

General information

ACExC 01.2 actuator controls for controlling multi-turn actuators of the SAEx/SAREx .1, SAEx/SAREx .2 type ranges and part-turn actuators of the SQEx/SQREx .2 type range with HART interface.

Features and functions

Explosion protection	Standard: II2G Ex de IIC T4 or T3 Gb II2D Ex tb IIIC T130 °C or T190 °C Db IP6x Option: II2G Ex d IIC T4 or T3 Gb																																																																																																																																					
EC type examination certificate	In combination with SAEx: DEKRA 11ATEX0008 X In combination with SQEx: DEKRA 13ATEX0016 X																																																																																																																																					
Power supply	Standard voltages AC: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="12" style="text-align: left;">3-phase AC</th> </tr> <tr> <th colspan="12" style="text-align: left;">Voltages/frequencies</th> </tr> <tr> <td style="text-align: right;">Volt</td> <td>220</td> <td>230</td> <td>380</td> <td>380</td> <td>400</td> <td>400</td> <td>415</td> <td>440</td> <td>460</td> <td>480</td> <td>500</td> </tr> <tr> <td style="text-align: right;">Hz</td> <td>60</td> <td>50</td> <td>50</td> <td>60</td> <td>50</td> <td>60</td> <td>50</td> <td>60</td> <td>60</td> <td>60</td> <td>50</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="5" style="text-align: left;">1-phase AC</th> </tr> <tr> <th colspan="5" style="text-align: left;">Voltages/frequencies</th> </tr> <tr> <td style="text-align: right;">Volt</td> <td>110 – 120</td> <td>110 – 120</td> <td>220 – 240</td> <td>220 – 240</td> </tr> <tr> <td style="text-align: right;">Hz</td> <td>50</td> <td>60</td> <td>50</td> <td>60</td> </tr> </table> Special voltages AC: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="9" style="text-align: left;">3-phase AC</th> <th colspan="2" style="text-align: left;">1-phase AC</th> </tr> <tr> <th colspan="9" style="text-align: left;">Voltages/frequencies</th> <th colspan="2" style="text-align: left;">Voltages/frequencies</th> </tr> <tr> <td style="text-align: right;">Volt</td> <td>220</td> <td>240</td> <td>525</td> <td>575</td> <td>575</td> <td>600</td> <td>660</td> <td>690</td> <td style="text-align: right;">Volt</td> <td>208</td> </tr> <tr> <td style="text-align: right;">Hz</td> <td>50</td> <td>50</td> <td>50</td> <td>50</td> <td>60</td> <td>60</td> <td>50</td> <td>50</td> <td style="text-align: right;">Hz</td> <td>60</td> </tr> </table> Permissible variation of mains voltage: ±10 % Permissible variation of mains voltage: ±30 % (option) Permissible variation of mains frequency: ±5 % Special voltages DC: (on request) <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="7" style="text-align: left;">DC current</th> </tr> <tr> <th colspan="7" style="text-align: left;">Voltages</th> </tr> <tr> <td style="text-align: right;">Volt</td> <td>24</td> <td>48</td> <td>60</td> <td>110</td> <td>125</td> <td>220</td> </tr> </table> Permissible voltage deviation: (on request)	3-phase AC												Voltages/frequencies												Volt	220	230	380	380	400	400	415	440	460	480	500	Hz	60	50	50	60	50	60	50	60	60	60	50	1-phase AC					Voltages/frequencies					Volt	110 – 120	110 – 120	220 – 240	220 – 240	Hz	50	60	50	60	3-phase AC									1-phase AC		Voltages/frequencies									Voltages/frequencies		Volt	220	240	525	575	575	600	660	690	Volt	208	Hz	50	50	50	50	60	60	50	50	Hz	60	DC current							Voltages							Volt	24	48	60	110	125	220
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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 %: <ul style="list-style-type: none"> • 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 %: <ul style="list-style-type: none"> • 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 nominal motor power, refer to Electrical data pertaining to the actuator																																																																																																																																					

Features and functions	
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 on actuator.
Control and feedback signals	Via HART interface Device category: Actuator: Analogue 4 – 20 mA setpoint with digital HART communication Device category: Current Output: Analogue 4 – 20 mA position feedback signal with digital HART communication
HART interface with additional input signals (option)	Device category: "Actuator": <ul style="list-style-type: none"> Inputs OPEN, STOP, CLOSE, EMERGENCY, I/O interface, (via opto-isolator thereof OPEN, STOP, CLOSE with one common and EMERGENCY, I/O interface respectively without common) <ul style="list-style-type: none"> OPEN, STOP, CLOSE, EMERGENCY control inputs I/O interface: Selection of control type (HART or additional input signals) Device category: "Current Output": <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> OPEN, STOP, CLOSE, EMERGENCY control inputs I/O interface: Selection of control type (HART or additional input signals) MODE: Control selection of additional input signals (0/4 – 20 mA setpoint or discrete control inputs OPEN, STOP, CLOSE)
Control voltage/current consumption for control 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 100 – 125 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 HART interface
HART interface with additional output signals (option)	Additional, binary output signals (only available in combination with additional input signals (option)) <ul style="list-style-type: none"> 6 programmable output contacts: <ul style="list-style-type: none"> 5 potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load) Standard assignment: 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) Standard assignment: Collective fault signal (torque fault, phase failure, motor protection tripped) 6 programmable output contacts: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 6 potential-free change-over contacts without one common, max. 250 V AC, 5 A (resistive load) 6 programmable output contacts: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 4 mains failure proof potential-free NO contacts, max. 250 V AC, 5 A (resistive load), 2 potential-free change-over contacts, max. 250 V AC, 5 A (resistive load), All binary output signals must be supplied with the same potential. In combination with device category: "Actuator": <ul style="list-style-type: none"> Analogue output signal for position feedback <ul style="list-style-type: none"> Galvanically isolated position feedback 0/4 – 20 mA (load max. 500 Ω)

Features and functions	
Voltage output	Standard: Auxiliary voltage 24 V DC: max. 100 mA for supply of control inputs, galvanically isolated from internal voltage supply.
	Option: Auxiliary voltage 115 V AC: max. 30 mA for supply of control inputs, galvanically isolated from internal voltage supply (Not possible in combination with PTC tripping device)
Analogue output (option)	2 analogue outputs: With position transmitter option: Output of travel and torque as continuous values between 0/4 and 20 mA
Analogue input (option)	2 analogue inputs: With positioner/process controller option: Input of actual position value/actual process value as continuous values between 0/4 and 20 mA
Local controls	Standard: <ul style="list-style-type: none"> • Selector switch LOCAL - OFF - REMOTE (lockable in all three positions) • Push buttons OPEN, STOP, CLOSE, RESET <ul style="list-style-type: none"> - 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.) • 6 indication lights: <ul style="list-style-type: none"> - End position 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
	Options: <ul style="list-style-type: none"> • Special colours for the indication lights: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> • AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) • AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)
Application functions	Standard: <ul style="list-style-type: none"> • 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 • Positioner: <ul style="list-style-type: none"> - Position setpoint via HART interface - Automatic adaptation of dead band (adaptive behaviour selectable) - Change-over between OPEN-CLOSE control and setpoint control via HART interface
	Option: <ul style="list-style-type: none"> • PID process controller: with adaptive positioner, process setpoint via 0/4 – 20 mA analogue input or HART, actual process value via 0/4 – 20 mA analogue input • Multiport valve: Up to 16 positions, signals (pulse or edge), accuracy < 0.2 % • Automatic deblocking: Up to 5 operation trials, travel time in opposite direction can be set
Safety functions	Standard: <ul style="list-style-type: none"> • EMERGENCY operation (programmable behaviour) <ul style="list-style-type: none"> - Digital input: Low active (option) - 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).
	Options: <ul style="list-style-type: none"> • Enabling local controls via digital input Enable LOCAL. Thus, actuator operation can be enabled or disabled via push buttons on the local controls. • Interlock for main/by-pass valve: Enabling the operation commands OPEN or CLOSE via two digital inputs • PVST (Partial Valve Stroke Test): programmable to check the function of both actuator and actuator controls: Direction, stroke, operation time, reversing time

Features and functions	
Monitoring functions	<ul style="list-style-type: none"> 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 functions	<ul style="list-style-type: none"> Electronic device ID with order and product data Operating data logging: A resettable counter and a lifetime counter each for: <ul style="list-style-type: none"> 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): <ul style="list-style-type: none"> 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: PTC tripping device in combination with PTC thermistors within actuator motor
	Option: Thermal overload relay in controls combined with thermostiches within actuator
Electrical connection	Standard: AUMA Ex plug/socket connector with screw-type terminals (KP), max. 38 control terminals / max. supply voltage 525 V AC
	Options: <ul style="list-style-type: none"> AUMA Ex plug/socket connector with terminal blocks (KES), increased safety Ex e AUMA Ex plug/socket connector with terminal blocks (KES), flameproof enclosure Ex d AUMA Ex plug/socket connector (KT); screw-type motor terminals; push-in type control terminals
Threads for cable entries	Standard: Metric threads
	Options: Pg-threads, NPT-threads, G-threads
Wiring diagram (basic version)	Device category: "Actuator": TPCAI000-1A1-AA20 TPA00R2AA-0A1-000
	Device category: "Current Output": TPCAJ000-1A1-AA20 TPA00R2AA-0A1-000

Further options for version with MWG in actuator

Setting of limit and torque switching via local controls	
Torque feedback signal	Via HART 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)	Device category: "Actuator": TPCAI000-1A1-AA20 TPA00R200-0I1-000
	Device category: "Current Output": TPCAJ000-1A1-AA20 TPA00R200-0I1-000

Setting/programming the HART interface

Setting the HART address	The HART address is set via HART command 6 or alternatively via the actuator controls (default value: 0)
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General HART interface data	
Communication protocol	HART according to IEC 61158 and IEC 61784 (CPF 9)
Network topology	Point-to-point wiring
Communication signal	<p>HART, baud rate 1.2 kbit/s</p> <p>Device class: "Actuator"</p> <ul style="list-style-type: none"> • FSK (Frequency Shift Key) modulated to 4 – 20 mA setpoint signal • Input impedance: 250 Ω. The impedances of other HART devices connected (parallel or in series) must be within the HART specification • Point-to-point wiring • Signal range: 4 – 20 mA • Working range: 2 – 22 mA • Minimum operation voltage: 7 V (at 22 mA) • Integrated reverse polarity protection <p>Device category: "Current Output":</p> <ul style="list-style-type: none"> • FSK (Frequency Shift Key) modulated to 4 – 20 mA position feedback signal • Input impedance: 40 kΩ. The impedances of other HART devices connected (parallel or in series) must be within the HART specification • Point-to-point or multidrop wiring • Current output active, short-circuit proof. No further external power supply permitted
HART cable specification	Refer to HART specification
Power supply	Internal power supply of HART interface via actuator controls (apart from HART supply voltage, no other supply required)
Device identification	<p>Manufacturer name: AUMA</p> <p>Manufacturer ID: 0x607C</p> <p>HART protocol revision: 7.4</p> <p>Number of device variables: 12</p> <p>Model name: AUMATIC AC 01.2/ACExC 01.2</p> <p>Device type code: 0xE1FD</p>
Supported HART commands	<ul style="list-style-type: none"> • Universal Commands • Common Practice Commands: <ul style="list-style-type: none"> - Command 33 (Read Device Variables) - Command 40 (Enter/Exit Fixed Current Mode) - Command 42 (Perform Device Reset) - Command 45 (Trim Loop Current Zero) - Command 46 (Trim Loop Current Gain) - Command 50 (Read Dynamic Variable Assignments) - Command 79 (Write Device Variable) - Command 95 (Read Device Communication Statistics) • Device Specific Commands: <ul style="list-style-type: none"> - Command 128 (Write Operation Command) - Command 131 (Read Software Version) - Command 132 (Reset to Factory Default) - Command 133 (Reset Operational Data) - Command 134 (Reset HART Configuration) - Command 160 (Read Parameter) - Command 161 (Write Parameter) - Command 162 (Read Process Data)

Commands and signals of the HART interface	
Output data	Device class: "Actuator" Supported control types: <ul style="list-style-type: none"> • Loop Current Mode activated: Analogue 4 – 20 mA control signal for position setpoint • Loop Current Mode deactivated: Digital HART commands for position setpoint (0 – 100.0 %) or for discrete operation in directions OPEN and CLOSE Device category: "Current Output": <ul style="list-style-type: none"> • Loop Current Mode activated: Analogue 4 – 20 mA output signal for position feedback signal (point-to-point wiring) Digital HART commands for position setpoint (0 – 100.0 %) or for discrete operation in directions OPEN and CLOSE • Loop Current Mode deactivated: Analogue output signal for position feedback fixed to 4 mA (multidrop wiring) Digital HART commands for position setpoint (0 – 100.0 %) or for discrete operation in directions OPEN and CLOSE
Feedback signals	End positions OPEN, CLOSED Position setpoint 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 Device Status Informationen <ul style="list-style-type: none"> • Field Device Status • Device Specific Status • Extended Device Status Information • Standardized Status • Analog Channel Saturated • Analog Channel Fixed
Fehlermeldungen	Motor protection tripped Torque switch tripped in mid-travel One phase missing Failure of analogue customer inputs

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 +40 °C/+60 °C Options: –40 °C to +40 °C/+60 °C, extreme low temperature version Low temperature versions incl. heating system for connection to external power supply 230 V AC or 115 V AC or internal version 400 V AC.
Humidity	Up to 100 % relative humidity across the entire permissible temperature range
Enclosure protection according to EN 60529	IP68 Terminal compartment additionally sealed against interior of actuator controls (double sealed) According to AUMA definition, enclosure protection IP68 meets the following requirements: <ul style="list-style-type: none"> • Depth of water: Maximum 8 m head of water • Duration of continuous immersion in water: Maximum 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)

Technical data Actuator controls

Service conditions	
Vibration resistance according to IEC 60068-2-6	1 g, from 10 Hz to 200 Hz Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. (Not valid in combination with gearboxes)
Corrosion protection	Standard: KS Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.
	Option: KX Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.
Coating	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 actuator controls mounted separately from the actuator, including plug/socket connector. Connecting cable on request. Recommended for high ambient temperatures, difficult access, or in case of heavy vibration during service. Cable length between actuator and actuator controls is max. 100 m (not suitable for version with potentiometer in the actuator). Instead of the potentiometer, an MWG has to be used. (MWG requires separate data cable.)
Programming software	AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)

Further information	
Weight	Approx. 12 kg (including Ex-plug/socket connector with screw-type terminals)
Directives	ATEX Directive: (2014/34/EU) Electromagnetic Compatibility (EMC): (2014/30/EU) Low Voltage Directive: (2014/35/EU) Machinery Directive: (2006/42/EC)
Reference documents	Brochure Electric actuators for the automation of valves in the oil and gas industry Dimensions Multi-turn actuators with AUMATIC integral controls Dimensions Part-turn actuators with AUMATIC integral controls