General information

Actuator controls AC 01.2 for controlling multi-turn actuators of the SA/SAR .2 type range and part-turn actuators of the SQ/SQR .2 type range with Modbus TCP/IP interface.

Features and functions

Power supply

Standard voltages AC:

3-phase AC current Voltages/frequencies								**1-phase AC current** Voltages/frequencies		
Volt	380	400	415	440	460	480	500	Volt	110, 115, 120	220, 230, 240
Hz	50	50	50	60	60	60	50	Hz	60	50

Special voltages AC:

3-phase AC current Voltages/frequencies										**1-phase AC current** Voltages/frequencies	
Volt	220	230	240	525	575	575	600	660	690	Volt	208
Hz	50	50	50	50	50	60	60	50	50	Hz	60

Permissible variation of mains voltage: ±10 %

Permissible variation of mains voltage: ±30 % (option)

Permissible variation of mains frequency: ±5 %

Special voltages DC: (on request)

DC Voltages						
Volt	24	48	60	110	125	220

Permissible voltage deviation: (on request)

External supply of the electronics (option)

24 V DC: +20 %/–15 %,

Current consumption: Basic version approx. 250 mA, with options up to 500 mA

External power supply must have reinforced insulation against mains voltage in accordance with IEC 61010-1 and may only be supplied by a circuit limited to 150 VA in accordance with IEC 61010-1.

Current consumption

Current consumption of controls depending on mains voltage:

For permissible variation of mains voltage of ±10 %:

- 100 to 120 V AC = max. 740 mA
- 208 to 240 V AC = max. 400 mA
- 380 to 500 V AC = max. 250 mA
- 515 to 690 V AC = max. 200 mA

For permissible variation of mains voltage of ±30 %:

- 100 to 120 V AC = max. 1,200 mA
- 208 to 240 V AC = max. 750 mA
- 380 to 500 V AC = max. 400 mA
- 515 to 690 V AC = max. 400 mA

Overvoltage category

Category III according to IEC 60364-4-443

Rated power

Actuator controls are designed for rated motor power (refer to Electrical data Multi-turn/ Part-turn actuators)

Switchgear

Standard:	Reversing contactors (mechanically and electrically interlocked) for AUMA power classes A1/A2
Options:	Reversing contactors (mechanically and electrically interlocked) for AUMA power class A3
	Thyristor unit for mains voltage up to 500 V AC (recommended for modulating actuators) for AUMA power classes B1, B2 and B3

The reversing contactors are designed for a lifetime of 2 million starts. For applications requiring a high number of starts, we recommend the use of thyristor units.

For the assignment of AUMA power classes, please refer to Electrical data Multi-turn /Part-turn actuators.

Control and feedback signals

Via Modbus TCP/IP interface

Modbus TCP/IP interface with additional input signals (option)	• 2 free analogue inputs (0/4 – 20 mA), 4 free digital inputs - Signal transmission is made via fieldbus interface • Inputs OPEN, STOP, CLOSE, EMERGENCY, I/O interface, MODE (via opto-isolator thereof OPEN, STOP, CLOSE, MODE with one common and EMERGENCY, I/O interface respectively without common) - Control inputs: OPEN, STOP, CLOSE, EMERGENCY - I/O interface: Selection of control type (fieldbus or additional input signals) - MODE: Selection between open-close duty (OPEN, STOP, CLOSE) or modulating duty (0/4 – 20 mA position setpoint) - Additionally 1 analogue input (0/4 – 20 mA for position setpoint) • Inputs OPEN, STOP, CLOSE, EMERGENCY, I/O interface, MODE (via opto-isolator thereof OPEN, STOP, CLOSE, MODE with one common and EMERGENCY, I/O interface respectively without common) - Control inputs: OPEN, STOP, CLOSE, EMERGENCY - I/O interface: Selection of control type (fieldbus or additional input signals) - MODE: Selection between open-close duty (OPEN, STOP, CLOSE) or modulating duty (0/4 – 20 mA position setpoint) - Additionally 1 analogue input (0/4 – 20 mA) for setpoint position and 1 analogue input (0/4 – 20 mA) for actual process value	
Control voltage and current consumption of optional, digital additional inputs	Standard:	24 V DC, current consumption: approx. 10 mA per input
	Options:	48 V DC, current consumption: approx. 7 mA per input 60 V DC, current consumption: approx. 9 mA per input 115 V DC, current consumption: approx. 15 mA per input 100 – 120 V AC, current consumption : approx. 15 mA per input
	All input signals must be supplied with the same potential.	
Status signals	Via Modbus TCP/IP interface	
Modbus TCP/IP interface with additional output signals (option)	Additional, binary output signals (only available in combination with additional input signals (option)) • 6 programmable output contacts: - 5 potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load) Default configuration: End position CLOSED, end position OPEN, selector switch REMOTE, torque fault CLOSE, torque fault OPEN - 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) Default configuration: Collective fault signal (torque fault, phase failure, motor protection tripped) • 6 programmable output contacts: - 5 potential-free change-over contacts with one common, max. 250 V AC, 1 A (resistive load) - 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: - 6 potential-free change-over contacts without one common, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: - 4 mains failure proof potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load), 1 potential-free NO contact, max. 250 V AC, 1 A (resistive load), 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: - 4 mains failure proof potential-free NO contacts, max. 250 V AC, 1 A (resistive load), 2 potential-free NO contacts, max. 250 V AC, 1 A (resistive load), All binary output signals must be supplied with the same potential. • Analogue output signal for position feedback - Galvanically isolated position feedback 0/4 – 20 mA (load max. 500 Ω)	
Local controls	Standard:	• Selector switch: LOCAL - OFF - REMOTE (lockable in all three positions) • Push buttons: OPEN, STOP, CLOSE, RESET - Local STOP The actuator can be stopped via push button STOP of local controls if the selector switch STOP is in position REMOTE. (Not activated when leaving the factory.) • 6 indication lights: - End positions and running indication CLOSED (yellow), torque fault CLOSE (red), motor protection tripped (red), torque fault OPEN (red), end position and running indication OPEN (green), Bluetooth (blue) • Graphic LC display: illuminated
	Option:	• Special colours for the indication lights: - End position CLOSED (green), torque fault CLOSE (blue), torque fault OPEN (yellow), motor protection tripped (violet), end position OPEN (red)

Bluetooth communication interface	Bluetooth class II chip, version 2.1: with a range up to 10 m in industrial environments, supports the SPP Bluetooth profile (Serial Port Profile). Required accessories: AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC)	
Application functions	Standard:	• Selectable type of seating, limit or torque seating for end position OPEN and end position CLOSED • Torque by-pass: Adjustable duration (with adjustable peak torque during start-up time) • Start and end of stepping mode as well as ON and OFF times: can be set individually for directions OPEN and CLOSE, 1 to 1,800 seconds • Any 8 intermediate positions between 0 and 100 %, reaction and signal behaviour programmable • Running indication blinking: can be set
	Options:	• Positioner: - Setpoint position via Modbus TCP/IP interface - Automatic adaptation of dead band (adaptive behaviour selectable) - Change-over between OPEN-CLOSE control and setpoint control via fieldbus • PID process controller: with adaptive positioner, via 0/4 – 20 mA analogue inputs and Modbus TCP/IP for process setpoint and actual process value • Multiport valve: up to 12 positions, signals (pulse or edge) • Automatic deblocking: up to 5 operation trials, travel time in opposite direction can be set • Static and dynamic torque recording for both rotation directions with torque measurement flange as additional accessory
Safety functions	• EMERGENCY operation (programmable behaviour) - Via additional input (option, low active) or via fieldbus interface - Reaction can be selected: Stop, run to end position CLOSED, run to end position OPEN, run to intermediate position - Torque monitoring can be by-passed during EMERGENCY operation - Thermal protection can be by-passed during EMERGENCY operation (only in combination with thermoswitch within actuator, not with PTC thermistor). • Release of local controls via fieldbus interface: Thus, actuator operation can be enabled or disabled via push buttons on the local controls. • Local STOP: - The actuator can be stopped via push button STOP of local controls if the selector switch is in position REMOTE. (Not activated when leaving the factory.) • Interlock for main/by-pass valve: Enabling the operation commands OPEN or CLOSE via two digital inputs • EMERGENCY Stop push button (latching): interrupts electrical operation, irrespective of the selector switch positions. • PVST (Partial Valve Stroke Test): programmable to check the function of both actuator and actuator controls: Direction, stroke, operation time, reversing time	
Monitoring function	• Valve overload protection: adjustable, results in switching off and generates fault signal • Motor temperature monitoring (thermal monitoring): results in switching off and generates fault indication • Monitoring the heater within actuator: generates warning signal • Monitoring of permissible on-time and number of starts: adjustable, generates warning signal • Operation time monitoring: adjustable, generates warning signal • Phase failure monitoring: results in switching off and generates fault signal • Automatic correction of rotation direction upon wrong phase sequence (3-ph AC current)	
Diagnostic function	• Electronic device ID with order and product data • Logging of operating data: A resettable counter and a lifetime counter each for: - Motor running time, number of starts, torque switch trippings in end position CLOSED, limit switch trippings in end position CLOSED, torque switch trippings in end position OPEN, limit switch trippings in end position OPEN, torque faults CLOSE, torque faults OPEN, motor protection trippings • Time-stamped event report with history for setting, operation and faults: - Status signals according to NAMUR recommendation NE 107: "Failure", "Function check", "Out of specification", "Maintenance required" • Torque characteristics (for version with MWG in actuator): - 3 torque characteristics (torque-travel characteristic) for opening and closing directions can be saved separately. - Torque characteristics stored can be shown on the display.	
Motor protection evaluation	Standard:	• Monitoring the motor temperature in combination with thermoswitches within actuator motor
	Options:	• Thermal overload relay in controls combined with thermoswitches within actuator • PTC tripping device in combination with PTC thermistors within actuator motor

Electrical connection	Standard:	AUMA plug/socket connector with screw-type connection
	Options:	• Terminals or crimp connection • Gold-plated control plug (pins and sockets)
Threads for cable entries	Standard:	Metric threads
	Options:	PG-threads, NPT-threads, G-threads
Wiring diagram (basic version)	TPCAC000-1A1-A5E0 TPA00R1AA-0A1-000	

Further options for Non-intrusive version with MWG in the actuator	
Setting of limit and torque switching via local controls	
Torque feedback signal	Via Modbus TCP/IP interface Galvanically isolated analogue output 0/4 – 20 mA (load max. 500 Ω) (option), only possible in combination with output contacts
Wiring diagram (basic version)	TPCAC000-1A1-A5E0 TPA00R100-0I1-000

Settings/programming the Modbus TCP/IP interface	
Setting the fieldbus address	Baud rate, parity and Modbus address are set via the display of the AC 01.2
Setting the Modbus gateway	Settings are made via web server Default settings of the IP interface:

IP Address Selection	
Address Type	Static IP
Static IP Address	192.168.255.1
Subnet Mask	255.255.0.0
Default gateway	192.168.0.1

Genearl Modbus TCP/IP interface data		
Communication protocol	Modbus TCP/IP according to IEC 61158 and IEC 61784	
Network topology	Star structure, point-to-point wiring	
Transmission medium	IEC IEEE 802.3, cable recommendation: Cat.6_A	
Transmission rate/cable length	• Baud rate of 10/100 Mbits/s • Maximum cable length: 100 m	
Supported Modbus functions (services)	01	Read Coil Status
	02	Read Input Status
	03	Read Holding Registers
	04	Read Input Registers
	05	Force Single Coil
	15 (0FHex)	Force Multiple Coils
	06	Preset Single Register
	16 (10Hex)	Preset Multiple Registers
	17 (11Hex)	Report Slave ID
	08	Diagnostics: • 00 00 Loopback • 00 10 (0AHex) Clear Counters and Diagnostic Register • 00 11 (0BHex) Return Bus Message Count • 00 12 (0CHex) Return Bus Communication Error Count • 00 13 (0DHex) Return Bus Exception Error Count • 00 14 (0EHex) Return Slave Message Count • 00 15 (0FHex) Return Slave No Response Count • 00 16 (10Hex) Return Slave NAK Count • 00 17 (11Hex) Return Slave Busy Count • 00 18 (12Hex) Return Character Overrun Count

Commands and signals of the Modbus TCP/IP interface	
Process representation output (command signals)	OPEN, STOP, CLOSE, position setpoint, RESET, EMERGENCY operation command, enable LOCAL, Interlock OPEN/CLOSE
Process representation input (feedback signals)	End positions OPEN, CLOSED Actual position value Actual torque value, requires magnetic limit and torque transmitter (MWG) in actuator Selector switch in position LOCAL/REMOTE Running indication (directional) Torque switches OPEN, CLOSED Limit switches OPEN, CLOSED Manual operation by handwheel or via local controls Analogue (2) and digital (4) customer inputs
Process representation input (fault signals)	Motor protection tripped Torque switch tripped in mid-travel One phase missing Failure of analogue customer inputs
Behaviour on loss of communication	The behaviour of the actuator is programmable: • Stop in current position • Travel to end position OPEN or CLOSED • Travel to any intermediate position • Execute last received operation command

Service conditions			
Use	Indoor and outdoor use permissible		
Mounting position	Any position		
Installation altitude	≤ 2,000 m above sea level > 2,000 m above sea level on request		
Ambient temperature	Standard:	–30 °C to +70 °C	
Humidity	Up to 100 % relative humidity across the entire permissible temperature range		
Enclosure protection according to EN 60529	Standard:	IP68 with AUMA 3-phase AC motor/1-phase AC motor For special motors, differing enclosure protection is possible	
	Option:	DS Terminal compartment additionally sealed against interior (double sealed)	
	According to AUMA definition, enclosure protection IP68 meets the following requirements: • Depth of water: maximum 8 m head of water • Duration of continuous immersion in water: Max. 96 hours • Up to 10 operations during continuous immersion • Modulating duty is not possible during continuous immersion.		
Pollution degree according to IEC 60664-1	Pollution degree 4 (when closed), pollution degree 2 (internal)		
Vibration resistance according to IEC 60068-2-6	Resistance against vibration can be given on request		
Corrosion protection	Standard:	KS	Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.
	Options:	KX	Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.
Top coat	Double layer powder coating Two-component iron-mica combination		
Colour	Standard:	AUMA silver-grey (similar to RAL 7037)	
	Option:	Available colours on request	

Accessories	
Wall bracket	For AC 01.2 mounting separately from the actuator, including plug/socket connector, connecting cable on request Recommended for high ambient temperatures, difficult access, or heavy vibration during service. Cable length between actuator and AC 01.2 max. 100 m. (Not suitable for version with potentiometer in the actuator.) Instead of the potentiometer, the actuator has to be equipped with an electronic position transmitter. (Cable length for non-intrusive version with MWG in the actuator max. 100 m requires separate data cable for MWG.)
Programming software	AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC)
Torque measurement flange DMF	Accessory for torque measurement for SA/SAR 07.2 to SA/SAR 16.2

Further information	
Weight	Approx. 7 kg (with AUMA plug/socket connector)
EU Directives	Electromagnetic Compatibility (EMC): (2004/108/EC) Low Voltage Directive: (2006/95/EC) Machinery Directive: (2006/42/EC)
Reference documents	Brochure Electric actuators for industrial valve automation Dimensions Multi-turn actuators with AUMATIC integral controls Dimensions Part-turn actuators with AUMATIC integral controls