auma®

Solutions for a world in motion

Electric multi-turn actuators with integral controls

for applications in the oil and gas industry

Product description

The actuator specialist

AUMA are one of the leading manufacturers of electric actuators, actuator controls and valve gearboxes for the automation of industrial valves in the oil and gas industry. AUMA have 50 years of experience in research & development and manufacture of electric multi-turn and part-turn actuators. AUMA manufacture their products not only in Germany but also in the Unites States. Three service centers have been set up to offer service support. 2,300 employees belong to the AUMA group worldwide.

AUMA automate valves

AUMA actuators have to stand up to a multitude of complex requirements and operate in the most different applications – this is our daily business. The modular AUMA design principle forms the basis of the long-term product policy and offers the required flexibility to adapt our range of actuators to suit customer requirements.

Global presence

For this purpose, you have to know your markets well. Thinking globally means acting regionally. A comprehensive worldwide sales and service network ensures that there is a competent local contact for every customer.

Single source supply

From product development to device testing, to final inspection, AUMA offer continuous manufacturing and quality assurance processes which are subject to constant review.

Since 1964, AUMA have established an excellent brand name in the world of actuators. Reliability and innovation are concepts which are closely linked with AUMA. This is above all to be credited to AUMA's dedicated employees who work devotedly on the future of the actuators.

Contents

Solutions for a world in motion

This brochure will provide both the beginner and the expert with an overview of the functions and applications of AUMA SAEx series actuators as well as the AMExC and ACExC actuator controls. It can be used as the basis to determine the suitability of a device for the chosen application.

For detailed product selection, please refer to the separate data sheets. On request, AUMA engineers within field service and within our subsidiaries can assist you in defining the correct device for the application.

The latest information on the AUMA products can be found on the Internet at www.auma.com. All documents, including dimensional drawings, wiring diagrams, technical and electrical data sheets as well as final inspection records are available on the Internet in digital form.

2013.06.07

Applications

Tank farms

- Loading jetty
- Storage
- Distribution
- Manifold
- Metering

Platforms

- Wellhead control
- Drilling & exploitation
- Transmission
- Separators
- Gas lift
- Manifold

Refineries

- Separators
- Cracker & coker
- Refining & treatment
- Fire fighting
- Isolation
- ESD applications

Transport

- Terminals
- Pipelines
- Pumping stations
- Booster
- Pressure reduction
- Fuelling

The AUMA SAEx multi-turn actuators cover a torque range between 10 Nm and 16,000 Nm. In combination with GS part-turn gearboxes, torques up to 675,000 Nm can be achieved. This large torque range ensures that AUMA products are suitable to automate valves of various sizes and pressure levels within any plant. All actuators are integrated into the DCS using standardised control technology.

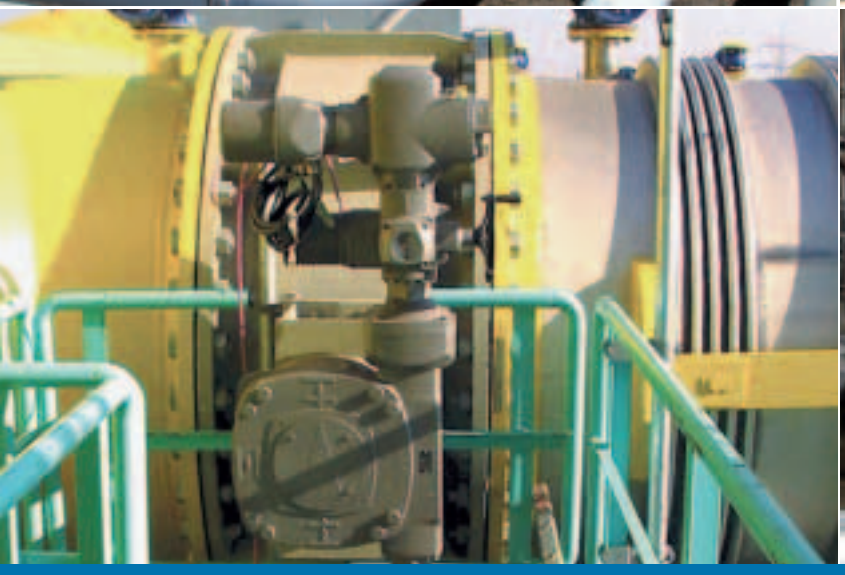
[1] **Multi-turn actuator SAEx 07.2**

- Torque range 10 Nm – 30 Nm

[2] **Multi-turn actuator SAEx 35.1 with part-turn gearbox GS 630.3**

- Torques up to 675,000 Nm

Large torque range



AUMA actuators and actuator controls are widely used in process plants throughout the world. Their highly developed technology and proven reliability guarantee accurate long-term performance in a wide variety of applications.

Generation .2 represents a significant development for the increasing demands in process plants within the oil and gas industry. The modular structure provides the perfect combination of multi-turn actuators and appropriate actuator controls. Using standardised components, a customised solution can be developed for valve applications.

Anticipating the needs of tomorrow

Generation .2 is compatible with previous AUMA versions. The actuator controls and multi-turn actuators of different generations can be combined.

This ensures low-risk investments and guarantees that we will always be at the forefront of technological development.

Easy operation

- All operation and configuration options are presented on a large and easy-to-read display.
- User-friendly and multi-lingual menu navigation.
- Operation via local controls or wireless connection using PDA/laptop via AUMA ToolSuite.

Advanced diagnostic - avoiding down times

Permanent recording and analysis of all effective factors such as torque, temperature and vibration are possible. Deviations from specifications and limit excesses are recorded. The plant operator receives information about any situation which could lead to failures. This allows action to be taken thereby reducing down times. All events and signals are classified according to NAMUR guidelines.

Settings, operation processes and faults are recorded in a time-stamped event record which can be displayed whenever required.

Easy device integration

In parallel communication, up to 10 digital inputs and up to 12 output contacts offer a comprehensive interface to the DCS. The ACExC offers interfaces to all conventional fieldbus systems, including Profibus DP-V2, and supports the concepts for smooth device integration into the DCS, such as e.g. FDT/DTM.

Enhanced applications

- Undervoltage conditions up to –30 %
- Ambient temperatures between –60 °C and +70 °C

Improved handling and operation

The user friendliness for Generation .2 actuators was enhanced.

- The improved AUMA handwheel activation allows single-handed handwheel operation and valve position adjustment by applying minimal force. Activation of manual operation can be signalled to the control room.
- The AUMA motor plug/socket connection is now available throughout the complete Generation .2 series.
- One single adjustable reduction gearing set within the control unit for all conventional stroke ranges

Precision and control accuracy

An improved mechanical structure and reduced mechanical tolerances have led to improved control accuracy and extend the output speed range for modulating actuators.

Permanent reliability

Material selection, design and new manufacturing methods as well as the further enhanced corrosion protection ensure longer service life.

Flexibility and adaptation

The valve attachment for Generation .2 - implemented as standardised hollow shaft plug sleeve solution - allows flexible adaptation to the valve.

Safety

Support of plant specific safety concepts. Redundant fieldbus sub-assemblies and/or combined interfaces with parallel and fieldbus communication increase fail safe reliability. In cases of emergency, actuators can be positioned into predefined safety position via emergency inputs.

Approvals

AUMA actuators are approved for worldwide application in hazardous areas. They have been awarded with the approval of the leading oil and gas companies for use in their plants.

The environmental conditions in the oil and gas industry are extreme. Salt-laden air in offshore applications, aggressive atmospheres in refineries or rough operation - AUMA devices must operate reliably over many years without major maintenance requirements under all conditions.

For this reason, AUMA has focussed on making AUMA devices resistant to the most unfavourable conditions and has adapted protective measures to the state-of-the-art technology.

Enclosure protection IP 68

AUMA devices of Generation .2 are supplied with improved enclosure protection IP 68 in compliance with EN 60529. IP 68 means protection against submersion up to 8 m head of water for minimum 96 hours. During submersion, up to 10 operations are permissible.
In order to guarantee enclosure protection IP 68, suitable cable glands must be used. They are not part of the standard supply, but can be provided by AUMA on request.

Ambient temperatures

AUMA actuators are used in both hot and cold environments. Adapted versions with large temperature ranges are available to suit various ambient temperatures. Furthermore, the approved temperature ranges vary from one certification area to another. Refer to page 48 for detailed information.

Service conditions

AUMA actuators installed on a platform offshore the Malaysian coast

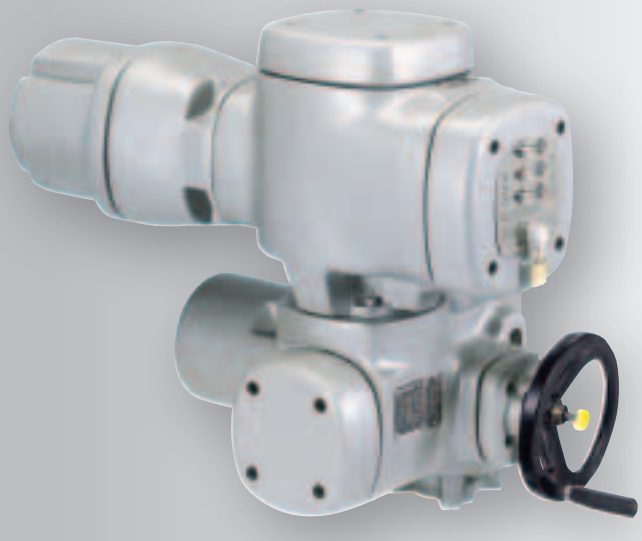
Corrosion protection

AUMA corrosion protection is outstanding in the world of actuators. Based on chemical preliminary treatment with subsequent double-layer powder coating of individual parts, the standard corrosion protection already efficiently protects against corrosion even under the most unfavourable conditions while providing high mechanical resistance. In compliance with the corrosivity categories according to EN ISO 12944-2, various AUMA corrosion protection levels are provided to suit the different applications.

Colour

The standard colour is silver-grey (similar to RAL 7037). Other colours are possible on request.

Classification of environments according to EN ISO12944-2 Atmospheric-corrosivity categories	AUMA		Location
	Corrosion protection class	Total film thickness	
C1 (very low): Heated buildings with clean atmosphere	KS	140 µm	Outdoor use of devices and for low atmosphere pollution
C2 (low): Unheated rooms and rural areas with low level of pollution			
C3 (medium): Production rooms with humidity and moderate pollution. Urban and industrial areas with moderate sulphur dioxide pollution			Use of devices in occasionally or permanently aggressive atmospheres with a moderate pollutant concentration
C4 (high): Chemical plants and areas with moderate salinity			
C5-I (very high, industrial): Permanently high condensation with high pollution	KX KX-G (aluminium-free)	200 µm	Use of devices in extremely aggressive atmospheres with high humidity and high pollutant concentration
C5-M (very high, marine): Permanently high condensation with high salinity and high pollution			Use of devices in extremely aggressive atmospheres with high humidity, high salinity and high pollutant concentration (e.g. cooling tower, offshore)



SAEx 07.2 with AMExC 02.1 in fireproof version

Fireproof actuators (option)

In case of fire, AUMA fireproof actuators can contribute a great deal to limiting the risks. The functionality, application possibilities, operation and user friendliness are comparable to non-fireproof actuators.

The special coating applied to these actuators renders the devices completely operational during minimum 30 minutes at a temperature up to 1,100 °C. Within this period of time, the corresponding valve can still be operated.

As an alternative, the actuators can be installed in fireproof boxes.

Open-close and modulating duty

Valves are subdivided in shut-off valves and modulating valves.

- In general, shut-off valves are either open or closed. They are rarely operated; when operated, they cover the complete stroke. The interval between two travels can amount to minutes or even to months. They are controlled by means of the binary signals OPEN and CLOSE. This type of duty is classified as open-close duty.
- Modulating valves are used to set a default variable being constantly verified and adjusted at short intervals. Control takes place by means of a continuous setpoint, e.g. a 0/4 – 20 mA signal. The time interval between two travels is a matter of seconds. This type of duty is classified as modulating duty.

Number of starts and motor duty types

Modulating duty and open-close duty subject the actuator to different mechanical loads. Accordingly, there are suitable actuators for all types of duty.

The types of duty in compliance with IEC 60034-1 and EN 15714-2 are typical distinction criteria. For modulating actuators, the permissible number of starts is indicated in addition (please also refer to page 43).

Multi-turn actuators for open-close duty

The type designation for AUMA multi-turn actuators for open-close duty is SAEx:

- SAEx 07.2 – SAEx 16.2
- SAEx 25.1 – SAEx 40.1

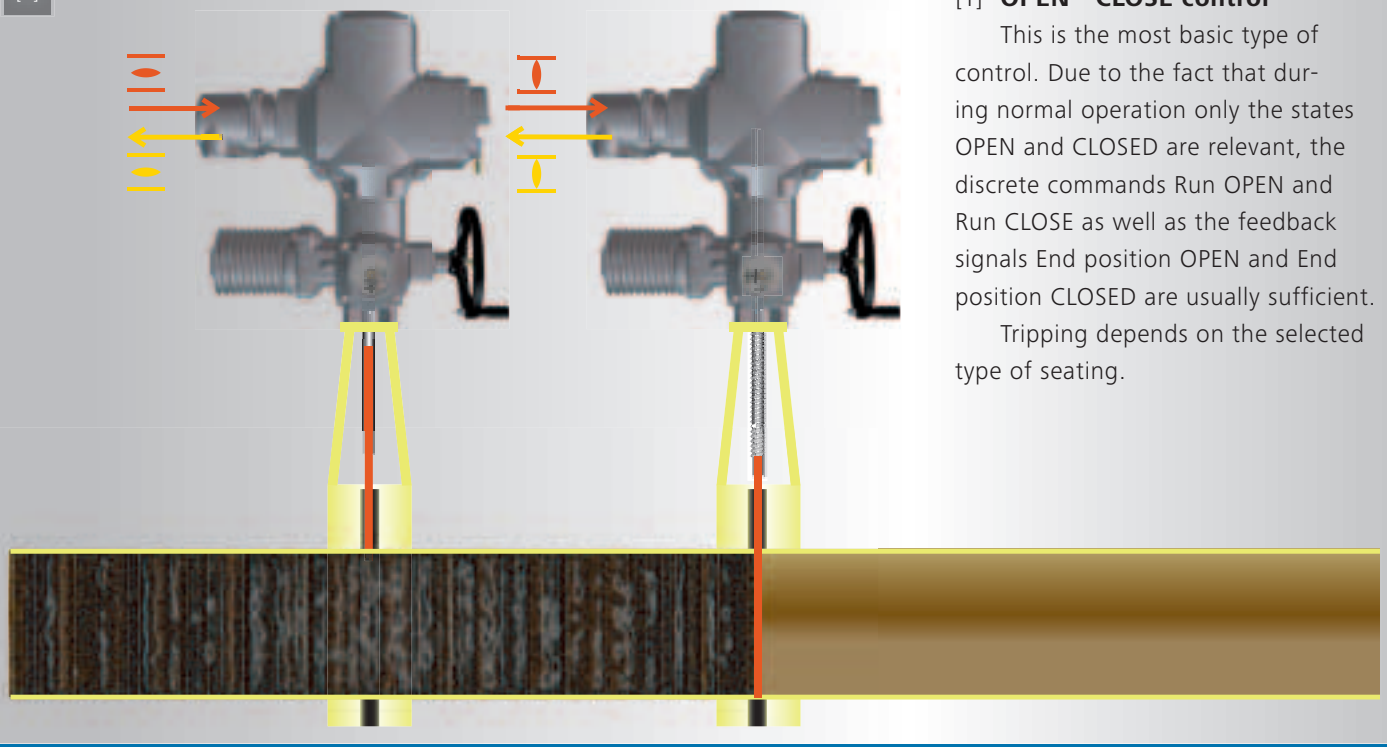
Multi-turn actuators for modulating duty

The type designation for AUMA multi-turn actuators for modulating duty is SAREx:

- SAREx 07.2 – SAREx 16.2
- SAREx 25.1 – SAREx 30.1

Basics - Main functions of actuators

[1]



[1] **OPEN - CLOSE control**

This is the most basic type of control. Due to the fact that during normal operation only the states OPEN and CLOSED are relevant, the discrete commands Run OPEN and Run CLOSE as well as the feedback signals End position OPEN and End position CLOSED are usually sufficient.

Tripping depends on the selected type of seating.

Switching off in the end positions

Irrespective of whether the actuator is operated in open-close or modulating duty, the device must automatically switch off when reaching an end position. Two different switch-off mechanisms are available and are applied depending on the type of valve.

- Limit seating
  As soon as the preset switching point in one end position is reached, the controls automatically switch off the actuator.
- Torque seating
  As soon as the preset torque is applied at the valve end position, the controls automatically switch off the actuator.

For actuators without integral controls, the type of seating must be programmed in the external unit. For actuators with AMExC or ACExC integral controls, the type of seating is selected in the integral actuator controls and may even differ for the two end positions.

Protective functions

Overload protection for the valve

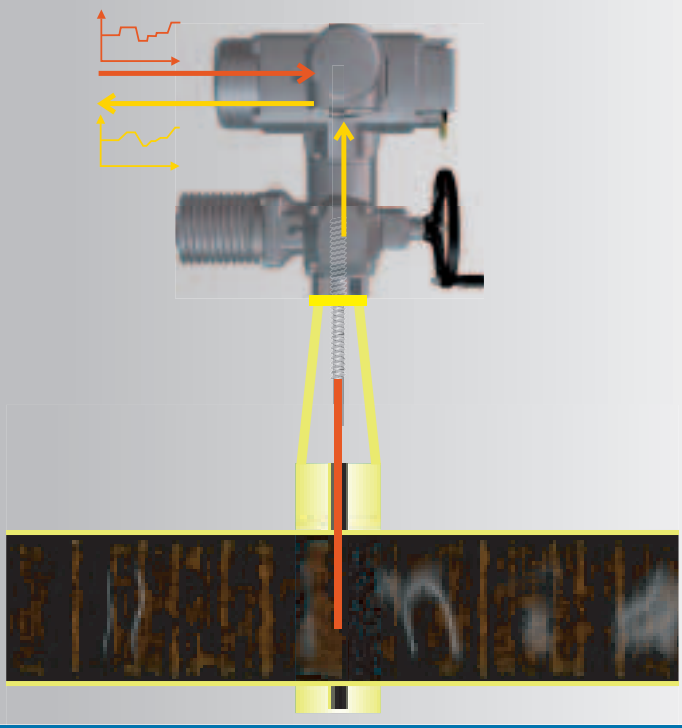
If an excessive torque is applied during travel, e.g. due to a trapped object or deposits within the valve, the controls switch off the actuator to protect the valve.

Thermal motor protection

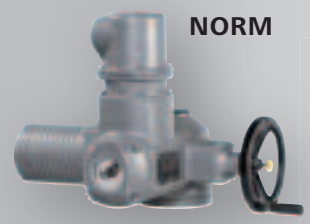
PTC thermistors or thermoswitches (as an option) in the motor winding trip as soon as the motor temperature exceeds 140 °C. Embedded within the controls, they optimally protect the motor winding against overheating.

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

[2]



[2] **Setpoint control**
The controls receive a position setpoint from the host DCS, e.g. as 0/4 – 20 mA signal. The integral positioner compares this value with the current valve position and controls the actuator motor as required until the offset value comes close to zero. The valve position is usually transmitted to the DCS.



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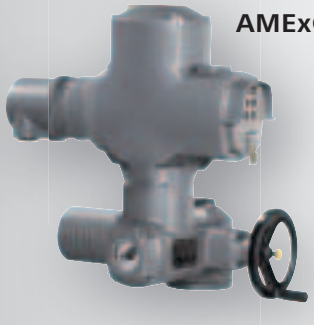
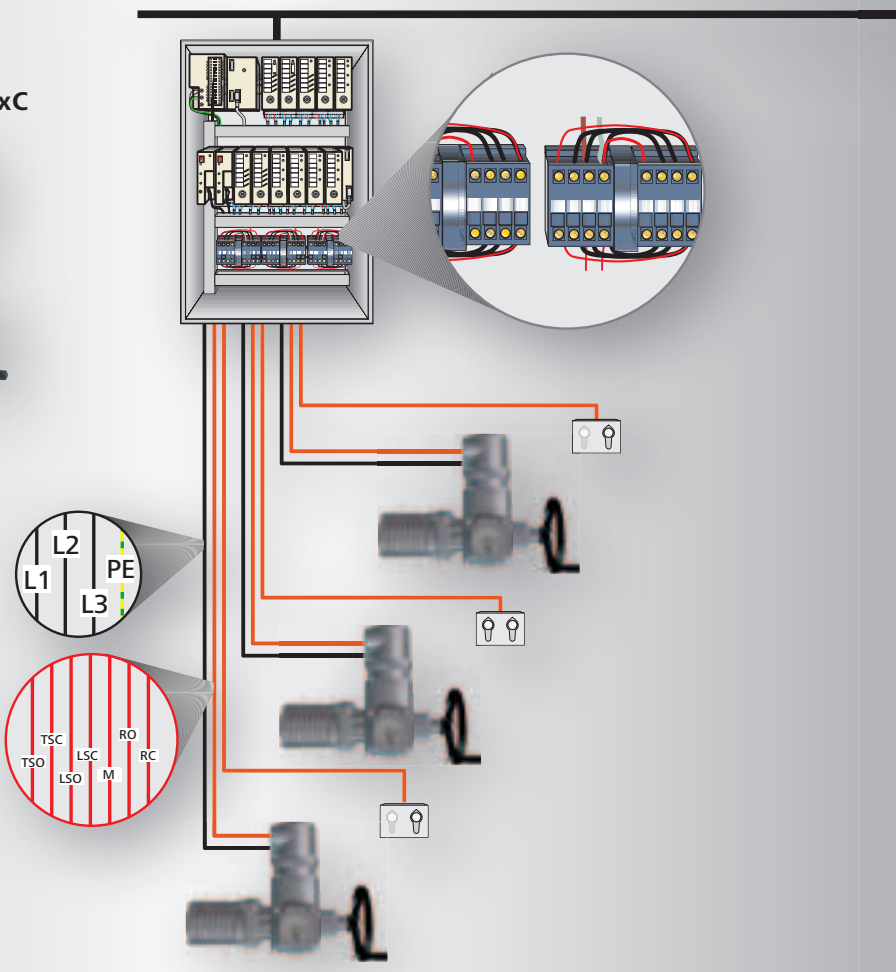


AMExC

ACExC



[1] **Power supply**
e.g. 400 V 3-phase AC current

Basics - Controls concepts

In principle, AUMA actuators may be integrated within any automation system. The state-of-the-art solution is to equip the actuator with integral controls to eliminate the time-consuming and costly engineering, installation and documentation for external controls. A further benefit in favour of integral controls is the easy commissioning.

External controls

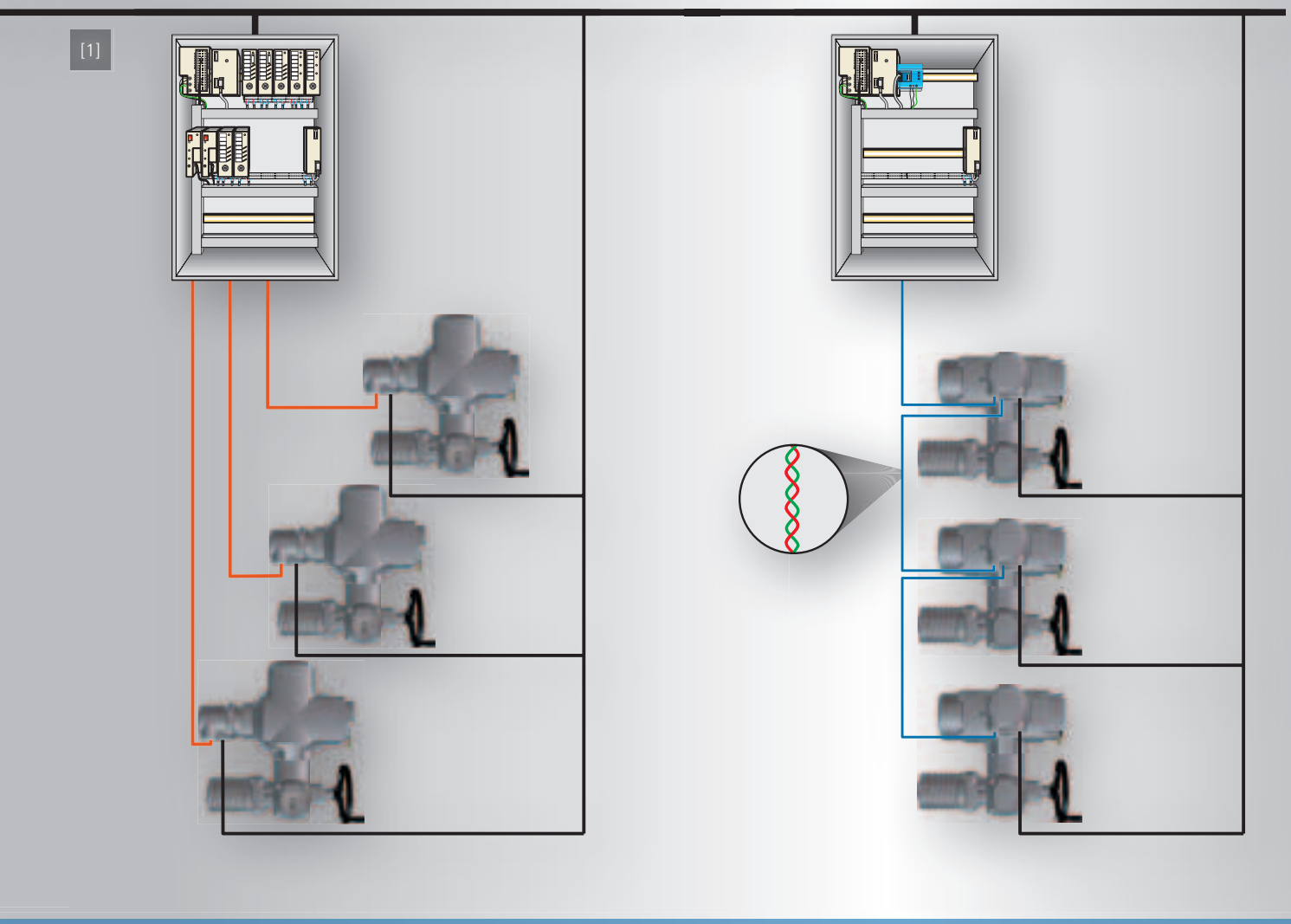
For this controls concept, actuators contain no or only few electronic components. All actuator signals, limit switch signals, torque switch signals, motor protection or valve position are centrally processed in an external PLC. During programming, care must been taken to consider the required protective mechanisms and to minimise delay time.

The switchgear for motor control is installed within a control cabinet and wired accordingly to the actuator.

If local controls are required, they have to be installed and programmed accordingly within the PLC.

In this configuration, AUMA actuators are designated as AUMA NORM.

[1]



Integral controls

Actuators with integral controls are immediately ready for use. The controls are perfectly adapted to the actuator. As soon as the power supply has been established, the actuator can be operated via the operating elements on the local controls.

The actuator can be completely set on site, without requiring direct connection to the DCS. Only operation commands and feedback signals are still exchanged between the control system and the actuator. Motor switching is performed within the device and without delay.

AUMA actuators can be supplied with AMExC or ACExC integral controls. Distinction between both is made in their functional features.

Fieldbus

By using a single data transmission medium for all signals from many devices, the structure of fieldbus systems can be kept very clear and simple.

While the control cabinet of commonly used systems is filled with input and output sub-assemblies, the fieldbus only requires a single interface.

Digitization of all data made it possible to extend functionality. This includes the field device setting via the DCS or request for all device data from the control room.

AUMA actuators with integral actuator controls are available with interfaces to all common fieldbus systems within process automation.

Integration within the DCS - AMExC and ACExC actuator controls

The integral controls evaluate the actuator signals and operation commands and automatically perform the required switching procedures without delay, using the installed switchgear, reversing contactors or thyristors.

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

The integral controls allow for local actuator operation.

AMExC and ACExC controls are compatible with other AUMA actuator series. From the DCS point of view, a homogenous appearance is created for different valve and actuator types.

Please refer to page 47 for a detailed overview of the controls' functions.

AMExC 01.1

The AMExC controls with their simple logic are the ideal solution wherever the requirement is limited to opening or closing valves, wherever conventional parallel signal transmission is used and data exchange is reduced to the absolute minimum.

At the time of commissioning, only a small number of parameters are defined via DIP switches, e.g. the type of seating.

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

Further options include a 3-point positioner allowing actuator control via the 0/4 – 20 mA signal and a simple Profibus DP or Modbus RTU interface.

ACExC 01.2

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

ACExC controls are equipped with a large and freely programmable parallel interface and/or interfaces to established fieldbus systems within process automation, including Profibus DP-V2.

The diagnostic functions comprise a time-stamped event report, torque characteristics logging, continuous recording of temperatures and vibration within the actuator and, furthermore, counting the number of starts and motor running times.

Further to the basic functions, they offer a number of options to meet special demands. These include torque bypass to unseat valves if tightly seated, functions for modifying operating times or special control functions, e.g. for direct positioning of multiport valve outputs.

With the development of the ACExC 01.2, particular emphasis was laid on user-friendliness and the ease of integration of actuators into the DCS. The large graphic display is used to perform menu-controlled programming of the controls, optionally using the AUMA ToolSuite via wireless Bluetooth connection. For fieldbus connections, ACExC programming can be performed from the control room.

Operation and clarity

Modern actuators can be adapted to special application requirements by a multitude of parameters. Monitoring and diagnostic functions generate signals and collect operating parameters.

For actuators with AMExC integral controls, the programming possibilities and the number of signals are limited. Accessing the considerably more detailed ACExC data is facilitated by the clearly structured and intuitive user interface.

The display structure is user-friendly, in plain text and available in a large number of languages.

Signals classified in compliance with NAMUR

During operation, the plant operators may be confused to receive device-specific signals. For this purpose, ACExC status signals are classified in compliance with NAMUR recommendation NE 107. Refer also to page 39.

Password protection

The ACExC password protection is an important safety feature. Especially if devices are freely accessible, non-authorised persons are not able to perform any modifications.

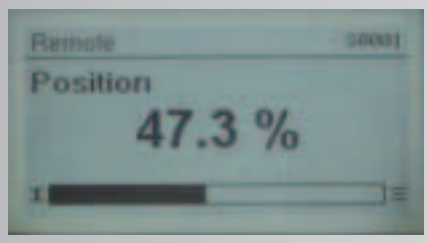
[1] **Backlit display**

The graphic display shows texts and graphic elements as well as characteristics. The display is permanently lit; during use the backlight shines brighter.

[2] **Indication lights**

Visual actuator signals via indication lights can be programmed. Signals, which are required to be recognisable from a long distance, can be assigned accordingly. The default factory signal setting is: End position CLOSED (yellow), end position OPEN (green), torque fault OPEN, torque fault CLOSE and motor protection tripped (all red).

[5]



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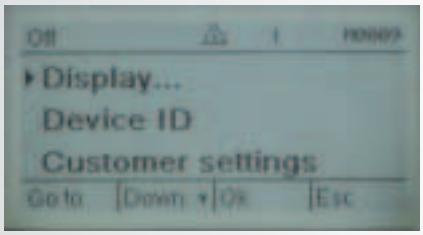

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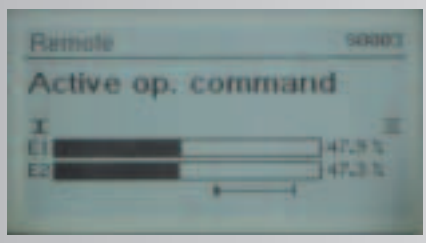

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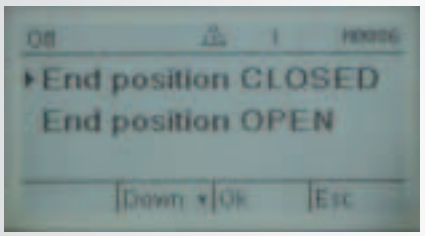

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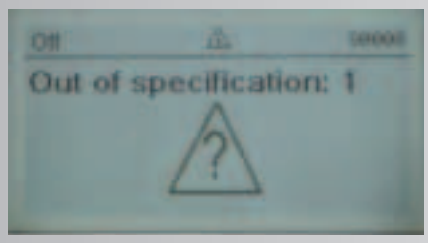

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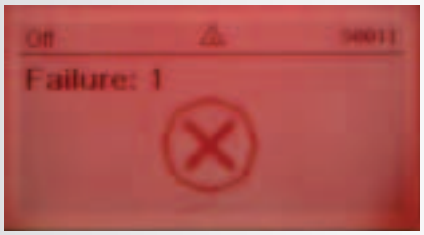


[3] **Selecting the control mode**

The selector switch LOCAL - OFF - REMOTE is used to define whether the actuator is operated from remote or via the local controls. In OFF position, hold down the RESET button for a few seconds to enter the programming menu.

[4] **Operation and programming**

Depending on the selector switch position, the push buttons enable either electric actuator operation, status signals requests or menu navigation.

[5] **Displaying the valve position**

The large display allows the operator to read the valve position even from a long distance.

[6] **Displaying operation commands/setpoints**

Operation commands and setpoints emitted from the DCS can be displayed.

[7] **Diagnostic/monitoring displays**

Actuator operation is subjected to special basic conditions. They are permanently monitored. When exceeding permissible limits e.g. temperature, the ACExC generates a warning signal. Exact values can be requested via the display.

[8] **Main menu**

The main menu allows actuator data requests and operation parameter modifications.

[9] **Non-intrusive setting**

If the actuator is equipped with an electronic control unit, the end positions and tripping torques can be set using the display without opening the device housing or using setting tools.

[10] **Failure**

In case of failure, the colour of the display colour changes to red. The cause for failure can be requested via the display.

For actuators with AMExC or ACExC integral controls, all settings can be directly performed at the actuator. If the actuator is equipped with an electronic control unit and an ACExC, settings are made via the display, without opening the housing.

Alternatively, actuators with ACExC can be configured via the AUMA ToolSuite Commissioning and Diagnostic Tool (CDT). This tool allows clearer presentation of parameters and actuator data. Furthermore, it converts a PDA or a laptop to a remote control for the actuator.

AUMA ToolSuite database

Actuator data can be archived in the AUMA ToolSuite database. This supports, for example, an available Plant Asset Management System. If an ACExC has to be replaced, all database parameters can be uploaded to the replacement device, thus quickly restoring the previous functionality.

AUMA ToolSuite diagnostic tool

AUMA ToolSuite is the ideal tool to analyse the time-stamped ACExC event report or to compare torque characteristics taken at different points in time. This allows reliable comparisons of previous operations of actuator and valve.

Wireless connection

Connection between actuator and programming device is based on Bluetooth standard, supported by most laptops or PDAs. The connection is password-protected to exclude any unauthorised access.

The addressed actuator indicates the access via a blue indication light. The device can be clearly identified due to the works number or a customer-specific name assignment.

AUMA ToolSuite for testing the Fieldbus interface

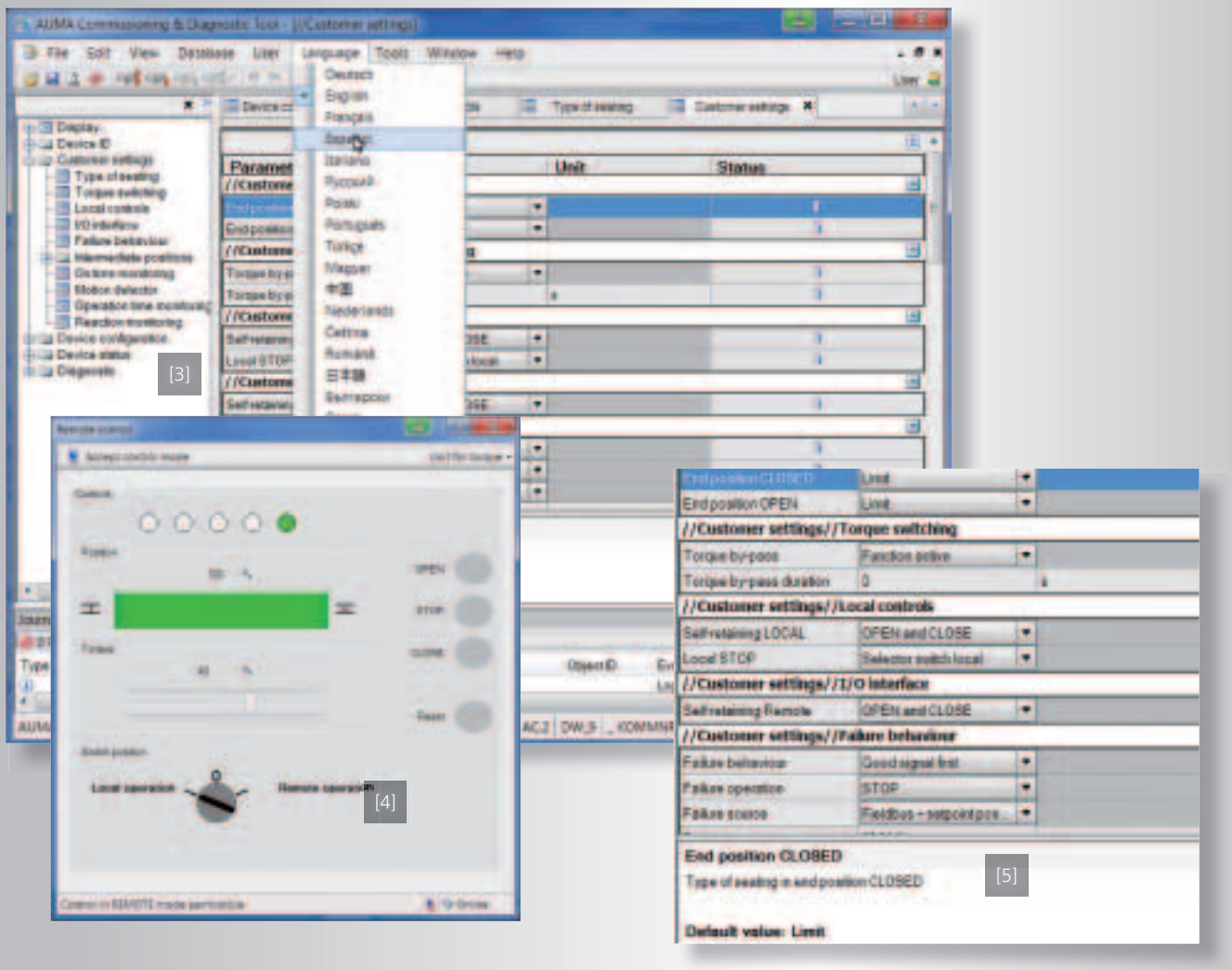
The AUMA ToolSuite is used to test correct functioning of the fieldbus interface within the actuator. From the actuator point of view and for the duration of the test phase, the laptop equipped with the AUMA ToolSuite will take over the master function.

Operation and clarity - AUMA ToolSuite for the ACExC

AUMA ToolSuite functions

- Programming the operation parameters
- Reading all operational data
- Reading the event report
- Actuator operation
- Archiving the ACExC data in a database
- Transferring parameter data from the database to the ACExC
- Testing the Fieldbus interface

AUMA ToolSuite and display texts of the ACExC are currently available in more than 30 languages, such as Arabic, Chinese, English and Russian.



[1] **AUMA ToolSuite for laptop**

System requirements

- Bluetooth interface
- Windows XP, Windows Vista, Windows 7

[2] **AUMA ToolSuite for PDA**

System requirements

- Bluetooth interface
- Windows Mobile

[3] **Programming via AUMA ToolSuite**

The parameter display is more comfortable in the AUMA ToolSuite than on the ACExC display. The parameters may only be changed when entering a password.

[4] **Remote control**

The remote control allows actuator operation via AUMA ToolSuite. At the same time, all indication light signals and all status signals which can be displayed on the ACExC display can also be clearly shown.

[5] **ToolTips**

The AUMA ToolSuite supplies an explanation for each selected parameter.

Database

All parameters, operating data, events, product data can be archived in a database.

Event report

The AUMA ToolSuite allows clear presentation of the event report. It is possible to select events according to definable criteria using a search function.

Although the mechanical interfaces between actuators and valves have been standardised for many decades and are stable, there are a multitude of different interfaces to the DCS. In spite of efforts for standardisation, communication technology is subject to constant improvement due to continuous developments within the electronics sector.

Due to the modular product range, AUMA are in a position to offer an interface for any system, from the AUMA NORM actuator without integral controls to the actuator with ACExC controls, programmable from the control room via fieldbus.

Furthermore, the AUMA modularity makes it possible to upgrade AUMA actuators to a new DCS.

Parallel signal transmission to the DCS - AMExC

For the AMExC, all input and outputs are hard wired. Please refer to the terminal plan for respective assignment.

- Three binary inputs for the control commands OPEN, STOP, CLOSE
- Five binary outputs with the following assignments: End position CLOSED, end position OPEN, selector switch in REMOTE, selector switch in LOCAL, collective fault signal
- Alternatively to the control inputs, an analogue 0/4 – 20 mA input for positioner control
- As an option, an analogue 0/4 – 20 mA output for remote position indication.

The binary inputs and outputs are potential-free, the analogue output is galvanically isolated.

Communication - Tailor-made interfaces

AUMA actuators with fieldbus interface installed on a multiport valve within a manifold

Parallel signal transmission to the DCS - ACExC

The ACExC offers a large number of feedback signals. The plant operator decides which signals are to be transmitted. Assignment of outputs and inputs, if available, can be modified at a later date with the ACExC device setting.

Depending on the version, the ACExC provides:

- Up to ten binary inputs
  e.g. operation commands OPEN, STOP, CLOSE; intermediate position control; release signals for the local controls, emergency commands, etc.
- Up to twelve binary outputs
  e.g. for feedback of end position, intermediate positions, selector switch position, failures, etc.
- Up to two analogue inputs (0/4 – 20 mA)
  e.g. setpoint for controlling the positioner
- Up to two analogue outputs (0/4 – 20 mA)
  e.g. for feedback of valve position or torque

The binary inputs and outputs are potential-free, the analogue outputs are galvanically isolated.

Serial communication

From the fieldbus point of view, the ACExC is state-of-the-art. AUMA permanently keep track on further developments of fieldbus protocols and consequently implements all elements of vital importance for the valve automation applications.

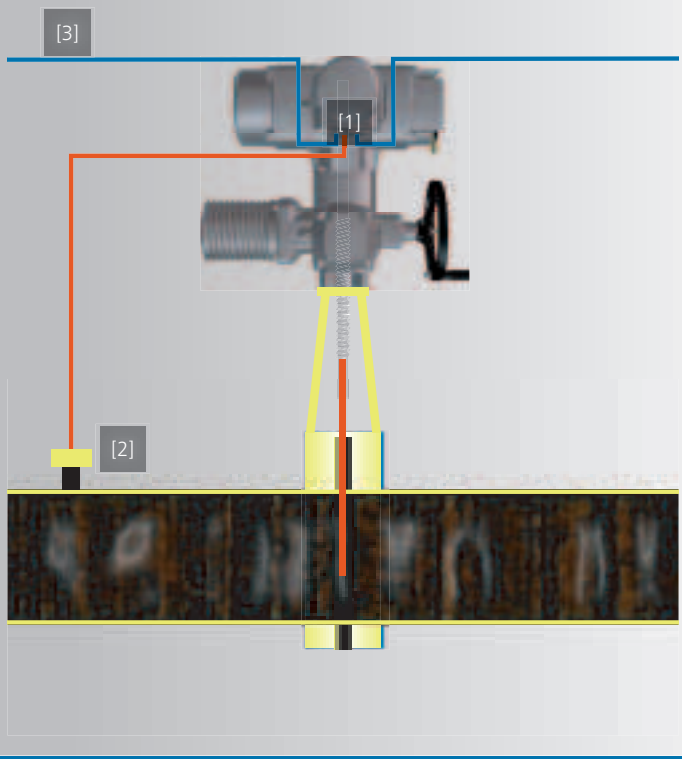
One key advantage is that the ACExC is fully upgradable and can thus be adapted to new developments.

Controls are available with the following fieldbus interfaces:

	AMExC	ACExC
Profibus DP	■	■
Profibus DP-V1 and DP-V2	–	■
Modbus RTU	■	■
Foundation Fieldbus	–	■

Fieldbus interfaces can be combined within a device equipped with parallel interfaces.

For further information on fieldbus systems, please refer to the following pages.



ACExC as fieldbus data transmitter

As an option, an ACExC with fieldbus interface can be supplied with four binary and/or two analogue inputs [1]. They are used to connect conventional sensors [2] to the ACExC. The ACExC processes the sensor data for transmission via the fieldbus [3].

Profibus

Profibus offers a complete family of fieldbus versions; Profibus PA for process automation, Profinet for data transmission on Ethernet and Profibus DP for automating plants and machines. Due to its simple and robust physical layer (RS-485) and the different service levels DP-V0 (fast cyclic and deterministic data exchange), DP-V1 (acyclic access to device parameters and diagnostic data) as well as DP-V2 (further functions such as time stamp or redundancy), Profibus DP is the ideal solution for plant automation.

- International standard (www.profibus.com)
- Worldwide availability
- Large number of units installed
- Standardised integration within the DCS (FDT, EDD)
- Large selection of devices

Modbus

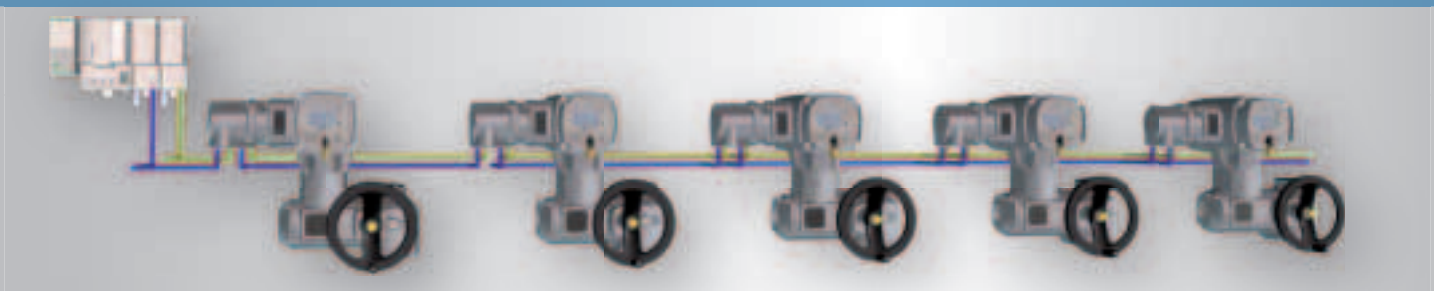
Modbus is a comparatively simple but multi-functional fieldbus protocol. It offers all services required for plant automation (e.g. exchange of simple, binary information, analogue values, device parameters or diagnostic data).

For plant automation, the simple and robust physical layer RS-485 is often used.

On the basis of this physical layer, Modbus supports various telegram formats (e.g. Modbus RTU or Modbus ASCII). Using the Modbus TCP/IP version based on Ethernet, the vertical integration into a host automation system is simplified.

- International standard (www.modbus.org)
- Simple protocol
- Widely implemented
- Largely sufficient for many simple automation tasks

Communication - Fieldbus



For Profibus DP and Modbus RTU, the basic topology is the line/tree structure via RS-485.

AUMA actuators and Profibus DP

- Supports Profibus DP-V0, DP-V1 and DP-V2
- High speed data exchange (up to 1.5 Mbit/s - corresponds to approx. 0.3 ms/actuator)
- Integration within the DCS via FDT or EDD
- Cable length up to approx. 10 km (without repeater up to 1,200 m)
- Up to 126 devices can be connected
- Redundant line topology as an option
- Additional parallel communication to safety PLC as an option

AUMA actuators and Modbus RTU

- Fast data exchange (up to 115.2 kbit/s - corresponds to approx. 30 ms/actuator)
- Cable length up to approx. 10 km (without repeater up to 1,200 m)
- Up to 247 devices can be connected
- Redundant line topology as an option
- Additional parallel communication to safety PLC as an option

Foundation Fieldbus

The basic idea behind Foundation Fieldbus (FF) is to quit the classic master - slave concept and to distribute the tasks within the automation system to the components involved. For this reason, Foundation Fieldbus is more than a conventional fieldbus system.

This leads to the following consequences:

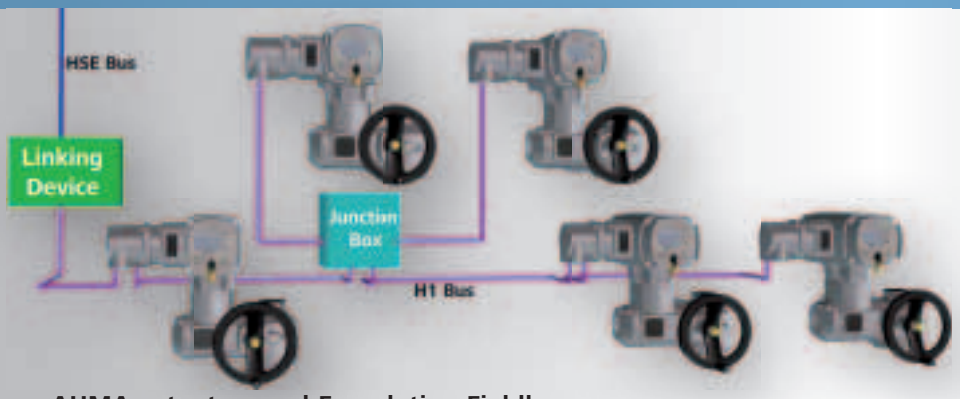
- Information is no longer bidirectionally exchanged between field device and master: all information is generally available to all participants.
- There is no longer a central master processing the fieldbus data
- The schedule of the bus communication is controlled by the "Link Active Scheduler" (LAS) ensuring structured fieldbus communication.
- Integration within the DCS via standardised function blocks

Wireless

Radio transmission is based on wireless communication standard IEEE 802.15.4 (ISM band). Communication provides a coding to protect the data transfer and parameterization of field devices against unauthorised modification.

The network organises itself (mesh network). Simply enter a network ID to add a field device to an existing network; the topology will organise itself automatically. If participants are separated in space, even larger distances can be covered as the intermediate participants act as repeaters.

If one participant fails as transmission medium, transmission is automatically established via another participant.



AUMA actuators and Foundation Fieldbus

- AUMA actuators support the FF-H1 version
- Data exchange at 31.25 kbit/s, typical cycle times 500 ms – 2s, depending on the number of devices
- Cable length up to approx. 9.5 km (without repeater up to 1,900 m)
- Up to 240 devices can be connected
- HSE bus: Connection to DCS
- Linking device: Connection HSE - H1 bus
- Junction box: Signal amplification, allows branching

AUMA as system integrator

AUMA not only possesses the expertise to manufacture actuators but also has the ability to perfectly integrate actuators into any automation environment.

For this, the SIMA Master Station is a key element. The SIMA Master Station works with open fieldbus protocols such as Profibus DP or Modbus RTU.

- SIMA MS as commissioning system allows for independent commissioning of the connected actuator network.
- SIMA MS as network manager controls the communication to the field devices, including redundant data channels.
- SIMA MS as data concentrator facilitates data access of the connected actuators. Data transmission to the control room only comprises information required for regular operation.
- In the event of failures, the SIMA MS as diagnostic tool supports fast fault identification and remedy.
- SIMA MS as a protocol converter is used to adapt the actuator network to the available interfaces of the DCS.

[1] **SIMA Master Station**

The SIMA MS is based on standardised industrial computer components and has been expanded by the required fieldbus interfaces. The entire hardware is integrated in a solid 19" industrial housing with EMC protection. The SIMA MS is available both with or without touchscreen.

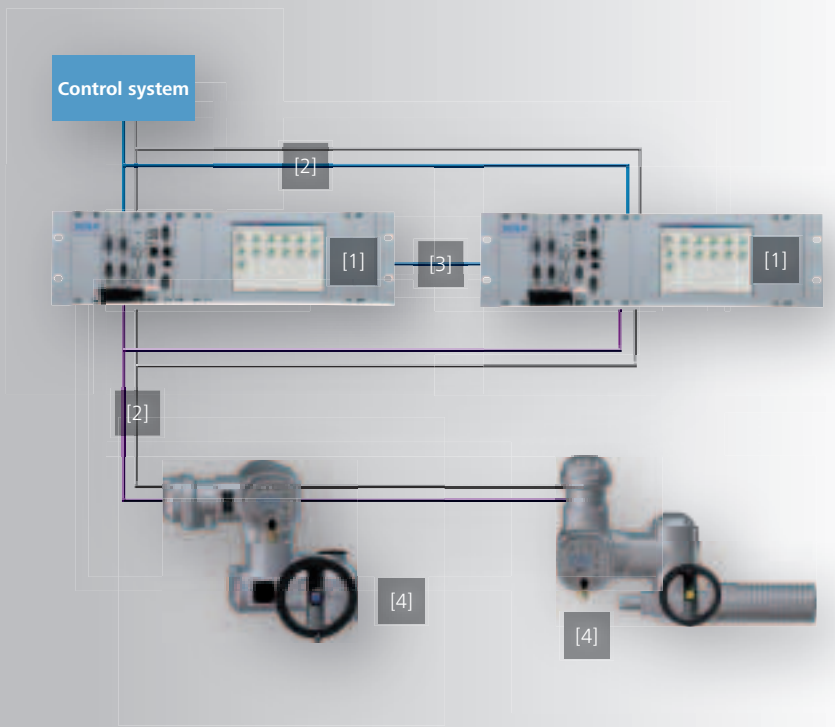
[2] **Communication**

For the communication with field devices, SIMA MS supports standardised fieldbus protocols such as Profibus DP or Modbus RTU. The cable types specified in the fieldbus standards are used as transmission medium.

Up to 32 devices can be connected to a single bus segment; when using repeaters, up to 247 devices are possible.

Communication with the DCS can be performed via Modbus RTU or Modbus TCP/IP. Moreover, customised RS-232 solutions can be implemented.

Communication - Device integration



[3] **Redundancy**

SIMA supports various redundancy concepts. Both redundancy to the AUMA field devices and/or to the DCS and also SIMA master redundancy are possible. In case of loss of communication or master failure, automatic change-over to the redundant component will be performed.

[4] **AUMA actuators**

The SIMA is designed for the control of AUMA actuators. Communication is performed according to standardised fieldbus protocols such as Profibus DP or Modbus RTU.

Redundant Modbus RTU loop

With the SIMA Master Station, AUMA offers the ideal solution to cover large distances - this might occur for tank farms - with simultaneous data channel redundancy. Costly glass fibre technology is not required; in spite of the long network cable length of up to 296 km, standard RS-485 fieldbus cables can be used for data transmission (see illustration below).

Wireless

A further option for data exchange via large distances is offered by the wireless technology. AUMA actuators with ACExC integral controls and SIMA are available with wireless interfaces.

Modbus RTU in redundant loop topology with SIMA Master Station

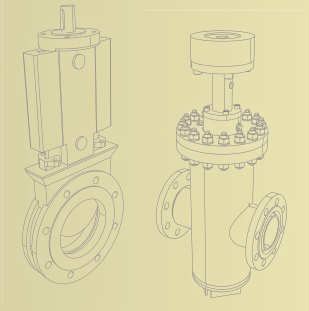
- Redundant loop topology via RS-485
- Fast data exchange (up to 115.2 kbit/s - corresponds to approx. 30 ms/actuator)
- Length of cable up to 296 km
- Up to 247 devices can be connected
- Automatic slave address assignment to all actuators
- Automatic setting of desired data transmission rate at all actuators
- Redundant communication to the DCS as an option
- Redundant SIMA Master Station as an option
- Additional parallel communication to safety PLC as an option

With AMExC integral controls
Simple controls for OPEN - CLOSE applications

NORM actuators
SAEx 07.2 – SAEx 16.2
SAEx 25.1 – SAEx 40.1

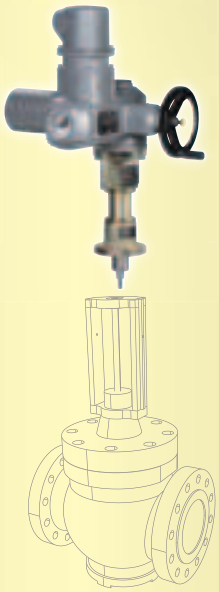
- Torques: 10 Nm – 16,000 Nm
- Automation of gate and globe valves

Combinations with multi-turn gearboxes GST or GK

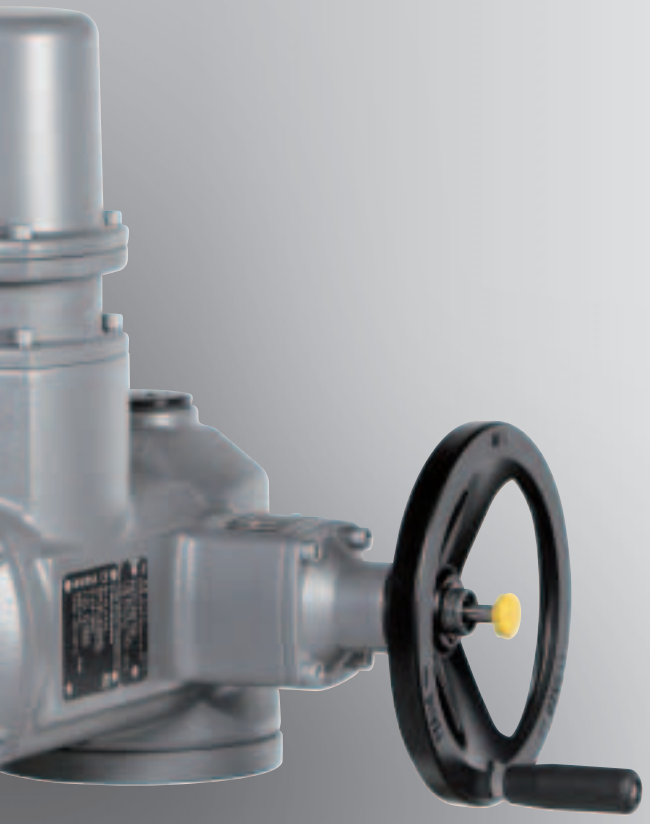


- Torques: up to 16,000 Nm
- Automation of gate and globe valves, solutions for special installation conditions

Combinations with linear thrust unit LE



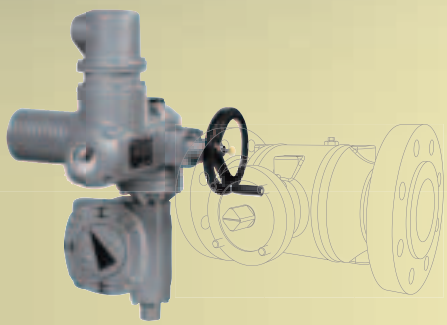
- Thrusts:
  Between 4 kN and 217 kN
- Strokes: 50 mm – 500 mm
- Automation of globe valves



With ACExC integral controls

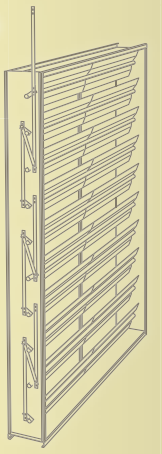
Microprocessor based controls for functionally sophisticated applications and/or for integration of actuators into fieldbus systems

Combinations with part-turn gearboxes GS



- Torques: up to 675,000 Nm
- Automation of butterfly valves and ball valves

Combinations with lever gearboxes GF



- Torques: up to 45,000 Nm
- Automation of butterfly valves with lever arrangement

[1] **Multi-turn actuator AUMA NORM**

The basic AUMA NORM actuator consists of the following components: motor, worm gearing, control unit, handwheel for emergency operation, electrical connection and valve attachment.

For normal operation, AUMA NORM actuators require external controls with switchgear and appropriate logic.

Usually, the NORM actuator is supplied with integral controls AMExC or ACExC. Due to the modular design principle, the controls are connected to the actuator via a simple plug/socket connection.

[2] **Motor**

3-phase AC and 1-phase AC motors with high starting torques, developed especially for valve automation. Thermal protection is ensured by PTC thermistors of thermoswitches.

A dog coupling for torque transmission and an internal motor plug/socket connector allow for fast replacement in the event of service requirement.

Refer also to page 43.

[3] **Control unit**

Determining the valve position and setting the valve end positions/torque recording to protect the valve against overload. Depending on customer specification, a control unit is installed either as electromechnical or electronic version.

[3a] **Control unit - electromechanical version**

Travel and torque are mechanically recorded; microswitches are operated when reaching the tripping points. The tripping points for both end positions and the tripping torques for both directions are mechanically set.

As an option, the valve position can be transmitted as continuous signal to the control room.

[3b] **Control unit - electronic version**

High-resolution magnetic transmitters replace the switching units; they are analysed with the ACExC controls. Valve settings are made via the control panel without opening the housing. Valve position and torque are transmitted as continuous signal.

The electronic control unit requires the use of ACExC integral controls.

For further information, please refer to pages 34 and 42.

[4] **Diagnostics (option)**

Continuous recording of torque curve, actuator operating time, number of starts, vibration as well as gearbox and motor temperatures. This data with time stamp is saved and analysed within the ACExC and forms the basis for advanced diagnostics and a preventive maintenance schedule (please also refer to page 38).

[7] **Integral controls (option)**

Contrary to the NORM version, actuators equipped with AMExC or ACExC integral controls are immediately ready for operation. The integral controls contain switchgear units, power supply unit, interface to the DCS and the ability to process control commands and actuator feedback signals. The actuator is operated on site via the local controls.

The electrical connection between integral controls and actuator is made by using a quick release plug/socket connector.

For further information on controls, please refer to pages 14 and 45.

[7a] **AMExC**

Controls comprising easy logic to process limit and torque signals as well as the control commands OPEN, STOP, CLOSE. Three indication lights at the local controls indicate the actuator status.

[7b] **ACExC**

Microprocessor based controls with comprehensive functionality and configurable interface. A graphic display indicates the actuator status in more than 30 language options. When combined with the electronic control unit, all settings can be performed without opening the housing. The programming via menu navigation is made directly at the device or wireless via Bluetooth with the AUMA ToolSuite.

ACExC controls are ideal for the challenging actuator integration into complex control systems. Supports Plant Asset Management.

[8] **Switchgear**

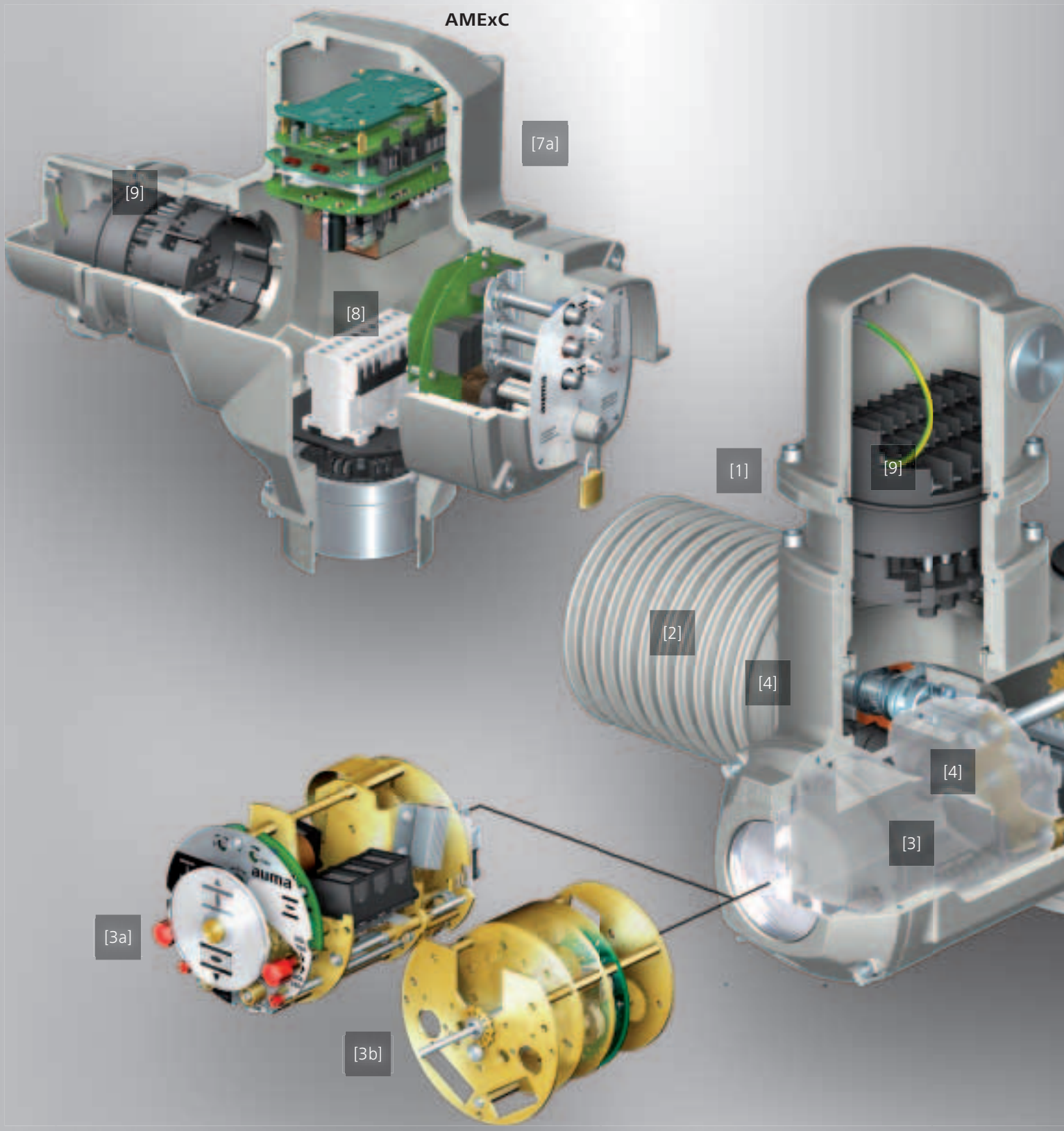
As standard, reversing contactors are used for power switching. If modulating actuators are expected to perform a high number of starts, we recommend using thyristor units not subject to wear (also refer to page 46).

[9] **Electrical plug/socket connection**

Identical principle for all configurations, whether with or without integral controls. During maintenance work, the wiring remains undisturbed; electrical connections can be quickly removed and reconnected.

This reduces down times and avoids wiring faults when reconnecting.

All electrical connections are double sealed, i.e. there is an additional sealing between terminal compartment and the interior of the controls [9b] (refer also to pages 32 and 44).


AMExC
[7a]
[9]
[8]
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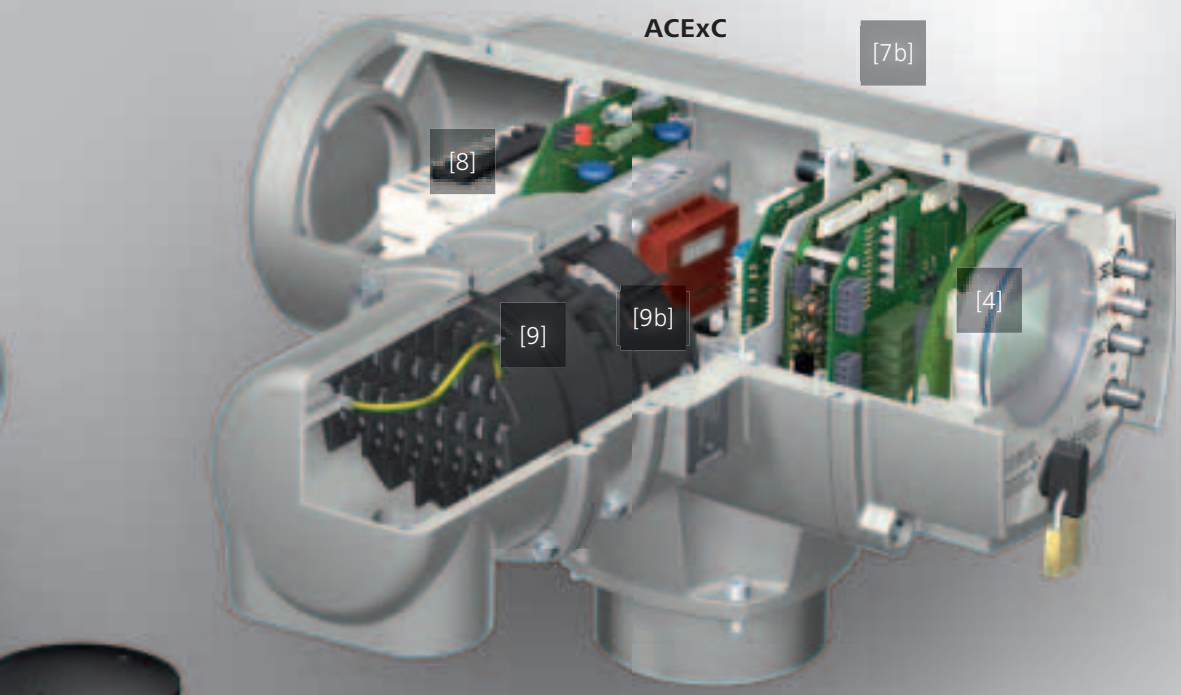
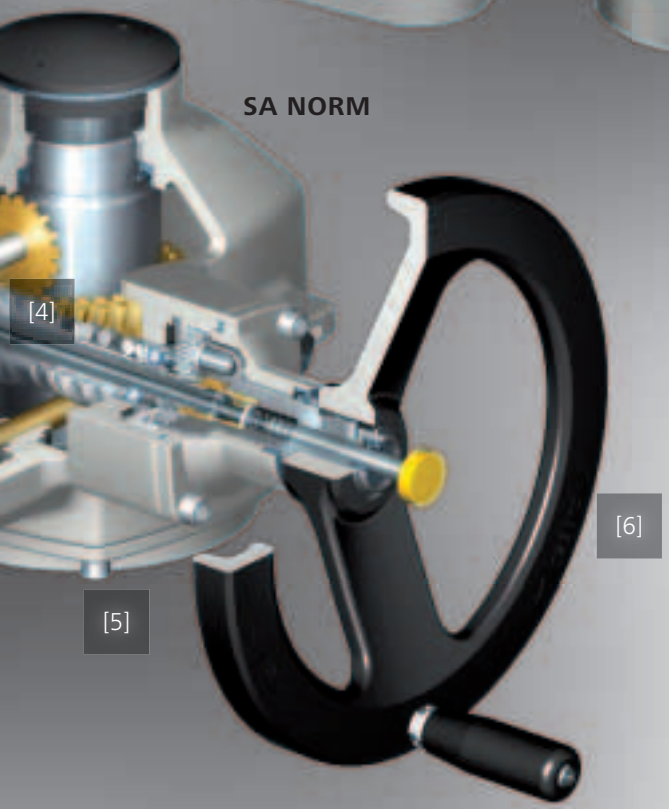




[6] **Handwheel**

Handwheel for emergency operation in the event of power failure. Handwheel activation and handwheel operation require minimal effort. Activation and operation can be performed using just one hand.

Switching on the motor deactivates manual operation, the handwheel does not rotate during motor operation.

The self-locking effect is maintained even during manual operation.

Options:

- Microswitch signals activation of manual operation to controls
- Locking device to protect against unauthorised use
- Handwheel extension
- Adapter for connecting a power tool in case of emergency

[5] **Valve attachment**

According to EN ISO 5210 or DIN 3210. Various output drive types are available.

Refer also to page 33.

[1] **Electrical connection**

The electrical plug/socket connector is an essential component of the modularity and forms a separate unit. The different connection types are compatible throughout all type ranges and can be used for actuators with or without integral controls. All electrical connections are double sealed.

[1a] **Plug/socket connector**
KP with screw-type terminals (standard)

With optimised arrangement of the three cable entries and enlarged terminal compartment. Apart from connection terminals for power supply, the KP connector is equipped with 38 screw-type connectors for signal cable connection.

[1b] **Plug/socket connector**
KES with terminal blocks (option)

Contains up to 48 terminal blocks to for signal cable connection. Use for voltage ranges exceeding 525 V and/or if many terminal connectors are required. The electrical connection has up to 6 cable conduits.

[1c] **Plug/socket connector KES**
with FO cable coupler (option)

Always in combination with ACExC controls and signal transmision via FO cable. An FO cable coupler is installed instead of the terminals.

[1d] **Plug/socket connector KES**
with flameproof enclosure (option)

In basic version, this connection corresponds to explosion protection 'increased safety'. As an option, all KES connections can be supplied enclosure protection ‘flameproof enclosure’.

[2] **Valve attachment**

Mechanical interface to the valve, in compliance with ISO 5210 or DIN 3210.

[2a] **Plug sleeve with splines**

The plug sleeve solution allows for flexible adaption to all output drives. For output drives B1, B2, B3 or B4, the plug sleeve is provided with the appropriate bores and keyways.

[2b] **Output drive type A**

Stem nut for rising, non-rotating stems. The mounting flange together with the stem nut and thrust bearings form an assembly, which is suitable for accepting thrust.

[2c] **Output drive type AF**

Similar to type A, this stem nut is additionally spring-loaded. The springs compensate for dynamical axial forces when operating at fast speeds and even for thermal expansion of the valve stem.

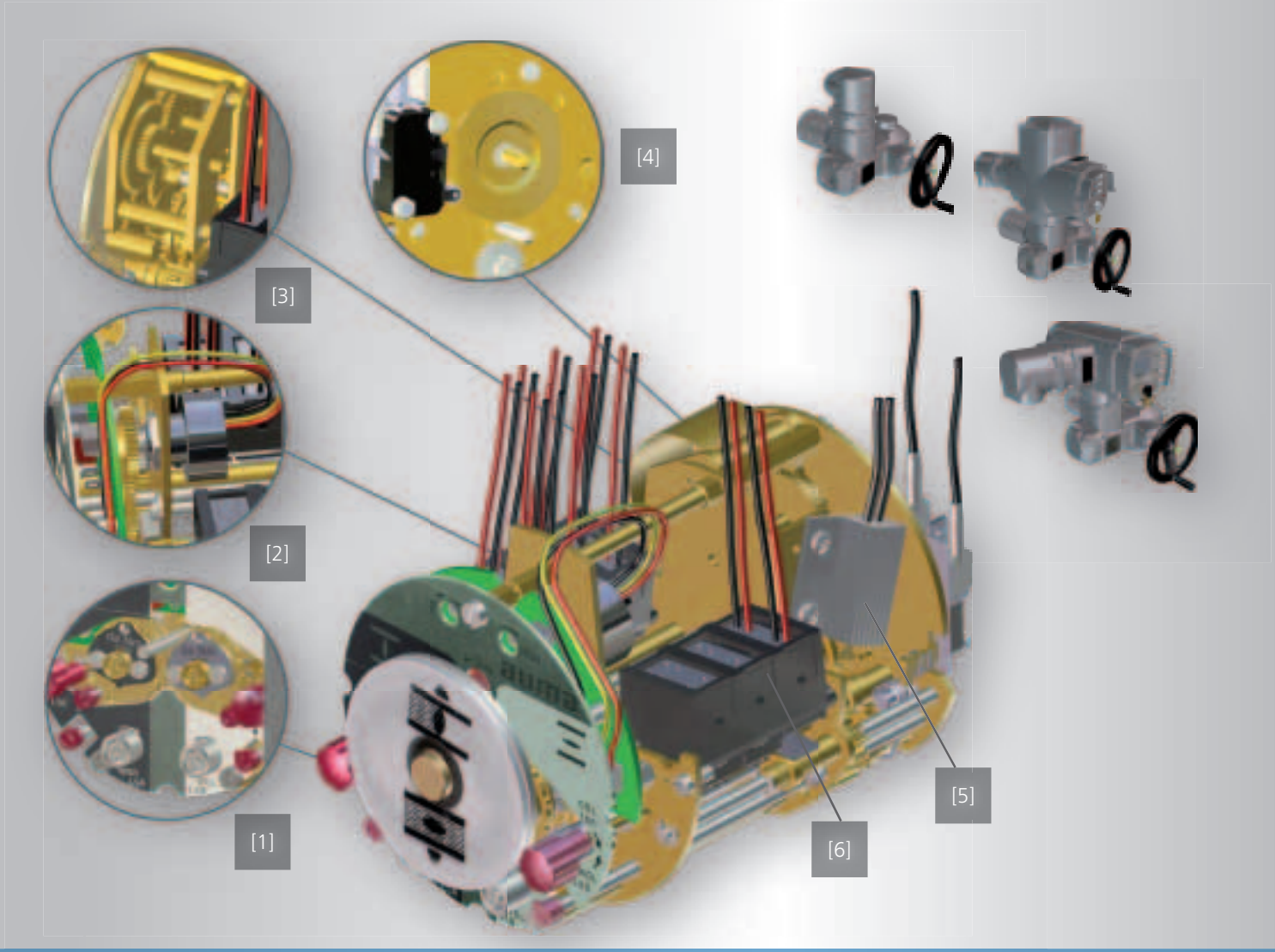
Special output drive types (not shown)

- Pendulum stem nut AK,
- Galvanically isolated output drive types IB1 and IB3, e.g. for piping with cathodic corrosion protection

For detailed information on special output drive types refer to separate data sheets and price lists.

[3] **Anti-backdrive device**

To be used when self-locking is essential e.g. for high speed actuators. The anti-backdrive device inhibits any valve displacement in case external forces act upon the closing element. This way, the use of brake motors is not required. The unit is mounted between the actuator and valve.



Electromechanical control unit

[1] **Limit and torque switch setting**

After removal of the housing cover and the mechanical position indicator, all setting elements are freely accessible (also refer to page 42).

[2] **Remote position transmitter (option)**

The remote position transmitter is used to inform the DCS of the valve position (also refer to page 43).

[3] **Reduction gearing**

The adjustable reduction gearing is required to reduce the valve stroke to the registration range of the poten-tiom-eter and the mechanical position indicator.

[4] **Blinker transmitter for running indication**

Throughout full travel, the segment washer operates and releases the blinker switch (also refer to page 42).

[5] **Heater**

The heater minimises condensation within the switch compartment (also refer to page 45).

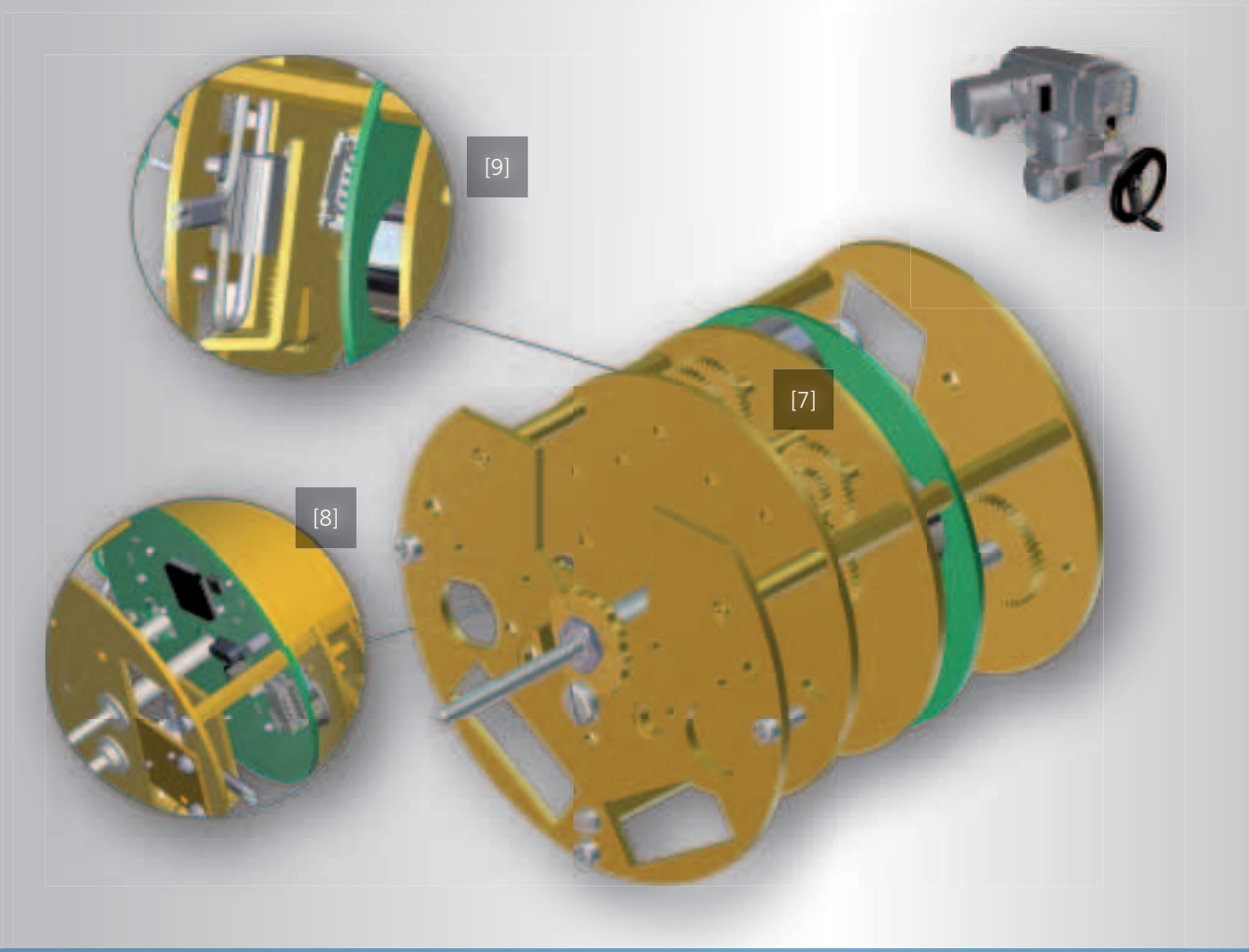
[6] **Microswitches**

Upon reaching an end position or when exceeding the tripping torque, the respective microswitch is operated.

In the basic version, one limit switch each is available for the end positions OPEN and CLOSED and one torque switch for the directions OPEN and CLOSE (also refer to page 42). For switching two different potentials, tandem switches with two galvanically isolated compartments can be integrated.

DUO limit switching

As an option, a switching unit with intermediate switches can be installed for each direction to set one fur-ther switching point for each direction, as required.



Electronic control unit

The electronic control unit and the ACExC controls allow for end position and tripping torque setting via the local controls of the ACExC - without opening the housing.

[7] **Absolute encoder - Limit**

The position of four gear stages represents the current valve position. Limit sensing is done mechanically and even functions in the event of power failure. Thus, battery back up is not required.

[7] **Absolute encoder - Torque**

The procedure is the same as for the limit sensing, with the difference that one gear stage is sufficient.

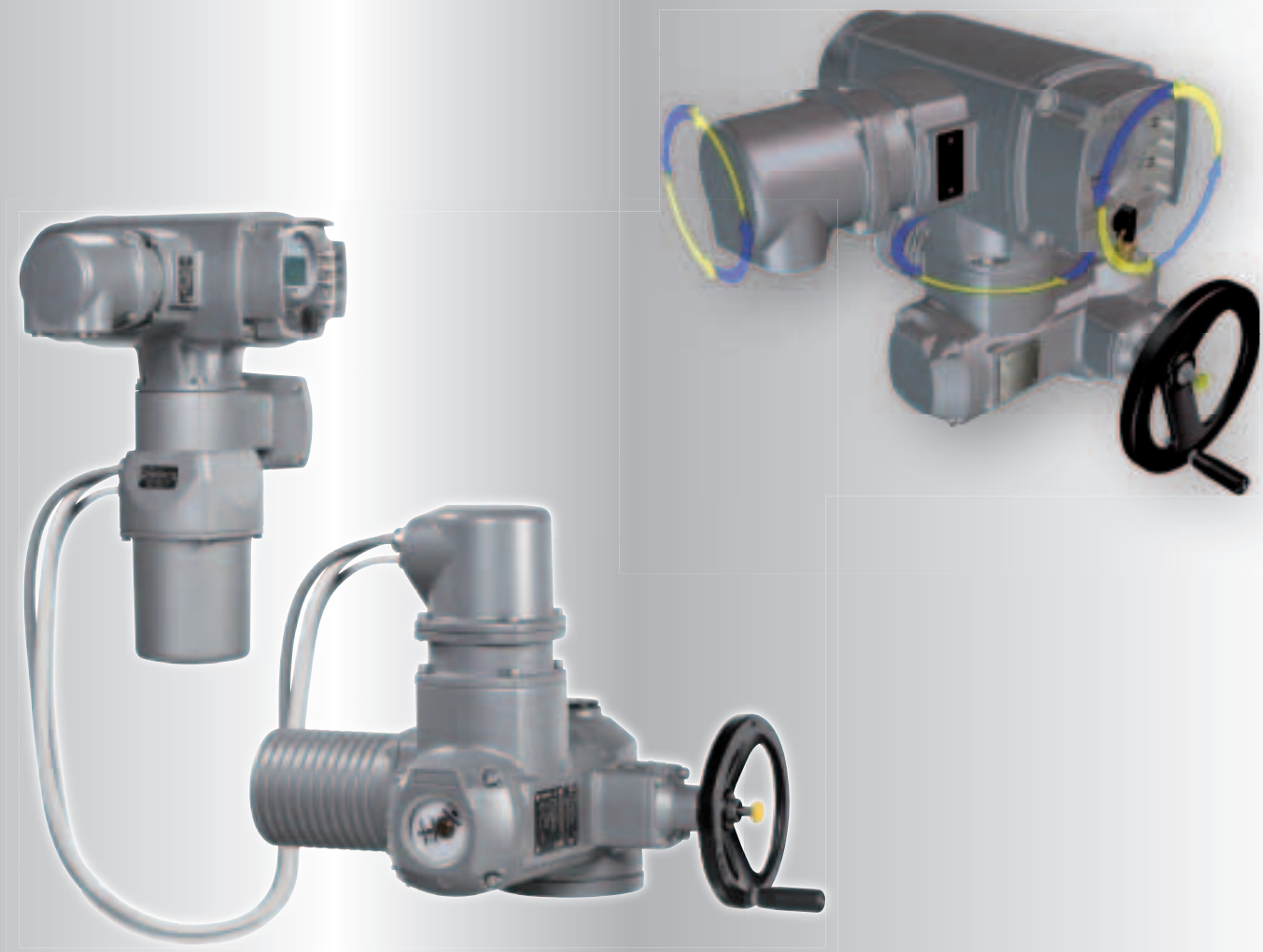
[8] **Electronic recording**

Hall sensors permanently sense the gear stage positions of limit and torque recording. The electronics generates a continuous limit or torque signal.

End position and torque settings are saved in the electronics. When replacing the ACExC controls, these settings still be retained.

[9] **Heater**

The heater minimises condensation within the switch compartment (also refer to page 45).



Particular conditions - Local adaptations possible!

One of the many advantages of a modular design is the ease at which site upgrade can be achieved.

Wall bracket

If the actuator is difficult to access or in case of significant vibration or even high ambient temperatures at the place of valve installation, the controls with the operational 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.

Wall bracket retrofitting is possible at any later date.

Customisation of device positioning

The optimum positioning is easily adjustable thus avoiding that the display is upside down, inaccessible operation elements, awkward cable gland alignments, etc. The correct position can easily be chosen.

The following positioning adjustments at 90° increments are possible: controls to actuator, local controls to controls as well as the electrical plug/socket connector. The plug/socket connections allow easy on-site adjustment of the mounting position.

AUMA actuators comply with global safety standards. For this purpose, they provide the following protective functions.

Correction of the direction of rotation

The automatic correction of the direction of rotation upon wrong phase sequence is an integral feature of the controls. If the phases are exchanged when connecting the three-phase supply, the actuator still travels in the correct direction when receiving the respective operation command.

Valve overload protection

The controls switch off the actuator if inappropriate and excessive torque is applied during travel.

Locking manual to motor operation

Handwheel and motor drives cannot be simultaneously engaged. Not even under fault conditions. Motor operation is predominant. Even handwheel activation while the motor is running does not cause any problems.

Failure behaviour in case of signal loss or in emergency

If a signal required for operation fails or if an emergency signal is activated, the actuator proceeds with a failure behaviour, previously defined. Deactivation of protective actuator mechanisms is possible if such a situation occurs.

Protection tube for rising valve stem

The protection tube, available as an option, encloses a rising valve stem, thus protecting the stem against contamination and the plant operators against injury.

Handwheel extension

For actuators difficult to approach, e.g. shaft installation, the handwheel access is extremely difficult. In these cases, the AUMA handwheel extension makes manual operation much easier.

Fireproof actuators and SIL

For information on fireproof actuators and SIL, please refer to pages 9 or 50.

Safe and reliable – in any circumstance

Protection against unauthorised operation

Handwheel locking device

Activation of manual operation can be inhibited by means of a locking device.

Remote release of local controls for the ACExC (option)

Electrical actuator operation via the local controls is not possible without the release signal from the control room.

Lockable selector switch

The switch can be locked in all three positions.

Lockable protection cover

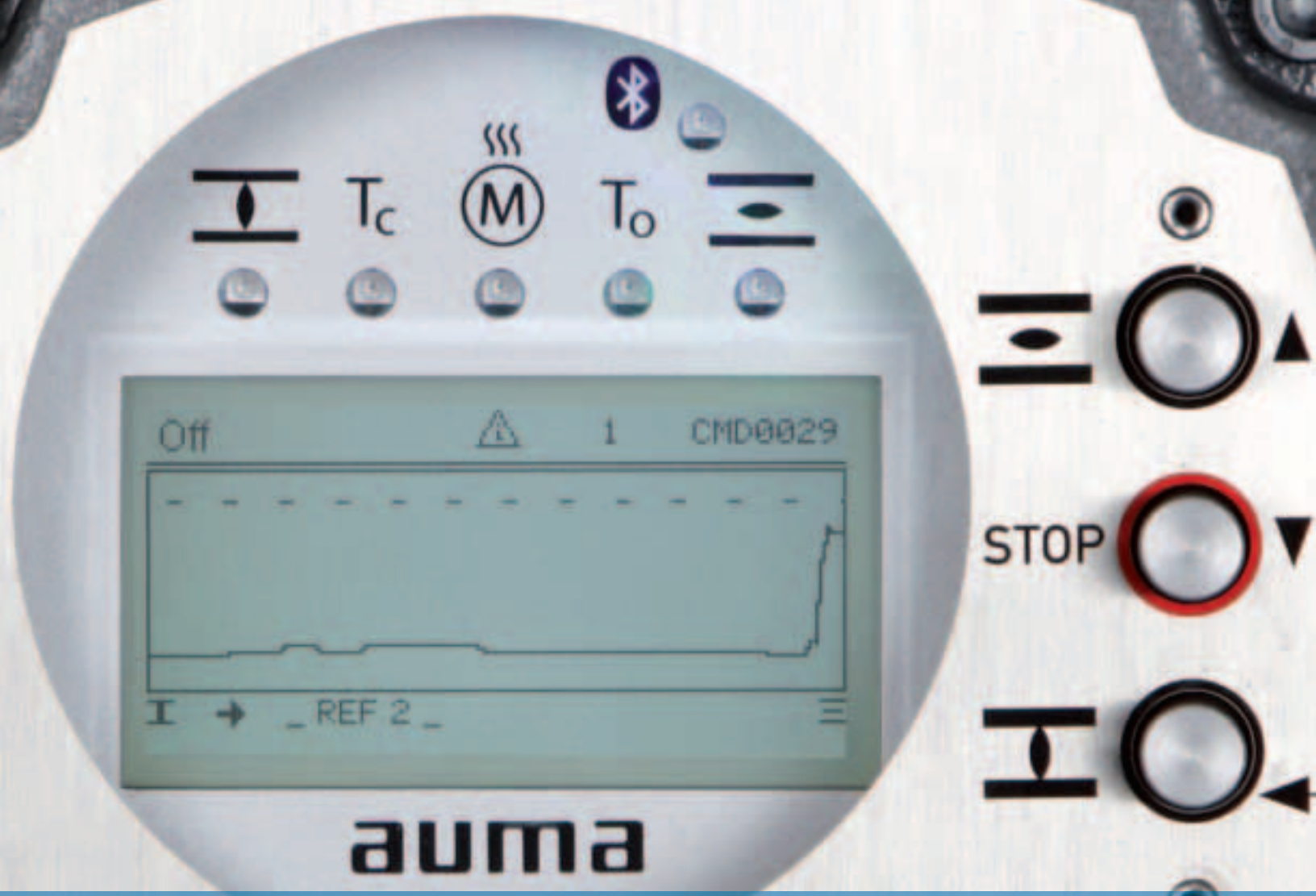
illustration for ACExC.

Password protection for ACExC device parameters

Device parameters may only be changed after password entry.

Protected Bluetooth connection with ACExC

Password entry is required to establish a connection between a laptop or PDA and an actuator with ACExC integral controls.



Prevention, service life, maintenance - Complete with test engineering

The user of an actuator expects the fulfilment of three main features: long service life, long maintenance intervals and maintainability. These characteristics are important contributions to the plant operating costs and must therefore be closely monitored by the plant operator.

With the development of the SAEx .2 multi-turn actuators and the ACExC .2 actuator controls, the main focus consisted in the integration of advanced self-monitoring and diagnostic abilities, to allow the operator to perform targeted maintenance routines.

Self-monitoring - avoiding failures

Self-monitoring enables the actuators to provide information about their own states, exceeding by far conventional fault signals.

The operator is advised on time about any potential problems, for example with the NAMUR classified signal "Out of specification". This signal indicates that the actuator is operated outside specified operation conditions which could lead to a subsequent failure. Thus, action as required can be taken in time to avoid any failure.

Diagnostic information available - eliminating the problem

Whereas the operator is only provided with simple NAMUR signals, the actuator supplies detailed diagnostic information to the service technician, either via the display or via the AUMA ToolSuite. Thus, the origin for a "Maintenance required" indication can be identified and appropriate actions can be taken.

[1]

[2]

[3]

[4]

[1] **Failure**

Due to functionality failures within the actuator or the peripherals, the actuator might not be controlled from the control room.

[2] **Function check**

Due to ongoing work on the actuator, the device cannot be controlled from the control room at that specific time.

[3] **Out of specification**

Deviations from the permissible application conditions determined by the actuator itself through self-monitoring. The actuator can still be controlled from the control room.

[4] **Maintenance required**

The actuator can still be controlled from the control room. The device must be inspected by a device specialist to avoid any unscheduled downtime.

Application in accordance with NAMUR NE 107

The aim of this recommendation is to achieve a uniform and simple communication vehicle between the devices and the plant operator. Actuators classify internal status signals in compliance with the NAMUR recommendation. Exact diagnosis is performed when evaluating the device data.

features

Monitoring the life cycle factors

Apart from the valve torque requirement and the operating cycles as standard recorded factors, device temperatures are further decisive factors for the device life cycle. As an option, the actuators can be equipped with sensors continuously monitoring motor temperature, gearing temperature, electronics environmental temperature as well as vibration.

Time-stamped event report/ operating data logging

Setting procedures, switching procedures, warning signals, failures and running times are recorded within the time-stamped event report. The event report is a distinct component of the diagnostic feature of the ACExC.

Torque characteristics

The ACExC is capable of recording torque characteristics at different times. When comparing a current characteristic and a reference characteristic, conclusions can be drawn on the valve states.

Plant Asset Management

Due to extensive diagnostic features and the classification of status signals in compliance with NAMUR, AUMA actuators with ACExC .2 integral controls meet the requirements for integration into such systems.

Multi-turn actuators for open-close duty

The following data is valid for actuators with 3-phase AC motors operated in the S2 - 15 min type of duty. For detailed information, restrictions for actuators with high output speeds as well as data on other motor types and types of duty, refer to separate technical and electrical data sheets.

Type	Output speeds at 50 Hz	Setting range tripping torque	Valve mounting flange	
	rpm	Nm	EN ISO 5210	DIN 3210
SAEx 07.2	4 – 180	10 – 30	F07 or F10	G0
SAEx 07.6	4 – 180	20 – 60	F07 or F10	G0
SAEx 10.2	4 – 180	40 – 120	F10	G0
SAEx 14.2	4 – 180	100 – 250	F14	G1/2
SAEx 14.6	4 – 180	200 – 500	F14	G1/2
SAEx 16.2	4 – 180	400 – 1 000	F16	G3
SAEx 25.1	4 – 90	630 – 2 000	F25	G4
SAEx 30.1	4 – 90	1,250 – 4,000	F30	G5
SAEx 35.1	4 – 45	2,500 – 8,000	F35	G6
SAEx 40.1	4 – 32	5,000 – 16,000	F40	G7

Multi-turn actuators for modulating duty

The following data is valid for actuators with 3-phase AC motors with an S4 - 25 % duty type. For detailed information, restrictions for actuators with high output speeds as well as data on other motor types and types of duty, refer to separate technical and electrical data sheets.

Type	Output speeds at 50 Hz[1]	Setting range tripping torque	Permissible number of starts	Valve mounting flange	
	rpm	Nm	1/h	EN ISO 5210	DIN 3210
SAREx 07.2	4 – 90	15 – 30	900	F07 or F10	G0
SAREx 07.6	4 – 90	30 – 60	900	F07 or F10	G0
SAREx 10.2	4 – 90	60 – 120	900	F10	G0
SAREx 14.2	4 – 90	120 – 250	900	F14	G1/2
SAREx 14.6	4 – 90	250 – 500	900	F14	G1/2
SAREx 16.2	4 – 90	500 – 1 000	600	F16	G3
SAREx 25.1	4 – 11	1,000 – 2,000	300	F25	G4
SAREx 30.1	4 – 11	2,000 – 4,000	300	F30	G5

The maximum permissible torque in modulating duty is 50 % of the maximum tripping torque.

1 Higher speeds on request

Supply voltages/mains frequencies

Hereafter, please find the listing on standard supply voltages (other voltages upon request). Not all actuator versions or sizes are available with all motor types or voltages/frequencies. For detailed information refer to the separate electrical data sheets.

3-phase AC current

Voltages	Frequency
V	[Hz]
220; 230; 240; 380; 400; 415; 500	50
440; 460; 480	60

1-phase AC current

Voltages	Frequency
V	[Hz]
230	50
115	60

Permissible fluctuations of mains voltage and frequency

- Standard for SAEx, AMExC and ACExC
  Mains voltage ±10 %
  Frequency: ±5 %
- Option for ACExC
  Mains voltage: –30 %
  requires special sizing when selecting the actuator

Lifetime

Multi-turn actuators for open-close duty

An operation cycle is based on an operation from CLOSED to OPEN and back to CLOSED, with a travel of 30 turns per stroke.

Type	Operating cycles
SAEx 07.2 – SAEx 10.2	25,000
SAEx 14.2 – SAEx 16.2	20,000
SAEx 25.1 – SAEx 30.1	10,000
SAEx 35.1	5,000
SAEx 40.1	3,000

Multi-turn actuators for modulating duty

Type	Modulating steps in millions
SAREx 07.2 – SAREx 10.2	7.5
SAREx 14.2 – SAREx 14.6	5.0
SAREx 16.2	5.0
SAREx 25.1 – SAREx 30.1	2.5

Vibration resistance

According to EN 60068-2-6.

The actuators are resistant to vibration during start-up or failure of the plant up to 2 g, for a frequency range of 10 to 200 Hz. However, a fatigue strength may not be derived from this.

This data is valid for multi-turn actuators without integral controls with electrical connector KP but not in combination with gearboxes.

Complying to the conditions above, the applicable load limit for actuators with integral controls amounts to 1g.

Mounting position

AUMA actuators (with or without integral controls) can be operated without restriction in any mounting position.

Noise level

The noise level originated by the multi-turn actuator does not exceed 72 dB (A).

Control unit

Settings ranges of the limit switching

	Turn per stroke	
	electromechanical control unit	electronic control unit
Standard	2 – 500	1 – 500
Option	2 – 5,000	10 – 5,000

Electronic control unit

When using the electronic control unit, reaching an end position, the valve position, the torque and vibration (if applicable) are recorded in digital form and transmitted via internal bus to ACExC integral controls. ACExC controls internally process all signals and provides respective indications via the respective communication interface.

Electromechanical control unit

Binary and analogue signals of electromechanical control unit are internally processed if integral controls are available. Alternatively, signals can be connected to external wiring via electrical connector, for NORM actuators without integral controls this is the only procedure. For these cases, the technical data of switches and remote transmitters apply.

Limit and torque switches

Versions		
	Application/description	Type of contact
Single switch	Standard	One NC and One NO
Tandem switch (option)	For switching two different potentials. The switches have two compartments with galvanically isolated switches in a common sealed housing. The two switches are operated together; one switch is leading and should be used for signalisation.	Two NC and two NO contacts
Triple switches (option)	For applications where three different potentials are to be switched. The switch consists of one single and one tandem switch.	Three NC and three NO contacts

Rated power			
	Switch rating I_{max}		
Type of current	30 V	125 V	250 V
AC (inductive load) cos φ = 0.8	5 A	5 A	5 A
DC (resistive load)	2 A	0.5 A	0.4 A
With gold-plated contacts (recommended for controls with low voltages < 30 V/100 mA)			
Voltage	min 5 V, max. 50 V		
Current	min 4 mA, max. 400 mA		

Switches - other features	
Operation	Via lever
Contact element	Two snap action contacts
Contact material	Silver (standard), gold (option)

Blinker transmitter for running indication

Rated power			
	Switch rating I_{max}		
Type of current	30 V	125 V	250 V
AC (inductive load) cos φ = 0.8	4 A	4 A	4 A
DC (resistive load)	2 A	0.6 A	0.4 A

Blinker transmitter - other features	
Operation	Via a special segment washer
Contact element	One-snap action contact
Contact material	Silver (standard), gold (option)
Type of contact	One change-over contact

Electromechanical control unit (cont'd)

Remote position transmitter

Precision potentiometer		
	single	Tandem[1]
Linearity	≤ 1 %	
Power	0.5 W	
Resistance (standard)	0.2 kΩ	0.2/0.2 kΩ
Resistance (option)	0.1 kΩ, 0.5 kΩ, 1.0 kΩ, 5.0 kΩ	0.5/0.5 kΩ, 1.0/1.0 kΩ, 5.0/5.0 kΩ, 0.2/5.0 kΩ

1 up to size SAEx 16.2 only

Electronic remote position transmitter RWG 4020 for actuators up to size SAEx 16.2		
Output signal		
2-wire	3/4-wire	Power supply
4 – 20 mA	0/4 – 20 mA	24 V DC, ±15 % smoothed

Electronic remote position transmitter RWG 5020 for actuators up to size SAEx 25.1	
Output signal	
2-wire	Power supply
4 – 20 mA	10 - 28.5 V DC

Handwheel activation

Rated power of microswitch to signal handwheel activation		
	Switch rating I_{max}	
Type of current	12 V	250 V
AC (inductive load) cos φ = 0.8	–	3 A
DC (resistive load)	3 A	–

Microswitches for signalling handwheel activation – other features	
Operation	Via lever
Contact element	Snap action contact
Contact material	Silver (standard), gold (option)
Type of contact	Change-over contact

Motor

Type of duty according to IEC 60034-1/EN 15714-2

Typ	3-ph AC current	1-phase AC current	DC current
SAEx 07.2 – SAEx 16.2	S2 - 15 min, S2 - 30 min/ Classes A,B	S2 - 15 min[1]/ Classes A,B[1]	S2 - 15 min/ Classes A,B
SAEx 25.1 – SAEx 40.1	S2 - 15 min, S2 - 30 min/ Classes A,B	–	–
SAREx 07.2 – SAREx 16.2	S4 - 25 %, S4 - 50 %/ Class C	S4 - 25 %[2]/ Class C[2]	–
SAREx 25.1 – SAREx 30.1	S4 - 25 %, S4 - 50 %/ Class C	–	–

Indications on operation mode refer to the following conditions: nominal voltage, 40 °C ambient temperature, average load of approx. 35 % of maximum torque

1 available up to size 14.6
2 available up to size 14.2

Rated values for motor protection

As standard, PTC thermistors analysed by a PTC tripping device are used for motor protection. When using integral controls, motor protection signals are internally processed. This also applies for the optional thermoswitches. For actuators in AUMA NORM, signals must be analysed by external controls.

Rating of the thermoswitches	
AC voltage (250 V AC)	Switch rating I_{max}
cos φ = 1	2.5 A
cos φ = 0,6	1.6 A
DC voltage	**Switch rating I_{max}**
60 V	1 A
42 V	1.2 A
24 V	1.5 A

Wiring diagrams/electrical connection

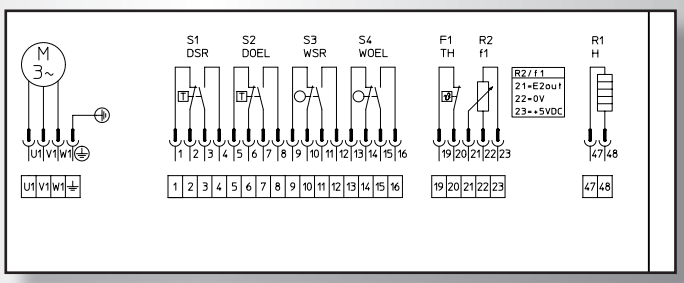
For the basic actuators, pre-defined terminal plans are available.

- TPA for SAEx 07.2 – SAEx 16.2 and SAEx 25.1 – SAEx 40.1

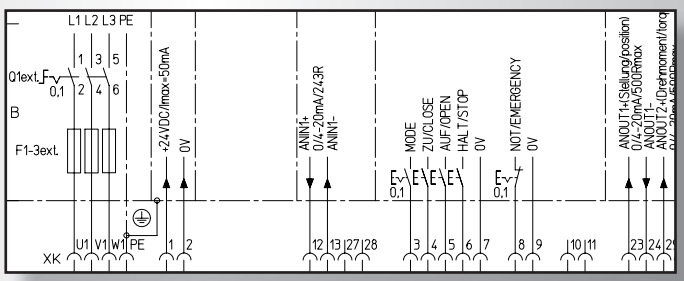
For actuators with integral controls, pre-defined wiring diagrams are available.

- MSP for AMExC
- TPC for ACExC

All diagrams show signal wirings to the electrical connector and are the basis for connecting both signal wires and the power supply. They can be downloaded at www.auma.com



TPA extract of a terminal plan for a multi-turn actuator



TPC extract of a terminal plan for an ACExC

AUMA plug/socket sonnector KP with screw-type terminals			
	Motor contacts	**Protective earth**	**Control contacts**
No. of contacts max.	3	1 (leading contact)	38 pins/sockets
Designation	U1, V1, W1	PE	1 to 24, 31 to 50
Connecting voltage max.	550 V	–	250 V
Nominal current max.	25 A	–	10 A
Type of customer connection	Screw	Screw	Screw
Cross section max.	6 mm²	6 mm²	1.5 mm²
Material - pin socket carrier	Araldite/Polyamide	Araldite/Polyamide	Araldite/Polyamide
Material - contacts	Brass	Brass	Brass, tin plated or gold plated (option)

AUMA plug/socket connector KES with terminal blocks			
	Motor contacts	**Protective earth**	**Control contacts**
No. of contacts max.	3	1	48
Designation	U1, V1, W1	PE	1 to 48
Connecting voltage max.	750 V	–	250 V
Nominal current max.	25 A	–	10 A
Type of customer connection	Screw	Screw	Cage clamp, screw-type connection as an option
Cross section max.	10 mm²	10 mm²	2.5 mm² flexible, 4 mm² solid

Thread dimensions of cable entries (selected choice)	
M-threads (standard)	1 x M20 x 1.5; 1 x M25 x 1.5; 1 x M32 x 1.5
Pg-threads (option)	1 x Pg 13.5; 1 x Pg 21; 1 x Pg 29
NPT-threads (option)	2 x ¾" NPT; 1 x 1¼" NPT
G-threads (option)	2 x G ¾"; 1 x G 1¼"

Heater

Heater in control unit to avoid condensation (standard)	Actuators without integral controls	Actuators with AMExC or ACExC integral controls
Heating element	Self-regulating PTC element	Resistance type heater
Voltage ranges	110 V – 250 V DC/AC 24 V – 48 V DC/AC 380 V – 400 V AC	24 V DC/AC (internal supply)
Power	5 W – 20 W	5 W

Heating system for actuators in low temperature version	Actuators without integral controls	Actuators with AMExC integral controls	Actuators with ACExC integral controls
Voltage ranges	115 V/230 V AC	115 V/230 V AC	115 V/230 V AC
Heater power within the control unit (self-regulating)	5 W – 20 W	5 W – 20 W	5 W – 20 W
Power of motor heating, required for temperature below –50 °C	12.5 W – 50 W[1]	12.5 W – 50 W[1]	12.5 W – 50 W[1]
Power of temperature-controlled controls heater	–	40 W	60 W

1 depending on motor size, refer to separate technical data sheets

AMExC and ACExC – parallel interface to the DCS

AMExC	ACExC
Binary input signals	
Standard Control inputs +24 V DC: OPEN, STOP, CLOSE via opto-isolator, one common	Standard Control inputs +24 V DC: OPEN, STOP, CLOSE, EMERGENCY via opto-isolator, one common
Option Like standard, with additional EMERGENCY input	Option Like standard, with additional inputs for MODE and ENABLE
Option Control inputs at 115 V AC	Option Control inputs at 115 V AC, 48 V DC, 60 V DC, 110 V DC
Auxiliary voltage for binary input signals	
24 V DC, max. 50 mA	24 V DC, max. 100 mA
115 V AC, max. 30 mA	115 V AC, max. 30 mA
Setpoint control (option)	
Analogue input 0/4 – 20 mA	
Output signals	
Standard 5 output contacts , 4 NO with one common, max. 250 V AC, 0.5 A (resistive load) Default configuration: end position CLOSED, end position OPEN, selector switch REMOTE, selector switch LOCAL 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) for collective fault signal torque fault, phase failure, motor protection tripped	Standard 6 output contacts can to be assigned as desired using parameters, 5 NO 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) End position OPEN, end position CLOSED selector switch REMOTE, torque fault OPEN, torque fault CLOSE, collective fault signal (torque fault, phase failure, motor protection tripped)
Option Signals in connection with positioner: end position OPEN, end position CLOSED (requires tandem switch within actuator) Selector switch REMOTE, selector switch LOCAL via selector switch 2nd level, 1 potential-free change-over contact, max. 250 V AC, 0.5 A (resistive load) For collective fault signal: torque fault, phase failure, motor protection tripped	Option 12 output contacts can to be assigned as desired using parameters, 10 NO with one common, max. 250 V AC, 1 A (resistive load), 2 potential-free change-over contacts for collective fault signal max. 250 V AC, 5 A (resistive load)
	Option Separate change-over contacts without common, max. 250 V AC, 5 A (resistive load)
Continuous position feedback (option)	
Position feedback signal, 0/4 – 20 mA	Position feedback signal, 0/4 – 20 mA

ACExC - serial interfaces to the DCS

	Profibus	Modbus	FF bus	Wireless
General information	Exchange of all discrete and continuous operation commands, feedback signals, status requests between actuators and DCS, as digital information			
Supported protocols	DP-V0, DP-V1, DP-V2	Modbus RTU	FF-H1	Wireless
Maximum number of devices	126 (125 field devices and one Profibus DP master), Without repeater; i.e. max. 32 devices per Profibus DP segment	247 field devices and a Modbus RTU master Without repeaters, max. 32 devices per Modbus segment	240 field devices including linking device. A maximum of 32 devices can be connected to a single Foundation Fieldbus segment.	250 per gateway
Max. cable lengths without repeater	Max. 1,200 m (for baud rates < 187.5 kbit/s), 1,000 m at 187.5 kbit/s, 500 m at 500 kbit/s, 200 m at 1.5 Mbit/s	Max. 1,200 m	Max. 1,900 m	Distance covered Outside approx. 200 m, Inside buildings approx. 50 m
Max. cable lengths with repeater	Approx. 10 km (only applies to baud rates < 500 kbit/s), approx. 4 km (at 500 kbit/s) approx 2 km (at 1.5 Mbit/s) The maximum cable length which can be implemented depends on the type and the number of repeaters. Typically, maximum 9 repeaters can be used in one Profibus DP system.	Approx. 10 km The maximum cable length which can be implemented depends on the type and the number of repeaters. Typically, maximum 9 repeaters can be used in one Modbus system.	Approx. 9.5 km The maximum cable length which can be implemented depends on the number of repeaters. For FF, a maximum of 4 repeaters may be cascaded.	Each device acts as repeater. Subsequently arranged devices are used to cover large distances.
Overvoltage protection (option)	up to 4 kV		–	–

Data transmission via fibre optic cables		
Supported topologies	Line, star, loop	Line, star
Cable length between 2 actuators	Multi-mode: up to 2,000 m at 62.5 µm FO cables, up to 1,300, at 50 µm FO cables	

Local operation - local controls

	AMExC	ACExC
Operation	Selector switch LOCAL - OFF - REMOTE, lockable in all three positions	
	Push buttons OPEN, STOP, CLOSE	Push buttons OPEN, STOP, CLOSE, Reset
Indication	3 indication lights: End position CLOSED, collective fault signal, end position OPEN	5 indication lights: End position CLOSED, torque fault in direction CLOSE, motor protection tripped, torque fault in direction OPEN, end position OPEN
		Graphic display with white and red backlight Resolution 200 x 100 pixels

Switchgear

		AMExC and ACExC
		AUMA power classes
Reversing contactors, mechanically and electronically locked	Standard	A1
	Options	A2, A3, A4[1]
Thyristors, electronically locked	Standard	B1
	Options	B2, B3

For references regarding thermal overload relay adjustment, please refer to the electrical data sheets.

1 Switchgear supplied in separate control cabinet

Functions

Standard ● Option ■	AMExC	ACExC
Operational functions		
Type of seating programmable	●	●
Automatic correction of the direction of rotation upon wrong phase sequence	●	●
Positioner	■	■
Adaptive positioner	–	■
Intermediate position signals	–	●
Approaching the intermediate positions directly from remote	–	■
Operational profiles with intermediate positions	–	■
Extended operating time due to timer	–	●
Programmable EMERGENCY behaviour	■	●
Failure behaviour on loss of signal	■	●
Torque by-pass	–	●
Integral PID controller	–	■
Multiport valve function	–	■
Monitoring functions		
Valve overload protection	●	●
Phase failure/phase sequence	●	●
Motor temperature (limit value)	●	●
Monitoring the admissible on-time (type of duty)	–	●
Manual operation activated	■	■
Operation time monitoring	–	●
Reaction on operation command	–	●
Motion detector	–	●
Communication to DCS via fieldbus interface	–	■
Wire break monitoring, analogue inputs	–	●
Temperature of electronics	–	●
Diagnostic pack Continuous recording of: temperature in control unit, gearbox temperature, motor temperature, vibration	–	■
Heater monitoring	–	●
Monitoring of position transmitter in the actuator	–	●
Monitoring of torque sensing	–	●
Diagnostic functions		
Time-stamped event report	–	●
Electronic device ID	–	●
Operating data logging	–	●
Torque profiles	–	●
Status signals in compliance with NAMUR recommendation NE 107	–	●

Certification - international approvals

Actuators/ controls	Size	Explosion protection	Temperature		
			Standard	Low	High
ATEX – Europe					
SAExC	07.1 – 16.1	Ex de IIC T4/Ex d IIC T4	–40 °C ... +60 °C	–50 °C ... +60 °C	
		Ex de IIB T3			–20 °C ... +80 °C
SAEx	07.2 – 16.2	Ex de IIC T4/Ex d IIC T4	–20 °C ... +60 °C		
AMExB	01.1	Ex de IIB T4/Ex d IIB T4	–40 °C ... +60 °C	–50 °C ... +60 °C	
AMExC	01.1	Ex de IIC T4/Ex d IIC T4	–40 °C ... +60 °C	–50 °C ... +60 °C	
		Ex de IIB T3			–20 °C ... +70 °C
ACExC	01.1	Ex de IIC T4/Ex d IIC T4	–25°C ... +60 °C	–50 °C ... +60 °C	
		Ex de IIB T3			–20 °C ... +70 °C
ACExC	01.2	Ex de IIC T4/Ex d IIC T4	–20°C ... +60 °C		
IECEx – International/Australia					
SAExC	07.1 – 16.1	Ex de IIC T4/Ex d IIC T4	–20 °C ... +60 °C		
SAExC	07.2 – 16.2	Ex de IIC T4/Ex d IIC T4	–20 °C ... +60 °C		
AMExC	01.1	Ex de IIC T4/Ex d IIC T4	–20 °C ... +60 °C		
ACExC	01.1	Ex de IIC T4/Ex d IIC T4	–20 °C ... +60 °C		
ACExC	01.2	Ex de IIC T4/Ex d IIC T4	–20 °C ... +60 °C		
ROSTECHNADSOR – Russia					
SAExC	07.1 – 16.1	Ex de IIC T4 /Ex d IIC T4	–40 °C ... +60 °C	–60 °C ... +60 °C	
AMExB	01.1	Ex de IIB T4 /Ex d IIB T4	–40 °C ... +60 °C	–50 °C ... +60 °C	
AMExC	01.1	Ex de IIC T4 /Ex d IIC T4	–40 °C ... +60 °C	–60 °C ... +60 °C	
ACExC	01.1	Ex de IIC T4 /Ex d IIC T4	–25°C ... +60 °C	–60 °C ... +60 °C	
GOSPROMNADSOR – Belorussia					
SAExC	07.1 – 16.1	Ex de IIC T4 /Ex d IIC T4	–40 °C ... +60 °C	–50 °C ... +60 °C	
AMExB	01.1	Ex de IIB T4 /Ex d IIB T4	–40 °C ... +60 °C	–50 °C ... +60 °C	
AMExC	01.1	Ex de IIC T4 /Ex d IIC T4	–40 °C ... +60 °C	–50 °C ... +60 °C	
ACExC	01.1	Ex de IIC T4 /Ex d IIC T4	–40 °C ... +60 °C	–50 °C ... +60 °C	
FM – USA					
SAExC	07.1 – 16.1	Div 1 Class I Groups B,C,D Div 1 Class II Groups E,F,G Div 1 Class III Temperature class T4 (T3C)	–40 °C ... +40 °C (+60 °C)		
AMExC	01.1		–40 °C ... +40 °C (+60 °C)		
AMExB	01.1	Div 1 Class I Groups C,D Div 1 Class II Groups E,F,G Div 1 Class III Temperature Class T4 (T3C)	–40 °C ... +40 °C (+60 °C)		
ACExC	01.1		–25 °C ... +40 °C (+60 °C)	–40 °C ... +40 °C (+60 °C)	
CSA – Canada					
SAExC	07.1 – 16.1	Div 1 Class I Groups B,C,D Div 1 Class II Groups E,F,G Div 1 Class III Temperature Class T4 (T3C)	–40 °C ... +40 °C (+60 °C)		
AMExC	01.1	Div 1 Class I Groups C,D Div 1 Class II Groups E,F,G Div 1 Class III Temperature Class T4 (T3C)	–40 °C ... +40 °C (+60 °C)		
ACExC	01.1		–25 °C ... +40 °C (+60 °C)	–40 °C ... +40 °C (+60 °C)	
SAExC	07.1 – 16.1	Zone 1 Ex de IIC T4 /Ex d IIC T4	–40 °C ... +60 °C	–50 °C ... +60 °C	
AMExC	01.1		–40 °C ... +60 °C	–50 °C ... +60 °C	
ACExC	01.1		–40 °C ... +60 °C	–50 °C ... +60 °C	

The table applies to actuators with 3-ph AC motors. For actuators with 1-ph AC motors, please refer to separate data sheets.

Further approvals/countries

- KOSHA, Korea
- CQST, China
- TIIS, Japan
- C.E.E., India
- INMETRO, Brazil
- SABS, South Africa

Certification - international approvals

Country	Company	
Egypt	PPC	Petroleum Pipelines Company
Abu Dhabi	ADCO	Abu Dhabi Company for Onshore Oil Operations
Abu Dhabi	ADGAS	Abu Dhabi Gas Producing Company
Abu Dhabi	ADNOC	Abu Dhabi National Oil Company
Abu Dhabi	TAKREER	Abu Dhabi Oil Refinery Company
Algeria	Sonatrach	
Argentina	REPSOL YPF	
Bahrain	BANAGAS	Bahrain National Gas Company
Belgium	EXXON MOBIL	Antwerpen Loading Station
Brazil	PETROBRAS	
Chile	ENAP	Empresa Nacional del Petróleo
China	CNOOC	China National Offshore Oil Corporation
China	Petro China	Petro China Company Limited
China	Sinopec	China Petroleum & Chemical Corporation
Germany	BEB	BEB Erdgas und Erdöl GmbH
Germany	RUHRGAS	
Ecuador	PETROECUADOR	
France	TOTAL	Total Corporate Technology Group
India	EIL	Engineers India Ltd.
India	HPCL	Hindustan Pet. Co. Ltd.
India	IOCL	Indian Oil Corporation Ltd.
India	ONGC/CIDC	Oil and Natural Gas Corporation Ltd.
Indonesia	Pertamina	Perusahaan Pertambangan Minyak Dan Gas Bumi Negara
Iraq	MOC	Missan Oil Company
Iraq	SOC	South Oil Company
Italy	ENI	Ente Nazionale Idsocarburi
Italy	ERG PETROLINE	
Colombia	ECOPETROL	
Kuwait	KNPC	Kuwait National Petroleum Company
Kuwait	KOC	Kuwait Oil Company
Malaysia	Petronas	Petroleum Nasional Sdn. Bhd.
Mexico	PEMEX	Petroleos Mexicanos
Netherlands	ARAMCO	Aramco Overseas Company BV
Netherlands	SABIC	SABIC EUROPE

Country	Company	
Netherlands	Shell	Royal Dutch Shell plc
Nigeria	NNPC	Nigerian National Petroleum Company
Norway	ConocoPhillips	ConocoPhillips Norge, Tananger
Norway	STATOIL	Statoil ASA, Stavanger
Oman	ORC	Oman Refinery Company
Oman	PDO	Petroleum Development of Oman
Peru	Petroperú	
Portugal	GALP	
Qatar	Qatar Petroleum	Qatar Petroleum
Qatar	QGC	Qatar Gas
Qatar	QGPC	Qatar General Petroleum Corporation
Russia	GAZPROM	Gasowaja Promyschlennost
Russia	LUKOIL	Gazfield in Nahodka, refinery Nizhny Novgorod
South Africa	PetroSA	
Spain	ENAGAS	Empresa Nacional del Gas
Sri Lanka	CPC	Ceylon Petroleum Corporation
Thailand	PTT Public Company Ltd.	
Turkey	OPET	Öztürkles Petrol
Turkey	Turkish Petroleum	
Turkey	Turkpetrol	
USA	AMEC Parargon	Houston, Texas
USA	Chemco	
USA	Chevron Texaco	
USA	DUPONT	La Porte Texas
Uruguay	ANCAP	Administración Nacional de Combustibles, Alcohol y Portland
Venezuela	PDVSA	Petroleos de Venezuela S.A.
United Kingdom	BP	British Petroleum
United Kingdom	DOW	DOW CORNING
United Kingdom	EXXON-MOBIL	

DCS integrations - Selection

With a number of well-known DCS manufacturers, the integration tests with AUMA actuators were successfully completed. This ensures that AUMA actuators can be integrated in these DCS without any problems.

Fieldbus	DCS
Profibus DP	Siemens (PCS 7, SPPA T3000, SPPA T2000, Open PMC, etc..)
	ABB
	Mitsubishi
	Yokogawa (CS 3000)
	Metso
Foundation Fieldbus	Emerson (DeltaV and Ovation)
	Foxboro/Invensys
	Allan Bradley
	ABB (800 XA)
	Honeywell
	(Experion PKS)
	Yokogawa (CS 3000)
Modbus	Emerson (Delta V)
	Honeywell (TDC 3000)

SIL Functional safety

Risk reduction in plants and installations with a high hazard potential requires modern safety technology. A consistent safety concept from the sensor via the controls right through to the actuator is required. International standards regarding Functional Safety are of major importance when specifying systems in compliance with safety-related aspects. Consultants, plant operators and manufacturers will have to consider IEC 61508, IEC 61511 and IEC 62061, as well as other relevant standards.

These standards allow the assessment of safety-related systems regarding reliability and availability. The objective is hazard reduction for people, environment or material in processes/plants.

Therefore, the end user will increasingly demand a risk evaluation according to IEC 61508, 61511. This evaluation must be performed by the planning engineer/plant manufacturer.

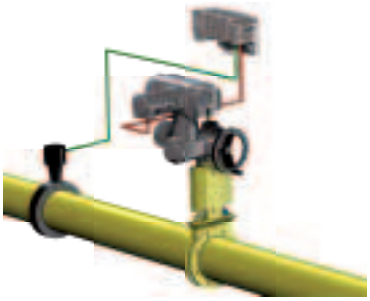
Safety Integrity Level (SIL)

IEC 61508 defines 4 safety integrity levels. Depending on the risk/requirement, one of the four "Safety Integrity Levels" is required for the safety-related system. A specific failure rate is assigned to each level. SIL 4 represents the highest level, SIL 1 the lowest level.

It has to be considered that the Safety Integrity Level is a feature of the Safety Instrumented System (SIS) and not the characteristic of one single component.

In general, a safety instrumented system includes the following components:

- Sensor
- Controls (safety PLC)
- Actuator
- Valve



Figures

Safety-related figures are determined for individual devices. They are used to assign the SIL capability to the components. The final classification of the Safety Instrumented System (SIS) can only be made after assessing the safety-related figures of all components.

Safety-related figures are mostly determined on the basis of generic data. This data (statistical failure values for individual components) is listed in special databases (SIEMENS, MIL, EXIDA, etc.).

Only minor generic data is available for mechanical components. For determination of the figures, AUMA evaluates field feedback data and test results.

Determination of failure probability is one of the major characteristics for SIL classification. Furthermore, they are weighted with further characteristics, such as the interval between two proof tests.

Classification of AUMA actuators

The following table illustrates the figures for selected AUMA actuators.

Figure	AUMA 10-03-053 R006 V2R0 SA .2 AUMA NORM	AUMA 10-03-053 R006 V2R0 SA .2 AUMA NORM with PVST
Safety function	OPEN/CLOSE	OPEN/CLOSE withPVST
λ_{safe}	367 FIT	367 FIT
λ_{DD}	0 FIT	162 FIT
λ_{DU}	203 FIT	41 FIT
DC_D	0 %	80 %
MTBF	201 a	201 a
SFF	64 %	92 %
$T_{[proof]}$ = 1 year	$PFD_{AVG} = 1.05 \times 10^{-3}$	$PFD_{AVG} = 4.96 \times 10^{-4}$
$T_{[proof]}$ = 2 years	$PFD_{AVG} = 1.92 \times 10^{-3}$	$PFD_{AVG} = 6.55 \times 10^{-4}$
$T_{[proof]}$ = 5 years	$PFD_{AVG} = 4.53 \times 10^{-3}$	$PFD_{AVG} = 1.13 \times 10^{-3}$
SIL capability	SIL 2	SIL 2

Please contact us for further SIL figures of other actuator types.

Improvement of SIL capability

Regular function tests, for actuators the so-called partial valve stroke tests (PVST), and/or the use of actuators in redundant configuration (1oo2) can reduce the failure probability of a safety instrumented system and, depending on the version, SIL 3 may be achieved.

EU Directives

Declaration of Incorporation in compliance with the Machinery Directive and Declaration of Conformity according to the Low Voltage, ATEX and EMC Directives

According to the Machinery Directive, AUMA actuators and actuator controls are considered as partly completed machinery. This means that a Declaration of Conformity in accordance with this Directive will not be issued by AUMA. AUMA's Declaration of Incorporation confirms that during the design stage of the devices, the fundamental safety requirements stipulated in the Machinery Directive were applied.

AUMA actuators fulfil the requirements of the Low Voltage, ATEX and EMC Directives. This has been proved in extensive tests. Therefore, AUMA issues a Declaration of Conformity.

The declarations of incorporation and conformity form a joint certificate, also integrated within the operation instructions.

According to the Low Voltage and EMC directives, the devices are labelled with the CE mark.

CE

Final inspection record

After assembly, all actuators are thoroughly tested according to AUMA's inspection specification and the torque switches are calibrated. The procedure is recorded on the final inspection record.

Certificates

Notified bodies perform type tests on the instruments to determine whether the devices are suitable for specially defined applications. One example are the tests to prove electrical safety for the North American market. If a device has passed the test, this is recorded in a certificate. For all devices mentioned in this brochure, the relevant certificates can be provided.

Where can I get the certificates?

All certificates and records are provided by AUMA on request either as a hard or digital copy.

The documents can be downloaded from the AUMA website at any time; some of them are password protected.

- www.auma.com

CERTIFICATE

The Certification Body
of TÜV SÜD Management Service GmbH
certifies that

auma

AUMA Riester GmbH & Co. KG
Aumastr. 1
D-79379 Müllheim

has established and applies a
Quality, Environmental and Safety Management System
for the following scope of application:

**Design and development, manufacture,
sales and service of electric actuators, integral controls
and gearboxes for valve automation as well as
components for general actuation technology.**

Performance of audits (Report-No. 70009378)
has furnished proof that the requirements under:

**ISO 9001:2008
ISO 14001:2004
BS OHSAS 18001:2007**

are fulfilled. The certificate is valid in conjunction
with the main-certificate until **2015-06-08**

Certificate Registration No. **12 100/104/116 4269/01 TMS**

Munich, 2012-07-24

TGA-ZM-07-92

CERTIFICATE ◆ CERTIFICADO ◆ СЕРТИФИКАТ ◆ CERTIFICATE

Quality is not just a matter of trust

Actuators must be reliable and dependable. They determine the cycle of precisely defined work processes. Reliability does not begin during commissioning. It begins with a well thought out design and careful selection of materials. This continues with reliable production using state-of-the-art machine tools. This is done in clearly controlled and supervised production steps while keeping in mind the environment.

The importance of environmentally sound production is reflected in our certifications according to ISO 9001 and ISO 14001. However, quality management is no one-time or static matter. It has to be proven day by day. Numerous audits by our customers and independent institutes confirm these high standards.

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HK-Tsuen Wan, Kowloon

DW Controls Co., Ltd.
KR-153-702 Gasan-dong, GeumChun-Gu, Seoul

Petrogulf W.L.L
QA-Doha

Sunny Valves and Intertrade Corp. Ltd.
TH-10120 Yannawa Bangkok

Top Advance Enterprises Ltd.
TW-Jhonghe City Taipei Hsien (235)

Australia

BARRON GJM Pty. Ltd.
AU-NSW 1570 Artarmon

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auma®

Solutions for a world in motion

[1] Multi-turn actuators
SAEx 07.2 – SAEx 16.2
SAEx 25.1 – SAEx 40.1
Torques from 10 to 16 000 Nm
Output speeds from 4 to 180 rpm

[2] Multi-turn actuators SAEx/SAREx
with controls AUMATIC Ex
Torques from 10 to 1,000 Nm
Output speeds from 4 to 180 rpm

[3] Linear actuators SAEx/LE
combination of multi-turn actuator SAEx and linear thrust unit LE
Thrusts from
4 kN to 217 kN
Strokes up to 500 mm
Linear speeds
from 20 to 360 mm/min

[4] Part-turn actuators
SGEx 05.1 – SGEx 12.1
Torques from 100 to 1,200 Nm
Operating times for 90° from 4 to 180 s

[15 Part-turn actuators SAEx/GS
Combination of multi-turn actuator SAEx and part-turn gearbox GS
Torques up to 675,000 Nm

[6] Bevel gearboxes
GK 10.2 – GK 40.2
Torques up to 16,000 Nm

[7] Spur gearboxes
GST 10.1 – GST 40.1
Torques up to 16,000 Nm

[8] Lever gearboxes
GF 50.3 – GF 250.3
Torques up to 32,000 Nm

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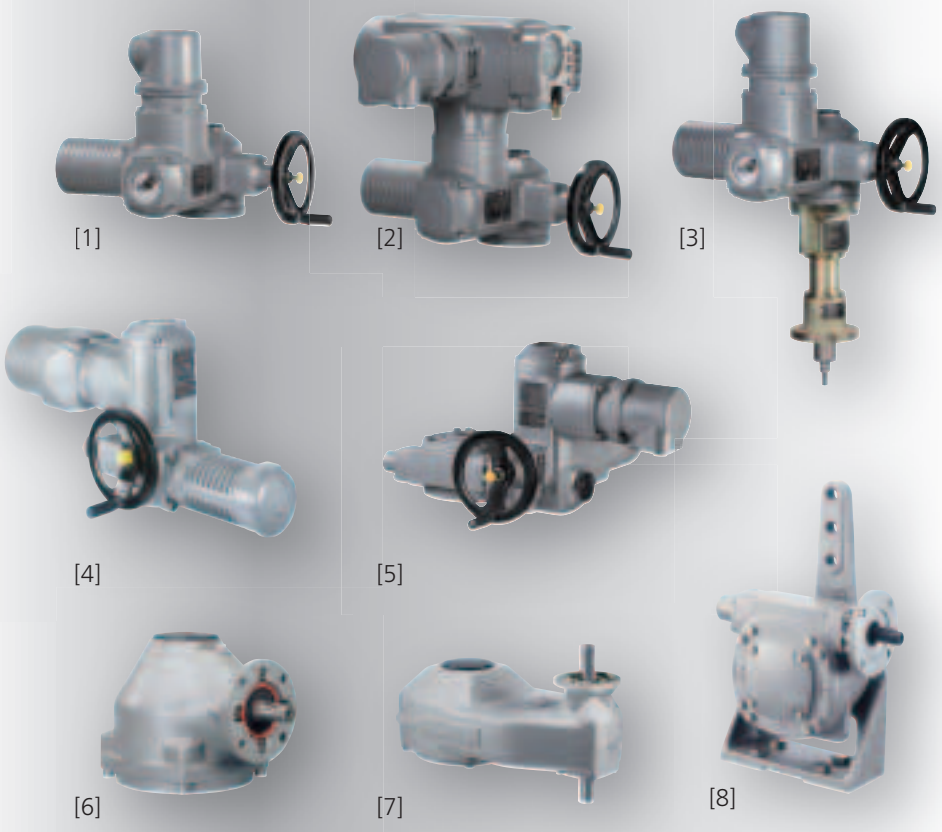

AUMA Actuators, Inc.
Registered to ISO 9001
Certificate No. A4682

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