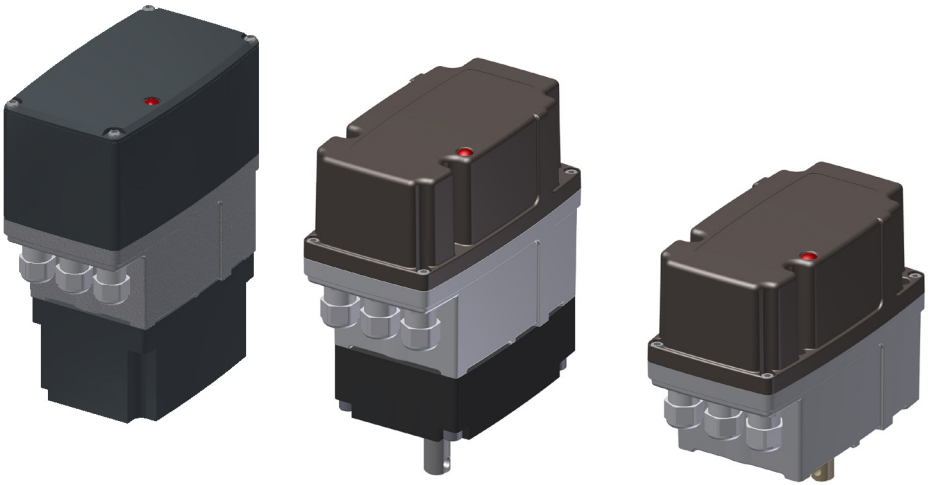
ARIS
Stellantriebe

Original declaration of incorporation with manual for

ARIS actuator Tensor
Tensor
Tensor+ (Option)
Tensor+ Zone 2/22 (Option)



CE

TE1737EN01

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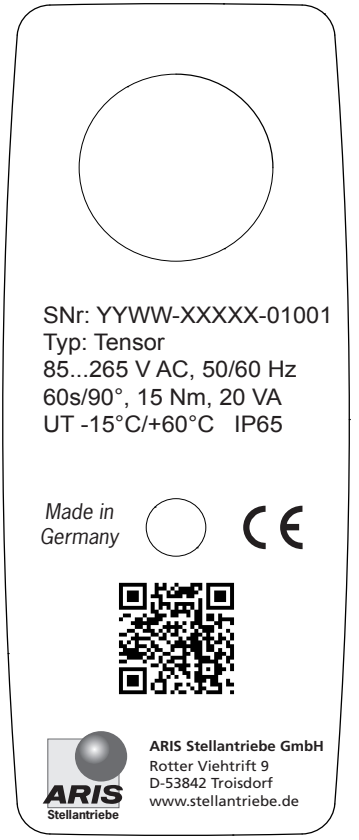
1. Identification

This manual is valid for:

Description:	Electric actuator
Type:	Tensor
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 housing (IP-Code)	Protection class testing	DIN EN 60529:1991

ADVICE	EMC considerations of the overall system and system perturbations and their fight 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 the 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 advices, useful hints and work recommendations, which don´t have influence on the safety and health of the staff.

2.2 General safety advices

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 advices.

ADVICE	• This manual has to be kept at the operating place at any time. • Read the manual carefully prior to installation and initial operation.
WARNING	While operation of 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 total system by qualified technical personnel.

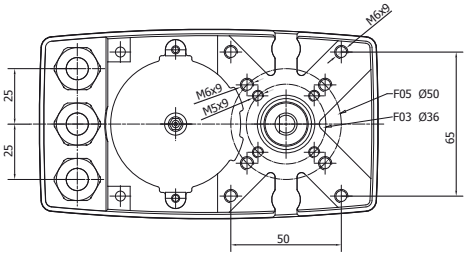
The ARIS company assumes no liability for any direct or indirect damage arising from
- an insufficient test period of the actuator in the total system,
- an improper utilization of the actuator,
- a further utilization after an error was detected.

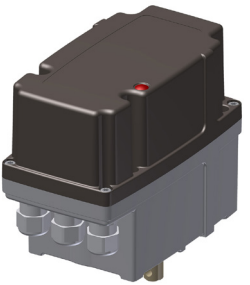
Perform controls on a regular basis during the operation. Pay particular attention to:
- intended utilization of the actuator (Chapter 3.1);
- unusual sounds, severe vibrations or increased temperatures;
- examine the correct tightening torque and impermeability of fixing screws, cable entries, cable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

Should malfunctions arise, you have to stop the actuator and remedy the malfunction.

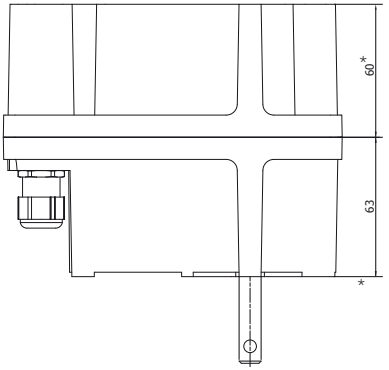
All persons who do the installation, commissioning and setting must
- be specially trained and qualified;
- be mentally and physically capable;
- observe the operating instructions.

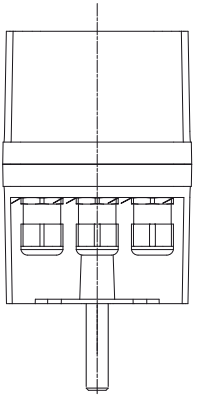
- Valves, levers and connecting rods are moving during actuator operation.
- Check for proper function of all emergency equipment on your machinery/system.
- Check for proper function of the actuator and operated valves after completion of all installation work.
- Never work with or operate a faulty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



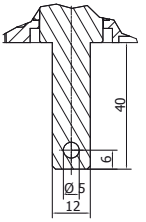


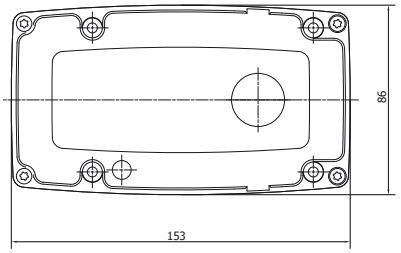
*Option metal cover (Tensor+) = 70 mm



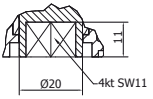


Round shaft
with cross hole
(Standard)

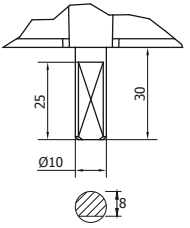




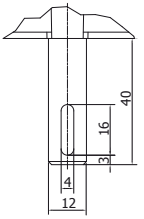
ISO shaft
inner 4-square
(Option)

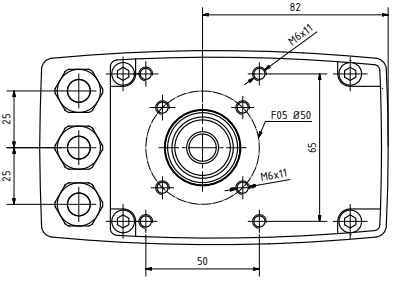


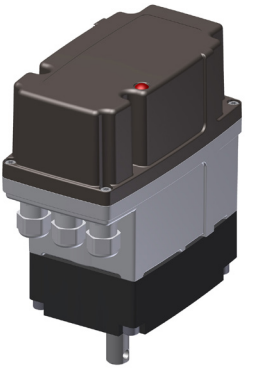
D-shape
(Option)



Round shaft
with feather key
(Option)







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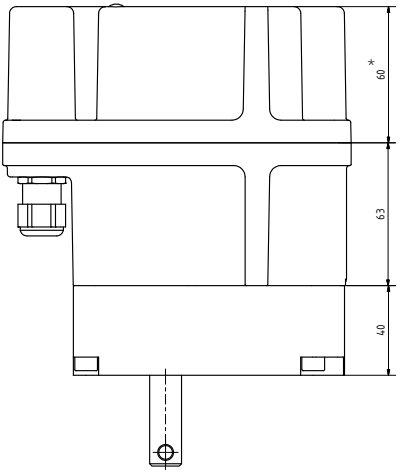
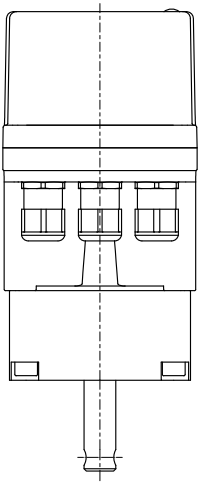
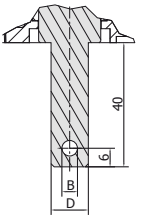
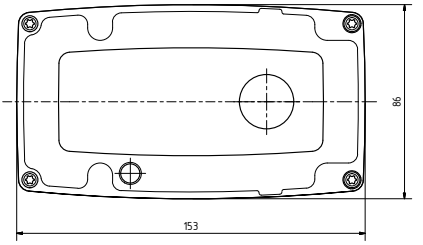


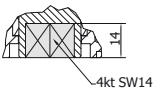


Round shaft
with cross hole
(Standard)

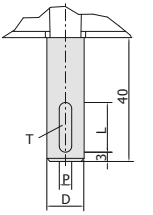




ISO shaft
inner 4-square
(Option)

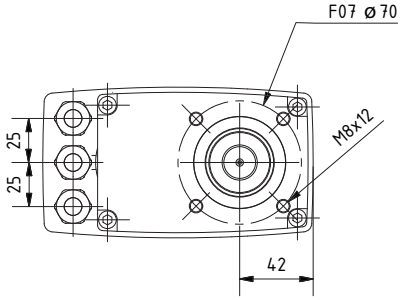


Round shaft
with feather key
(Option)

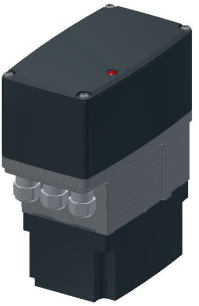


Type	D	B	L	P	T
30 to 40 Nm	12	5	16	4	2.5
50 to 60 Nm	14	6	22	5	3

Special shafts upon request



Tensor L



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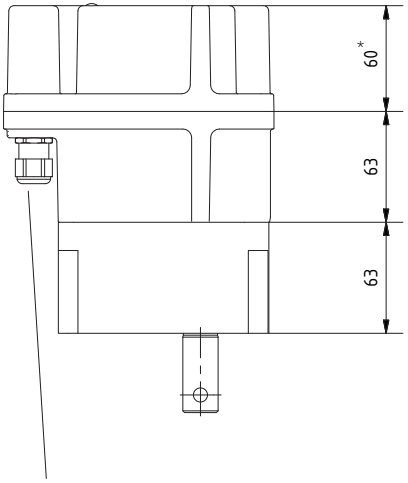
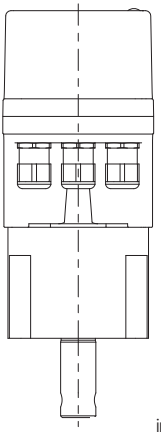
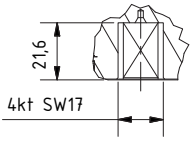


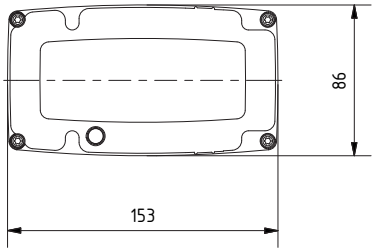
cable gland optional
(standard=blind plug)

Option metal lid

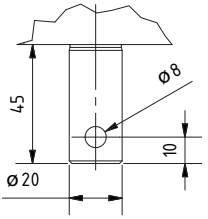


inner 4-square
(Option)

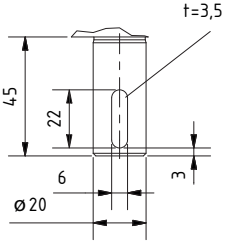




round shaft with
cross hole
(standard)



round shaft with
feather key
(option)



3.4 Performance data

3.4.1 Actuator specifications

Protection class	IP65 (IP 66/IP 67 Option)
Motor	• Supply: 85...265 V AC (50/60 Hz) / 24…48 V DC • Protection: Primary: 2A Tr • Control: BLDC • 50/60Hz ±5%, 100% ED • Isolation class E acc. to DIN EN 60085
Connection	3 cable entries M16x1.5 (customer provided)
Path cutoff	Digital via magnet sensor
Ambient temperature	-15 °C up to +60 °C (other temperature range optional)
Installation position	Arbitrary
Potentiometer (Option)	Electronic
Travel	28°…100 revolutions

3.4.2 Specifications I-ACT (PMR)

Function group flash controller, DSP functions	
System resolution	12 bit
Set value input	Current input max. 0...20 mA, burden 250 W Voltage input adjustable 0...5 V or 0...10 V Limited protection against overload and reverse polarity
Actual value transducer	Magnetic position sensor on basic board
Actual value output	4...20 mA, 0...20 mA, galvanically isolated Burden max. 500 Ω, Output stroke max. 10 V Burden 250 Ω, Output stroke 0...5 V
Operation	3 buttons: Left / MENU / Right 1 switch: AUTO / MANU Status display via two 7-segment displays

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 as a 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 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 at 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 advices:
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 in the housing 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.

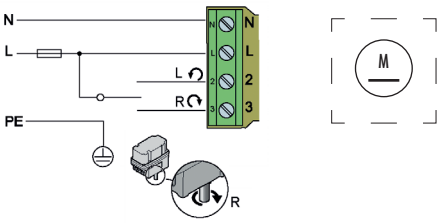
Check prior to initial switch on:

- 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.
- Observe the wiring diagram inside the cover.
- Use separate (shielded) wires for low voltages.
- Set up limit switches prior to initial operation.

4.5.2 Wiring diagram

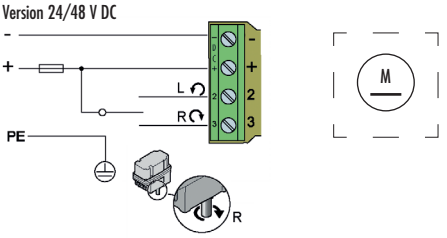
Connection 85...265 V AC

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



Connect the ground wire to the housing.

–/+	Connection 24…48 V DC
2	Control connection > left-turning
3	Control connection > right-turning



ADVICE	The control terminals only have a function if the tensor electronics are operated without the controller module I-ACT (PMR).
CAUTION	The drive must be permanently energized, otherwise the holding torque is not available!

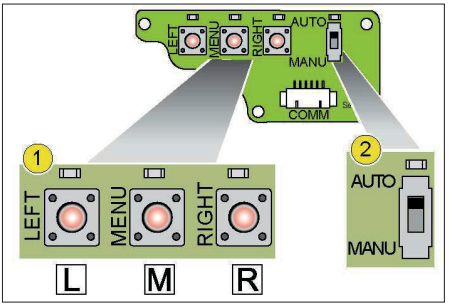
5. Actuator operation without controller and display module (Standard)

5.1 Operation

5.1.1 Buttons and switches

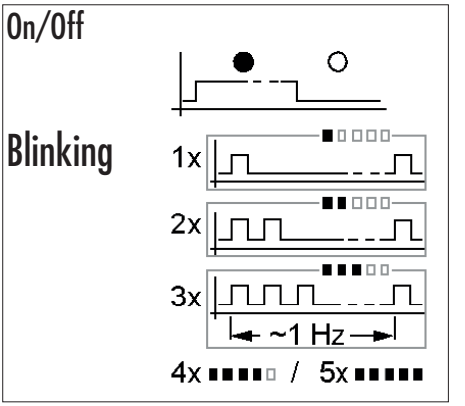
The buttons (1) are marked with
LEFT [L]
MENU [M]
RIGHT [R]

Switch (2) changes between automatic and manual mode.
In MANU position the setup operation can be turned on from manual mode by keystroke.



5.1.2 LED displays

The LEDs on the operation module show information by flashing or blinking.



LED		Status	Meaning
	LEFT	ON 2x blink	Down shaft rotates left End position reached or override
	MENU	ON 2x blink	Supply voltage ON Setup mode active
	RIGHT	ON 2x blink	Down shaft rotates right End position reached or override
	AUTO	ON/OFF	ON: Automatic active OFF: Hand mode active
	ERROR	ON OFF 1x blink 4x blink 5x blink	Current limit active at actuator LI/RE no error Holding current active at motor STOP Sensor error Motor error
	SERVICE	ON/OFF	Status changing every second Microcontroller in function and OK

ADVICE

In case of loss of the mains voltage the MENU LED turns off. After saving the sensor position all LED light until the final loss of the operating voltage. The drive does only have a mechanical holding torque.

5.2 Programming the end positions (Setup mode) without option modules

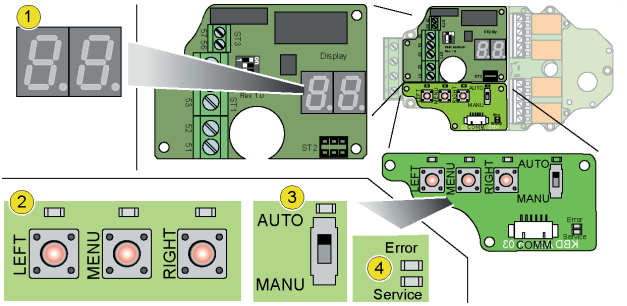
1. In manual mode, press the MENU button for >5s → the menu LED flashes 2x. Now the setup mode is active, the drive can now be moved even over the pre-programmed limits.
2. Move the actuator to the left end position using the LEFT button. Hold buttons MENU and LEFT at once. → Left LED is blinking. Hold buttons until the LED flashes permanently → the left end position is now saved.
3. Move the actuator to the right end position using the RIGHT button. Hold buttons MENU and RIGHT at once. → Right LED is blinking. Hold buttons until the LED flashes permanently → the right end position is now saved.

- Quit the programming mode by switching to AUTO mode or by cutting the supply voltage.
- Now the actuator moves only between the programmed end positions.

ADVICE

Left and right end position can be reversed, the allocation of the directions of rotation of the inputs 2/3 and the switch LI/RE does not change as a result.

6. Operations with modules and extras

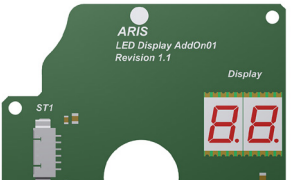


Overview allocation of the tensor menu items to the particular AddOn Boards

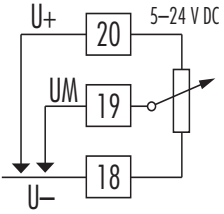
Menu	AddOn PMR		AddOn power output		AddOn Potentiometer		AddOn LED	Function	Parameter	Remarks
EL	✓		✓		✓		✓	end position left	no / yes	0…100%
ER	✓		✓		✓		✓	end position right	no / yes	0…100%
SL	✓		×		×		×	set value input left	0/4/20/0…99 0…5 0…10	0...99 mA 0...5V 0...10V
SR	✓		×		×		×	set value input right		
CL	✓		✓		×		×	actual value output left		
CR	✓		✓		×		×	actual value output right		
db	✓		×		×		×	wire break detection	OF,St, oP, Po, cL	Off/Stop/Open/ Close/Position
PL	×		×		✓		×	Poti left		
PR	×		×		✓		×	Poti right		
RE	✓		✓		✓		✓	relay board	s.Chapter 5.3.3	
Ao	✓		✓		✓		×	alarm via fault message output	0/1/2	1,2 active; 0 inactive
Ad	✓		×		×		×	message control deviation	0:1..9	1%...9%
FI	✓		✓		✓		✓	Main filter	0…5	OFF …90%
Hb	✓		✓		✓		✓	switch off hysteresis (b:brake)	0…8, hysteresis to switch off	0…80%
Hd	✓		✓		✓		✓	switch on hysteresis (d:difference)	0…9; hysteresis to switch on	0…90%
RP	✓		✓		✓		✓	RPM speed drop	0…9	0…90%
SC	✓		✓		✓		✓	Stall Count	1…5	staring attempts
bL	✓		✓		✓		✓	Block Detection	0: 1…9	0=OFF, 1…9%
FR	✓		✓		✓		✓	Firmware Revision		shows firmware
E	✓		✓		✓		✓	Exit		

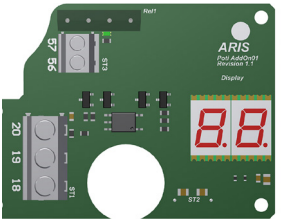
6.1 LED display module

The LED display module simplifies the setup of the actuator via a clear presentation of the menu items in the double-digit 7-segment display.



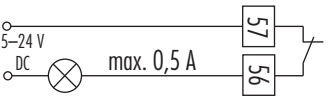
6.2 Potentiometer (electronic via additional board)





Connection configuration
Use only shielded wires

18	GND Poti
19	Output Poti 0...100% (Wiper, output impedance 1 kΩ)
20	+Ub Poti 5...24 V DC
56, 57	Fault message output (potential free closer max. 200 V/0.5 A)



Actual value output of the potentiometer end position
The actual value has to be determined for both stop positions.

- Choose menu item „PL“ for programming the left end position or „PR“ for the right end position and confirm with button [M]. The Display indicates a confirmation dialogue.

PL

PR

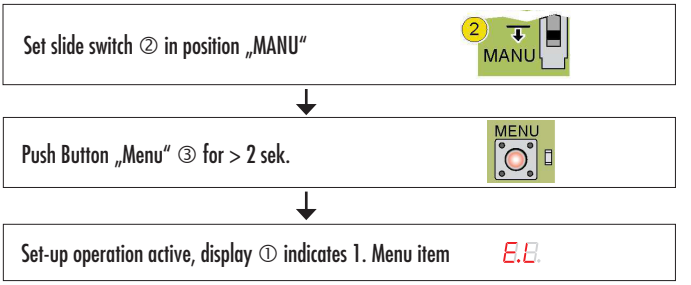
- Set the desired value with [R] or [L]. The Display indicates a confirmation dialogue.

L.. → 0% L0. → 10% L9. → 90% L10. → 100% LE. → free values

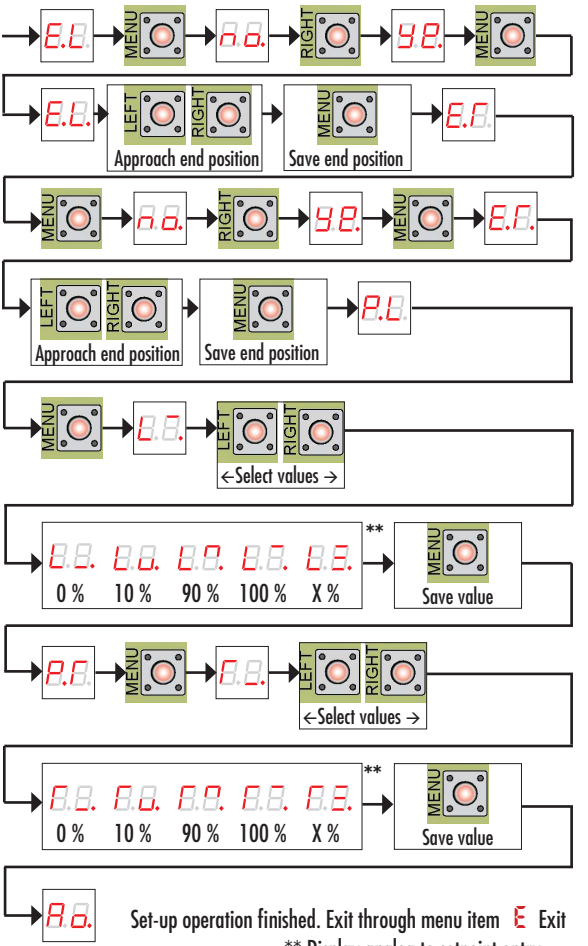
- Save the value with the button [M], this will activate the next menu item automatically.

ADVICE The potentiometer module has to be evaluated in the voltage division circuit in general.

Set-up operation potentiometer

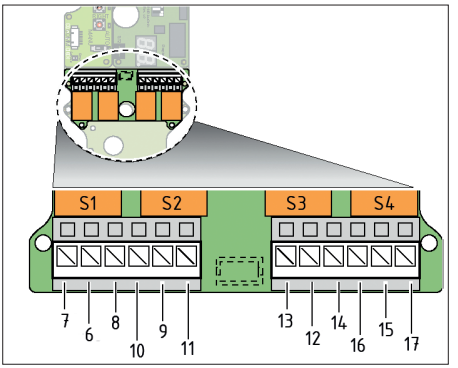


Programming the end position, setpoint input and actual value output:



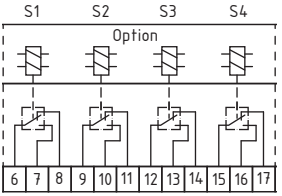
6.3 Additional auxiliary switches S1-S4 (add-on board)

The additional board ZW provides outputs for up to four additional bistable relays with preservation of the switching status in the deenergized condition, to be freely programmed.

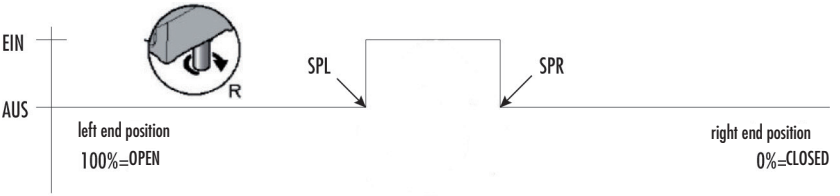


Switching points
It can be defined for each relay a left and right switching point.

While moving from LEFT to RIGHT applies to the transitions:
- **SPL** left switching point changes from OFF to ON
- **SPR** right switching point changes from ON to OFF

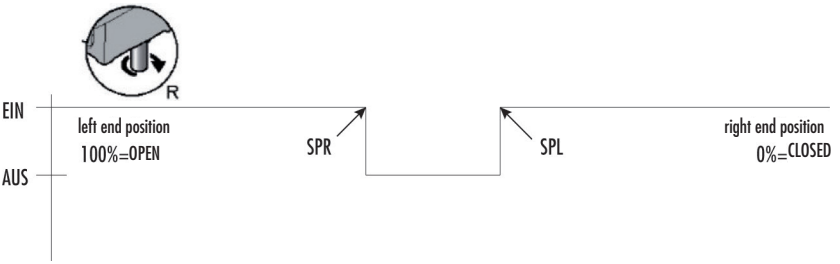


Example switching pattern



By defining and positioning of these two switching points different shift pattern can be freely defined.

Example switching pattern inverted



ADVICE

If no switching point defined, the corresponding relay is not switching. When turning on the power supply all switching points are checked and the relays are preset or possibly switched according to the current sensor position.

Minimum width of the switching point

Both switching points must be different and must have a minimum distance. If they are programmed too close to each other, the switching points are placed with a minimum width (1/512 of the current sensor resolution) around the current position.

Sequential output

The relays are switched sequentially to the current reduction, i.e. if several relays are programmed on one and the same switching position, they are switched on or off in succession of REL1 to REL4 , the delay here is max. two program cycles (about 100ms).

Forced circuit

In order to detect even short switching points with fast angle changes each position crossing is stored and then processed and switched sequentially. Here is the minimum switch-on or -off time one cycle (about 50ms). This may lead to a short "tracking" of the switching points.

6.4 Programming of the switching points without 7-segment display

1) Choose programming mode

- In hand mode push [MENU]-button > 2s → The menu LED is blinking 2x (see chapter 5.1.2)
- Push [MENU]-button again >4s → The menu LED is blinking 4x

2) Choose relay

The current selected relays is now indicated via the appropriate fast blinking LED. Select the desired relays with buttons [R] / [L]. Confirm with [MENU].

3) Define/delete switching points

Now the switching points can be defined.

- Set the desired position via buttons [L] / [R], then save:
  [MENU] + [L]: Save left switching position
  [MENU] + [R]: Save right switching position
  [L] + [R]: Delete both switching positions. Hold both buttons at once, until the appropriate LED (L and/or R) blinks fast and then permanently flashes.

Display of LEDs on the relay board:

Selected relays: - slowly blinking ca. 1x/sec.: no switching position defined
- 1x flash: 1 switching position defined
- 2x flash: 2 switching positions defined

Not selected relays: - all showing the actual status of the selected relays (ON / OFF)

ADVICE

To ensure reliable switching even when driving over an end position, it can be run over by about 10° by pressing the L / R button.

4) Select other relays

- Button [M] > push 2 seconds → further see item 2) or 5)

5) Exit programming menu

- Switch to AUTO mode.

ADVICE	During loss of supply voltage the current switching states remain unchanged. After switching on again the relay states will be determined and set by means of the current sensor position.

6.5 Programming of the switching points with 7-segment display

1) Select programming mode

- In hand mode push MENU button > 2s → the display shows „EL“
- Select menu item RE via button [R] and confirm with [Menu].

2) Select relays

Select the desired relays with buttons [R] / [L]. The selected relays is shown in the display.
The additional fifth menu item E (EXIT) can be selected.
Confirm with [Menu].

3) Define/delete switching points

Now the switching points can be defined.

- Set the desired position via buttons L / R, then save/delete:
  The actual position is shown (0..100%).

By activating the buttons, the appropriate commands are issued:

- [MENU] + [L] → SL (Save Left) Save left switching point
- [MENU] + [R] → SR (Save Right) Save right switching point
- [L] + [R] → dE (Delete)
- [MENU] → E (EXIT)

4) Select other relays

- Push button [M] > 2 seconds → further see item 2) or 5)

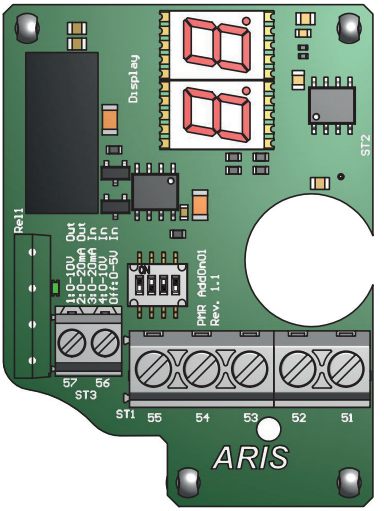
5) Exit programming menu

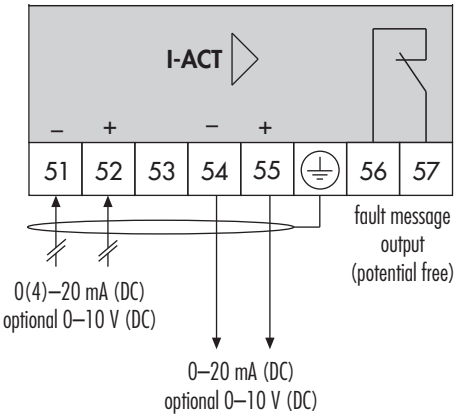
- Select menu item E (EXIT) and confirm with [MENU]

7. Operation of actuators with microprocessor controller I-ACT (PMR)

7.1 Wiring diagram and pin configuration

57/56 Message output, potential free opener, max. 200 V, max. 0.5 A, max. 10 W
55 Actual value output, +
54 Actual value, ground
53 + 5 V supply
52 Set value input +
51 Set value input, ground





ADVICE

All drives are preset at the factory. When you change the DIP switch, the instructions given here are to be observed!

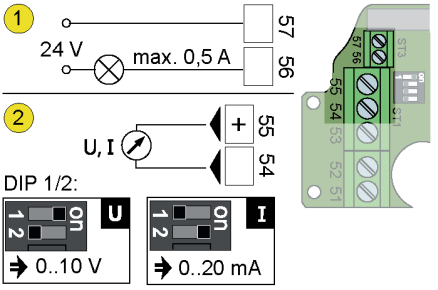
The function of the inputs and outputs at pin 51 to 55 is set by DIP switches, see section 7.2. The message output is used for operational monitoring.

Message output

The message output (1) Pin 56/57 works as potential free activated opener. The capacity of the contact is
max. 200 V supply
max. 0.5 A
max. 10 W

Actual value output

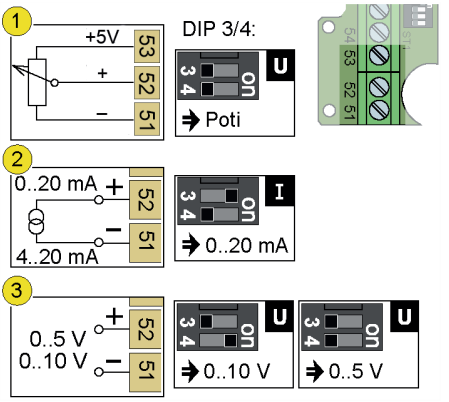
The output (2) at pin 54 / signal terminal 55 is supplying voltage or current depending on the DIP switch setting.
The output is galvanically isolated from the other ports.



Set value input

Via pin 51/52 the controller receives a set value. When connecting a potentiometer (1) pin 53 supplies the encoder with the supply voltage. Via the DIP switches 3 and 4, the controller receives the information for use of input:

– Set value via poti (1)
– Set value as current (2)
– Set value as voltage (3)



7.2 Configure controller connection

To operate a drive control, the DIP switches must be configured correctly and the ports on the controller I-ACT (PMR) connected appropriately.

Setting up DIP switches

⚠CAUTION

Component damage by short-circuit.
The DIP switches 1-2 and 3-4 switch to the same outputs. If the DIP switches 1 and 2 or the DIP switches 3 and 4 are ON during operation, a short circuit can destroy components.
– Do not set DIP 1 and 2 to ON at once
– Do not set DIP 3 and 4 to ON at once

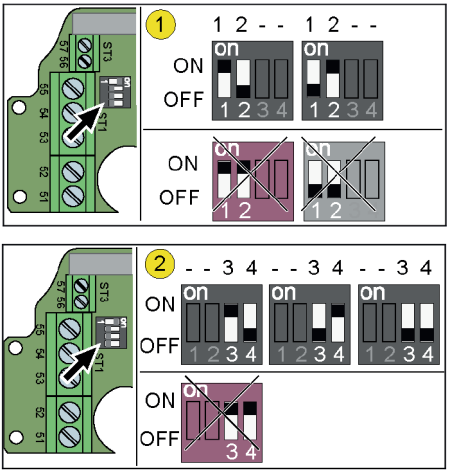
Via DIP 1-2 (1) the actual value output is configured. With DIP 3-4 (2) configure the set-point input.

Cut off supply voltage, set up DIP switches:

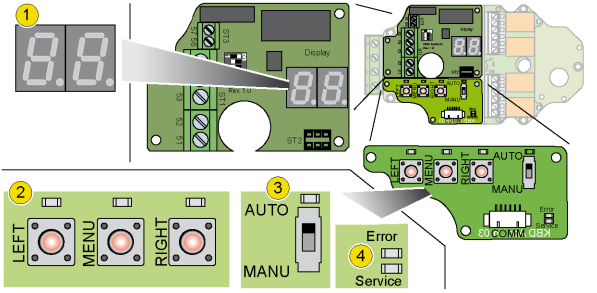
DIP	*Actual value output*
1 ON / 2 OFF	0...10 V
1 OFF / 2 ON	0...20 mA

DIP 1 and DIP 2 to OFF creates an undefined condition.

DIP	*Set value input*
3 ON / 4 OFF	0...20 mA
3 OFF / 4 ON	0...10 V
3 OFF / 4 OFF	0...5 V / Poti operation



7.3 Operation and display elements



Two 7-segment displays (1) provide information on the controller status and the operating steps. The controller is configured and operated with the three keys (2) and the switch (3). The small LEDs above the buttons and the switch and the two LEDs (4) below the switch indicate various operating states and messages.

8. Operation of the I-ACT (PMR), Current output

8.1 Automatic and hand mode

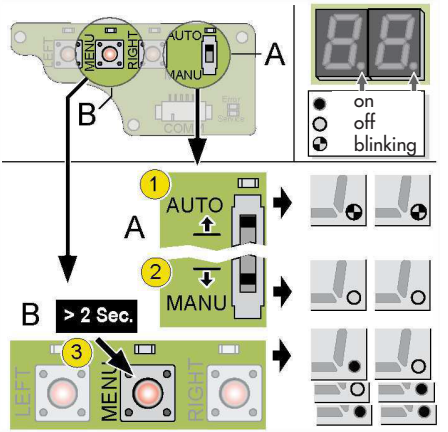
8.1.1 Operation modes

The controller works in three operation modes:

- Automatic: Control mode with surveillance
- Hand mode: Manual left- and right-run of the actuator
- Setup mode: Parameterization of the controller.

8.1.2 Change operation mode

Change the operating modes by using switch (A) and button (B). The two 7-segment fields show the current operating mode through the decimal points.



8.1.3 Automatic mode

Slide switch to AUTO (1).

Both points will flash alternately at 1 Hz; additionally the LED above the switch lights. The control is active.

The actuator is driven via signals from the set value input. The control monitors the approach of end positions and changes of input signals. The buttons (3) have no function.

8.1.4 Hand mode

Slide switch to MANU (2).

Both points and the LED above the switch are off. The control is active and waiting for input via push button. The actuator is operated via the two buttons [R] and [L]. The motor controller is active and switches off the motor upon reaching an end position.

- Hold button [R] to rotate the actuator right. The two segments show a circumferential clockwise dash order as long as the actuator rotates.
- Hold button [L] to rotate the motor left. The LED above the pressed button lights. Both segments show a circumferential counterclockwise dash order as long as the actuator rotates. Upon reaching an end position, the LED on the operated key will blink twice.

8.2 Setup mode I-ACT (PMR)

Survey

The microprocessor controller I-ACT (PMR) can perform the following tasks:

- Set left and right end position
- Set handling shortly before reaching an end position and switching on and off of the motor
- Enter voltage and current values for the end positions
- Activate message output

ADVICE	By changing the switch from manual to automatic the setup mode is left without saving a currently revised parameter value.

Start setup mode

1. Slide switch to „MANU“.
2. Hold down button [M] at least 2 sec.

The setup for parameter setting is turned on, the display shows the first menu item.

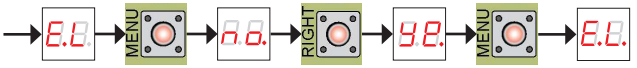
E.1 Setup mode active, 1. menu level in display.

To exit the programming mode, slide switch back to "AUTO".

8.2.1 *Menu items in detail*

8.2.1.1 *Programming end positions* E.L / E.r

- Select the menu item "EL" for programming the left end position or "Er" for the right end position and confirm with button [M]. The screen displays a confirmation dialog.

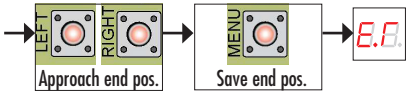


- Press the indicated button.

CAUTION

Motor or components may be damaged when driving on an obstacle. As long as the end position is reprogrammed, the engine no longer stops at the predetermined end position. For entering new end positions move the drive slowly and with caution.

- Move actuator to the desired end position by pressing [L] or [R] .



- Accept the current position as end position with the button [M] . If programming is aborted by changing to AUTO mode, the previously programmed end position applies.
- Repeat steps for the right end position.

ADVICE

For technical reasons the two end positions must be at least a 28° apart. If the difference range is too little, the controller gives out the error "RE" - "Range Error".

8.2.1.2 *Set value input for the end positions* S.L / S.r

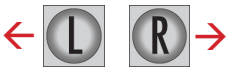
The left and right limit switch position is assigned to a new set value. Voltage or current values at the input terminals 51, 52 provide the controller with the default for the positioning of the motor. The actual position signals to the controller via the terminals 54, 55.

S.L S.r

The input must be connected suitably to the DIP switches configuration (3 and 4), see chapter 7.2.

- Select the menu item "SL" or "Sr" and confirm with button [M]. Depending on DIP switch setting one of the following three values will be displayed:
  - DIP3/DIP4 – ON/OFF: 0 mA / 4 mA / 20 mA / 0…20 mA
  - DIP3/DIP4 – OFF/ON: 0... 10 V
  - DIP3/DIP4 – OFF/OFF: 0... 5 V

- Voltage or current values must be set according to the following depiction and in accordance to the DIP switches configuration.



0 mA
(0 V optional)

4 mA
(2 V optional)

20 mA
(5 bzw. 10 V optional)

free values [mA]
([V] optional)

- Finally save new value with button [M], thereby the next menu item will be activated automatically.

ADVICE	Defaults for the set values of the end positions must cover at least 20% of full scale, otherwise the error "PE" - "Parameter Error" is reported. Example: Range 1..5 V => Covering (5-1) V x 20% = 0.8 V Lower end position 0.5 V => Upper end position min. 0.5 V+0.8 V =1.3 V

8.2.1.3 Actual value output for the end positions CL / Cr

The actual feedback must be set analog to the set values for both end positions.

CL

Cr

- Set with DIP switches 1 and 2 how the actual value is used, see chapter 7.2.
- Select menu item „CL" or „Cr" and confirm with button [M].
- Set the actual value (see 7.2):
  - DIP1/DIP2 – ON/OFF: 0…10 V
  - DIP1/DIP2 – OFF/ON: 0... 20 mA
- Finally save the new value with button [M], thereby the next menu item will be activated automatically.

ADVICE	Defaults for the actual limits of the end positions must cover at least 20% of full scale, otherwise the error "PE" - "Parameter Error" is reported. Example: Set range 4 mA => Covering 4 mV x 20% = 0.8 mA Lower end position 0.1 mA => Upper end position min. 0.9 mA (=0.1+0.8)

Set-up operation I-ACT (PMR)

Set slide switch ② in position „MANU"

↓

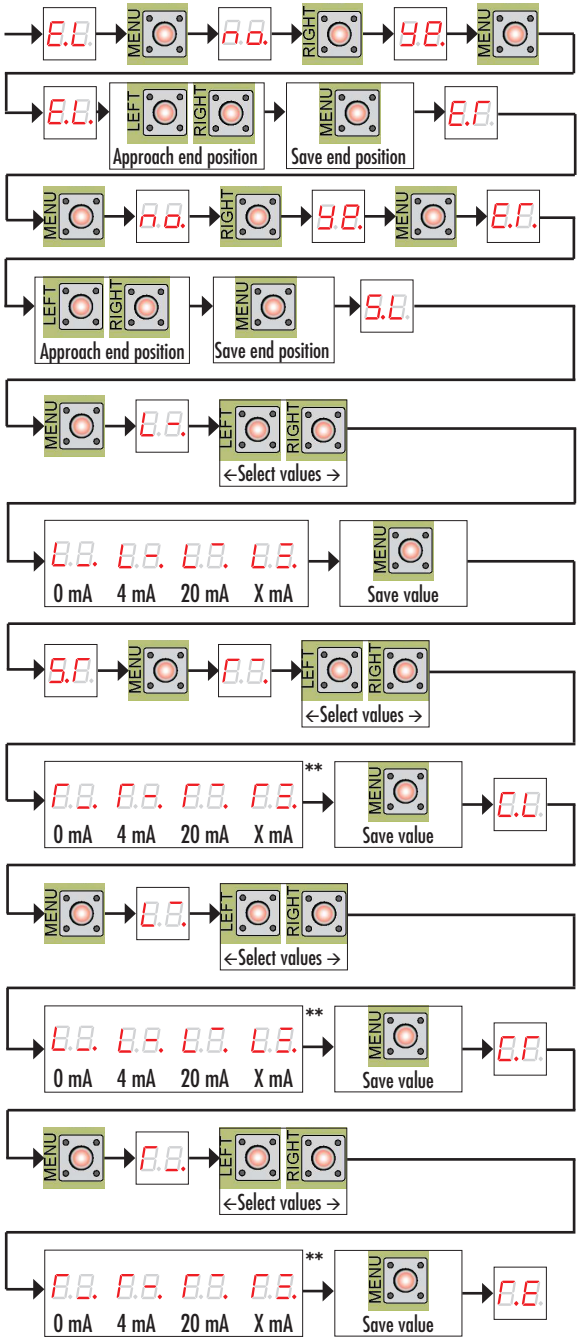
Press button „Menu" ③ > for 2 sek.

↓

Set-up operation active, Display ① indicates 1. Menu item E.0

Programming of the end positions, set value inputs and actual value outputs:

Set-up operation has to be active



** Display analogous to set point default

8.2.1.4 Cable break monitoring db

Cable break monitoring only functions in range 4...20 mA or 2...10 V.
In range 4-20 mA or 2-10 V the cable break monitoring detects a failure of the set value signal below a determined threshold. This threshold amounts to 50% of the calibrated minimum value, therefore 2 mA or 1V. At a set value range of 0-20 mA or 0-10 V the cable break monitoring remains functionless.

The performance of the tensor can be set within the menu.

db	**Function**	**Conduct in case of cable break detection**
Off (OF)	no detection	Set value input minimal
Stop (St)	STOP	Actuator stops immediately
Open (oP)	Position OPEN / 100%	Actuator drives to 100%
Close (cL)	Position CLOSE / 0%	Actuator drives to 0%
Position (Po)	programmed failure position*	Actuator drives into programmed position

* When selecting the menu item Po (position) the current position is saved as failure position. In menu itself the actuator can NOT be driven into an other position. For changing the failure position, approach the desired position in hand operation, confirm the selection 'Po' in menu item 'd.b' again. The new position will be saved.

When a cable break is detected the action set in the menu will be performed, the error 'd.b' will be indicated on the display and the fault message output will be set.

8.2.1.5 Fault message output A.o **(Alarm out)**

The contact to the terminals 56 and 57 is closed when the controller is in operation.
The following events will trigger the opening of the signal contact:

- I-ACT is in hand mode
- >> bE: Motor Error
- >> SE: Sensor Error
- >> RE: Range Error
- >> CE: Calibration Error
- >> PE: Parameter Error
- >> db: Drahtbruch (Wire breakage)
- >> Ad: Message deviation
- >> St: Stall Error

Detailed description of errors see chapter 13.1

A.o

Activation:

- Select menu item „Ao“ and confirm with button [M].
- Make a choice on basis of the table below (buttons R / L).
- Finally save new settings with button [M]

Ao	Modus	Function	Description
---	Manu	Off	Contact open
A0	Auto	Off	Contact open
A1	Auto	Fault & stall Error	Contact open in the event of a fault
A2	Auto	Fault & stall warning	Contact open in the event of a fault

8.2.1.6 Message deviation Control Ad

Activate

- Select menu item Ad and confirm with button [M]
- Select value 0…9 and confirm with button [M]
  0 (message off)
  1…9 (at deviation 1…9% between actual and set value a fault message is issued). Right and left end position as well as parameterized right and left set value are the reference
- Finally save new setting

Ad	
0	Message off
1…9	At deviation 1..9% between actual and set value a fault message is issued

Example:
Menu status 2=2%
Right end position 0% [0°] / left end position 100% [90°]. At a distance of 90° corresponds a setting of 2% 1,8°. If the current actual value deviates by more than 1,8° from the current set value default, the signal contact switches (opens).

8.2.1.7 Hysteresis run (motor start and stop)

Start and stop run of the engine can be influenced by a hysteresis function. e.g. to protect the mechanism and to increase the reliability in operation.

H.b
Switch-off hysteresis

H.d
Switch-on hysteresis

With "Hb" (H-brake) the switch-off hysteresis of 0 - 80% is set. "Hd" (H-difference) defines a hysteresis between 0 - 90% for the switch-on run. A value of 0% disables the hysteresis functions.

- Select menu item „Hb“ or „Hd“ and open the sub menu with button [M].
- Set a value between 0 and 80% (0...8) for Hb or 0 and 90% (0...9) for Hd. The difference of set value and actual value is compared with the hysteresis. If this difference is less than the switch-off hysteresis, the drive stops. If its larger than the switch-on hysteresis, the drive regulates.

8.2.1.8 Speed reduction

RPM speed reduction when approaching the end position

rP

- Select menu item „rP“ and confirm with button [M].
- Set the value between 0 (=no deceleration prior to approaching the end position) and 9 (=high deceleration prior to approaching the end position) in the sub menu.

8.2.1.9 Stall count

The stall-detection recognizes a standstill or blockade of the BLDC-motor. If a blockade is recognized the motor is set into STOP / HOLD mode in order to protect the motor.
The motor tries to start again with n attempts. If the blockade is not rectified, a fault message is issued.

Activate:

- Select menu item SC and confirm with [M]
- Select values 1…5. The motor tries to start again according to the value. If the actuator does not proceed after the given number of attempts, the stall-error will be released.
- Remove the blocking reason and program the actuator new. See chapter 13.1.

Setting the starting attempts

SC	
1	The motor starts 1x
2…5	Amount of the starting attempts

8.2.1.10 Block Detection / Anti-lock

Recognizes the drive into a stop in the end position area and suppresses the stall-error and in order with that a multiple restart attempt of the motor.

Activate:

- Select menu item bL and confirm with button [M]
- Select values 0…9. Detection zone 0…9% ahead of both end positions.

bL	
0	OFF, functions as before
1…9	Detection zone 1…9% ahead of the particular end position

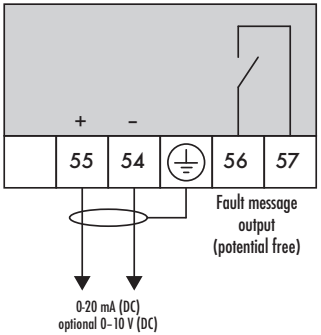
If a stop is detected, this will be interpreted as end position. In order to reset the detection, the actuator must rotate to the opposite direction. If the regular programmed end position is reached, the actuator will shut down.

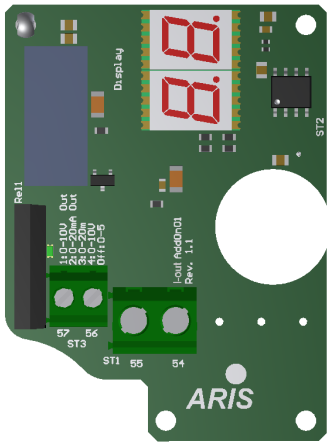
Example: Menu status 2=2% ahead of end position
If the current actual value position reaches more than 98% or less than 2% while opening and closing and an obstacle (e.g. a blockade) is detected, the motor will switch into Hold/Stop mode.

9. Operation of the actuator with current output

9.1 Circuit diagram and pin assignment

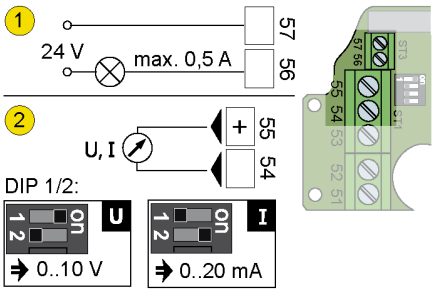
57/56 Message output, potential free opener, max. 200 V, max. 0,5 A, max. 10 W
55 Actual value output, +
54 Actual value output, ground





Fault message output
The message output (1) Pin 56 / 57 works as potential free operated opener. The capacity of the contact is
max. 200 V-supply
max. 0.5 A
max. 10 W

Actual value output
The output (2) at Pin 54/55 provides a voltage or a current according to the DIP-button position.
The output is separated galvanically from the other supplies.



9.2 Configure function

Set DIP-switch

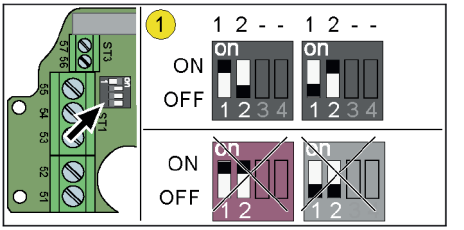
⚠CAUTION

Component damage by short-circuit.
The DIP switches 1-2 and 3-4 switch to the same outputs. If the DIP switches 1 and 2 or the DIP switches 3 and 4 are ON during operation, a short circuit can destroy components.
– Do not set DIP 1 and 2 to ON at once
– Do not set DIP 3 and 4 to ON at once

Via DIP 1-2 (1) the actual value output will be configured. Via DIP 3-4 (2) the set value input will be configured.

Shut down supply voltage, set DIP-switches:

DIP	*Actual value output*
1 ON / 2 OFF	0...10 V
1 OFF / 2 ON	0...20 mA



9.3 Operation

9.3.1 Operation and display elements

Menus
Menus are only given in set-up operation in order to set parameters and values. The function of a menu item arises from an abbreviation consisting of two letters, e.g.: end position left:

E.L determine left end position

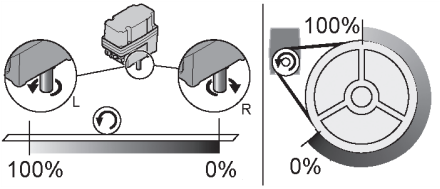
Parameter values
The segment display is able to indicate values from 0 up to 100. The value 100 is displayed as a ring across both segments.

0.0. ... 9.9. C.

Fault message
The controller indicates faults while operation through permanent blinking of an error code. For details concerning the error codes see chapter 13.1.

Actuator movement

The 7-segment display indicates the actuator position and direction of rotation. The actuator position is displayed as %-value from 0 up to 100%. The controller calculates the current %-value from the track between both end positions. The left end position complies with 100%, the right complies with 0%. If the actuator rotates, a circumferential dash across both segments indicates the rotation direction. The running direction of the dash corresponds to the rotation direction of the pinion shaft at sight through the actuator. Position and rotation direction are displayed in second change while the actuator is running.



Idle mode

If the actuator is not activated for 10 seconds, the display switches into idle mode and shortly indicates the %-value of the actuator position every two seconds. The display exits idle mode as soon as a button is pushed or the actuator is driven.

9.3.2 Displays on the current output

Menus

Menus are only given in set-up operation in order to set parameters and values. The function of a menu item arises from an abbreviation consisting of two letters (see 6.1), e.g.: end position left:

E.L determine left end position (see 6.1)

Parameter values

The segment display is able to indicate values from 0 up to 100. The value 100 is displayed as a ring across both segments.

0.0. ... 9.9. C.J.

Fault message

The controller indicates faults while operation through permanent blinking of an error code. For details concerning the error codes see chapter 13.1.

Actuator movements

The display indicates the actuator position and direction of rotation. The actuator position is displayed as %-value from 0 up to 100%. The electronics calculate the current %-value from the track between both end positions. The left end position complies with 100%, the right complies with 0%.

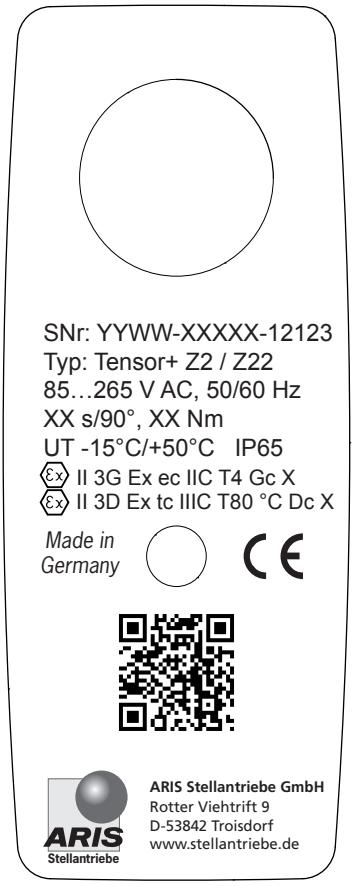
If the actuator rotates, a circumferential dash across both segments indicates the rotation direction. The running direction of the dash corresponds to the rotation direction of the pinion shaft at sight through the actuator. Position and rotation direction are displayed in second change while the actuator is running.

ADVICE The end postions must be programmed prior to initial operation.

10. Additional advices concerning the intended use in potentially explosive atmospheres of the zone 2 and 22 (Option)

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

10.1 Nameplate



CAUTION

Do not disconnect under tension!

← *Serial number (Year/Week-order no.-Pos./seq. no.)*
← *Actuator type*
← *Voltage/Frequency/Power consumption*
← *Actuating time/Torque*
← *Ambient temperature/Protection class*
← *Labelling according to ATEX*

Basic version: Tensor+ Z2 / Z22
II 3G Ex ec IIC T4 Gc X
II 3D Ex tc IIIC T80 °C Dc X
-15 °C ≤ Ta ≤ +50 °C

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

Actuators of the series Tensor+ 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).

10.2 Guidelines and standards

ARIS actuators of the type Tensor+ 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 accordance with type-examination certificate number IBExU16ATEXB001 X: EN 60079-0:2012 + A11:2013, EN 60079-7:2015, and EN 60079-31:2014

10.3 Technical specifications

10.3.1 Functions and application area (intended use)

ARIS actuators of the type Tensor+ 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 Tensor+ meet the requirements of the ignition protection type "protection by enclosures t" for an explosion proof device of the group II and the category 3D as well as ignition protection "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 and 21
- At temperatures below -15 °C or above 50 ° C
- Underground environments
- Near open fires
- Under water

Additional specifications to ranges and limits of the intended use are shown on the nameplate of the actuator according to ATEX guideline 2014/34/EU (see 10.1).

ADVICE

Special conditions:
Gc & Dc: Only use ATEX certified cable glands with O-ring sealings!
Dc: If the actuator is used in explosive dust atmospheres, make sure that no potential highly charged energetically processes are expected near the appliance!

10.4 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	• Supply: 85…265 V AC, 50/60 Hz; 24 V AC/DC • Protection: Primary 2A Tr • Type: BLDC • 50/60 Hz±5%, 100% ED • Isolation class E acc. to DIN EN 60085
Cable gland	ATEX-certified cable glands acc. to required protection class, e.g.: WISKA Hoppmann & Muslow GmbH, Type ESKE/1-e 16 EC-Type-examination certificate number: PTB 13 ATEX 1015 X Ø cable min. 4 mm, Ø cable max. 9 mm
Path cutoff	Digital via magnet sensor
Ambient temperature	-15 °C bis +50 °C
Installation position	Arbitrary
Potentiometer (Option)	Electronic
Travel	28°…100 revolutions

ADVICE

Only fixed installed cables and lines are allowed to be inducted with ATEX certified cable glands. Please follow the manufacturer´s advice.
The Operator must guarantee an appropriate strain relief.

WARNING

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

- **Always** connect the protective conductor terminal (see symbol ⏚ in actuator enclosure) with the protective conductor.
- **Never** operate the actuator without connected protective conductor!

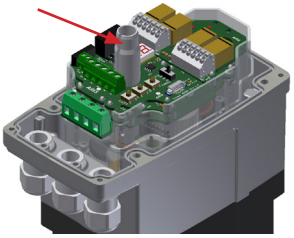
Explosion hazard!
The actuator may only be operated with properly closed cover and cable glands.

11 ⚠CAUTION ions

11.1 Internal manual override (mechanical)

Operating the manual override with a cordless screwdriver is not permitted because the transmission can be destroyed due to the high speed!

Turn the drive shaft with a s



ition is reached.

⚠CAUTION

11.2 Option hand wheel

Danger of a mechanical stroke.
The hand wheel is only allowed to be used if the system powe

1. Turn off operating voltage of the actuator.
2. Press down hand wheel and turn into 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.

12. Parameter RESET

The Parameter-Reset-Function is implemented in order to restore the factory settings.

Perform the Parameter-RESET:

- Switch into HAND-Modus in de-energized state
- Hold buttons L+R down
- Turn on power supply and hold buttons down

  a) LED L+R blink slowly (approx. 4 s)
  b) LED L+R blink fast (approx. 4 s)
  c) LED L+R light permanently

- Release buttons

ADVICE

13. Required customer information

	If it is not possibly to remedy the malfunction, please inform your ARIS contact person. Advices at: www.stellantriebe.de

WARNING

13.1 Troubleshooting and repair

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

Error messages

If the 7-segment display is present, error messages occur according to the table below. Automatic and manual operation can not be used as long as a fault is present. The set-up can be started.

Display	Function	Meaning	Remarks
bE	Motor Error	No valid values for motor control from Hall sensor	Please contact your responsible ARIS contact person
SE	Sensor Error	No valid values from position sensor. No existing magnet or out of valid range	Please contact your responsible ARIS contact person
rE	Range Error	Programmed end positions too close	End positions must be > 0.5 sensor turns (corresponding 28°) apart
CE	Calibration Error	Actual output value too low Set input value too low	Please contact your responsible ARIS contact person
SF	Sensor Fault	Correlation error, not correctable	Disconnect power supply. After re-energizing the error should not be displayed.
PE	Parameter Error	Too low difference between free set and actual values	At free values, the difference must cover at least 20% of the complete range
St	Stall Error	Standstill or blockade of the motor	Please contact your responsible ARIS contact person
db	Wire break	Wire break detection caused message	Examine control lines and clamps
EE	EEprom Error	Fault in EEPROM Data, inconsistent data, operation no longer possible	Please contact your responsible ARIS contact person

FI

ADVICE

13.2 Mains filter

Only active at alternating voltage supply.

The digital input filter suppresses ripple voltage and faults on the inputs 2/3 at 50/60 Hz AC operation. The supply voltage functions as reference. The filter can only be set if a 7-segment display is present. For Selection of menu item FI see bullet point 6.

FI	Switching threshold
0	OFF
1	50%
2	60%
3	70%
4	80%
5	90%

Example:
Menu status 1=50%, i.e. at a supply voltage of e.g. 230 V AC voltages below 115 V AC will not be processed at the inputs 2/3.

14. Maintenance

14.1 Service

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

14.2 Accessories

ADVICE

No special tools are required for installation.

14.3 Spare parts

Order spare parts at aris@stellantriebe.de any time. Please always state the serial number of the actuator.

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 following harmonized standards were applied:
DIN EN ISO 12100:2011-03 („Safety of machinery“)

The product is a partly completed machinery 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. For reasonable requests these documents can be sent electronically to the responsible authorities.

Regarding the outgoing electrical hazards of the partly completed machinery, the safety objectives of directive 2006/95/EC ("Low Voltage Directive") are complied with in accordance with Annex I No. 1.5.1 of Directive 2006/42/EC. Applied harmonized standard:

DIN EN 61010-1:2011-07 (“Safety requirements for electrical equipment for measurement, control, Control and laboratory use ")

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 EC directive 2006/42/EC, if it applies.

Authorized representative for collection of relevant technical documents:

Claudio Usai
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, 02. March 2015

i.V. C. Usai

C. Usai (Quality and product safety)

Subject to technical changes.

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