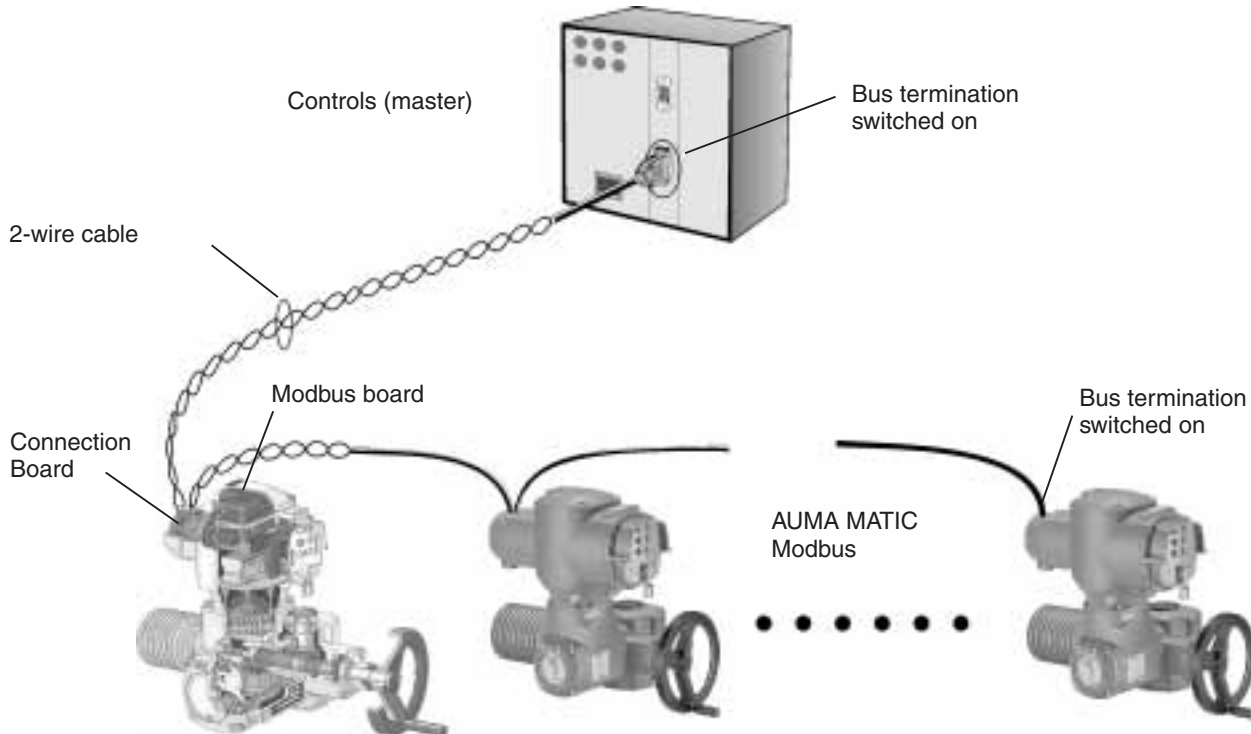
A maximum of up to 32 Modbus devices may be connected in one segment. If more stations are to be connected to one Modbus network, several segments must be connected with repeaters. The bus cable must be laid at a distance of at least 20 cm from other cables. It should be laid in a separate, conductive,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

The max. cable length without repeater amounts to 1,200 m (independent of the baud rate).

Cable recommendation for Modbus

| | |
|---------------------------|--|
| Characteristic impedance: | 35 to 165 Ohm, at a measurement frequency of 3 to 20 MHz. |
| Cable capacity: | < 30 pF per metre |
| Core diameter | > 0.64 mm |
| Core cross section: | > 0.34 mm ² , corresponds to AWG 22 |
| Loop resistance: | < 110 Ohm per km |
| Screening: | copper shielding braid or shielding braid and shielding foil |

Figure E: Example: Modbus with one segment



3.11 Setting the Modbus interface



A correct communication is only possible if the settings of the baud rate, the parity, and the stop bits agree with the master settings.

The settings are realised on the Modbus interface board.

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

Figure F-1

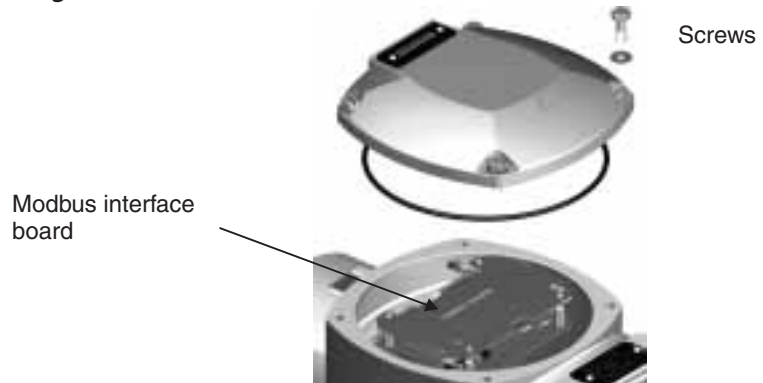
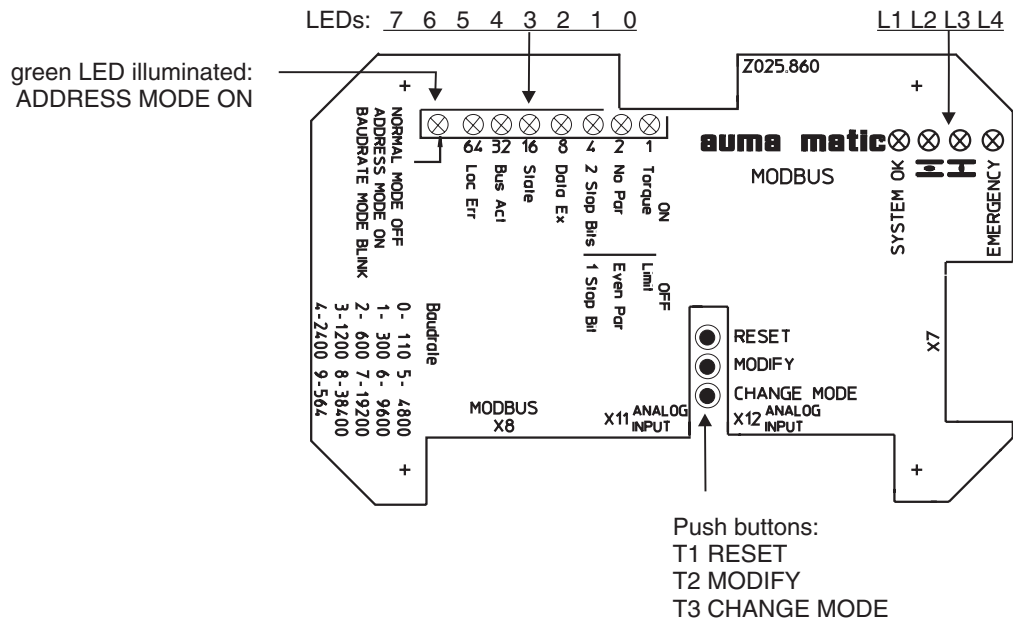


Figure F-2: Modbus interface board



3.12 Setting the communication parameters

Push buttons:

T1 **RESET**

T2 **MODIFY**

T3 **CHANGE MODE:**

DEFAULT MODE: for status indication and basic programming,

ADDRESS MODE for address setting

BAUD RATE MODE for baud rate selection

Push button 3 (CHANGE MODE) is used to switch between the following modes:

- 1) **DEFAULT MODE** is characterised by LED 7 (green) being switched off. Display and modification of type of seating in end position CLOSED, parity bits and stop bits as well as display of DataExchange, status, BusActivity, and LocalError.
- 2) **ADDRESS MODE** is characterised by LED 7 (green) being illuminated. The address is adjustable.
- 3) **BAUD RATE MODE** is characterised by the blinking of LED 7 (green). The baud rate is adjustable. If no push buttons are pressed for 30 seconds, the display will revert to **DEFAULT MODE**. The push button **MODIFY** allows incrementation of the figure shown in the LED row. The new value is immediately accepted in the **DEFAULT MODE**. For **ADDRESS MODE** and **BAUD RATE MODE**, the value is only accepted when leaving these modes.

3.13 Setting parameter type of seating in end position CLOSED, parity bits and number of stop bits

When not pressing push button **CHANGE MODE**, you are in the **DEFAULT MODE** (LED 7 is not illuminated). LED 0, LED 1, and LED 2 show the value of the three mentioned parameters:

| LED | Parameter | LED On | LED Off |
|-----|--|----------------|---------------|
| 0 | Type of seating in end position CLOSED | torque seating | limit seating |
| 1 | Parity setting | No Parity | Even Parity |
| 2 | Number of stop bits | 2 Stopbits | 1 Stopbit |

Push button S3 "**MODIFY**" is used to set these parameters. If, for example, type of seating in end position CLOSED = torque seating, parity setting = even parity, and number of stop bits = 1 stop bit is to be selected, the combination 001 must be illuminated for the first 3 LEDs. The push button "**MODIFY**" is operated until this combination appears. The parameter values become immediately valid.

3.14 Setting the Modbus address

The Modbus address is set using push buttons T2 and T3. This is done according to the following sequence:

- (a) Press push button T1 **CHANGE MODE** (hold down for 1 to 2 seconds):
The green LED 7 **ADDRESS MODE** is illuminated (not blinking); it indicates the programming mode for the Modbus address.
The actually set Modbus address is displayed as binary coding by LEDs 6 to 0 (1 to 127).
- (b) Set desired bus address using push button T2 **MODIFY**:
(Factory setting: slave address 2)
- (c) Each pressing of the push button increments the address value by one. Address 1 will follow after address 127. If push button T2 **MODIFY** is held down (approx. 1/3 s), the incrementation is done automatically.

- (d) After setting the required Modbus address, quit the programming mode by pressing key T3 **CHANGE MODE**. The newly set address now becomes valid.
Pressing the key T3 results in changing to **BAUD RATE MODE**; renewed pressing of key 3 results in reverting to **DEFAULT MODE**.
- (e) Alternatively to clause d), pressing the push button T3 may be omitted. After 30 s the status address mode is automatically quit and the **DEFAULT MODE** is indicated. The set address is thus accepted.

3.15 Setting the baud rate

The baud rate is selected with the push buttons T2 and T3. This is done according to the following sequence:

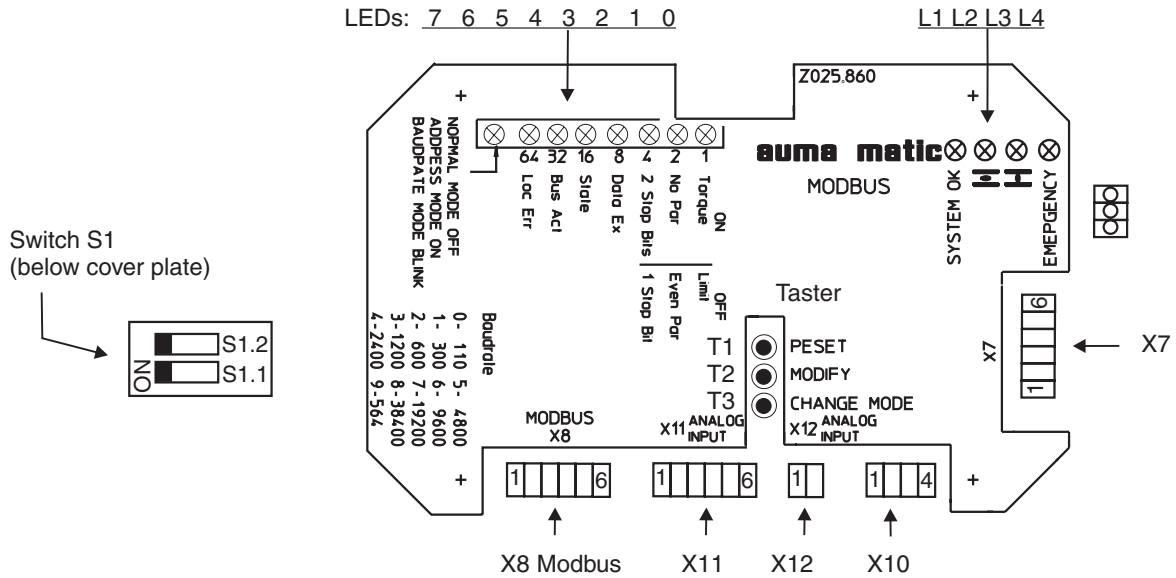
- (a) Press push button T3 **CHANGE MODE** (hold down for 1 to 2 seconds): The green LED 7 is illuminated (not blinking): the **ADDRESS MODE** is active.
- (b) Press push button T3 **CHANGE MODE** again (hold down for 1 to 2 seconds): The green LED 7 is blinking: now, the **BAUD RATE MODE** is active.
- (c) Select the desired Modbus baud rate pressing push button T2 **MODIFY**.
- (d) The baud rate setting changes each time, push button T2 is pressed. After the setting 56,400 bit/s (1001), the setting 110 Bit/s (0000) follows again. If push button T2 **MODIFY** is held down (approx. 1/3 s), the incrementation is done automatically. Only the first 4 LEDs count as only 10 baud rate settings are possible.

| Setting | LED 3 | LED 2 | LED 1 | LED 0 | Baud rate Bit/s | Notes |
|---------|-------|-------|-------|-------|-----------------|-------------------------------|
| 0 | 0 | 0 | 0 | 0 | 110 | |
| 1 | 0 | 0 | 0 | 1 | 300 | |
| 2 | 0 | 0 | 1 | 0 | 600 | |
| 3 | 0 | 0 | 1 | 1 | 1200 | |
| 4 | 0 | 1 | 0 | 0 | 2400 | |
| 5 | 0 | 1 | 0 | 1 | 4800 | |
| 6 | 0 | 1 | 1 | 0 | 9600 | Default setting |
| 7 | 0 | 1 | 1 | 1 | 19200 | |
| 8 | 1 | 0 | 0 | 0 | 38400 | Baud rate deviation -2 % ! |
| 9 | 1 | 0 | 0 | 1 | 56400 | Baud rate deviation +2.5 % |

- (e) After setting the required Modbus baud rate, close the programming mode by pressing push button T3. The newly set baud rate becomes valid and the interface is in **DEFAULT MODE**.
- (f) Alternatively to clause e), pressing the push button T3 **CHANGE MODE** may be omitted. After 30 s, the **BAUD RATE MODE** status is automatically quit and the **DEFAULT MODE** is indicated. The set baud rate is thus accepted.

4. Description Modbus interface

Figure G: Modbus interface board



- S1.1** When using the external analogue input X11 AI 3/4, the switch S1.1 must be in position On.
- S1.2** Switch for setting the position feedback via position transmitter potentiometers/RWG (option).
S1.2 = OFF: The actuator is equipped with a potentiometer.
S1.2 = ON: Switch may only be in this position if an RWG (0/4 – 20 mA) is installed in the actuator.

4.1 Indication during system start-up

When starting the system, the LEDs 0 to 7 will be illuminated. LEDs L1 to L4 are switched off. This signifies that the board is correctly started. After a short time (approx. 1/4 s), the LED L1 (round red LED) will be illuminated and the LEDs 0 to LED 7 will be switched off one after the other. This means that the microcontroller is now operating. If LED L1 is switched off and the LEDs 0 to 7 are still illuminated, then the system is in the reset status (this situation can also be reproduced by constantly pressing push button T1).

4.1.1 Indications of operation LEDs 7 to 0

| Indications of operation | | | | |
|--------------------------|------------------|------------------|--------------|----------------|
| LED | Default Mode | | Significance | |
| | LED on | LED is off | Address Mode | Baud rate Mode |
| 0 (red) | torque seating | limit seating | 1 | 1 |
| 1 (red) | no parity | even parity | 2 | 2 |
| 2 (red) | 2 stop bits | 1 stop bit | 4 | 4 |
| 3 (red) | data exchange | no data exchange | 8 | 8 |
| 4 (red) | state (blinking) | | 16 | – |
| 5 (red) | bus active | no bus active | 32 | – |
| 6 (red) | local error | no local error | 64 | – |
| 7 (red) | off | | on | blinking |

- LED 0 Indicates torque or limit switching in end position CLOSED (illuminated for torque switching).
- LED 1 Indicates the quantity of the parity bits from the Modbus protocol (illuminated for No Parity). Only No Parity and Even Parity are supported, Odd parity is not supported.

- LED 2 Indicates the quantity of stop bits - 1 or 2 - (illuminated for 2 stop bits)
- LED 3 Is blinking for each incoming telegram which is assigned to the actuator.
- LED 4 Applications LED:
 - is blinking in 1 s intervals for normal service (0.5 s illumination, 0.5 s pause)
 - is permanently illuminated in case of initialisation failure
 - is blinking twice while Fail Safe status is active.
- LED 5 Is blinking for each telegram which has been recognized at the bus.
- LED 6 Local actuator signal:
 - blinking once: Thermal fault
 - blinking twice: Power failure
 - blinking 3 times: TSO (DOEL) fault
 - blinking 4 times: TSC (DSR) fault
 - blinking 5 times: 24 V power supply > 28.3 V or <18 V
- LED 7 indicates the setting mode:
 - Off: **DEFAULT MODE**
 - On: **ADDRESS MODE**
 - Blinking: **BAUD RATE MODE**

4.1.2 System displays LEDs L1 to L4

LED L1 indicates the actuator status. If L1 is illuminated, the actuator is ready for operation.

| System displays | |
|-----------------|---------------------------|
| L1 (red) | System o.k. (CPU working) |
| L2 (red) | Actuator runs OPEN |
| L3 (red) | Actuator runs CLOSE |
| L4 (red) | not assigned |

LEDs L2 to L4 are illuminated if the actuator has received and processed a feasible operation command via the bus. The following combinations are valid:

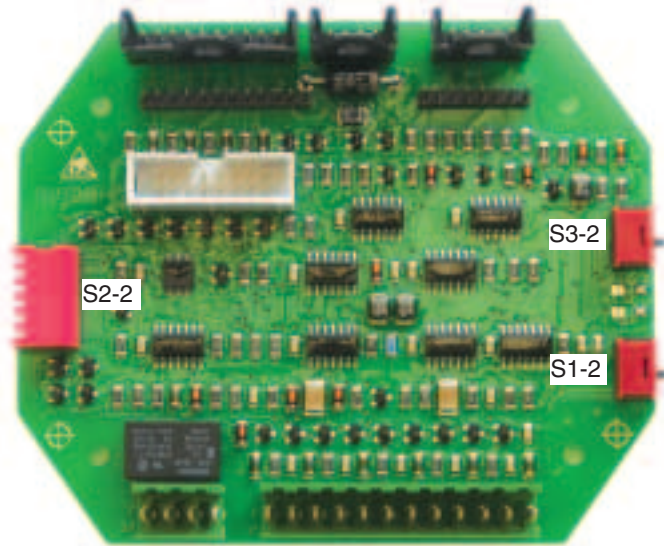
| Operation indications | | | |
|-----------------------|-------|-------|---------------------------|
| LED 4 | LED 3 | LED 2 | Signification |
| Off | Off | Off | no operation |
| Off | Off | On | operation direction OPEN |
| Off | On | Off | operation direction CLOSE |





4.2 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 Modbus board.

Figure H: 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 Modbus board (LED 0 in default mode, figure G, page 16) and on the logic board (switch S1-2).

Table 5

| 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 |  |  |
| Self-retaining LOCAL |  |  |
| Push-to-run operation LOCAL |  |  |
| Blinker transmitter (option) | Blinker transmitter must be deactivated | Blinker transm. deact.  |
| Torque error: torque switch tripping (in mid-travel) contained in collective fault signal (insignificant for fieldbus interface) | Included | Not included |
| |  |  |

5. Appendix A Literature references

1. Modicon protocol:
Reference Guide PI-MBUS-300
2. <http://www.modbus.org>
Modbus Application Protocol Specification
Modbus over serial line specification and implementation guide

6. Appendix B Connecting the cable shield for 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).



Index

| | | | | | |
|--------------------------------|-------|--------------------------|-----|-----------------------|----|
| B | | L | | S | |
| Blinker transmitter | 18 | Literature | 19 | Safety instructions | 3 |
| Bus cable | 11,12 | Loop resistance | 12 | Screening (bus cable) | 12 |
| Bus connection | 11 | M | | Self-retaining | 18 |
| C | | Maintenance | 3 | Switching-off | 18 |
| Cable capacity | 12 | Motor connection | 10 | T | |
| Cable recommendation | 12 | N | | Technical data | 9 |
| Characteristic impedance | 12 | Name plate | 8 | Termination resistors | 5 |
| Collective fault signal | 18 | O | | Torque switching | 7 |
| Connection board | 5 | Overvoltage protection | 6 | W | |
| Core cross section (bus cable) | 12 | P | | Wall bracket | 7 |
| Core diameter (bus cable) | 12 | Parking frame | 8 | Warnings | 3 |
| E | | Plug/socket connector | 8,9 | | |
| Electrical connection | 3,4 | Position transmitter RWG | 7 | | |
| | | Power supply | 4 | | |
| | | Push-to-run operation | 18 | | |

Information also available on the Internet:

Wiring diagram, inspection records, and further actuator information can be downloaded directly from the Internet by entering the order no. or COMM. no (refer to name plate).
Our website: <http://www.auma.com>

auma®

Solutions for a world in motion

.01 Europa

AUMA Riester GmbH & Co. KG

Werk Müllheim
DE-79373 Müllheim
Tel +49 7631 809 - 0
Fax +49 7631 809 - 250
riester@auma.com
www.auma.com

Werk Ostfildern-Neilingen
DE-73747 Ostfildern
Tel +49 711 34803 - 3000
Fax +49 711 34803 - 3034
riester@wof.auma.com

Service-Center Köln
DE-50858 Köln
Tel +49 2234 20379 - 00
Fax +49 39204 20379 - 99
Service@sck.auma.com

Service-Center Magdeburg
DE-39167 Niedermodeleben
Tel +49 39204 759 - 0
Fax +49 39204 759 - 19
Service@scm.auma.com

Service-Center Bayern
DE-85748 Garching-Hochbrück
Tel +49 89 329885 - 0
Fax +49 89 329885 - 18
Riester@scb.auma.com

Büro Nord, Bereich Schiffbau
DE-21079 Hamburg
Tel +49 40 791 40285
Fax +49 40 791 40286
Stephan.Dierks@auma.com

Büro Nord, Bereich Industrie
DE-29664 Walsrode
Tel +49 5167 504
Fax +49 5167 565
Erwin.Handwerker@auma.com

Büro Ost
DE-39167 Niedermodeleben
Tel +49 39204 75980
Fax +49 39204 75989
Claus.Zander@auma.com

Büro West
DE-45549 Sprockhövel
Tel +49 2339 9212 - 0
Fax +49 2339 9212 - 15
Karlheinz.Spoede@auma.com

Büro Süd-West
DE-69488 Birkenau
Tel +49 6201 373149
Fax +49 6201 373150
Dieter.Wagner@auma.com

Büro Württemberg
DE-73747 Ostfildern
Tel +49 711 34803 80
Fax +49 711 34803 81
Siegfried.Koegler@wof.auma.com

Büro Baden
DE-76764 Rheinzabern
Tel +49 7272 76 07 - 23
Fax +49 7272 76 07 - 24
Wolfgang.Schulz@auma.com

Büro Kraftwerke
DE-79373 Müllheim
Tel +49 7631 809 192
Fax +49 7631 809 294
Klaus.Wilhelm@auma.com

Büro Bayern
DE-93356 Teugn/Niederbayern
Tel +49 9405 9410 24
Fax +49 9405 9410 25
Mathias.Jochum@auma.com

AUMA Armaturentriebe GmbH
AT-2512 Tribuswinkel
Tel +43 2252 82540
Fax +43 2252 8254050
office@auma.at

AUMA (Schweiz) AG
CH-8965 Berikon
Tel +41 566 400945
Fax +41 566 400948
RettichP.ch@auma.com

AUMA Servopohony spol. s.r.o.
CZ-10200 Praha 10
Tel +420 272 700056
Fax +420 272 704125
auma-s@auma.cz

OY AUMATOR AB
FI-02270 Espoo
Tel +35 895 84022
Fax +35 895 8402300
auma@aumator.fi

AUMA France
FR-95157 Taverny Cédex
Tel +33 1 39327272
Fax +33 1 39321755
info@auma.fr
www.auma.fr

AUMA ACTUATORS Ltd.
GB- Clevedon North Somerset BS21 6QH
Tel +44 1275 871141
Fax +44 1275 875492
mail@auma.co.uk

AUMA ITALIANA S.R.L.
IT-20023 Cerro Maggiore Milano
Tel +39 0331-51351
Fax +39 0331-517606
info@auma.it
www.auma.it

AUMA BENELUX B.V.
NL-2314 XT Leiden
Tel +31 71 581 40 40
Fax +31 71 581 40 49
office@benelux.auma.com

AUMA Polska
PL-41-310 Dabrowa Górnicza
Tel +48 32 26156 68
Fax +48 32 26148 23
R.Ludzien@auma.com.pl
www.auma.com.pl

AUMA Priwody OOO
RU-141400 Moscow region
Tel +7 095 221 64 28
Fax +7 095 221 64 38
aumarussia@auma.ru
www.auma.ru

ERICHS ARMATUR AB
SE-20039 Malmö
Tel +46 40 311550
Fax +46 40 945515
info@erichsarmatur.se
www.erichsarmatur.se

GRÖNBECH & SÖNNER A/S
DK-2450 København SV
Tel +45 33 26 63 00
Fax +45 33 26 63 21
GS@g-s.dk
www.g-s.dk

IBEROPLAN S.A.
ES-28027 Madrid
Tel +34 91 3717130
Fax +34 91 7427126
iberoplan@iberoplan.com

D. G. Bellós & Co. O.E.
GR-13671 Acharnai Athens
Tel +30 210 2409485
Fax +30 210 2409486
info@dgbellos.gr

SIGURD SØRUM A. S.
NO-1301 Sandvika
Tel +47 67572600
Fax +47 67572610
post@sigurd-sorum.no

INDUSTRA
PT-2710-297 Sintra
Tel +351 2 1910 95 00
Fax +351 2 1910 95 99
jpalhares@tyco-valves.com

MEGA Endüstri Kontrol Sistemleri Tic. Ltd. Sti.
TR-06460 Öveçler Ankara
Tel +90 312 472 62 70
Fax +90 312 472 62 74
megaendustri@megaendustri.com.tr

CTS Control Limited Liability Company
UA-02099 Kiyiv
Tel +38 044 566-9971, -8427
Fax +38 044 566-9384
v_polyakov@cts.com.ua

Afrika

AUMA South Africa (Pty) Ltd.
ZA-1560 Springs
Tel +27 11 3632880
Fax +27 11 8185248
aumasa@mweb.co.za

A.T.E.C.
EG- Cairo
Tel +20 2 3599680 - 3590861
Fax +20 2 3586621
atec@intouch.com

Amerika

AUMA ACTUATORS INC.
US-PA 15317 Canonsburg
Tel +1 724-743-AUMA (2862)
Fax +1 724-743-4711
mailbox@auma-usa.com
www.auma-usa.com

AUMA Chile Respresentative Office
CL- La Reina Santiago de Chile
Tel +56 2 821 4108
Fax +56 2 281 9252
aumachile@adsl.tie.cl

LOOP S. A.
AR-C1140ABP Buenos Aires
Tel +54 11 4307 2141
Fax +54 11 4307 8612
contacto@loopsa.com.ar

Asvotec Termoindustrial Ltda.
BR-13190-000 Monte Mor/ SP.
Tel +55 19 3879 8735
Fax +55 19 3879 8738
atuador.auma@asvotec.com.br

TROY-ONTOR Inc.
CA-L4N 5E9 Barrie Ontario
Tel +1 705 721-8246
Fax +1 705 721-5851
troy-ontor@troy-ontor.ca

MAN Ferrostaal de Colombia Ltda.
CO- Bogotá D.C.
Tel +57 1 4 011 300
Fax +57 1 4 131 806
dorian.hernandez@manferrostaal.com
www.manferrostaal.com

PROCONTIC Procesos y Control Automático
EC- Quito
Tel +593 2 292 0431
Fax +593 2 292 2343
info@procontic.com.ec

IESS DE MEXICO S. A. de C. V.
MX-C.P. 02900 Mexico D.F.
Tel +52 55 55 561 701
Fax +52 55 53 563 337
informes@ieess.com.mx

Multi-Valve Latin America S. A.
PE- San Isidro Lima 27
Tel +511 222 1313
Fax +511 222 1880
multivalve@terra.com.pe

PASSCO Inc.
PR-00936-4153 San Juan
Tel +18 09 78 77 20 87 85
Fax +18 09 78 77 31 72 77
Passco@prtc.net

Suplibarca
VE- Maracaibo Estado, Zulia
Tel +58 261 7 555 667
Fax +58 261 7 532 259
suplibarca@intercable.net.ve

Asien

AUMA (INDIA) PRIVATE LIMITED
IN-560 058 Bangalore
Tel +91 80 2839 4655
Fax +91 80 2839 2809
info@auma.co.in
www.auma.co.in

AUMA JAPAN Co., Ltd.
JP-210-0848 Kawasaki-ku, Kawasaki-shi Kanagawa
Tel +81 44 329 1061
Fax +81 44 366 2472
mailbox@auma.co.jp

AUMA ACTUATORS (Singapore) Pte Ltd.
SG-569551 Singapore
Tel +65 6 4818750
Fax +65 6 4818269
sales@auma.com.sg
www.auma.com.sg

AUMA Middle East Rep. Office
AE- Dubai
Tel +971 4 3682720
Fax +971 4 3682721
auma@emirates.net.ae

PERFECT CONTROLS Ltd.
HK- Tsuen Wan, Kowloon
Tel +852 2493 7726
Fax +852 2416 3763
joieip@perfectcontrols.com.hk

DW Controls Co., Ltd.
KR-153-803 Seoul Korea
Tel +82 2 2113 1100
Fax +82 2 2113 1088/1089
sichoi@actuatorbank.com
www.actuatorbank.com

AL-ARFAJ Eng. Company W. L. L.
KW-22004 Salmiyah
Tel +965 4817448
Fax +965 4817442
arfaj@qualitynet.net

BEHZAD Trading Enterprises
QA- Doha
Tel +974 4433 236
Fax +974 4433 237
behzad@qatar.net.qa

Sunny Valves and Intertrade Corp. Ltd.
TH-10120 Yannawa Bangkok
Tel +66 2 2400656
Fax +66 2 2401095
sunnyvalves@inet.co.th

Top Advance Enterprises Ltd.
TW- Jhonghe City Taipei Hsien (235)
Tel +886 2 2225 1718
Fax +886 2 8228 1975
support@auma-taiwan.com.tw
www.auma-taiwan.com.tw

AUMA Beijing Representative Office
CN-100029 Beijing
Tel +86 10 8225 3933
Fax +86 10 8225 2496
mailbox@auma-china.com
www.auma-china.com

Australien
BARRON GJM Pty. Ltd.
AU-NSW 1570 Artarmon
Tel +61 294361088
Fax +61 294393413
info@barron.com.au
www.barron.com.au

Australien

BARRON GJM Pty. Ltd.
AU-NSW 1570 Artarmon
Tel +61 294361088
Fax +61 294393413
info@barron.com.au
www.barron.com.au

2005-09-06

auma® auma®

AUMA Riester GmbH & Co. KG
P.O. Box 1362
79373 Müllheim, Germany
Tel +49 7631 - 809-0
Fax +49 7631 - 809 1250
riester@auma.com
www.auma.com

AUMA Riester GmbH & Co. KG
P. O. Box 1151
D - 73747 Ostfildern
Tel +49 711 - 34803 0
Fax +49 711 - 34803 34
riester@wof.auma.com
www.auma.com



Certificate Registration No.
12 100/104 4269

For detailed information on AUMA products, please refer to the Internet:

www.auma.com

Y004.018/003/en/1.08.01