ARIS
Stellantriebe

Original declaration of incorporation with manual for

ARIS actuator
Tensor²
Tensor² Highspeed
Tensor²+ (Option)
Tensor²+ Zone 2/22 (Option)

CE

TE22138EN01

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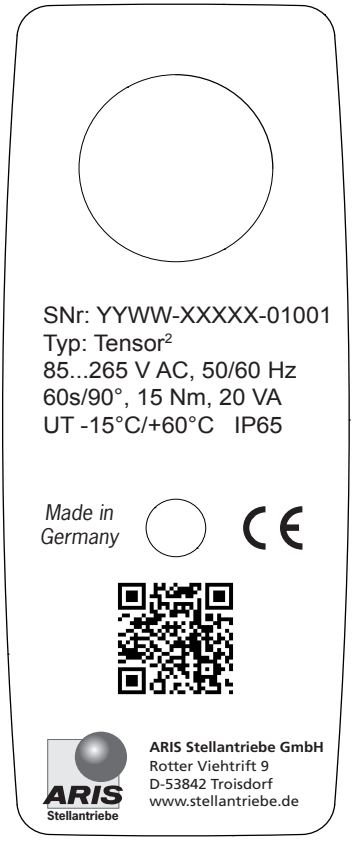
1. Identification

This manual is valid for:

Description:	Electrical actuator
Type:	Tensor² (and add-ons), Tensor² Highspeed
Serial no.:	YYWW-xxxxx-01001 ff.

1.1 Nameplate



← *Serial number (YYWW= year of manufacture+week)*
← *Actuator type*
← *Voltage/Frequency (DC as an option)*
← *Actuating time/Torque/Power consumption*
← *Ambient temperature/Protection class*

1.2 Guidelines and standards

ARIS actuators are partly completed machinery according to directive 2006/42/EC.

Further applicable EC directives:	EMC Directive 2014/30/EC	DIN EN 61000-3-3 DIN EN 61000-6-2 DIN EN 61000-6-3 DIN EN 61000-6-4 DIN EN 55011
Applied harmonized standards:	LVD Directive 2014/35/EC MachDir 2006/42/EC	DIN EN 61010-1:2011-07 DIN EN 12100:2011-03
Protection class by enclosure (IP-Code)	Protection class testing	DIN EN 60529:1991

ADVICE	EMC considerations of the overall system and system perturbations and their combating have to be treated by the system manufacturer or system operator. The wiring of the actuator should be carried out in accordance with DIN EN 60204-1.

2. Safety information

2.1 Warnings

Installation and initial operation only by certified experts according to this manual.
Observe the significance of the following symbol and note explanations. They are subdevided in security levels and classified according to ISO 3864-2.

DANGER	DANGER indicates a hazard with a high risk degree, which, if not avoided, causes death or heavy injuries.
WARNING	WARNING indicates a hazard with a medium risk degree, which, if not avoided, can cause death or heavy injuries.
CAUTION	CAUTION indicates a hazard with a low risk degree, which, if not avoided, can cause slight or moderate injuries.
ADVICE	Indicates general advice, useful hints and work recommendations, which don´t have influence on the safety and health of the staff.

2.2 General safety advice

The actuator components are conform to the state of the art and apply as generally safe at the time they are shipped.
This manual serves as basis to install and operate ARIS actuators safety conform. All persons working with or on ARIS actuators must observe this manual and especially its safety advice.

ADVICE	• This manual has to be kept at the operating site at any time. • Read the manual carefully prior to installation and initial operation.
WARNING	While operating electronic devices certain parts are obligatory under hazardous voltage.

- Working on electric appliances or equipment is only allowed for electrically qualified persons or other instructed persons under guidance and custody of an electrically qualified person according to the electro-technical regulations.
- Observe all safety and accident prevention regulations while installing, operating and testing any electrical appliances or machinery.
- Prior to all installation or regular work on the actuator make sure to switch off all connected machinery/appliances.

3. Technical specification

3.1 Functions and application areas (Intended use)

ARIS actuators are exclusively designed for industrial use. ARIS actuators are utilized for operating regulating and shut-off appliances (valves, ball valves, taps, slide valves, dosing pumps, etc.).

ARIS actuators may not be used for:
- Temperatures below or above the specified data
- Underground environments
- Near open fires
- Under water

3.2 Safe and accurate use

ARIS actuators are factory checked prior to delivery. The final functional testing must be performed within the final system by qualified technical personnel.

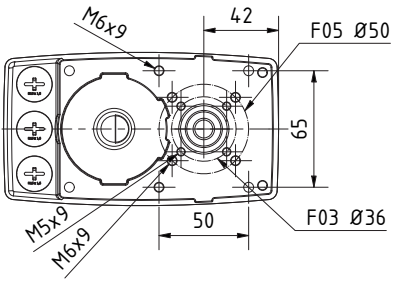
The ARIS company assumes no liability for any direct or indirect damage arising from
- an insufficient test period of the actuator in the final system,
- an improper utilization of the actuator,
- a further utilization after an error was detected.

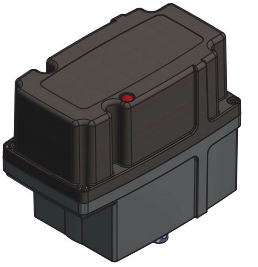
Perform controls on a regular basis during the operation. Pay particular attention to:
- intended utilization of the actuator (Chapter 3.1);
- unusual sounds, severe vibrations or increased temperatures;
- examine the correct tightening torque and impermeability of fixing screws, cable entries, cable glands and sealing plugs;
- the condition of the electrical lines.

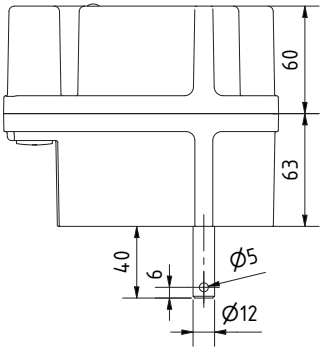
In case of malfunctions, you have to stop the actuator and remedy the malfunction.

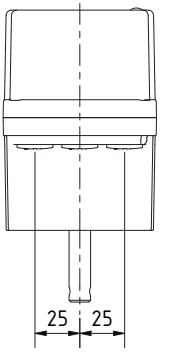
All persons who work on installation, commissioning and setting must
- be specially trained and qualified;
- be mentally and physically capable;
- observe the operating instructions.

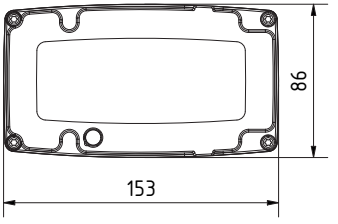
- Valves, levers and connecting rods are moving during actuator operation.
- Check for proper function of all emergency equipment on your machinery/system.
- Check for proper function of the actuator and operated valves after completion of all installation work.
- Never work with or operate a faulty actuator.



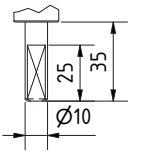


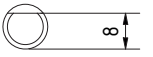




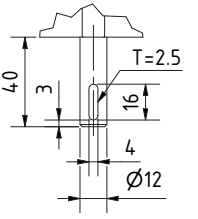


D-Shaft
(Option)

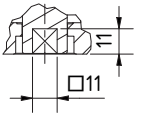


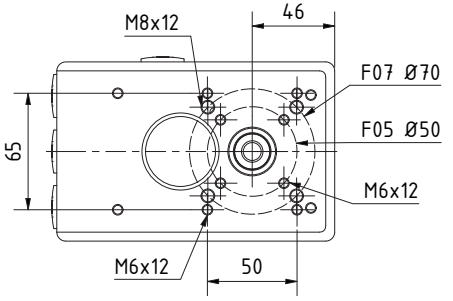


Round shaft
w/feather key
(Option)



ISO shaft
4-square
(Option)

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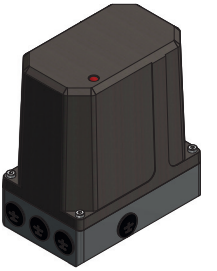
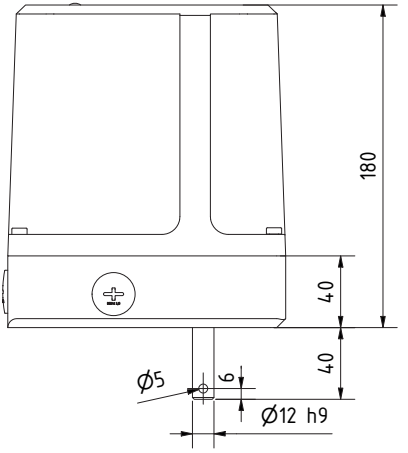
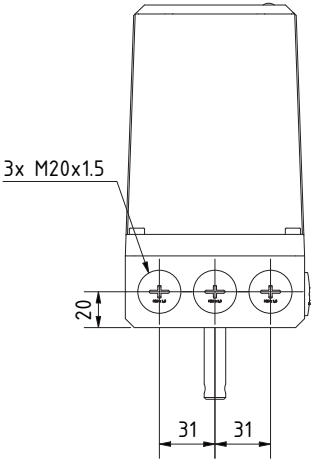
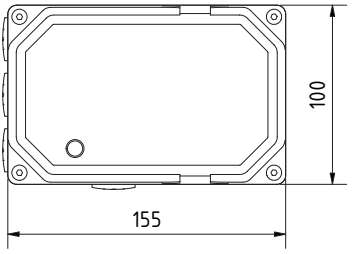
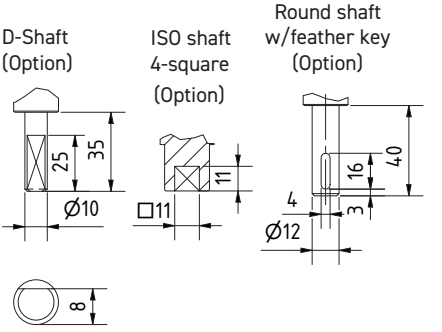
46
F07 Ø70
F05 Ø50
65
M6x12
M6x12
50

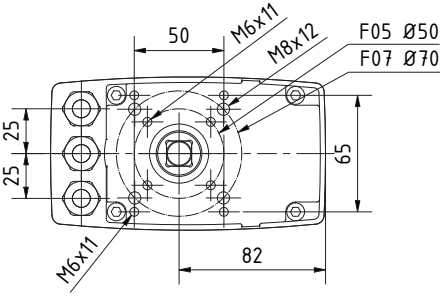


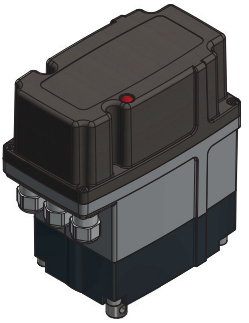

180
40
40
ϕ5
6
Ø12 h9

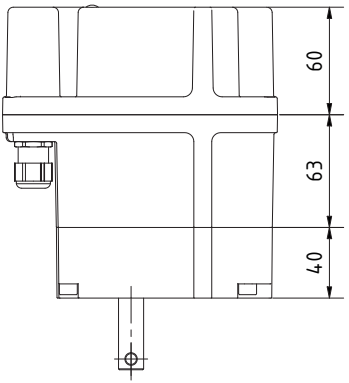

3x M20x1.5
20
31
31

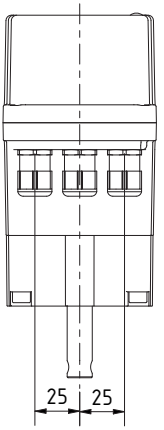

100
155

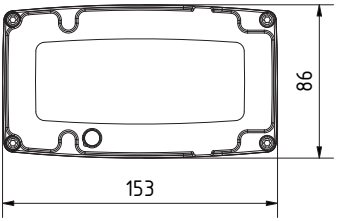

D-Shaft
(Option)
ISO shaft
4-square
(Option)
Round shaft
w/feather key
(Option)
25
35
Ø10
11
□11
40
16
3
4
Ø12
8



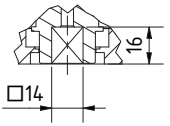




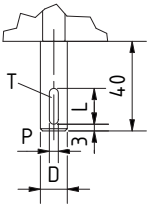




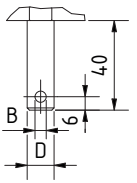
ISO shaft
4-square
(Option)



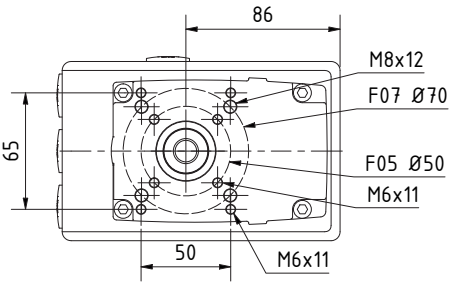
Round shaft
w/feather key
(Option)

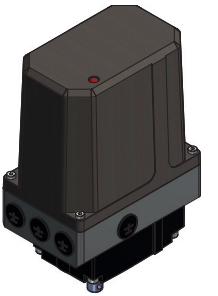


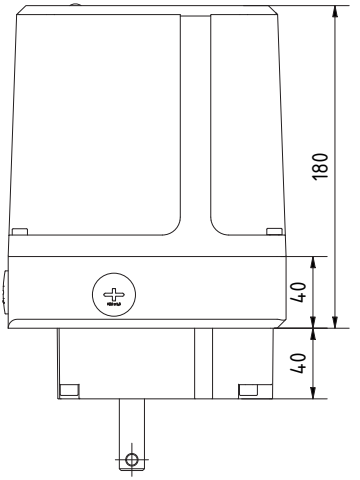
Round shaft
w/cross hole

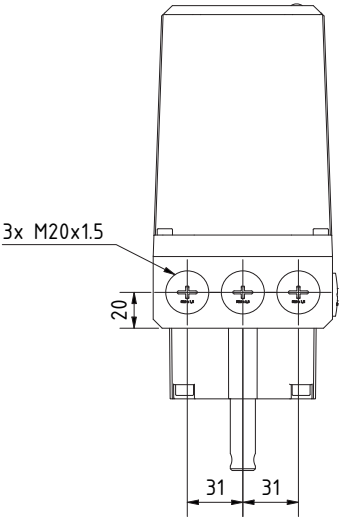


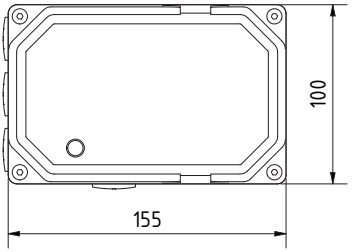
Type	D	B	L	P	T
30 - 40 Nm	12	5	16	4	2.5
50 - 75 Nm	14	6	22	6	3



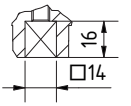




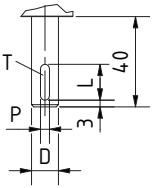




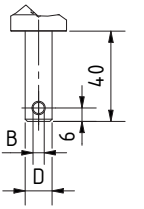
ISO shaft
4-square
(Option)



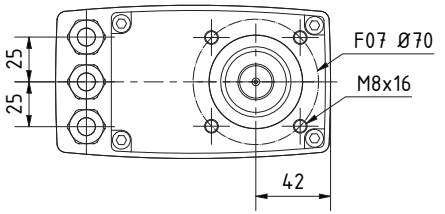
Round shaft
w/feather key
(Option)

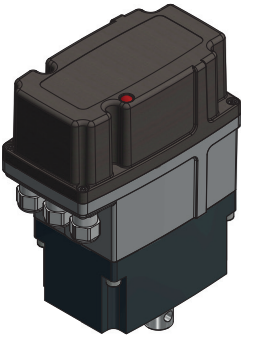


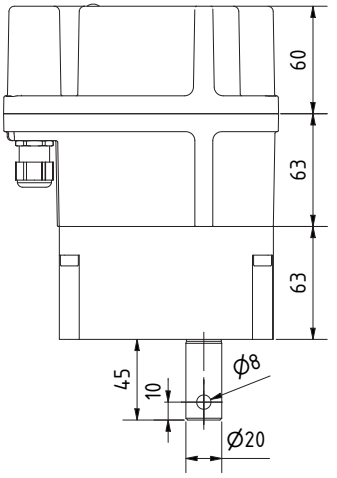
Round shaft
w/cross hole

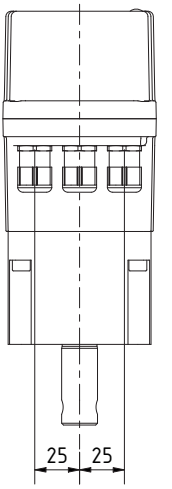


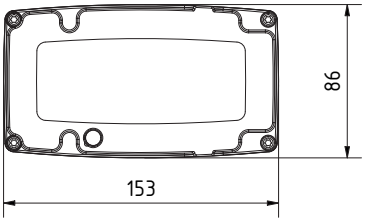
Type	D	B	L	P	T
30 - 40 Nm	12	5	16	4	2.5
50 - 75 Nm	14	6	22	6	3



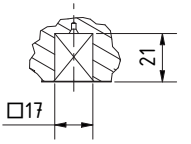




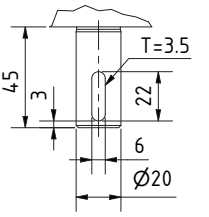


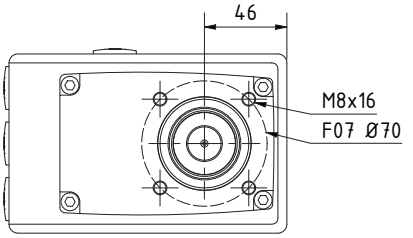


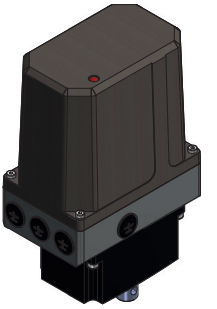
ISO shaft
4-square
(Option)

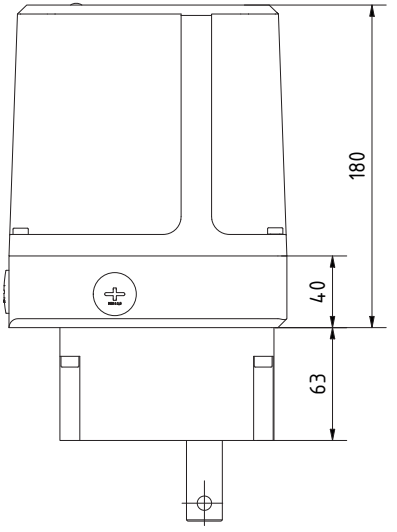


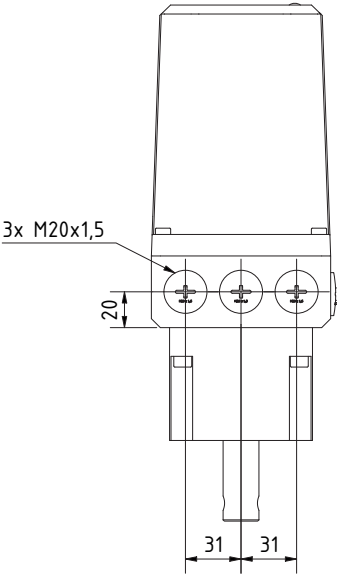
Round shaft
w/feather key
(Option)

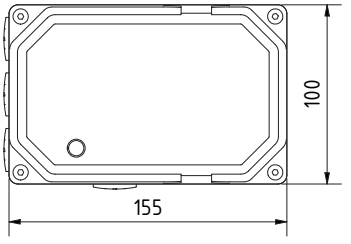




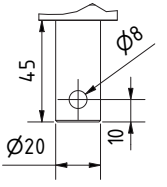




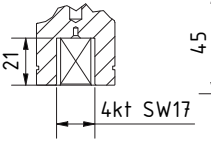




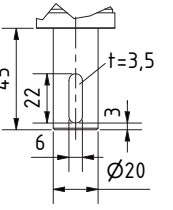
Round shaft w/cross hole



ISO shaft 4-square (Option)



Round shaft w/feather key (Option)



3.4 Performance data

3.4.1 Actuator specifications

Voltage supply	85…265 V AC (50/60 Hz) / 19.2…28.8 V DC
Protection class	IP65 (IP 66/IP 67 Option)
Motor	BLDC-Motor
Connection	Tensor²: 3 cable entries M16x1.5 (provided by customer) Tensor² HS: 3 cable entries M20x1.5 (provided by customer)
Position feedback	Digital via magnet sensor
Ambient temperature	-15 °C up to +60 °C (other temperature ranges optional)
Installation position	Arbitrary
Potentiometer (Option)	Electronical
Travel	>28°…100 revolutions
Operation	Onboard: 3 buttons (Left / Menu / Right), 1 slide switch (AUTO / MANU) External: 4 buttons (Left / Menu / Right / Mode)
Display	OLED-Display 0.96"

3.5 Expected lifespan and intended disposal

ARIS actuators have an expected lifespan of several years, depending on their utilization and application. No longer usable actuators must not be dismantled in whole, but separately recycled in parts divided by their materials. Non-recyclable components must be disposed according to national disposal regulations.

4. Actuator setup for utilization

4.1 Transport, (temporary) storage and downtimes

Use the factory packaging for transport to the installation point.
Replace a damaged original packaging by a new solid packaging.

- Actuators with attached valves: Attach lifting gear only on the valve and NEVER on the actuator;
- Do not use ARIS actuators as a climbing or support aid;
- ARIS actuators must not operate in unsecured lifting operations without additional applications.

ADVICE Possible damage by wrong storage.

- Store in well-ventilated rooms;
- Protection against possible ground humidity (shelf storage);
- Add moisture-absorbing agents to the actuator during longer periods of storage;
- Protect the actuators from dirt and dust;
- Take measures for prevention of condensation (e.g. at temperature fluctuations).

4.2 Packaging

ARIS actuators are protected by special cardboard packaging on delivery.

4.3 Safe disposal of packaging

Additionally necessary packaging is made by easily separable packaging materials and can be recycled individually:
- Wood
- Cardboard
- Paper
- Plastics

4.4 Installation and mounting

- Inspect the actuator for damages prior to installation;
- the screw-in depth of connecting thread holes must not exceed 9 mm;
- check leak tightness of cable glands and blank plugs prior to initial operation;
- tighten the cover screws evenly (max. 1.2 Nm);
- do not operate before limit switches have been adjusted;
- protect the actuator against climatic influences (e.g. by a protective cover);
- do not expose the actuator to hard shocks (e.g. by dropping);
- do not attach ropes, hooks or the like to the actuator;
- permanent overload and blocking leads to actuator damages;
- use only ARIS original spare parts.

Consider prior to attachment of couplings:

- Do not turn actuator shafts by force;
- actuator and valve shafts must run centric.

For all actuators observe the following advice:
The initial operation of the actuator is only permitted with orderly closed cover and closed cable entries. Use only cable glands which are appropriate for the respective protection class.

- Cable entries
  Ensure that all cable entries are closed properly during storage, installation and initial operation.
  Use only cables which are suitable for the diameter of the cable entries.
- Cover assembly
  During the cover assembly make sure that the cover fits correctly.
  The cover must not show any damages on the joint surface.
  Tighten cover screws evenly (max. 1.2 Nm).

⚠ CAUTION	No additional bores are allowed to the enclosure and the cover.

4.5 Initial operation

4.5.1 Electrical connection

⚠ WARNING	Hazardous voltage: Possible stroke! • The initial operation must be carried out only by experts! • De-energize the actuator before opening. • Observe the appropriate regulations during electrical installation and initial operation.

Connect the actuator as follows (wiring diagram see chapter 4.5.2):

- Connect the ground wire of the electric supply to the appropriate protective earth terminal.
- Always refer to the wiring diagram located inside the actuator.

Check prior to initial switching on:

- Is the actuator undamaged on the outside?
- Is the mechanical connection correct?
- Has the electrical connection been made regularly?
- Check if current type, voltage and frequency match with the motor data (see nameplate on cover and inside the actuator).
- Insert suitable cable glands for the connection line.
- Use separate (shielded) wires for low voltages.
- Set up limit switches prior to initial operation.

4.5.2 Wiring diagram

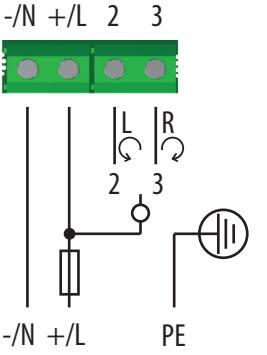
Connection 85…265 V AC

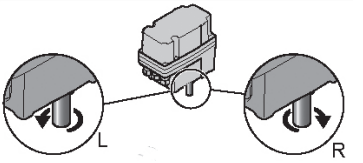
N	Neutral conductor
L	Phase / Supply 85 ... 265 V AC
2	Control connection > left-turning (CCW)
3	Control connection > right-turning (CW)

Connect the ground wire to the inside of the housing.

Connection 19.2…28.8 V DC

–	GND
+	Connection 19.2…28.8 V DC
2	Control connection > left-turning (CCW)
3	Control connection > right-turning (CW)

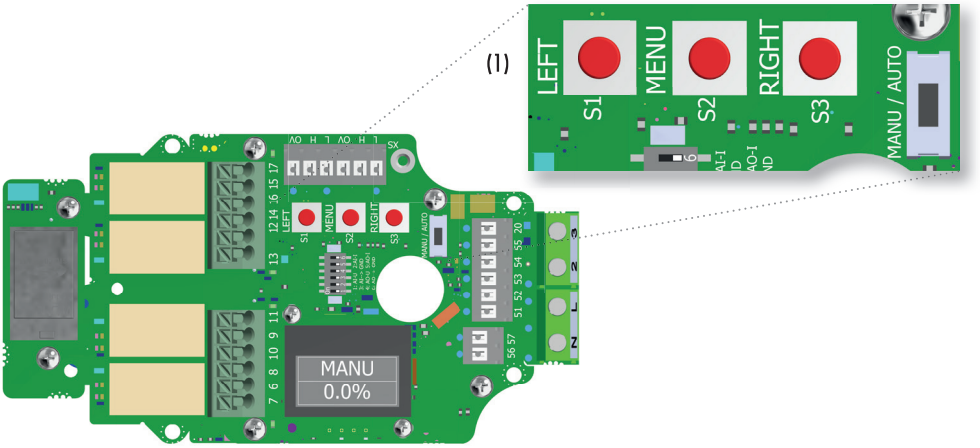




ADVICE	The control terminals "2/3" are only active if the "Signal In"-Option "Terminal 2/3" has been chosen in the Expert Menu.
CAUTION	The drive must be permanently energized, otherwise the holding torque is not available!

5. Actuator operation without modules (Standard)

5.1 Operation



The Tensor² is operated via 3 buttons and a slide switch, located above the actuator´s display. The OLED display makes setting up the actuator easier by showing text such as letters, numbers and signs.

Navigate between different menu items by using the buttons LEFT [L] & RIGHT [R].

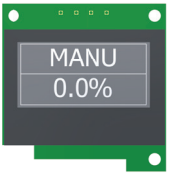
5.1.1 Buttons and switches

The buttons (1) are indicated with
LEFT [L]
MENU [M]
RIGHT [R]

The functionality of the buttons is explained in section "Operating modes".

5.1.2 Operating modes

The different operating modes of the actuator can be selected via the slide switch resp. the MENU button. The actual operating mode is shown on the display.

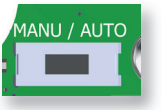


Automatic operation (AUTO mode, switch position "AUTO"):
The actuator runs with an external signal, which is present depending on the setting on the terminal clamps, the signal clamps or CAN clamps. The onboard buttons are without function.

Manual mode (MANU mode, switch position "MANU"):
The actuator can run left and right by using the buttons "L" & "R", if the actuator is not in setup mode. Change to setup mode by pressing the MENU button longer than >1s.

Setup mode (Switch position "MANU"):
Different actuator parameters can be set up and adjusted.

Start setup mode:



1. Slide switch to position"MANU"
2. Press button MENU longer than >1s

Setup mode is turned on and the first menu item "MAIN MENU" is displayed.
Within the setup menu navigate between different menu items and adjustments by pressing the buttons "L" & "R".
Confirm any entry by pressing the MENU button (press <0.5s).
Exit any menu item by pressing the MENU button longer than >1s.

Exit setup mode:
Exit the setup mode by moving the slide switch to position "AUTO" and confirming the notification message.
Alternatively press the MENU button in the top menu layer longer than >1s and confirm the notification message. The actuator then changes to manual mode (MANU mode).

ADVICE	A warning message is displayed when switching between different operating modes, because the actuator can run under certain conditions. Confirm the message with the MENU button.
WARNING	The actuator may run and move the connected valve when switching from MANU to AUTO and you confirm the warning message. After switching from MANU to AUTO and confirming the warning message the actuator can be operated by using the buttons "L" & "R".

5.1.3 Menu system overview

Menu items

Depending on the selected user, stored access authorisation, set parameters and the model type of the actuator, single menu items may be invisible/hidden differing from the following overview.

x = menu item visible

Menu	Sub item	Function	Standard	POTI (Potentiometer)	A-OUT (Analog output, Current/Voltage output	CONTROL (Controller, i-Act)
MAIN MENU		**Main Menu**				
	LOGIN	Login (Select user)		X		
	End positions	Set up end positions (Left & right)				
	Poti input	Settings for operating the actuator via external potentiometer				X
	Poti output	Settings for potentiometer output values (Feedback)		X		X
	Set value	Settings for set value defaults (Drive via set value)				X
	Actual value	Settings for actual value output (Feedback current/voltage)			X	X
	Relay switch	Programming relays behaviour (Option board)	visible only with attached relays module (Option board)			
EXPT. MENU		**Expert Menu**				
	Signal IN	Selection of input signal for driving the actuator		X		
	Signal OUT	Selection of output signal for position feedback				
	Wire monitor	Setting of actuator behaviour in case of cable breakage (formerly wire break monitoring)				X
	Status info	Activate/Deactivate message output		X	X	X
	Offset	Settings for allowed control deviation in controller mode				X

	Hyst. Start	Define start hysteresis	X
	Hyst. Stop	Define stop hysteresis	
	Stall-det.	Settings for block detection	
	Block-det.	Settings for block detection near the end positions	
	RPM acc.	Define acceleration ramp of actuator	
	RPM red.	Define break ramp of actuator	
	Add feature	Entry of activation code for function extensions	
POWR. MENU		**Power Menu**	X
	Torque/Speed	Selection of a torque/time combination for CCW resp. CW rotation	
INFO MENU		**Information Menu**	X
	Firmware	Indicates firmware revision	
	Hardware	Indicates hardware revision	
	Serial-No.	Indicates serial number of the electronics	
	Features	Indicates unlocked actuator functions	
	On-time	Indicates operating hours of the actuator	
	Cycl. Count	Indicates number of starts of the actuator	
	Modules	Indicates connected modules/option boards	

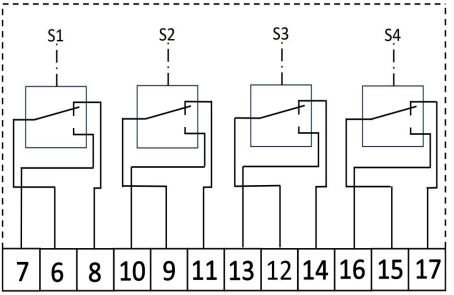
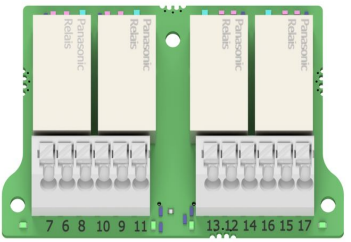
Menu items in detail

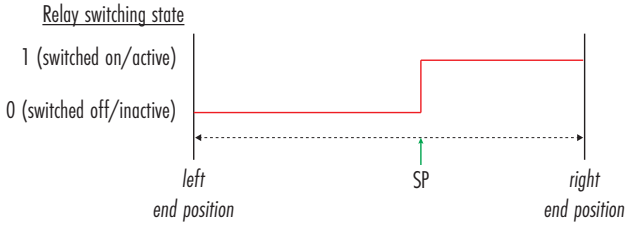
MAIN MENU

Login	Enables selection of an access level. If a password has been stored, enter it here to proceed to further menu items. Depending on the selected access level, single menu items may not be visible or adjustable. If the login is missing, only the INFO MENU and the menu item LOGIN (in MAIN MENU) are visible.
	The following users are selectable: • User • Service • Manufacturer (ARIS only) A logged in user can be logged out via the menu item "Logout".

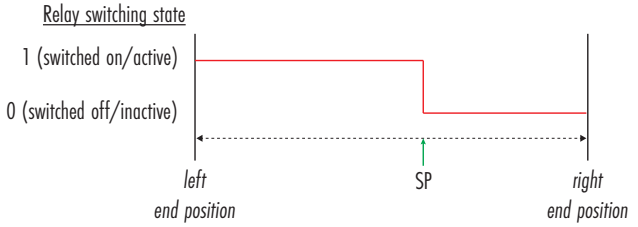
Login (Contd.)	**ADVICE** A user has to be selected/logged in on initial switch on or after a voltage loss, even if no password was given for the selected user. If no password was stored for the user, the password entry is skipped and the first menu item will be displayed.
	Password entry: • Select the appropriate figure via buttons L & R (actual figure is flashing) • To edit the figure press the MENU button –> An underscore is shown below the figure. • Set selected figure by using buttons L & R. • Confirm the set figure with the MENU button. • Navigate to the confirmation arrow after password entry and confirm with the MENU button. No error message is shown when entering a wrong password. A correct password or the active user is marked with an asterisk (*) behind the selected user. Example with user "User": Password correct/User active: > User* Password wrong/User inactive: > User
End positions	*End positions*
	Selection and setting of the left (EL) and right (ER) end position.
	Approach end positions using buttons L and R and then store them.
	Procedure: • Select the end position to be set • Within the display "<EL>" or "<ER>" approach left resp. right end position via buttons L & R and confirm with MENU button • Accept (Y) or cancel (N) storing the end positions. Change between (Y)/(N) via buttons L & R, confirm selection with MENU button.
	CAUTION Motor or parts can be damaged when driving against obstacles. The motor does not stop at the prior set end positions during an end position is re-programmed. Drive the actuator slowly and carefully when setting new end positions.
	ADVICE Left and right end positions can be interchanged. The assignment of the turning direction of the inputs 2/3 and the buttons LI/RE do not change. The end positions must be 28° apart due to technical reasons. If the difference range is too small, the actuator will prompt "Error Code 51".

Poti Input	*Actuator control via external potentiometer, only visible and adjustable with "Signal IN" = "Poti"*
	Matching of the set value signal for the left and right end positions for controlling the actuator via a potentiometer. This menu item can only be set, when "Poti" is selected under "Signal IN". The DIP switch must be set correctly on the board (see menu item "Signal IN"). The connected potentiometer is supplied with 5 V DC via the electronics of the actuator. The set value signal of both end positions can be set as a percentage of the total voltage applied to the potentiometer. The following settings are possible for the left and right end positions: Set value signal = 0% | 10% | 90% | 100% | free (free values, selectable via display)
Poti Output	*Position feedback via potentiometer, only visible and adjustable with "Signal OUT" = "Poti"*
	Setting of the actual value signal at the output of the electrical potentiometers relating to the left and right end position. This menu item can only be set, when "Poti" is selected under "Signal OUT". The DIP switch must be set correctly on the board (see menu item "Signal OUT"). The actual value signal of both end positions can be set as a percentage of the total voltage applied to the potentiometer. The following settings are possible for the left and right end positions: Actual value signal = 0% | 10% | 90% | 100% | free (free values, selectable via display)
	ADVICE The terminal designation for the potentiometer output is differently to prior Tensor electronics. The original terminals 18 and 19 are replaced with terminals 54 and 55. Wiring diagram see description for "Signal OUT".
	Performance data for potentiometer Resolution: 12 bit Output impedance: 1 kΩ Supply voltage: 4.75…28.8 V DC
Set Value	*Settings for set value input when controlling with i-Act controller, only adjustable with "Signal IN" = "Ctrl. [mA]" or "Ctrl. [V]"*
	Matching the set value signal for the left and right end position. This menu item can only be set, when "Ctrl. [mA]" or "Ctrl. [V]" is selected under "Signal IN". The set value signal of both end positions can be set as follows: Set value signal current = 0 mA | 4 mA | 20 mA | free (free values, selectable via display) Set value signal voltage = 0 V | 2 V | 10 V | free (free values, selectable via display)
	ADVICE For a proper function, the DIP switch near the buttons must be set equivalent to the settings in the menu! Setting the DIP switch see description for "Signal IN". NOTICE: Defaults for the set value of the end positions must cover min. 20% of the total range, otherwise "Error Code 80" will be displayed. Example: Signal range 4 mA => Coverage 4 mA x 20% = 0.8 mA Lower end position 0.1 mA => Upper end position min. 0.9 mA (= 0.1mA + 0.8 mA)

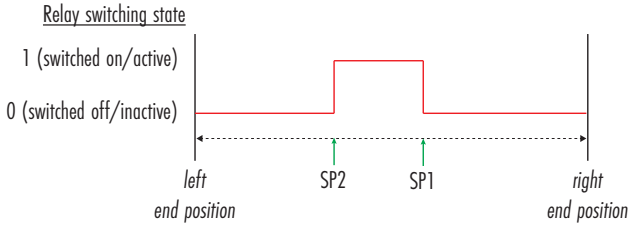
Set Value (Contd.)	Performance data for set value input Resolution: 12 bit Set value input: Current input 0…20 mA, Burden 50 Ω Voltage input 0…10 V DC, input impedance >200 kΩ
Actual Value	***Settings for actual value output as position feedback, only adjustable with "Signal OUT" = "Ctrl. [mA]" or "Ctrl. [V]"***
	Matching the actual value signal for the left and right end position. This menu item can only be set, when "Ctrl. [mA]" or "Ctrl. [V]" is selected under "Signal OUT". The actual value signal of both end positions can be set as follows: Set value signal current = 0mA | 4 mA | 20 mA | free (free values, selectable via display) Set value signal voltage = 0 V | 2 V | 10 V | free (free values, selectable via display)
	ADVICE For a proper function, the DIP switch near the buttons must be set equivalent to the settings in the menu! Setting the DIP switch see description for "Signal OUT". NOTICE: Defaults for the set value of the end positions must cover min. 20% of the total range, otherwise "Error Code 70" will be displayed.
	Performance data for actual value output Resolution: 12 bit Actual value encoder: Magnetic position sensor Actual value output: Current output 0…20 mA, Burden 50 Ω / Voltage output 0…10 V DC
Relay Switch	***Relay settings for options board with additional switches for position feedback, only adjustable in combination with mounted relay board***
	Behaviour setup for the bi-stable relays on the relay board. Up to 4 relays are available, depending on the chosen relay board. The switching state of the relays is retained even in currentless condition, so that the auxiliary switches can be used.
	Performance data of relay (Add-on board) Amount of relays: 2 (optional 4) Relays type: Bi-stable relay Switching voltage: max. 250 V AC / 125 V DC Allowed continuous current/channel: max. 2 A (at 230 V AC / 30 V DC); max. 0.2 A (at 125 V DC)  

Relay Switch (Contd.)	The following relay settings are available: 1. "Off": Relays switched off/inactive 2. "Sw.pt.high" (Switch point high): Relay is switched on/active from right end position to the set switching point SP. Relay is switched off/inactive from left end position to the set switching point SP. 3. "Sw.pt.low" (Switch point low): Relay is switched off/inactive from right end position to the set switching point SP. Relay is switched on/active from left end position to the set switching point SP. 4. "Cam high" (Switch cam high): Relay is switched off/inactive from right end position to the set switching point SP1, switched on/active between switching points SP1 and SP2 and switched off/inactive again after switching point SP2. Relay is switched off/inactive from left end position to the set switching point SP2, switched on/active between switching points SP2 and SP1 and switched off/inactive again after switching point SP1. 5. "Cam low" (Switch cam low): Relay is switched on/active from right end position to the set switching point SP1, switched off/inactive between switching points SP1 and SP2 and switched on/active again after switching point SP2. Relay is switched on/active from left end position to the set switching point SP2, switched off/inactive between switching points SP2 and SP1 and switched on/active again after switching point SP1. 6. "Bl.det.le" (Block detection left): Relay switches off when detecting a blockage in range of the left end position. Settable only on relays no. 3 & 4! 7. "Bl.det.ri" (Block detection right): Relay switches off when detecting a blockage in range of the right end position. Settable only on relays no. 3 & 4!
	[1] Off 
	[2] Sw.pt.high 

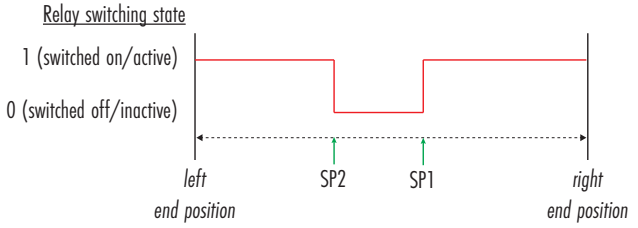
[3] Sw.pt.low



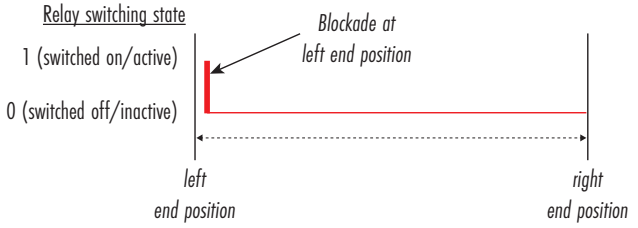
[4] Cam high

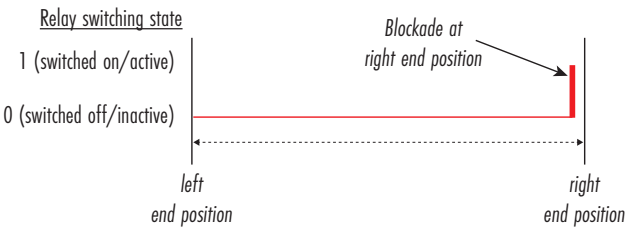


[5] Cam low



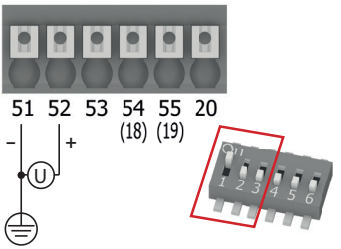
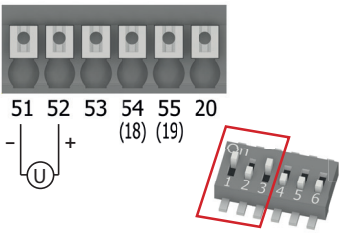
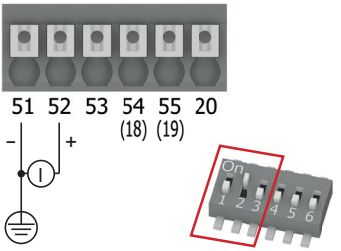
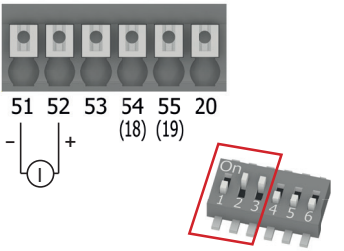
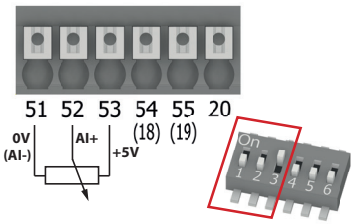
[6] Bl.det.le



	[7] Bl.det.ri 
	Feedback of block detection via relay (Setting 6 & 7) The condition of the block detection can be put out via relay 3 and 4. Therefore, the settings for block detection are matched to the preferred relay in the relay settings menu. The block detection feedback can differ between block detection in left end position and block detection in right end position. On a block detection within the set range, the relay will switch.

EXPT. MENU (Expert menu)

Signal IN	*Input signal*
	Selection of input signal type for controlling the actuator. The following control features are available (depending on the activated features): • Term. 2/3 (Terminal 2/3): Driving the actuator via terminal 2/3. • Ctrl. [mA] (Control [mA], i-Act): Driving the actuator by feeding a set value signal in range 0...20 mA. • Ctrl. [V] (Control [V], i-Act): Driving the actuator by feeding a set value signal in range 0...10 V. • Poti (Potentiometer, i-Act): Driving the actuator via a connected external potentiometer.
	ADVICE The input signal type must additionally be set up with the onboard DIP switch, according to the desired signal type. DIP switch 1 and DIP switch 2 must not be active (On) simultaneous! DIP switch 4 and DIP switch 5 must not be active (On) simultaneous!

Signal IN (Contd.)	Settings of the DIP switch for input signals (DIP switches 1-3) For the settings of the input signals use DIP switches1-3. The position of DIP switches 4-6 is irrelevant to the input signal setting.
i-Act	Voltage input [V] Voltage source grounded  Voltage source potential-free 
i-Act	Current input [mA] Current source grounded  Current source potential-free 
i-Act	Potentiometer input When driving the actuator via a connected potentiometer, an auxiliary voltage of 5 V DC is generated over terminal 53 for poti supply. An additional external voltage supply for the potentiometer is not necessary. Potentiometer input 

Signal OUT	*Output signal*
	Selection of the output signal type, used as position feedback. The following position feedbacks are available (depending on activated features): Feedback signal: • Off: No feedback of actuator position. • Ctrl. [mA] (Control [mA], i-Act or current/voltage output): Output of an actual value signal [mA]. • Ctrl. [V] (Control [V], i-Act or current/voltage output): Output of an actual value signal [V]. • Poti (Potentiometer): Output of a voltage value of the internal electrical potentiometer, assigned to the actual actuator position.
	ADVICE The input signal type must additionally be set up with the onboard DIP switch, according to the desired signal type. DIP switch 1 and DIP switch 2 must not be active (On) simultaneous! DIP switch 4 and DIP switch 5 must not be active (On) simultaneous!
	Settings of the DIP switch for output signals (DIP switches 4-6) For the settings of the output signals use DIP switches 4-6. The position of DIP switches 1-3 is irrelevant to the output signal setting.
i-Act Current/Voltage output	Voltage output [V] Voltage output 51 52 53 54 55 20 (18) (19) – + U On 1 2 3 4 5 6 Current output [mA] Current output 51 52 53 54 55 20 (18) (19) – + I On 1 2 3 4 5 6
Potentiometer electronical	Potentiometer output Potentiometer output Voltage source grounded 51 52 53 54 55 20 (18) (19) U- + U+ U U 5-24V On 1 2 3 4 5 6 Potentiometer output Voltage source potential-free 51 52 53 54 55 20 (18) (19) U- + U+ U U 5-24V On 1 2 3 4 5 6

Signal OUT (Contd.)

ADVICE

The terminal indication for the potentiometer output is different to prior Tensor electronics. The original terminal indications 18 and 19 were substituted by 54 and 55 (see wiring diagram).

Wire Monitor

Wire monitoring, formerly wire break monitoring

Monitoring of the set value signal at the terminals when driving the actuator with set value signals (mA resp. V).
The monitoring works only with preset values 4…20 mA resp. 2…10 V.
In this range a set value signal <2 mA resp. <1 V is detected as an error and the error code 90 is displayed.

The following actuator behaviour can be set:

Setting	Behaviour on missing/wrong set value signal
Off	Monitoring deactivated
Stop	Actuator stops
Open	Actuator moves to OPEN position (turning direction of shaft CCW)
Close	Actuator moves to CLOSE position (turning direction of shaft CW)
Position	Actuator moves to a preset position

Setting "Position"
Selecting the setting "Position" will show "<WP[actual position]%>" in the display.

- Pressing the buttons L & R, the actuator can be set to the desired position it should run to in case of a missing set value signal.
- Confirm desired position with the MENU button.
- Confirm (Y) or cancel (N) storing the position. Change between (Y)/(N) via buttons L & R, confirm selection with the MENU button.

Status Info

Message output

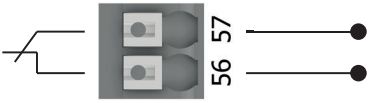
The message output delivers the actual status of the actuator via a potential-free contact.
The following settings are possible:

- Off: Message output not active (no feedback over terminal 56|57)
- On: Message output active

When set to "On", the contact on terminal 56|57 is closed, while the actuator is in AUTO mode.
The following events/conditions lead to an open contact:

- Actuator in MANU mode
- Detection of a control variance (when active)
- Occurrence of an error

Performance data of the message output
Switching voltage: 250 V AC / 30 V DC
Allowed continuous current: 3 A



Offset	*Control variance*
	Setting of the max. variance allowed between actual and set value of the controller (Standard variance). The allowed variance is stated in % depending on the set travel of the actuator. An override of the set max. variance will indicate an error at the message output (see "Status Info"). Possible settings: 0 = Standard variance check deactivated 1...9% = Allowed standard variance in % Example: Menu setting = 2% Right end position 0% [0°] / Left end position 100% [90°]. A 90° travel corresponds to a max. allowed variance of 90° x 2% = 1.8°. The message output opens on a variance of the actual position from the set position of >1.8°.
Hyst. stop	*Shut-off hysteresis*
	The shut-off hysteresis defines the shut-off accuracy of the actuator when reaching the default set value position. The actual position of the actuator is checked against the set position and the default hysteresis value. The actuator stops if the actual position lies within the (shut-off) hysteresis range around the set value. The shut-off hysteresis of the actuator in control mode can be set in steps of 0.01% in a range of 0…5.00%.
	ADVICE The shut-off hysteresis has to be set lower than the turn-on hysteresis! If the hysteresis is set too low, the actuator may operate in an unwanted behaviour depending on the actuator type. In this case, the hysteresis must be increased.
Hyst. start	*Turn-on hysteresis*
	The turn-on hysteresis defines at which variance from the actual position to the set position the actuator will readjust. The actual position of the actuator is checked against the set position and the default hysteresis value. If the actual position of the actuator lies outside the (tun-on) hysteresis range around the set position, the actuator moves to the deafult set position. The turn-on hysteresis of the actuator in control mode can be set in steps of 0.01% in a range of 0…5.00%.
	ADVICE The turn-on hysteresis has to be set higher than the shut-off hysteresis! If the hysteresis is set too low, the actuator may operate in an unwanted behaviour depending on the actuator type. In this case, the hysteresis must be increased.

Stall-Det.	*Stall detection*
	The stall detection recognizes an accidental halt of the actuator and the BLDC motor, caused by a blockade. Subsequently the actuator stops to avoid damages to the actuator or the connected valve and an error code (Error Code 3X) is displayed. The error can be reset by driving the actuator in the opposite direction.
Block-Det.	*Block detection in range of the end positions*
	The block detection recognizes the run of the actuator against an intended block (e.g. valve seal, valve stop bar, etc.) within a settable range around the end positions and suppresses a stall error in this range. The capture range of the block detection is set in % from the right resp. left end position and can be set differently for both end positions. The following settings are possible: 0 = Block detection deactivated 1...10% = Capture range of block detection at an end position The block detection condition can be put out via the relays 3 and/or 4 (if applicable). See further information in section "Relay switch". If a block was detected, it will be interpreted as an end position. The display of the actuator´s position (in %) stays uneffected from the block detection. On a block detection, reset the detection by driving the actuator in the opposite direction. The actuator turns off, if it reaches a default end position. Example: Menu setting: Block detection left/right = 2% When the actuator reaches the actual position <2% resp. >98% and detects a blockade in this range, the actuator stops on the blockade position. Relay 3 or 4 reacts depending on the equipment and setting of the actuator. No error will be displayed.
RPM acc.	*Acceleration ramp*
	Defines the time [ms] of the acceleration ramp of the actuator in AUTO mode.
RPM red.	*Brake ramp*
	Defines the time [ms] of the brake ramp of the actuator in AUTO mode.

Add feature	*Adding features*
	Enables the entry of an access code for activation of further actuator features. The following features can be activated by entering the access code: • Potentiometer: Activation of the electronical potentiometer for position feedback • Current/Voltage output: Activation of the current/voltage output for position feedback • i-Act: Activation of the electronical potentiometer, the current/voltage output for position feedback and activation of the potentiometer input and the current/voltage input for controlling the actuator via set value signals ([mA] & [V]).
	ⓘ ADVICE If you are interested in any additional feature, please contact the ARIS sales department and have the serial number of the mounted electronics ready (check INFO MENU "Serial-No.").

POWR. MENU (Power menu)

Torque/Speed	*Torque/Actuating speed*
	Enables the setting of pre-defined torque/time combinations. The setting of the torque/time combination can be made separately and differently for both turning directions "CCW" and "CW".

INFO MENU (Information menu)

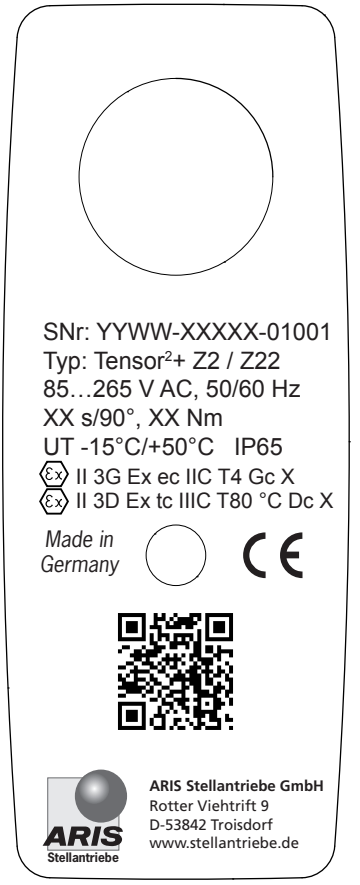
Firmware	Displays the firmware version of the electronics.
Hardware	Displays the version of the electronics hardware.
Serial-No.	*Serial number*
	Displays the serial number of the actuator´s electronics. The serial number of the electronics is used for the activation of additional actuator features and may be asked by the ARIS customer service.
Features	*Functions/Features*
	Shows active features/functions and further available features/functions of the actuator. The status of the different functions is marked as follows: Example for feature/function "POTI": Feature/Function activated: > POTI* Feature/Function not activated: > POTI

On-time	*Operating hours counter*
	Displays the overall operating hours of the actuator. The operating hours counter starts as soon as the actuator is supplied with power and stops when the power supply is cut off. The operating hours are stored even when a power failure occurs. A reset of the operating hours is not possible.
Cycl. count	Cycle count
	The cycle count counts the number of starts of the actuator in AUTO mode. The number of starts is stored even in case of a voltage cutoff. A reset of the counter is not possible.
Modules	*Modules*
	Displays (add-on) boards which are connected with the electronics. Connected and recognized boards are marked with an asterisk (*) after the board name. Example with relay board: Board connected/recognized: > Relay* Board not connected/not recognized: > Relay
	ADVICE Add-on boards must only be mounted/dismounted when the electronics is de-energized!

6. Additional advice concerning the intended use in potentially explosive atmospheres of the zone 2 and 22 (Option) ⟨Ex⟩

ADVICE All following chapters of this operating instruction apply additionally to this complementary advice.

6.1 Nameplate



⚠CAUTION

Do not disconnect under voltage!

← *Serial number (YYWW= year of manufacture+week)*
← *Actuator type*
← *Voltage/Frequency/Power consumption (DC as an Option)*
← *Actuating time/Torque*
← *Ambient temperature/Protection class*
← *Labelling according to ATEX*

Standard version Tensor²+ Z2 / Z22
⟨Ex⟩ II 3G Ex ec IIC T4 Gc X
⟨Ex⟩ II 3D Ex tc IIIC T80°C Dc X
-15 °C ≤ Ta ≤ +50 °C

Version with auxiliary switches: Tensor²+ Z2 / Z22 R
⟨Ex⟩ II 3G Ex ec nC IIB T4 Gc X
⟨Ex⟩ II 3D Ex tc IIIC T80°C Dc X
-15 °C ≤ Ta ≤ +50 °C

Actuators of the series Tensor²+ of the appropriate type have to be marked with the additional label according to ATEX-directive 2014/34/EC on the nameplate (s. image above).

6.2 Guidelines and standards

ARIS actuators of the type Tensor²+ for the intended use in potentially explosive atmospheres of the zone 2 and 22 are electronic devices of the device group II and device category 3 according to appendix II of the directive 2014/34/EU. The fundamental health- and safety requirements are met through type examination certificate IBExU16ATEXB001 X in accordance with:
EN 60079-0:2012 + A11:2013, EN 60079-7:2015, and EN 60079-31:2014.

6.3 Technical specifications

6.3.1 Functions and application area (intended use)

ARIS actuators of type Tensor²+ for the intended use in potentially explosive atmospheres are exclusively designed for industrial use. They are utilized for operating regulating and shut-off appliances (valves, ball valves, taps, slide valves, dosing pumps, etc.). The actuators Tensor²+ meet the requirements of the ignition protection type "Protection by enclosures" for a explosion proof device of the group II and the category 3 D and ignition protection type "Increased safety" for group II and category 3G.

ARIS actuators for the EX-zones 2 and 22 may not be used
- in explosion-endangered areas of the zones 1, 21;
- at temperatures below -15 °C or above 50 ° C;
- underground environments;
- near open fires;
- under water.

Further appropriation of extent and limits of the inteded use arise from additional labelling acc. to ATEX Directive 2014/34/EU (see 6.1) listed on the actuator´s nameplate.

ADVICE	**Special conditions**: Gc & Dc: Only ATEX certified cable entries with O-ring seals are allowed! Dc: Make sure that no potential highly charged processes are expected near the appliance, when operating the actuator in explosive dust areas!

6.4 Performance data

The maximum surface temperature of the actuators with regard to an ambient temperature of +50 °C is +80 °C.

Protection class	IP65
Motor	• Power supply: 85…265 V AC, 50/60 Hz; 19.2…28.8 V DC • Type: BLDC • Duty cycle: 100% ED • Isolation class E acc. to DIN EN 60085
Cable glands	ATEX-certified glands acc. to required protection class, e.g.: WISKA Hoppmann & Muslow GmbH, Type ESKE/1-e 16 EU type examination certificate no.: PTB 13 ATEX 1015 X Ø Cable min. 4 mm, Ø Cable max. 9 mm
Position feedback	Digital magnet sensor
Ambient temperature	-15 °C up to +50 °C
Installation position	Arbitrary
Potentiometer (Option)	Electronical
Travel	28°…100 revolutions

ADVICE

Only fixed installed cables and wires in combination with ATEX-certified cable glands are allowed to be inserted to the actuator. Pay attention to the manufacturer´s references. The operator must guarantee an appropriate strain relief.

WARNING

If an error occurs: Dangerous voltage when the protective conductor is NOT connected. Possible electric shock!

- Connect the protective conductor terminal (s. symbol ⏚ in actuator enclosure) with the protective conductor **at any time**.
- Do only put the actuator in operation with connected protective conductor!

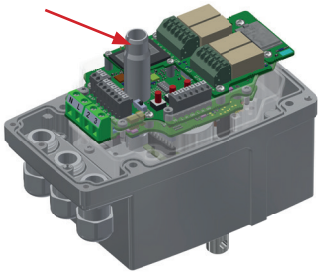
Explosion hazard!
The actuator is only allowed to be used if the cover is closed properly and cable entries are closed.

7. Additional options

7.1 Internal manual override (mechanical)

⚠CAUTION	Operating the manual override with a power tool is not permitted, the transmission can be destroyed due to the high speed!

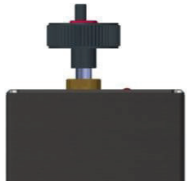
Turn the drive shaft with a flat-tip screwdriver at the manual override until the desired position is reached.



7.2 Option hand wheel

⚠CAUTION	Danger of mechanical stroke. The hand wheel is only allowed to be used if the system power is turned off!

1. Turn off operating voltage of the actuator.
2. Press down hand wheel and turn to desired direction. Adjusted positions remain.
3. If the desired position is reached release the hand wheel (the coupled state releases).
   The hand wheel does not rotate in decoupled state.



8. Parameter RESET

The parameter reset function is implemented in order to restore the factory settings.

Perform the Parameter-RESET:

- In de-energized state switch into HAND mode
- Hold buttons L&R down
- Turn on power supply and still hold down buttons
- While pressing the buttons L & R, the LED near the buttons blinks as follows:
  1. LED blinks slowly
  2. LED blinks fast
  3. LED lights permanently
- Release buttons L & R. The "Error Code 51" is displayed. Afterwards, the end positions of the actuator have to be set new. Furthermore, all settings should be checked and adjusted, if necessary.

9. Required customer information

ADVICE	If it is not possibly to remedy the malfunction, please contact the ARIS customer service. More at: www.stellantriebe.de

9.1 Troubleshooting and repair

WARNING	Hazardous voltage: Possible stroke! • Troubleshooting and repair only by experts! • Cut off voltage before opening the actuator. • Risk of crushing at rotating elements!
ADVICE	We recommend a repair at the ARIS factory. More information under: www.stellantriebe.de

Error messages

Error codes are stated on the actuator´s display.

The following table describes the error codes and shows possible troubleshooting.

Error Code	Description	Troubleshooting
30/32	The block protection has responded.	Drive actuator in opposite direction to revoke the error.
31/33	The overload protection has responded.	The error will reset automatically, when the overload has been eliminated. If the error does not reset automatically, please contact the ARIS customer service.
50/51	Range error. The distance between the end positions is too small.	Perform an end position setting acc. to section "End positions". Minimum travel between end positions is 28°!
70	Parameter error. The difference of the default set values for the right and left end position is too small.	Renew the setting for actual values ("Actual value"). Defaults for the actual values of the end positions must cover min. 20% of the full range (description see section "Actual value").
80	Parameter error. The difference of the default set values for the right and left end positions is too small.	Renew setting for set values ("Set value"). Defaults for the set values of the end positions must cover min. 20% of the full range (description see section "Set value").
90	The "Wire monitor" (Cable monitor, formerly wire break detection) detected a wire-breakage at the set value input.	Check input signals at the set value input or signal transmitter. More information see section "Wire monitor".
more	Some other error exists.	Please contact the ARIS customer service.

10. Maintenance

10.1 Service

ARIS actuators of type Tensor² have a lifetime lubrication and are generally maintenance-free.

10.2 Accessories

Please order accessories separately.

10.3 Spare parts

ADVICE	Order spare parts at aris@stellantriebe.de any time. Please have the the serial number of the actuator ready.

Declaration of Incorporation of partly completed machinery

according
EU directive 2006/42/EC Annex II B „Machinery Directive“

Herewith we declare, that the below mentioned incomplete machinery

Product description:	Electrical actuator
Product Types:	tensor and identical

fulfills the basic requirements of the annex I of the directice 2006/42/EC, if it applies to the appropriate order:
1.1.2c,e; 1.1.3; 1.1.5; 1.3.4; 1.5.1; 1.5.2; 1.5.4; 1.5.5; 1.5.6; 1.5.8; 1.5.9; 1.5.11; 1.6.1; 1.6.4; 1.7.3; 1.7.4

The product has been designed in accordance with the directives of the European Union.
Its conformity with the following standards and directives is ensured:

- **DIN EN ISO 12100:2011-03** ("Safety of machinery")
- **2014/35/EU** (Low Voltage Directive)
- **2014/30/EU** (Electromagnetic Compatibility / EMC Directive)
- **2011/65/EU** (Restriction of the Use of Certain Hazardous Substances.../ RoHS Directive).

The product is a partly completed machinery in accordance with Article 2 letter g of the Directive 2006/42/EG. The special technical documents according to annex VII part B have been created.
On reasonable requests these documents can be sent electronically to the responsible authorities.
The initial operation of this incomplete machinery is only permitted, if it is approved that the facility or machinery in which it will be installed corresponds to the european directive 2006/42/EC, if it applies.

Authorized representative for collection of relevant technical documents:

Raimund Schulte
Quality and product safety
ARIS Stellantriebe GmbH
Rotter Viehtrift 9
D-53842 Troisdorf

This declaration is invalid if the machinery is changed or rebuilt in a manner it was not designed for.

Troisdorf, 31.08.2021

R. Schulte (Quality and product safety)

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Subject to technical changes.

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