ACExC 01.2-SIL
Profibus DP
Technical data Actuator controls in SIL version

General information
ACExC 01.2 actuator controls in SIL version for controlling multi-turn actuators of the SAEx/SAREx .2 type range and part-turn actuators of the SQEx/ SQREx .2 type range with Profibus DP interface.

Information on SIL features of ACExC 01.2 – SIL actuator controls

Features and functions		
SIL control	Via digital inputs Safe ESD a,b and/or Safe STOP OPEN/CLOSE	
Control voltage/current consumption for inputs of the SIL functions	24 V DC, current consumption: approx. 10 mA per input	
SIL status signal	1 potentialfreier Wechsler (max. 24 V DC, 1 A) für SIL Sammelstörung	
SIL functions - safety functions	Standard:	• Safe ESD - Digital inputs (redundant inputs) low active - Reaction can be selected: Run to end position CLOSED (Safe ESD CLOSE, CLOSE), run to end position OPEN (Safe ESD OPEN, OPEN) - Torque monitoring and forced limit seating (OPEN and CLOSE) for Safe ESD can be by-passed - Thermal protection for Safe ESD can be by-passed • Seating types can be set - Forced limit seating in end position (Actuator only stops once end positions OPEN or CLOSED are reached irrespective of the torque applied.) - Limit seating with overload protection (Once the set tripping point in end positions OPEN or CLOSED has been reached, the actuator will be switched off. If excessive torque is applied during travel, the actuator is already switched off prior to reaching the end position.) - Forced torque seating (Actuator only stops when reaching the set end position torque.)
	Options:	• Safe STOP - 2 digital inputs (OPEN and CLOSE) low active - Reaction can be selected: STOP in direction OPEN (Safe STOP OPEN) and/or STOP in direction CLOSE (Safe STOP CLOSE) • Combination of Safe ESD and Safe STOP (in this case, Safe ESD has priority)
Local controls	Safety functions are executed irrespective of selector switch position LOCAL - OFF - REMOTE.	
SIL monitoring functions	Standard:	• Actuator operation monitoring, generates SIL fault signal • Monitoring of redundant wiring Safe ESD: In case of incorrect wiring, a SIL fault signal is generated • Internal monitoring of the SIL components of the controls. In case of a fault, a SIL fault signal is generated.
	Option:	• Safe end position feedback
Configuration	Due to the requirements on functional safety, other restrictions with regard to configuration options of the actuator and the actuator controls not listed here do apply.	
Actuator version in combination with ACExC .2-SIL	• The actuator must be equipped with a blinker transmitter • The actuator is supplied with the motor locked in disengaged position. Motor operation will only be possible once the lock is disabled	

Further options for version with MWG in actuator	
SIL limit switches	Forced seating type in end position
Actuator version in combination with ACExC .2-SIL	Only actuators in clockwise closing version may be used.

Information on general features of ACExC 01.2-SIL actuator controls

Features and functions

Explosion protection

Standard:	II2G Ex de IIC T4 or T3 II2D Ex tb IIIC T130 °C or T190 °C Db IP6x
Option:	II2G Ex d IIC T4 or T3

EC type test certificate

In combination with SAEx:	DEKRA 11ATEX0008 X
In combination with SQEx:	DEKRA 13ATEX00016 X

Power supply

Standard voltages AC:

3-phase AC current 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

Special voltages AC:

3-phase AC current Voltages/frequencies							
Volt	220	440	525	575	600	660	690
Hz	50	50	50	60	60	50	50

Permissible variation of mains voltage: ±10 %

Permissible variation of mains frequency: ±5 %

660 V and 690 V not permissible in combination with thyristors

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.

The "external supply of electronics" option refers to the components of the standard actuator controls. However, the SIL components of the actuators controls are not supplied.

Current consumption

Current consumption of controls depending on mains voltage:

For permissible variation of mains voltage of ±10 %:

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

Switchgear

Open-close duty:	Reversing contactors (mechanically and electrically interlocked) for AUMA power classes A1/A2
Modulating duty:	Thyristor unit for mains voltage up to 600 V AC (required to meet the safety figures for modulating actuators) for AUMA power classes B1 and B2

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 Profibus DP interface

Profibus DP-V1 (option)

Access to parameters, the electronic name plate and the operating and diagnostic data with acyclic write/read services

Profibus DP-V2 (option)

Redundancy behaviour according to Profibus DP-V2 specification no. 2.212 (Primary and Backup with RedCom)

Synchronisation of time between actuator controls and Profibus master with subsequent time stamp of the most important events such as malfunctions, end position and torque signals from actuator controls

Redundancy (option)

Requires Profibus DP-V2 (option)

Redundant line topology with universal redundancy behaviour according to AUMA redundancy I or II

Redundant line topology and redundancy behaviour according to Profibus DP-V2 specification no. 2.212 (Primary and Backup with RedCom)

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 is in position REMOTE. (Not activated when leaving the factory.) • 6 indication lights: - 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
	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) • AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)	
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 • Positioner: - Position setpoint via fieldbus interface - Automatic adaptation of dead band (adaptive behaviour selectable) - Change-over between OPEN-CLOSE control and setpoint control via fieldbus
	Options:	• PID process controller: With adaptive positioner, via 0/4 – 20 mA analogue inputs and Profibus for process setpoint and actual process value
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	
Diagnostic function	• Electronic device ID with order and product data • Logging of operating data: A resettable counter and a lifetime counter each • 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"	
Motor protection evaluation	Standard:	PTC tripping device in combination with PTC thermistors within actuator motor
	Option:	Thermal overload relay in controls combined with thermoswitches within actuator
Overvoltage protection (option)	Protection of the actuator and control electronics against overvoltages on the fieldbus cables of up to 4 kV	
Electrical connection	Standard:	AUMA Ex plug/socket connector with screw-type terminals (KP)
	Options:	• 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
Threads for cable entries	Standard:	Metric threads
	Options:	Pg-threads, NPT-threads, G-threads
Wiring diagram (basic version)	TPCCA0G4-1A1-A410 TPA00R2AA-1A1-AB0	

Further options for version with MWG in actuator	
Setting of limit and torque switching via local controls	
Torque feedback signal	Via fieldbus interface

Diagnostic function	• Torque characteristics - 3 torque characteristics (torque-travel characteristic) for opening and closing directions can be saved separately. Torque characteristics stored can be shown on the display.
Wiring diagram (basic version)	TPCCA0G4-1A1-A410 TPA00R20A-1I1-AB0

Setting/programming the Profibus DP interface	
Baud rate setting	Automatic baud rate recognition
Setting the fieldbus address	The Profibus DP address is set via the actuator controls display.
Configurable process representation via GSD file	For an optimum adaptation to the process control system, the process representation (feedback signals) can be configured as desired.

General data Profibus DP	
Communication protocol	Profibus DP according to IEC 61158 and IEC 61784
Network topology	Line (fieldbus) structure. When using repeaters, tree structures can also be implemented. Coupling and uncoupling of devices during operation without affecting other devices is possible.
Transmission medium	Twisted, screened copper cable according to IEC 61158
Profibus DP interface	EIA-485 (RS-485)
Transmission rate/cable length	Baud rate (kbit/s) / Max. cable length (segment length) without repeater / Possible cable length with repeater (total network cable length) 9.6 – 93.75 / 1,200 m / Approx. 10 km 187.5 / 1,000 m / Approx. 10 km 500 / 400 m / Approx. 4 km 1,500 / 200 m / 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 analogue inputs/outputs such as actuators, sensors
Number of devices	32 devices without repeater, with repeater expandable to 126
Fieldbus access	Token-passing between 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
Profibus DP ident no.	0x0C4F: Standard applications with Profibus DP-V0 and DP-V1 0x0CBD: Applications with Profibus DP-V2

Commands and signals of the Profibus DP interface	
Process representation output (command signals)	OPEN, STOP, CLOSE, position setpoint, RESET, enable LOCAL
Process representation input (feedback signals)	• End positions OPEN, CLOSED • Actual position value • Actual torque value, requires 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 • SIL function active (must not be used in SIS)
Process representation input (fault signals)	• Motor protection tripped • Torque switch tripped in mid-travel • One phase missing • SIL fault (must not be used in SIS)
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:	–25 °C to +40 °C/+60 °C	
	Options:	–60 °C to +40 °C/+60 °C, extreme low temperature version	
		Low temperature versions with heating system only.	
Humidity	Up to 100 % relative humidity across the entire permissible temperature range		
Enclosure protection according to EN 60529	IP68		
	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		
Pollution degree according to IEC 60664-1	Pollution degree 4 (when closed), pollution degree 2 (internal)		
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.
	Options:	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	Actuator controls separately mounted 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, the actuator has to be equipped with an electronic position transmitter. (MWG requires a 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	Functional safety of electrical/electronic/programmable electronic safety-related systems: (IEC 61508) 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 Manual Functional Safety Actuators SA 07.2 – SA 16.2/SAR 07.2 – SAR 16.2/SAEx 07.2 – SAEx 16.2/SAREx 07.2 – SAREx 16.2, SQ 05.2 – SQ 14.2/ SQR 05.2 – SQR 14.2/ SQEx 05.2 – SQEx 14.2/ SQREx 05.2 – SQREx 14.2 with actuator controls AC 01.2/ACExC 01.2 in SIL version