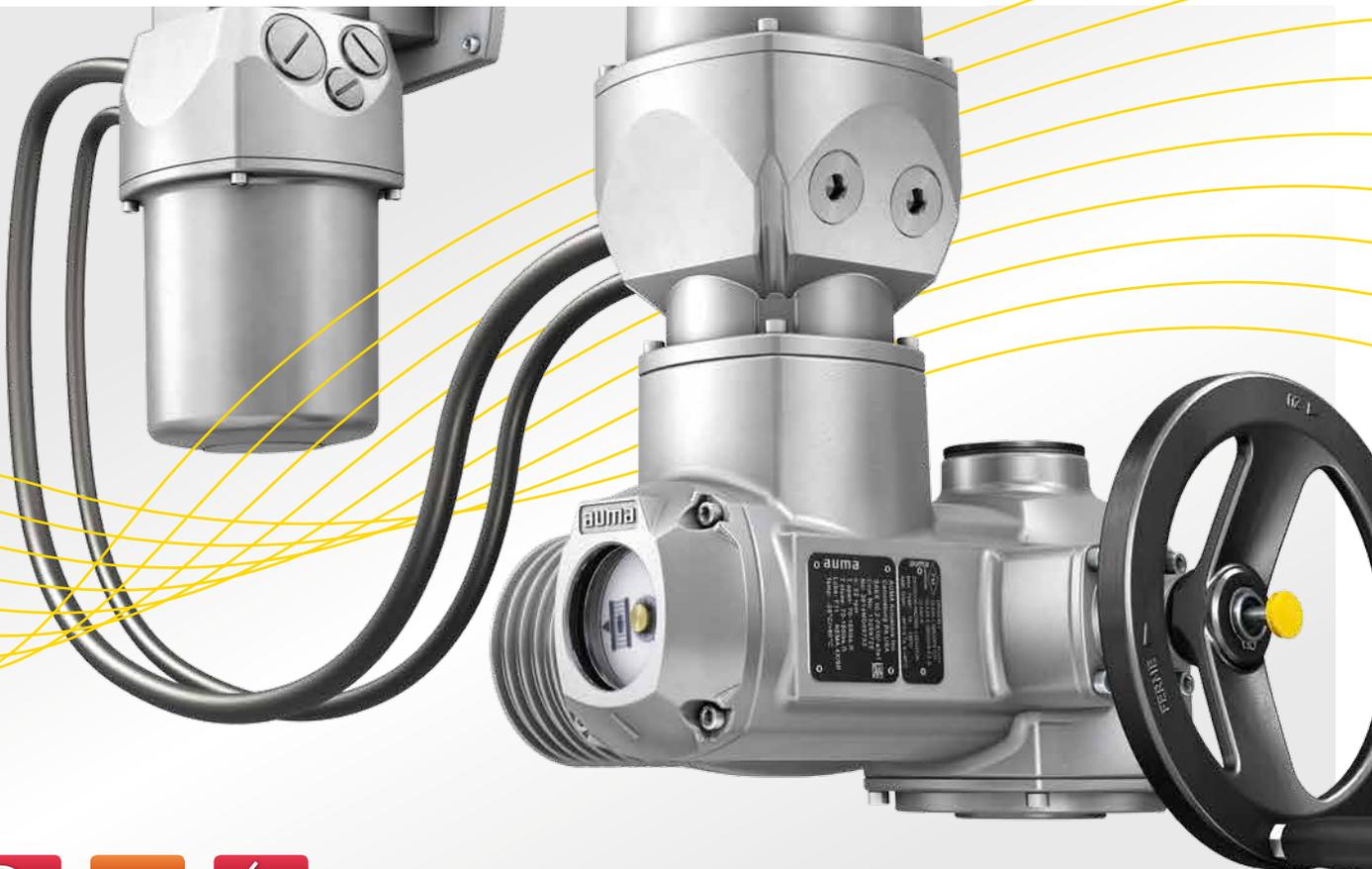




ELECTRIC ACTUATORS

for the automation of valves in the oil and gas industry



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Multi-turn actuators:
Gate valves



Linear actuators:
Globe valves



Part-turn actuators:
Butterfly valves, plug and ball valves



Lever actuators:
Dampers



AUMA-USA Headquarters near Pittsburgh, Pennsylvania (PA)

WHO IS AUMA?

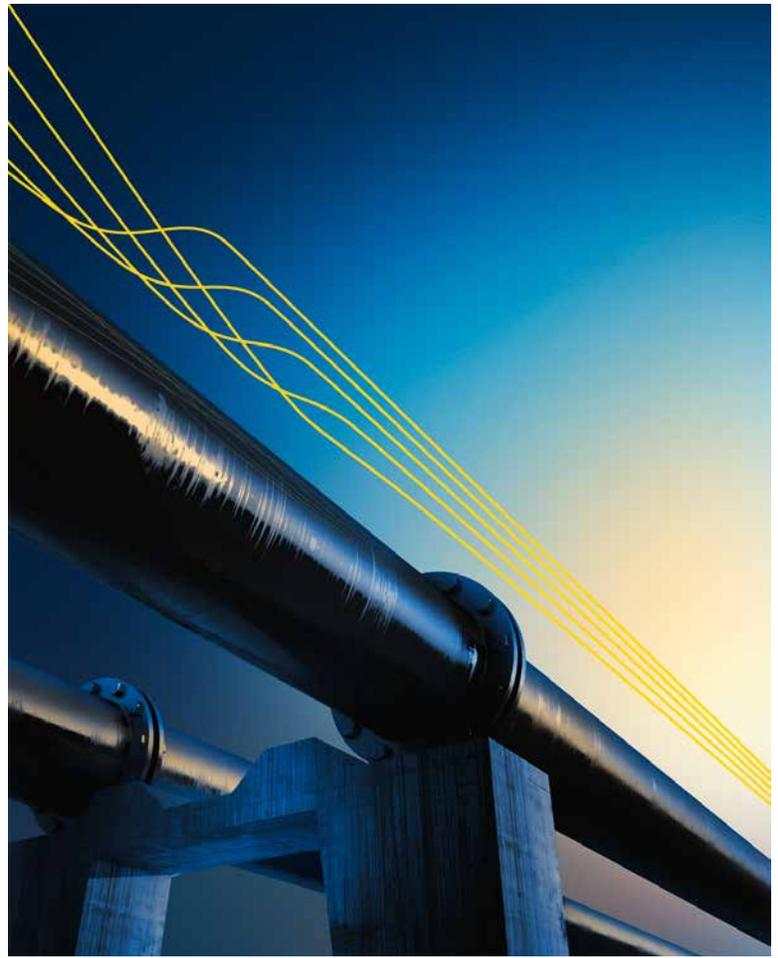
Armaturen Und Maschinen Antriebe - AUMA - one of the leading manufacturers worldwide of actuators for automating industrial valves. Since 1964, the founding year of the company, AUMA has focused on development, manufacture, sales and service of electric actuators.

The brand AUMA is synonym to long-standing experience and knowledge. AUMA is specialized in electric actuators not only for the oil & gas industry but also for the energy, water and industrial sectors.

As an independent partner of the international valve industry, AUMA supplies customer-specific products for electric automation of all industrial valves.



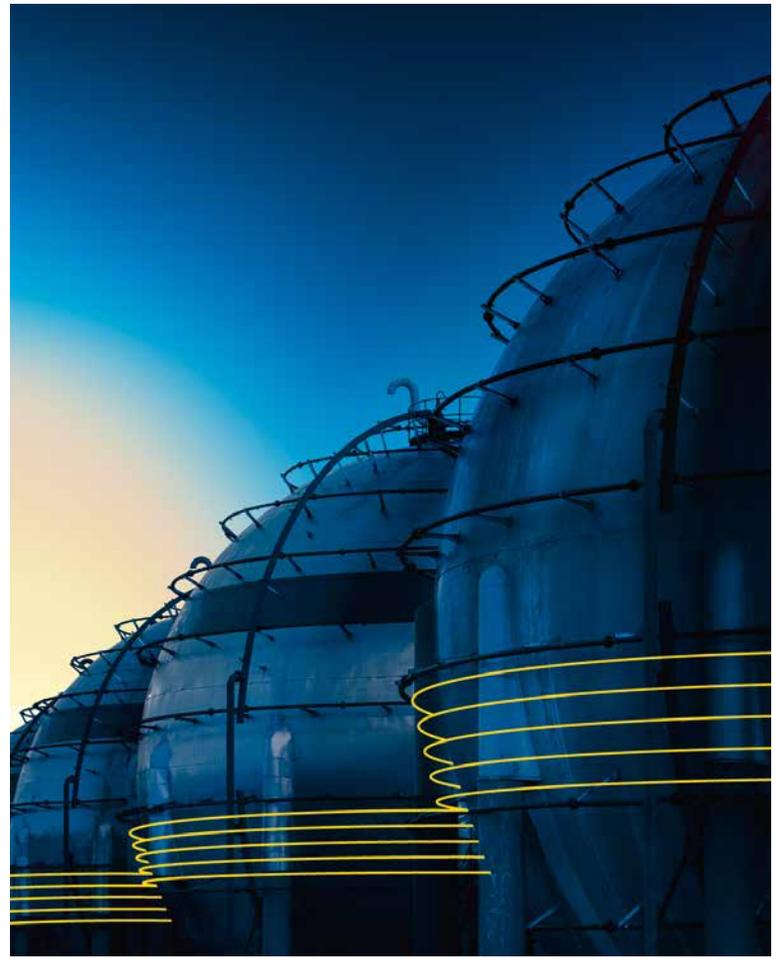
AUMA-USA Houston, Texas (TX) operation



APPLICATIONS

PIPELINES AND TERMINALS

No matter whether oil or gas is transported via pipelines, tankers or on the road - electric actuators play a key role in controlling the flow within pipelines or fueling procedures. Service conditions vary widely. Pipelines often cross vast unpopulated areas and different climate zones, while offshore conditions dominate onshore oil terminals. Day after day, AUMA actuators prove their reliability under any of those conditions: at $-60\text{ }^{\circ}\text{C}$ ($-76\text{ }^{\circ}\text{F}$) in a compressor station in Siberia or at $+50\text{ }^{\circ}\text{C}$ ($+122\text{ }^{\circ}\text{F}$) in an oil terminal on the shores of the Indian Ocean.



STORAGE

Storage is by no means static. Gases, crude oil as well as derived products are put on storage, moved to an intermediate storage or moved to completely different storage facilities. Available capacities, tanks and pipelines as well as handling equipment must be efficiently and safely used. This requires advanced control of both media flow and actuators, which can be integrated into the required DCS infrastructure. AUMA actuators not only meet the high safety standards demanded within this environment, they are also equipped with interfaces to the DCS to meet the special requirements. They include redundancy to increase safety during data transmission or overcoming large distances between field devices on the often vast areas. AUMA actuators support fast data exchange and proactively contribute to efficient handling of the ever changing processes.

REFINING AND PROCESSING

High pressures and/or high media temperatures are typically conditions within refinery pipelines. Special tasks and special automation solutions require many top grade valves, including lift plug valves or coker valves. Due to their high SIL capability, AUMA actuators are ideally suited for use in safety instrumented systems. In fireproof version, the actuator can be operated for 30 minutes in the event of fire.

ENCLOSURE PROTECTION

SAEx and SQEx AUMA actuators are supplied in increased enclosure protection IP68 in compliance with EN 60529. IP68 means protection against immersion up to 8 m (26 ft) head of water for max. 96 hours. During continuous immersion, up to 10 operations are permissible.

Typically, AUMA gearboxes are used in combination with AUMA multi-turn actuators. Gearboxes are also available in enclosure protection IP68.

EXPLOSION PROTECTION

Explosion-proof devices are designed so they will not act as ignition sources for a potentially explosive atmosphere. They will neither generate sparks nor hot surfaces.

Please refer to page 7 for details regarding explosion protection classification for North America in accordance with NEC 500 or 505 for FM approvals and for details regarding explosion protection classification for Canada in accordance with CEC/CSA .

SERVICE CONDITIONS



Explosion protection and ambient temperature conditions

Actuators	Ambient temperature range		Explosion protection
	min.	max.	
North America - FM			
Multi-turn actuators SAEx/SAREx 07.2 – 16.2	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
	-40 °C (-40 °F)	+80 °C (+176 °F)	Class I Div 1 Groups C, D T3; Class II Div 1 Groups E, F, G; Class III Div 1
Multi-turn actuators SAEx/SAREx 07.2 – 16.2 with AMExC or ACExC	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
	-40 °C (-40 °F)	+70 °C (+158 °F)	Class I Div 1 Groups C, D T3; Class II Div 1 Groups E, F, G; Class III Div 1
Multi-turn actuators SAEx/SAREx 25.1 – 30.1	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
Multi-turn actuators SAEx/SAREx 25.1 – 30.1 with AMExC or ACExC	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
Part-turn actuators SQEx/SQREx 05.2 – 14.2	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
	-40 °C (-40 °F)	+80 °C (+176 °F)	Class I Div 1 Groups C, D T3; Class II Div 1 Groups E, F, G; Class III Div 1
Part-turn actuators SQEx/SQREx 05.2 – 14.2 with AMExC or ACExC	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
	-40 °C (-40 °F)	+70 °C (+158 °F)	Class I Div 1 Groups C, D T3; Class II Div 1 Groups E, F, G; Class III Div 1
Canada - CSA			
Multi-turn actuators SAEx/SAREx 07.2 – 16.2	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
	-40 °C (-40 °F)	+80 °C (+176 °F)	Class I Div 1 Groups C, D T3; Class II Div 1 Groups E, F, G; Class III Div 1
	-60 °C (-76 °F)	+60 °C (+140 °F)	Class I Zone 1 Ex de IIC T4/T3; Ex d IIC T4/T3
Multi-turn actuators SAEx/SAREx 07.2 – 16.2 with AMExC or ACExC	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
	-40 °C (-40 °F)	+70 °C (+158 °F)	Class I Div 1 Groups C, D T3; Class II Div 1 Groups E, F, G; Class III Div 1
	-60 °C (-76 °F)	+60 °C (+140 °F)	Class I Zone 1 Ex de IIC T4/T3; Ex d IIC T4/T3
Part-turn actuators SQEx/SQREx 05.2 – 14.2	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
	-40 °C (-40 °F)	+80 °C (+176 °F)	Class I Div 1 Groups C, D T3; Class II Div 1 Groups E, F, G; Class III Div 1
	-60 °C (-76 °F)	+60 °C (+140 °F)	Class I Zone 1 Ex de IIC T4/T3; Ex d IIC T4/T3
Part-turn actuators SQEx/SQREx 05.2 – 14.2 with AMExC or ACExC	-40 °C (-40 °F)	+60 °C (+140 °F)	Class I Div 1 Groups B, C, D T4/T3C; Class II Div 1 Groups E, F, G; Class III Div 1
	-40 °C (-40 °F)	+70 °C (+158 °F)	Class I Div 1 Groups C, D T3; Class II Div 1 Groups E, F, G; Class III Div 1
	-60 °C (-76 °F)	+60 °C (+140 °F)	Class I Zone 1 Ex de IIC T4/T3; Ex d IIC T4/T3

Notes

- > The data is valid for actuators with 3-phase AC motors. Actuators with 1-phase AC motors comply with the requirements of explosion group IIB or Class I, Div 1, Group C, D
- > Temperature range may vary with product configuration.

FIREPROOF ACTUATORS

Safety concepts also include actions, which limit the impacts on persons, the environment and the system as such in case of a harmful event.

In the event of a fire, fireproof AUMA actuators will remain fully operable for 30 minutes at temperatures up to 1,100 °C (2,012 °F). Operating personnel still have the chance to remedy the situation, e.g. by cutting off the fuel supply when closing valves.

AUMA has various fireproof solutions available, such as boxes or blankets as specified by the end user, depending on the application requirements.

K-MASS™ Fireproof Coating

In the event of a fire, the coating will expand and absorb the externally supplied thermal energy of the fire. The actuators have no restriction with regards to accessibility of operating elements or the inside of the housing. All housing elements are individually coated. Installation, commissioning, and service tasks are performed in the same way as for non-fireproof devices.

MOV FR Fireproofing System

The fireproof coating (manufacturer designation FR Coating) consists of several cover elements, which perfectly enclose the actuator and are assembled using screws. Already installed actuators may easily be retrofitted with this fire protection. In the event of fire, the individual segments will expand and melt to a homogenous enclosure absorbing thermal energy.

SERVICE CONDITIONS



PROTECTIVE FUNCTIONS

OVERLOAD PROTECTION FOR THE VALVE

If excessive torque is applied during travel, e.g. due to a trapped object within the valve, the controls switch off the actuator to protect the valve.

THERMAL MOTOR PROTECTION

AUMA actuators are equipped with PTC thermistors or thermostats within the motor windings. They trip as soon as the temperature within the motor exceeds 140°C (284°F). Embedded within the controls, they optimally protect the motor winding against overheating.

PTC thermistors or thermostats offer better protection than thermal overload relays since the temperature rise is measured directly within the motor winding.

EMERGENCY SHUTDOWN

The emergency behavior can be used to determine the actuator behavior in an emergency situation. The emergency signal always has priority over the standard operation commands.

If a signal required for operation fails or if an emergency signal is activated, the actuator proceeds with a failure preassigned behavior. Examples of the failure behavior include the display color changing to red, actuator running to full OPEN or full CLOSED position or remaining in current position. Deactivation of protective actuator mechanisms is possible, but may void the explosion protection approval.

PRODUCT CERTIFICATIONS

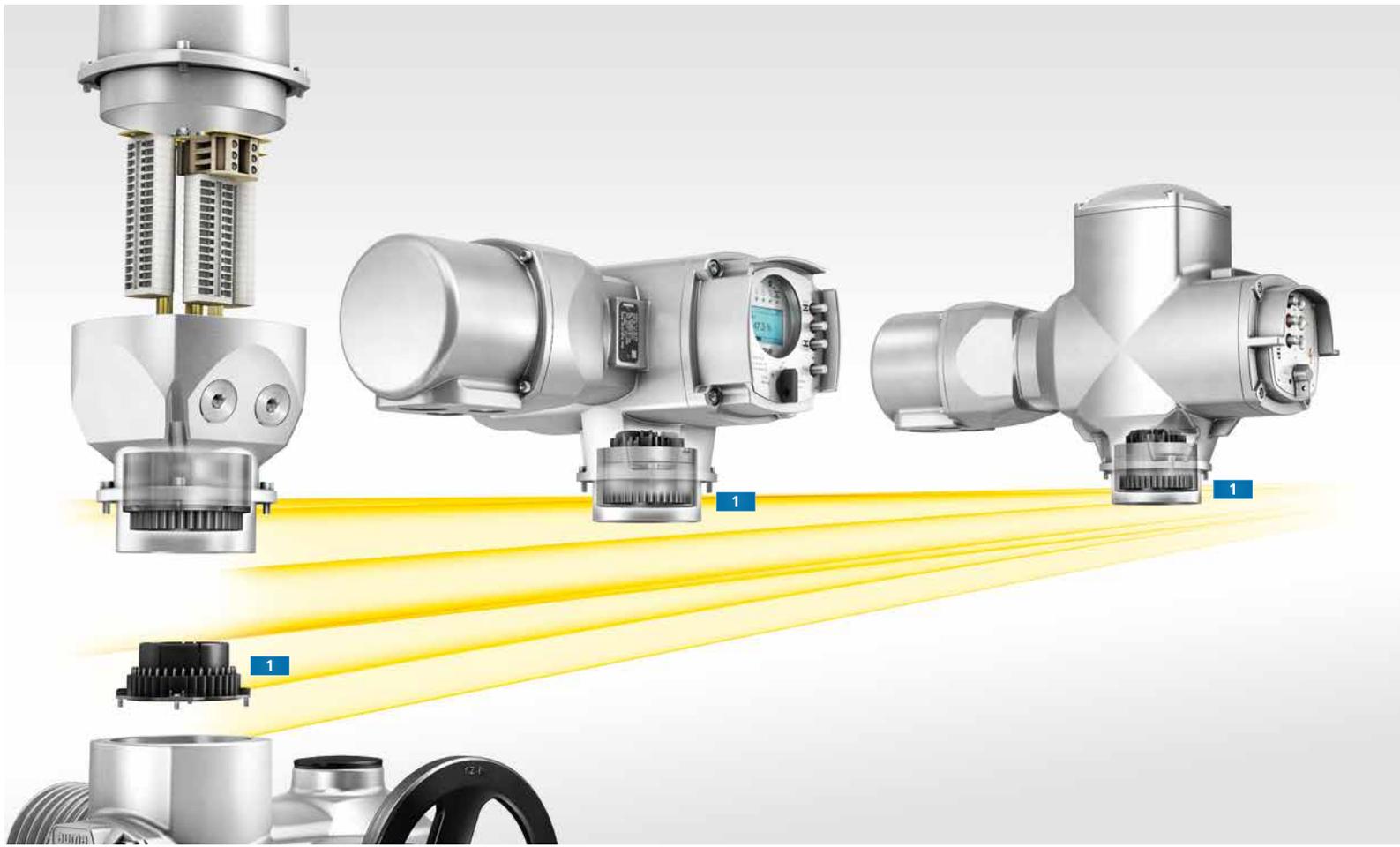
AUMA takes all necessary precautions, due to FM and CSA criteria, to ensure customers are receiving reliable products that are manufactured to the highest quality standards.

Moreover, all AUMA actuators are certified to applicable standards and specifications tested to protect properties from loss as well as required standards for safety and performance.

In accordance with ISO 9001:2008, AUMA's management team makes certain that customer requirements are determined and met in order to enrich customer service and satisfaction.

Records of AUMA's certifications can be downloaded from www.auma.com



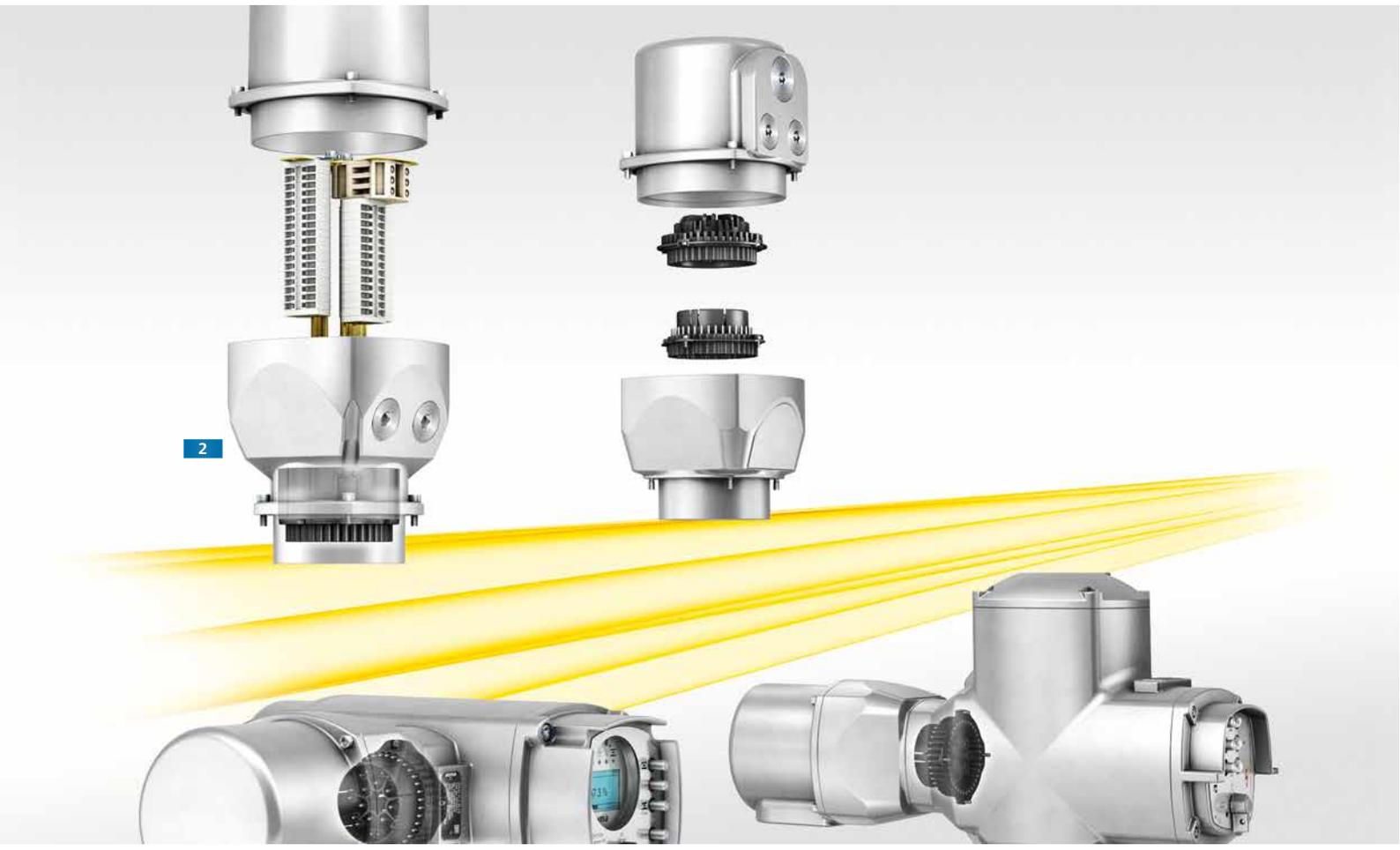


ELECTRICAL CONNECTION

PLUG & SOCKET ELECTRICAL CONNECTION

The plug & socket electrical connector **1** is a key element of the modular actuator design. The connector is a separate unit. The different connection types are compatible throughout all type ranges and can be used for actuators with or without integral controls.

During maintenance work, the wiring remains undisturbed; electrical connections can be quickly separated and reconnected. This reduces downtimes and avoids wiring faults when reconnecting.



ELECTRICAL CONNECTION KES (OPTIONAL WITH MOTOR CONTROLS)

The plug & socket connector KES **2** forms an independent unit, connected to the device (in our example ACExC actuator controls) by means of a 50-pin plug & socket connector. The plug & socket connector is compound sealed with the frame, providing a flameproof enclosure for inside the device.

The required number of terminals is fitted into the frame. Depending on the design of the cover, the electrical connection meets the requirements of protection type "increased safety" or "flameproof enclosure."



INTEGRAL CONTROLS

AMEXC 01.1

AMEXC controls offer a flexible, customizable design choice when using parallel signal transmission or when a relatively low number of feedback signals is required.

Few parameters need to be defined via DIP switches during commissioning, e.g. type of seating in end positions.

Actuator control is made via operation commands OPEN, STOP, CLOSE. End positions and collective fault signals are reported back to the DCS as feedback signals. These signals are visually displayed at local controls via the indication lights. As an option, the valve position can be transmitted as 0/4 – 20 mA signal to the DCS.

Conventional limit switches are easily calibrated with less than 5 turns of a screw driver – no matter the valve type or size!

Integral controls evaluate the actuator signals and operation commands and switch the motor on and off without delay, using the installed reversing contractors or thyristors.

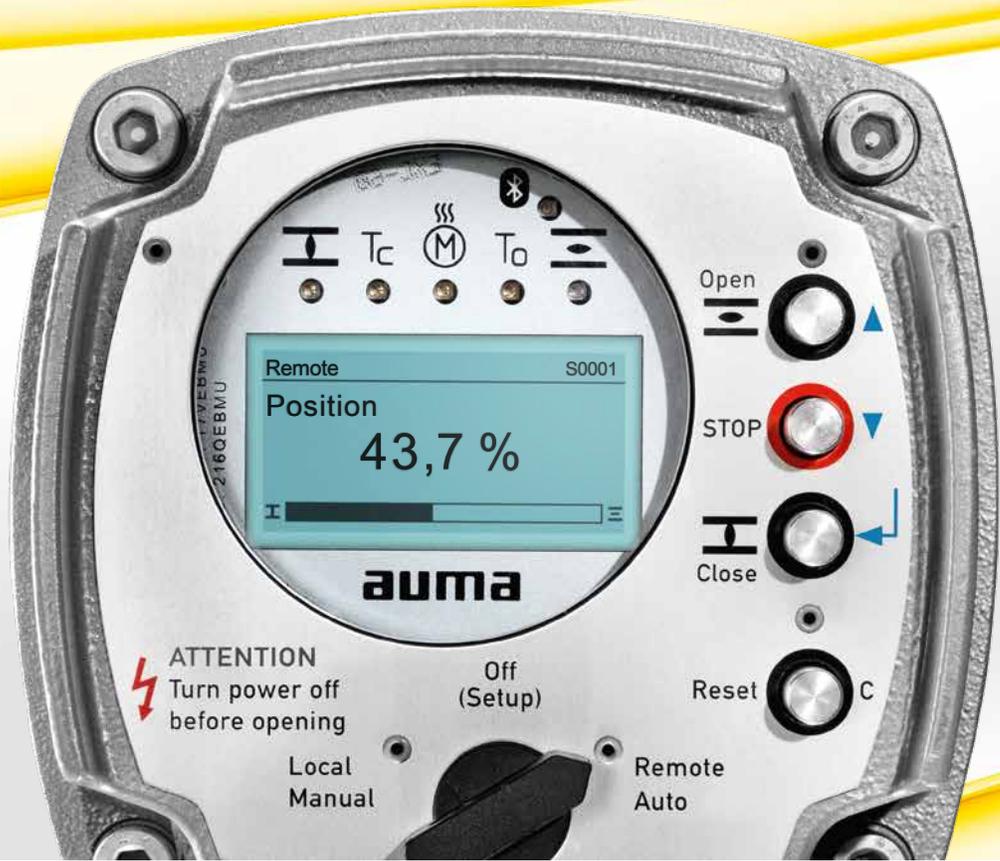
After analysis, the controls supply the actuator signals as feedback signals to the host level.

The integral local controls allow for local actuator operation.

AMEXC controls can be combined with both SAEx and SQEx actuators. This creates a homogenous picture for the DCS.

Benefits

- > Simple, flexible and easy to use motor controls, suiting most application needs
- > Plug & socket customer connection ("once and done wiring!")
- > Plug & socket motor connection (motor replacement in a matter of minutes)
- > FM: Explosion proof - Class I, Division 1, Groups C & D or Groups B, C & D
- > CSA: Explosion proof - zone and division system available
- > Open, stop, close pushbuttons
- > Open, close, fault lights
- > Selector switch for local, remote or off operations
- > Monitor relay for loss of phase or power, mid position torque switch trip or motor thermal
- > Power supply
- > Auto phase correction
- > Interface board (24 V DC or 115 V AC)
- > IP68-8 enclosure rating (parameters 24 ft for 96 hours)
- > Optional temperature ranges available
- > Selectable seal-in contacts
- > Accept emergency signal
- > Positioner (accepts analog signal)
- > Profibus DP-VO, Modbus RTU
- > DeviceNet
- > Overload relays
- > Padlockable cover for local controls
- > Remote mount separate from actuator
- > Complete AMEx module may be stocked as a spare
- > Easy calibration (5 turns or less of a screw driver) of limit switches



INTEGRAL CONTROLS

ACExC 01.2

ACExC controls are your perfect solution if the application requires self-adapting control functions, data logging, user configurable interface or if valve and actuator are to be integrated into a Plant Asset Management System due to advanced diagnostic functions.

ACExC controls are equipped with a parallel interface for free configuration and/or interfaces to fieldbus systems as used within process automation.

The diagnostic functions includes, but are not limited to: time-stamped event report, torque characteristics logging, continuous recording of temperatures and vibration within the actuator, counting the number of starts and motor running times.

In addition to the basic functions, ACExC controls offer a number of options to meet special demands. These include torque by-pass to unseat valves if tightly seated, stepping mode for extending or operating times to avoid water hammer within pipelines.

Benefits

- > FM: Explosion proof- Class I, Division I, Groups C & D or Groups B, C & D
- > Plug & socket electrical connection for customer wiring ("once and done wiring!")
- > Plug & socket motor connection (motor replacement in minutes)
CSA: Explosion proof - zone and division system available
- > Absolute encoder
- > No batteries to maintain or replace
- > Large, multi-lingual graphic display
- > Programmable indicating lights
- > Push buttons, lights and selector switch
- > Reversing starters
- > Power supply
- > Auto phase correction
- > IP68-8 enclosure rating (parameters 24 ft for 96 hours)
- > Bluetooth connectivity and communication for data exchange in industrial environment
- > 6 programmable output relays:
5 NO contacts with one common, 250 V AC, 1 A and 1 NO/NC contact, 250 V AC, 5 A
- > Chronological event logger
- > Diagnostic indication
- > Torque curves
- > Programmable opening or closing direction of actuator
- > Free commissioning and diagnostic software
- > Password protection
- > Fieldbus communication: Profibus, Modbus, Foundation Fieldbus (FF) and HART
- > DeviceNet
- > Remote mount separate from actuator
- > Complete ACEX module can be stocked as a spare



SPECIAL APPLICATIONS AND FUNCTIONS

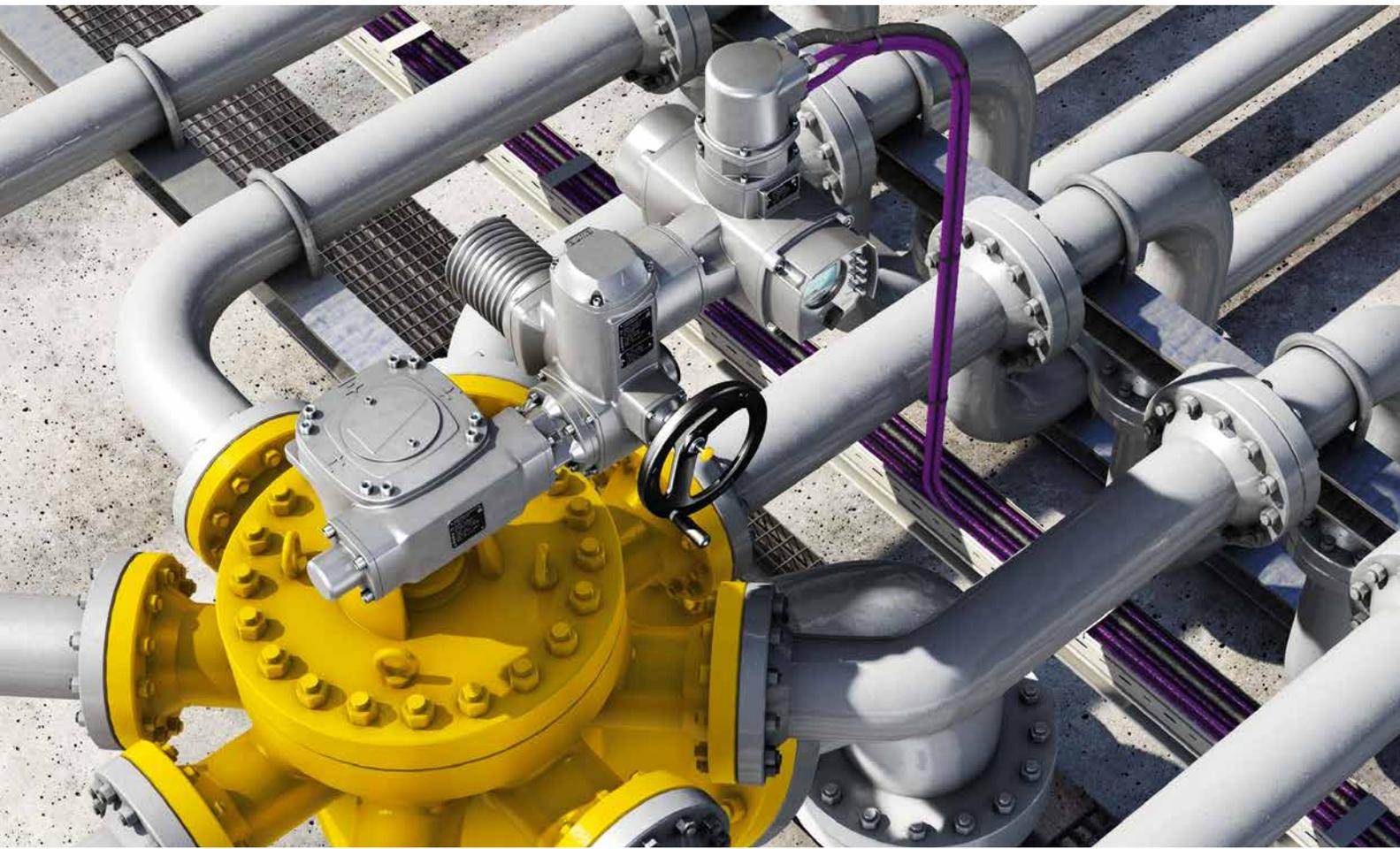
AUTOMATION OF COKER VALVES

Delayed coking systems transform the residual oil generated when refining crude oil and crack it into gas oil and petroleum coke. The heart of the plant is a coke drum with a height of more than 40 m (130 ft) where the conversion processes take place at high temperatures. Once the process is finished, the top and the bottom of the drum have to be opened to discharge the coke. By using automated special valves, manual opening, which is both dangerous and time-consuming while requiring a lot of personnel becomes obsolete.

Automation can be assured by means of two GHT gearboxes, which are operated simultaneously by an SAEx multi-turn actuator. The whole arrangement can provide torques up to 160,000 Nm (118,000 ft-lb).

WALL BRACKET

If the actuator is difficult to access or in case of extreme vibration or high ambient temperatures at the place of valve installation, controls with operating elements can be mounted separately from the actuator on a wall bracket. The cable length between actuator and controls may be up to 100 m (330 ft). The wall bracket may easily be retrofitted at a later date.



MULTIPOINT ACTUATOR PROGRAM

AUMA's multiport actuator program will allow the actuator/gearbox combination to accurately position the driven device in up to 12 programmable locations. This unique feature can be accomplished with or without the use of external position sensors. Typical installations include coker switch valves, multiport sampling valves, or any application requiring accurate multiple positions.

The number of inputs and outputs of ACEXC 01.2 actuator controls have been extended to include this feature. Approaching the intermediate positions can be via shortest route, clockwise (CW) or counterclockwise (CCW). Additionally, operation in only one direction is possible.

Moreover, the multiport function is available for DCS control through standard or fieldbus interfaces. Intermediate positions can be indicated via the fieldbus or programmable output relays.

The multiport option is also available in local mode with on screen port assignments. Other available features include: Bluetooth programming, torque monitoring, maintenance information and many more.

The multiport feature is available with AUMA's microprocessor based ACEXC 01.2 in both explosion proof and standard configurations.

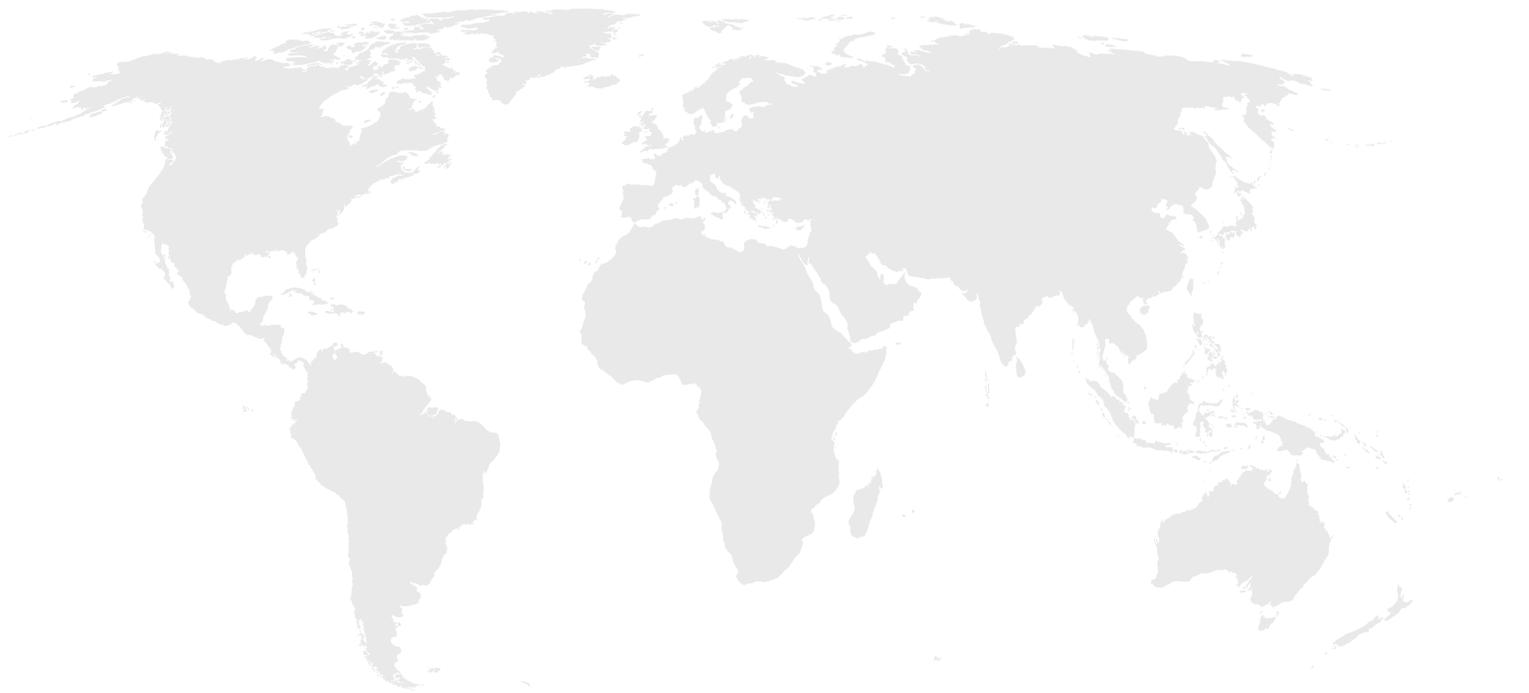


AUMA AUTOMATION

AUMA provides engineered solutions for automation either in the field or in our facilities. With over 40 years' experience, AUMA has provided automation solutions in water plants, wastewater plants, power plants, tank farms, refineries and other industrial applications.

AUMA electric actuators interface easily with new or upgraded plant wide control systems. AUMA has the knowledge and experience to determine actuation requirements for all applications to make specific automation recommendations from the mechanical point of view and the control system interface.

Automation services are available for applications requiring part-turn, multi-turn and linear operations. AUMA is an expert in automation by several methods including direct mounting the actuator and operating by means of a lever output and linkage. Complete valve automation, calibration and testing services are available. Simply put, AUMA can solve any automation challenge.



AUMA SERVICE

AUMA is a global service network with subsidiaries and representatives established in 70 countries. Therefore, AUMA provides direct support and advice, which is an advantage for customers. Service engineers obtain the technical expertise in the field of development and know the AUMA devices.

AUMA service offers customers comprehensive performance for actuators, actuator controls, and gearboxes. From installation and commissioning to training, maintenance and overhaul or repair right through global availability and supply of spare parts, AUMA service attributes great importance to customized advice and complete service throughout our products' lifetime.

auma[®]

Solutions for a world in motion

AUMA Actuators, Inc. - North America Headquarters

100 Southpointe Blvd.
Canonsburg, PA 15317 USA
Phone: 724-743-2862
Fax: 724-743-4711

AUMA Actuators, Inc. - Houston, TX Operation

10611 S. Sam Houston Parkway West
Suite 100
Houston, TX 77071 USA
Phone: 281-261-2862
Fax: 724-743-4711

After-Hour Emergency Parts and Service

Phone: 412-224-1036
24-Hour Service, 7 Days a Week

mailbox@auma-usa.com
www.auma.com



AUMA Actuators, Inc.
Certified to ISO 9001:2008
Certificate registration no. 10000766 QM08