# INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS


## Electric linear-thrust actuators ST 1, STR 1

REGADA®

74 0721 02

## TEST CERTIFICATE

ELECTRIC LINEAR THRUST ACTUATOR ST 1, STR 1

| | |
|---|---|
| Type number 491.................................... | Power supply..................................V .......... Hz |
| Serial number ........................................ | Switching-off thrust.............................................N |
| Production year ...................................... | Set switching-off thrust .......................................N |
| Wiring diagram ....................................... | Operating speed......................................mm/min |
| ............................................................... | Stroke.............................................................mm |
| ............................................................... | Transmitter ........................................................... |
| Warranty period ........................... months | Input operating signal ............................................ |

Serial number of electric motor .........................................................................................

Serial number of transmitter ...............................................................................................

Serial number of position controller ....................................................................................

Tests made in accordance with TP 74 0879 00

Tests made by ......................................................................................................................

| | |
|---|---|
| Date ....................................................... | Signature and stamp ............................................ |

## COMPLETENESS CERTIFICATE

Used valve ..............................................................................................................................

Assembled by: Firm ...............................................................................................................

Name.........................................................................................................

Warranty period ......................... months

| | |
|---|---|
| Date ..................................................... | Signature and stamp ............................................. |

## INSTALLATION CERTIFICATE

Location .................................................................................................................................

Installed by: Firm ....................................................................................................................

Name ..........................................................................................................

Warranty period.......................... months

| | |
|---|---|
| Date ..................................................... | Signature and stamp ............................................. |

*Please read these instructions carefully before mounting and operating the actuator!*

*Preventive and safety-measures applied on the actuator can not offer required safety level till the actuator and its safety systems are not applied by required and described way and if installation and maintenance is not applied according to applicable instructions and rules!*

## Contents




*Edition: 01/2019*
*The right of changes reserved!* *Ev. Nr.: 74 0721 02*

The Installation, Service and Maintenance Instructions are drawn up according to requirements of EC Executive Nr. 89/392/EEC "Uniform requirements for machines and devices from the point of view of safety and health care", to save life and health of users and to avoid material damages and exposure environment to danger.

# 1. General data

## 1.1 Purpose and applications

Electric linear thrust actuators (hereinafter **EA**) of **ST 1** or **STR 1** types with constant speed are high-powered electric-mechanical products, designed for direct installations onto controlled devices (regulating bodies -valves, etc.). EA of ST 1 types are provided for remote control of closing bodies, and EA of STR 1 types for automotive control of regulating bodies in both directions of their movement. They can be equipped with means of measuring and control of technological processes where an unified analogue direct current or voltage signal is an information bearer on their input and/or output. They can be used in heating, energy, gas, air-conditioning and other technological systems, which they are suitable for, regarding their features. They are connected with controlled devices with a flange according to DIN 3358 or using a pillars and flanges.

1. ***Do not count with tight closing performed by control signals of EA STR 1.***
2. ***It is forbidden to use EA as a lifting mechanism!***
3. ***Switching of actuator by a semiconductor switches have to be consulted with producer***.

## 1.2 Safety instructions

EA of **ST 1** and **STR 1** types are reserved technical devices with higher rate of danger, with possibility of installation in areas specially danger regarding casualties caused by electric current. Electric actuators are according to directive LVD 2014/35/EU and standard EN/IEC 61010-1 within valid edition.assigned for installation category II (overvoltage category).

**Product influence to environment**

**Electromagnetic compatibility (EMC):** the product complies with the requirements of the Directive 2014/30/EU of the European Parliament and of the Council on the approximation of the laws the Member States relating to the electromagnetic compatibility and with the requirements of standards as well EN/IEC 61000-6-4+A1, EN/IEC 61000-6-2, EN/IEC 61000-3-2 and EN/IEC 61000-3-3 within valid edition.

**Vibrations caused by the product:** product influence is negligible

**Noise produced by the product:** The maximum allowable noice level (A) of the product measured in a place of operation is 78 dB (A).

**Requirements for professional qualification of people performing installation, service and maintenance**

***Electric connection*** *can be performed only by an acquainted person, i.e. an* ***electrical engineer*** *with professional education of electrical engineering at an apprentice school or a technical school (secondary, complete secondary or university education) and whose qualification was verified by an educational facility authorised to verify professional qualification.*

**Instructions for stuff training**

*Service can be performed only by workers professionally qualified and trained by the producer or contracted service centre!*

**Warning for safety use**

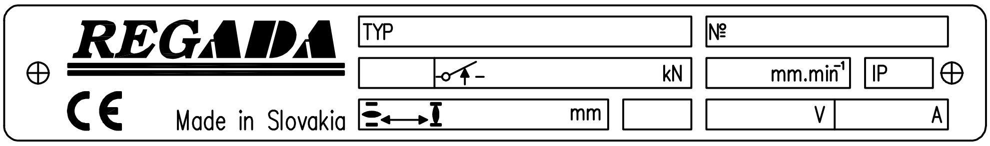
**Product protection**

EA ST 1, STR 1 does not have own short-circuit protection, therefore there must be included suitable protective device into the supply power ( circuit breaker, or fuse), which serves at the same time as main switch.

**Type of equipment from a connection point of view:** The equipment is designed for permanent connection.

## *1.3 Data specified on electric actuator*

Nameplate**:** **Warning plate:**

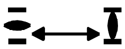



Nameplate contains the basic data concerning identification, performance and electricity: indication of producer, type, serial number, max. load thrust and switching-off thrust, protection code, operating speed, supply voltage and current.

### Graphic symbols on electric actuator

The graphic symbols used on electric actuator substitute the text messages. Some of them are in accordance with EN ISO 7010, ISO 7000 and IEC 60417 within valid edition.

 Dangerous voltage (EN ISO 7010-W012)

 Stroke of the electric linear actuator

 Switching-off thrust

 Manual control (0096 ISO 7000)

 Protection terminal (5019 IEC 60417)

## *1.4 Warranty conditions*

The supplier is responsible for completeness of the delivery and guarantees proprieties of the product, stated by technical conditions (TC), or proprieties agreed upon on purchase contract.

The supplier is not responsible for product deteriorated properties caused by the customer during storing, non professional assembly, or non professional operation.

## *1.5 Under-guarantee and after-guarantee service*

Our customers are provided with professional service of our firm in installation, operation, service, maintenance, revision and help in troubleshooting for all our products.

Trained professionals wait for you also in our contracted service centres.

Under-guarantee service is performed by the service department of the production plant, or by a contracted service centre according to a written claim.

In case of occurring of any fault please let us know it and state:

- type code
- serial number
- ambient parameters (temperature, humidity...)
- duty cycle including frequency of switching
- type of switching-off (position or thrust)
- set switching-off thrust
- type of fault - description of claimed fault
- it is recommended to place also Installation certificate.

It is recommended to have **after-guarantee service** performed by the service department of the production plant, or by a contracted service centre.

### *1.5.1 Lifetime of actuators*

The lifetime of an electric actuator (EA) is at least 6 years.
EA used for closing mode (closing valves) comply with the requirements for at least **15,000 working cycles** (cycle C – O – C: for linear EA).
EA used for regulating/modulating operation (control valves) comply with the below stated numbers of **operating hours** at the total number of 1 million start-ups:

| Switching frequency | | | | |
|---|---|---|---|---|
| max. 1,200 [$h^{-1}$] | 1,000 [$h^{-1}$] | 500 [$h^{-1}$] | 250 [$h^{-1}$] | 125 [$h^{-1}$] |
| Minimal lifetime expectancy – number of operating hours | | | | |
| 850 | 1,000 | 2,000 | 4,000 | 8,000 |

Time of **net operation** is min. 200 hours, max. 2,000 hours.
**Lifetime at operating hours** depends on loading and switching frequency.
*Note :* High switching frequency does not ensure better regulation. Setting of regulation parameters should be therefore made with the inevitably necessary switching frequency needed for the process in question.

## *1.6 Operation conditions*

### *1.6.1 Product location and operation position*

Electric actuators may be installed and operated in enclosed locations of industrial facilities with no temperature and moisture regulation, protected from direct climatic effects (such as direct sunlight). Moreover, special "marine" versions may be used in waste water treatment applications, water management, selected chemical applications, tropical environments and coastal areas.

Installation and operation of EA is possible in **any position.** Vertical position of output part axis and with the control part above the valve is usual. Electric actuator position under the valve not recommended.

**Warning:**
When the EA is installed in open air, **it must be** sheltered lightly to protect is against direct effects of atmosphere.
When installed in the areas with relative humidity more than 80%, in open air under a shelter is needed to connect the space heater directly – without a thermal switch.

### *1.6.2 Operation environment*

**According to valid standard IEC 60 721-2-1, there are delivered these versions of electric actuators:**
1) Version **„temperate“** for type climate temperate
2) Version **„cold“ -** for type climate cold
3) Version **„tropical“** for type climate tropical and dry
4) Version **„marine“**for type climate marine.

In accordance with IEC 60 364-1, IEC 60 364-5-51 and IEC 60 364-5-55 within valid edition the EA have to resist external effects and operate reliably:
**In the conditions of the following types of environment:**

- warm mild to very hot dry with temperature in range -25°C to +55°C ..................................................... **AA 7***
- cold, warm mild to hot dry with temperatures -50°C to 40°C ..................................................................... **AA 8***
- with relative humidity 10 to 100 %, including the condensation of up to 0,029 kg water content per 1 kg of dry air at 27 °C, with temperatures from -25°C up to +55°C ............................................................................ **AB 7***
- with relative humidity of 15÷100%, including the condensation of up to 0,036 kg water content per 1 kg of dry air at 33 °C direct exposed to a possible rainfall, with temperatures from –50°C up to +40°C .... ........... **AB 8***
- with height above sea level 2 000 m, with barometric pressure range 86 to 108 kPa ............................. **AC 1***
- with spraying or jet water from all directions–(protection enclosure IP x5)............................................... **AD 5***
- with shallow dive – (product in protection IP x 7)......................................................................................... **AD 7***
- with strong dustiness – with a possibility of influences of inflammable, non-conducted and non-explosive dust; the middle layer of dust; the dust drop more than 350 but not more than 1000 $mg/m^2$ per day (products with protection enclosure of IP 6x ............................................................................................................ **AE 6***
- with atmospheric occurrence of corrosive and pollution media (with high degree of atmosphere corrosive aggressiveness); important presence of corrosive pollution .................................................................**AF 2***

- with permanent exposure of big amount of corroding or contaminated chemicals and salt fog in execution for sea environment , for sewage water disposal plant and some chemical plant. ......................................... **AF 4***
- with a possibility of influences of mechanical stress:
  - medium sinusoid vibrations with frequency in range 10 up to 150 Hz, with shift amplitude of 0,075 mm for f<fp and acceleration amplitude 9,8 $m/s^2$ for f>fp; (transition frequency fp is from 57 up to 62 Hz) (applies to 2 pillars version)........................................................................................................ .. **AH 2***
  - medium sinusoid vibrations with frequency in range 10 up to 150 Hz, with shift amplitude of 0,15 mm for f<fp and acceleration amplitude 19,6 $m/s^2$ for f>fp; (transition frequency fp is from 57 up to 62 Hz) (applies to 4 pillars version)........................................................................................................ .. **AH 2***
  - medium impacts, shocks and vibrations ....................................................................................... **AG 2***
- with serious danger of plants and moulds growing ................................................................................ **AK 2***
- with serious danger of animals occurrence (insects, birds, small animals) .............................. .............. **AL 2***
- with detrimental influence of radiation:
  - of stray current with intensity of magnetic field (direct and alternating of power supply frequency) to 400 $A.m^{-1}$...................................................................................................................... **AM 2-2***
  - of sun radiation with intensity $> 500$ a $\leq 700$ $W/m^2$ ..................................................................... **AN 2***
- with effects of medium seismic activity with acceleration $> 300$ Gal $\leq 600$ Gal ..................................... **AP 3***
- with indirect danger of storm activity .................................................................................................. **AQ 2***
- with fast moving of air and strong winds ........................................................................... **AR 3 , AS 3***
- with persons frequent touching earth potential (persons often touch conductive parts or they stand on the conductive basement) ........................................................................................... ........................... **BC 3***
- without any danger media with object ........................................................................... ............... **BE 1***

** Marking in accordance with IEC 60364-1, IEC 60 364-5-51 and IEC 60 364-5-55 within valid edition*

### *1.6.3 Power supply and duty cycle*

**Power supply:**

electric motor................. 230/220 V AC ±10%,(3x400/3x380 V AC, 24 V AC/DC – only for EA without controller)
control............................................................................................... 230/220 V AC ± 10%, or 24 V AC ± 10%
potentiometer transmitter ............................................................................................ max $\sqrt{PxR}$ V AC/DC
electronic positional transmitter (EPV) without power supply................................. 15 up to 30 V DC, or 24 V DC
capacitive transmitter without power supply ................................................................... 18 up to 28 V DC
power supply frequency ...................................................................................... 50 Hz, or 60* Hz ± 2 %

* *Note: At frequency of 60 Hz operating speed is reduced by 1.2 times.*

**Duty cycle** (according to EN (IEC) 60034-1.8):

**ES ST 1** are designed for ***remote control:***

- short-time operation S2-10 min
- intermitted operation S4-25%, 6 up to 90 cycles per hour

**ES STR 1 with controller** are designed for ***automotic regulation:***

- intermitted operation S4-25%, 90 up to 1200 cycles per hour

*Note:*

1. *Duty cycle consist of load type, load factor and switching rate.*
2. *EA ST 1 is possible connect with an external controller and use this EA as controlled EA, for this EA stands duty cycle and power parameters as for type STR 1 with built-in controller. For EA with controller we do not suggest operating speed 63 and 80 mm per min.*

## *1.7 Conservation, packing, transport, storing and unpacking*

Surfaces without surface treatment are treated by conservation preparation MOGUL LV 2-3 before packaging .

Conservation is not necessary if the following storage conditions are complied with:

- Storage temperature: -10 to + 60 °C
- Relative air humidity max.80 %
- Electric actuators and their accessories must be stored in dry, well ventilated covered spaces, protected against impurities, dust, soil humidity (by placement to racks, or on palettes), chemicals and foreign interventions
- There shall be no corrosive gases present in the storage areas.

The **EA ST 1, STR 1** are delivered in solid packages guaranteeing resistance in accordance with EN 60 654 (IEC 60 654-1 and IEC 60 654-3).

Package is a box. Products in boxes is possible to load on the pallets (pallet is returnable). On the outer side of the package is stated:

- manufacturer label,
- name and type of product,
- number of pieces,
- other data – notices and stickers.

The forwarder is obliged to secure packed products, loaded on transportation means, against self-motion; if open transportation means are used, to secure their protection against atmospheric precipitations and splashing water. Displacement and securing of products in transportation means must provide their stable position, exclude the possibility of their inter-collision and their collision with the vehicle walls.
They can be transported in unheated and not airtight areas of transport means with effects in range:
temperature: -25°C up to +70°C (a strange version – 45 ° C up to + 45 ° C)
humidity: 5 up to 100%, with maximal content of water 0.029 kg/kg per kg of dry air
barometric pressure: 86kPa up to 108kPa

***After receiving EA check whether during transport or storage the actuator was not damaged. Compare also whether the parameters on their nameplates are in accordance with accompanying documentation or the Contract. If any discrepancy or fault occur inform immediately your supplier.***

*If the actuators and accessories are not immediately installed, they have to be stored in dry, well-ventilated sheltered roos, protected against dirt, dust, soil humidity (with placing onto shelves or onto pallets), chemical impacts and encroachment, at ambient temperature from -10°C up to +60 °C and relative humidity max. 80 %.*

***It is not allowed to store EA in the open air or in areas not protected against direct impact of climate!***
*If any scratch on the surface finishing occurs remove it immediately - you protect this way actuators against damaging with corrosion.*

If storing takes longer than 1 year, it is necessary to inspect lubrication fillings before putting EA into operation.

Assembled EA, but not put into operation is necessary to protect by the equivalent method as during storage (for example suitable protective cover).

After assembly to the armature in free and wet areas, or in areas with temperature changes, connect without delay heating resistor – thus preventing damages caused by corrosion from liquefied water in the control area.

Excessive preserving grease remove just before putting EA into operation.

## *1.8* Appreciation of the product and packing

The product and its package are made of recycling materials. Do not throw the single parts of the package and of the product after their life but sort them according to instructions in corresponding executives or regulations of environment protection, and allow their recycling.

The product and its packing are not a source of any environment pollution or contamination and do not contain any dangerous waste.

# *2. Description, function and specifications*

## *2.1 Description and function*

The **ST 1, STR 1** electric actuators consist of three parts differing in their function.

The **gear part** is made up by a flange adapter, or with pillars with a flange with a connecting part for connection onto a controlled device, and gears placed in the bottom; on the other side drive mechanisms for control part units are surfaced.

The **control part (Fig. 3)** is placed on a control board (2) consisting of:

- an electric motor (7) (at single-phase version with capacitor)
- a thrust unit (controlled with a worm axial shift)
- a position-signalling unit (3) with a position transmitter (5)- positioner (resistive - potentiometer, capacitive or an electronic position transmitter) and with a mechanical local position indicator
- a space heater with a thermal switch (8)
- electric connection is realised using **terminal boards** (6) (located in the control area) and cable bushings (12), or **connector** with cable bushings

The **STR 1** version is equipped with an **electronic controller**. The electronic controller allows automatic output unit position adjustment in dependency on input signal value and provides additional functions.

***Additional accessories:***

**Manual control**: made up by a hand wheel with a worm gearing.
**Local electric control module.**

The **STR** version is equipped with an **electronic controller**. The position controller allows automatic position adjustment of the EA output part depending upon the input signal value and provides also additional functions.

## 2.2 Basic specifications

### Basic EA specifications:

switching-off thrust [N], operating speed [mm/min], operating stroke [mm], max. load thrust [N] and electric motor parameters are given in Table 1.

**Table 1: Basic specifications**

| Type number | Operating speed[3] | Operating stroke | Max. load thrust (STR 1 with controller) | Max. load thrust (ST 1 without controller) | Switching-off thrust ±10 [%] | Weight | Electric motor[2] Power supply nominal voltage | | Nominal power | Nominal speed | Nominal current | Capacitor capacity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | [mm/min] | [mm] | [N] | [N] | [N] | [kg] | | [V] ±10% | [W] | [1/min] | [A] | [μF/V] |
| 1 | 2 | 3 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| **ST(R) 1**, type number **491** | 8 | 8; 10; 12,5; 16; 20; 25; 32; 40; 50; 64; 80 | 7000 | 8700 | 8000 - 10000 | 8,5 – 11,0 | Single-phase | 230/220 AC | 15 | 2750 | 0,18 | 2,2/400 |
| | 16 | | | | | | | | | | | |
| | 32 | | 5000 | 6300 | 6000-7500 | | | | | | | |
| | 63[1] | | - | 3200 | 3000-3700 | | | | | | | |
| | 10 | | 7000 | 8700 | 8000-10000 | | | | | | | |
| | 20 | | 6000 | 7500 | 6900-8600 | | | | | | | |
| | 40 | | 4000 | 5000 | 4600-5800 | | | | | | | |
| | 80[1] | | - | 2500 | 2300-2900 | | | | | | | |
| | 8 | | - | 8700 | 8000 - 10000 | | Three-phase | 3x400/3x380 AC | 15 | 2680 | 0,10 | - |
| | 16 | | | | | | | | | | | |
| | 32 | | - | 6300 | 6000-7500 | | | | | | | |
| | 63[1] | | - | 3200 | 3000-3700 | | | | | | | |
| | 10 | | - | 8700 | 8000-10000 | | | | | | | |
| | 20 | | - | 7500 | 6900-8600 | | | | | | | |
| | 40 | | - | 5000 | 4600-5800 | | | | | | | |
| | 80[1] | | - | 2500 | 2300-2900 | | | | | | | |
| | 8 | | 7000 | 8700 | 8000 - 10000 | | Single-phase/ direct current-voltage | 24 AC/DC | 20 | 2750 | 1,8 | - |
| | 16 | | | | | | | | | | | |
| | 32 | | 5000 | 6300 | 6000-7500 | | | | | | | |
| | 63[1] | | - | 3200 | 3000-3700 | | | | | | | |
| | 10 | | 7000 | 8700 | 8000-10000 | | | | | | | |
| | 20 | | 6000 | 7500 | 6900-8600 | | | | | | | |
| | 40 | | 4000 | 5000 | 4600-5800 | | | | | | | |
| | 80[1] | | - | 2500 | 2300-2900 | | | | | | | |

1) Valid for version without any controller.
2) Switching elements for different type of load (also for EA) defines standard EN (IEC) 60 947-4-1)
3) Anomaly of operating speed: -15% at temperatures under -10°C
± 10% at 230 V (or 3x400 V) AC
-50 up to +30% in dependence on load at 24 V AC/DC.

### Additional technical data:

**EA protection enclosure:** ........ IP67/IP 65 ((EN (IEC) 60 529))
**Mechanical ruggedness:** ........ see chapter 1.6
drop resistance: ........ 300 drops with acceleration 5 m.s$^{-2}$
seismic resistance: ........ amplitude of the shock off 6 on Richter scale
**Self-locking:** ........ guaranteed in range from 0 % up to 100% of max. load thrust
**Electric motor protection:** ........ with thermal switch
**Output part backlash:** ........ max. 0,5 mm at load of 5% of maximum thrust

**Switching-off**

Voltage ........................................................... max. 250 V; 50/60 Hz; 2 A; or 250 V DC; 0,1 A; or 24 V DC; 2 A
Hysteresis of position switches ..............................................................................................max. 3%
Switching-off thrust is adjusted to maximum value with tolerance ± 10 % if not agreed else.
Operation stroke is adjusted at producer according to specified value.

**Space heater (E1)**

Space heater - supply voltage: ................................ corresponding with motor supply voltage (max. 250 V AC)
Space heater power output:................................................................................................ max. 10 W / 55 °C

**Thermal switch of space heater (F2)**

Supply voltage: ................................ corresponding with motor supply voltage (max. 250V AC)
Switching-off temperature:................ +30°C ± 3K
Switching-on temperature:................ +20°C ± 4K

**Position transmitters**

**Resistive position transmitter**

Resistance (single **B1**) ..............................................................................................100; 2 000 Ω
Resistance (double **B2**) ....................................................................................... 2 x 100; 2 x 2 000 Ω
Operating life of transmitter ............................................................................................ $1.10^6$ cycles
Load capacity ......................................................................................... 0,5 W do 40 °C; (0 W/125 °C)
Maximum current load ................................................................................................................ 100 mA
Maximum current of sliding contact .......................................................................................... max.35 mA
Maximum supply voltage ..................................................................................... $\sqrt{PxR}$ V AC/DC
Potentiometer linearity error ........................................................................................ ±2,5 [%][1)]
Potentiometer hysteresis ..........................................................................................max. 2,5 [%][1)]
Potentiometer values at limit positions:

for **ST 1**: "O" (open)...... ≥ 93%, "Z" (closed).......≤ 5%
for **STR 1**: "O" (open)...... ≥ 85% and ≤ 95%, "Z" (closed)..... ≥3% and ≤ 7%

**Capacitive (B3): non-contact, life $10^8$ cycles**

**2-wire connection** with power supply or without power supply

The current signal **4 ¸ 20 mA** (DC) is acquired from the capacitive transmitter supplied from the internal or an external voltage supply source. The electronics of the transmitter is protected against eventual wrong polarity and current overloading. The entire transmitter is galvanic insulated so several transmitters can be connected to one external voltage source.

Power supply voltage (with power supply)........................................................................... 24 V DC
Power supply voltage (without power supply).................................................................. 18 to 28 V DC
Ripple voltage ...................................................................................................................max. 5%
Max power input................................................................................................................... 0,6 W
Load resistance0 to 500 Ω
Load resistance can be single side grounded.
Influence of resistance on output current.......................................................................0,02%/100 Ω
Influence of voltage on output current.............................................................................. 0,02%/1V
Temperature dependency................................................................................................ 0.5% / 10 °C
Output signal values at limit positions:

"O".... 20 mA (terminals 81; 82)
"Z"..... 4 mA (terminals 81; 82)

Values tolerance of output signal of capacitive transmitter

"Z"....... +0,2 mA
"O"...... ±0,1 mA

**Electronic positional transmitter (EPV) - converter R/I (B3)**

**a) 2-wire version -** without built-in power supply, or with built-in power supply

Current signal ........................ 4 ÷ 20 mA (DC)
Power supply voltage ........................ 15 to 30 V DC
Load resistance (at version without build-in power supply)........................max. $R_L=(U_n-9V)/0{,}02A$ [Ω]
($U_n$ - power supply voltage [V])
Load resistance (at version with build-in power supply)........................max. $R_L$ = 750 Ω
Temperature dependency ........................ max. 0,020 mA / 10 K
Output signal values at limit positions:
"O"............ 20 mA (terminals 81; 82)
"Z" .............. 4 mA (terminals 81; 82)
Values tolerance of output signal of EPV
"Z" ........... +0,2 mA
"O" ........... ±0,1 mA

**b) 3-wire version -** without built-in power supply, or with built-in power supply

Current signal ........................ 0 ÷ 20 mA (DC)
Current signal ........................ 4 ÷ 20 mA (DC)
Current signal ........................ 0 ÷ 5 mA (DC)
Power supply voltage (at version without built-in power supply). ........................24 V DC ±1,5%
Load resistance ........................ max. 3 kΩ
Temperature dependency ........................ max. 0,020 mA / 10 K
Output signal values at limit positions:
"O"............... .. 20 mA, or 5 mA (terminals 81; 82)
"Z" .............. ..... 0 mA, or 4 mA (terminals 81; 82)
Values tolerance of output signal of EPV and capacitive transmitter
"Z" ............+0,2 mA
"O"............ ±0,1 mA

EPV converter linearity error........................ ±2,5[%][1)]
EPV converter hysteresis ........................max. 2,5 [%][1)]

*1) from rated value of transmitter referred to output values*

**Electronic position controller (N)**

**Controller software equipment:**

**A) Function and parameters**

programmable **functions:**

- ..with functional buttons SW1, SW2 and LED diodes D1, D4 directly placed on controller
- ..with computer or terminal equipped with corresponding programme, using RS 232 interface.

programmable **parameters:**

- ..control signal
- ..response to SYS-TEST signal
- ..mirroring (ascending/descending characteristics)
- ..insensitiveness
- ..EA limit positions (only with computer and ZP2 programme)
- ..way of regulation

**B) Operation states of controller**

**Error message** from error memory: (using LED diodes and RS 232 and personal computer)

- ..control signal missing or faulty
- .. input value of current control signal under 3.5 mA
- ..existence of SYS-TEST signal
- ..activity of switches
- ..failure of feedback position transmitter

**Statistic data:** (using RS 232 and personal computer)

- ..number of controller operation hours
- ..frequency of relay switching in direction "opening"
- ..frequency of relay switching in direction "closing"

**Supply voltage:** ................... terminal 61 (L1) -1(N) ..................... 230 V AC, ±10%

**Frequency:** .......................... 50/60 Hz ±2%
**Input control signals - analogue:** ........... 0 - 20 mA
............................................................ 4 - 20 mA
............................................................ 0 - 10 V
Input resistance for signal 0/4 - 20 mA ............................................................................................. 250Ω
Input resistance for signal 0/2 - 10 V ............................................................................................. 50kΩ
(Actuator opens at rising of control signal.)

**Controller linearity:** ...................................... 0.5 %
**Controller insensitiveness:** ......................... 1 - 10% (adjustable)
**Feedback (position transmitter):** ................. resistive 100 up to 10,000 Ω
current 4 up to 20 mA

**Power outputs:** ............. 2x relay 5A/250 V AC
**Digital outputs:** ............4x LED (supply, error, adjustment, "opening", "closing" - with two-colour LED)
**Error status:** ..................................control switch 24 V, 2W - POR
**Reaction at error situation:** ...........transmitter error - error message LED
**Control signal missing:** .................error message LED
**SYS mode:** ......................................error message LED
**Adjusters:** .......................................communication connector
2x calibrating and adjusting button

**Manual control:** with hand wheel; rotating clockwisely (counterclockwisely) EA output part is moving in direction "Z" - closed ("O" - open)

**Mechanical connection:** Basic and connecting dimensions are given in dimensional drawings.

**Electric connection**
**with terminal board** (**X**): - max. 24 terminals – connecting cable size max. 1,5 $mm^2$
- 3 cable bushings – 1xM12 - cable diameter from 3,5 to 5 mm, 1xM16- cable diameter from 6 to 10,5 and 1xM20 - cable diameter from 8 to 14,5 mm
**with connector (XC):** - max. 32 terminals – connecting cable size max. 0,5 $mm^2$
- 2 cable glands, cable diameter 1x M20 - cable diameter from 8 to 14,5mm and 1xM25 - cable diameter from 12,5 to 19 mm
**with protection terminal:** - external and internal, mutually connected and marked with protection earthling mark.

Electric connection - according to **wiring diagrams.**

# *3. Installation and dismantling of actuator*

## *3.1 Installation*

***Abide by safety measures!***

*Note:*

*Check again if placement of EA reply to chapter "Operation conditions". In case that operation conditions are different from recommended, consultation with producer is needed.*

***Before starting of mounting the EA onto the valve:***

- Check again whether the EA was not damaged during storing.
- Check whether the adjusted operation stroke and connecting dimensions of the actuator (see the nameplate) are in compliance with the valve parameters.
- In case of inconsonance, perform adjusting according to the part "Adjustment“.

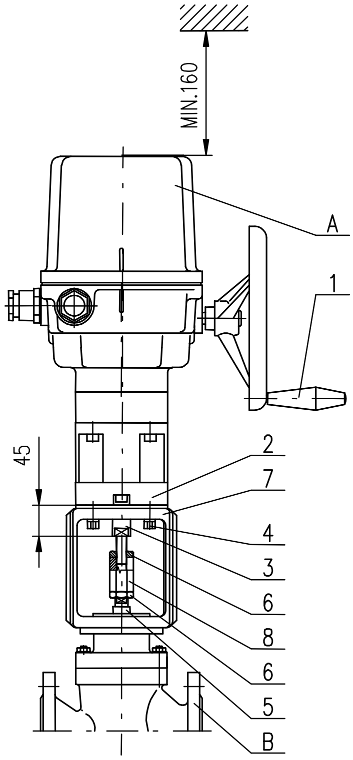
### *3.1.1 Mechanical connection*

EA is by the producer adjusted to parameters according to the nameplate, with connecting dimensions according to the corresponding dimensional drawing and put it to a mid-position.

Before installation put the hand wheel on.

## Mechanical connection with connection dimensions according to DIN

- Properly defat contact surfaces of the EA connecting flange and the valve.
- Check the nameplates to assure that actuator and valve strokes are the same.
- Set the actuator (A) and the valve (B) to the position ”closed“.
- Put the actuator (A) onto the valve (B) to have the actuator shaft (3) leant onto the valve coupling (8).
- Turn the valve output shaft (5) to connect the stem with the valve output shaft having the actuator flange (2) sitting on the valve flange (7).
- Tighten the screws (4) with the cross system to connect the actuator flange (2) with the valve flange (7).
- Check connection dimensions in accordance with Fig. 1.
- Turn the valve output shaft (5) by one revolution and lock it with the nut (6) (to create pre-stressing against the valve seat).




**A ... electric actuator**
1 ... hand wheel
2 ... actuator flange
3 ... shaft
4 ... screw

**B ... valve**
5 ... valve output shaft
6 ... locking nut
7 ... valve flange
8 ... valve coupling

Fig. 1

## Mechanical connection for pillar versions with flanges of A, B, C and D types

- Set the actuator (A) and the valve (B) to the position ”closed“.
- Loosen and unscrew two screws (5) on the actuator shaft (3) and disconnect the coupling clamping parts (8)
- Screw the coupling nut (8) onto the valve output shaft (6) (max. 28mm) to have an allowance between the coupling nut (9) and the actuator shaft (3) after the actuator is sat on.
- Place the actuator (A) onto the valve (B) and fix the actuator slightly with the screws (4a), or with the central nut (4) (according to shape of connecting flange of EA) in the way you be able to move it.
- By turning hand wheel (1) move end shaft EA (3) toward thread coupling (8) screwed onto valve output shaft (6) (or unscrew thread coupling)
- Put the clamping parts of the thread coupling (8) on, and tighten the both coupling screws (5) to have the coupling nut able to rotate
- Tighten the screws (4a), or central nut (4) with the cross system to fasten the actuator (2) and valve (7) flanges.
- Check the connection diameters in accordance with the Fig. 2.
- Unscrew the coupling nut (8) by one more revolution (to create the pre-stress against the valve seat), and tighten the coupling screws (5) firmly

*<u>Notes:</u>*
1. *Minimum mechanical ruggedness of screws is 8G.*
2. *If adjustment of the position-signalling unit or the transmitter in the production plant do not correspond with the EA connected this way, adjust the units.*

- In the end of mechanical connection check correctness of the connection with the valve with rotating the hand wheel.

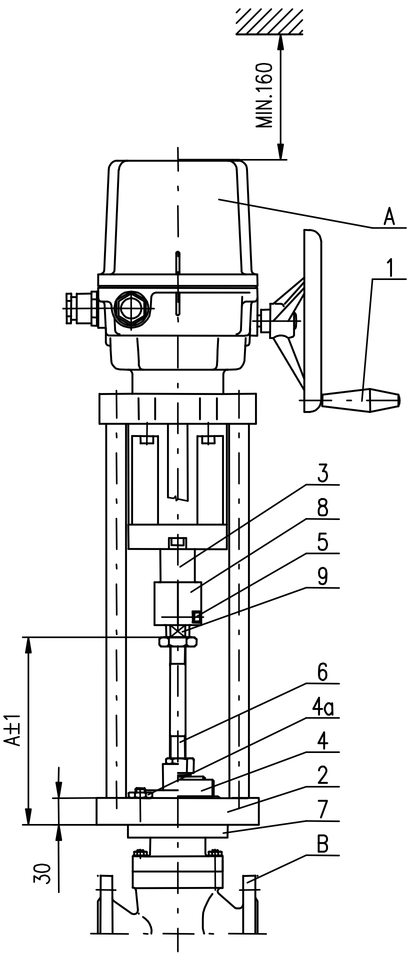



Fig.2

**A ....... electric actuator**
1 ....... hand wheel
2 ....... actuator flange
3 ....... shaft
4 ....... central nut
4a ...... screw
5 ....... screw

**B ... valve**
6 ....... valve output shaft
7 ....... valve flange
8 ....... coupling

### 3.1.2 Electric connection and checking of function

Follow up with connecting the EA with mains or master system.

*1. Follow instructions in the part "Requirements for professional qualification"!*
*2. While laying electrical line abide by the instructions for heavy current installations.*
*3. Cables to terminal boards or connectors lead through screw bushings.*
*4. Before initiation EA into operation internal and external protection terminals are needed to be connected.*
*5. Feeding cables are to be fixed to the solid construction at most 150 mm from the bushings.*
*6. To prevent moisture from entering the actuator around the connecting cables, the cables must be sealed with silicone material at the point of penetration through device shell.*

**Connecting with the master system:**
The EA can be controlled with:

- a built-in position controller
- an external position controller

*1. If the EA is controlled with an external controller using unified signal from a two- wire transmitter (capacitive or resistive with a converter in two-wire connection), it is needed to arrange connecting of the two-wire transmitter loop to electrical earth of the successive external controller!*
*2. Connection can be performed only in one point, in any part of loop out of the EA.*
*3. Electronics of the two-wire transmitters is galvanically insulated that is why it can serve as an external source for supplying of several transmitters (their number depends on current which the source can supply).*
*4. Do not connect and disconnect live connectors)!*

**Connecting to terminal board**

- Check whether the type of current, supply voltage and frequency correspond with data on the nameplate of electric motor.
- Remove the upper cover.
- In case of the single-phase version the phase L1 and the lead N connect to the corresponding terminals. In case of the three-phase version connect the phase cables L1, L2 and L3 to U, V, W (terminals 2, 3, 4), the protection cables to the marked places of internal and external protection terminals.

*For operating of armature without stop ends is needed to connect the positional switches S3, S4 to the wirring power supply of electric motor before S1, S2. The switches S3, S4 are adjusted to the required stroke by producer.*

- Connect the control cables according to the wiring diagram placed into the internal side of the cover.
- Put the cover on and tighten it uniformly crosswisely.
- Tighten the cable bushings firmly to assure the protection enclosure rate.

**Connection to connector:**

- Check whether the type of current, supply voltage and frequency correspond with data on the nameplate of electric motor.
- Release the connectors shells;
- Insulate the ends of conductors;
- Connect the appropriate sleeve connector by means of recommended pliers;
- Insert the sleeves into appropriate connector contacts according to connecting wiring diagrams.
- Fix the connectors and tighten them;
- Tighten the cable bushings firmly to assure the protection enclosure rate.

*Notes:*

1. *The EA are delivered with bushings, which in case of tight putting on the leads assure protection enclosure up to IP 68. For required protection enclosure it is needed to use rings according to the actual cable diameter.*
2. *While fixing the cable it is needed to count with allowed bend radius to avoid damaging or deformation of the sealing element of the bushing. The leads are to be fixed with the solid construction at most 150 mm from the bushings.*
3. *It is recommended to use screened cables to connect remote transmitters.*
4. *The face areas of the control part cover have to be before re-mounting clean, coated with a grease without any acid (e.g. vaseline) and sealing not damaged to avoid joint corrosion.*
5. *Reversation of the EA is sure, if the period between switching-off and switching-on of power supply for the reversed movement of the output part is minimally 50 ms.*
6. *Delay after switching-off, i.e. time since a reaction of switches till the motor is dead can be maximally 20 ms.*
7. *It is recommended to have the corresponding direction protection switched-off directly with the corresponding position or thrust switches.*

***Abide by instructions of valve producers, whether switching-off in limit positions is to be realised with position or thrust switches!***

**After electric connection perform checking of function:**

- Put the valve manually to a mid-position.
- Connect the EA electrically for the chosen direction of movement and watch the output part movement.
- If it does not correspond change the order of feeding phases (valid for 3x400/3x380V version), or change leads of the feeding phase to the corresponding terminals (valid for 230V/220 version).
- Check the control unit switches connection with switching consequently the contacts of the corresponding switches with pressing the control elements at running of the EA (at proper connection) to the chosen direction. In case of proper connection the EA stops or indicates the adjusted position according to switching of the chosen switch. If any of the functions is fault check connecting of the switches according to wiring diagrams.

*In the **STR 1 version** with the built-in **electronic controller** (Fig.9) it is needed to perform **autocalibration** for assuring optimal functioning.*

**The procedure is as follows**

Press the button **SW1** for about 2 sec (i.e. till the **D3** diode is got on) to set the controller to the **autocalibration** mode. During this process the controller checks the feedback transmitter and the sense of turning, puts the EA to the positions open and closed, measures inertia mass in the directions "opening" and "closing", and loads the adjusted parameters into the EEPROM memory. In case that during the initialisation process an error occurs (e.g. in connection or adjustment) the initialisation process will be interrupted and the controller with the **D4** diode reports about the type of the error. Else after finishing the initialisation process the controller is put into the **regulation mode**. If needed to change adjusted parameters of the controller follow instructions given in the part Adjusting of actuator.

## *3.2 Dismantling*

***Before dismantling it is required to disconnect the EA from mains!***
***Do not connect and disconnect live connectors!***

- Disconnect the EA from mains.
- Disconnect the leads from the EA terminal boards and loosen the cables from bushings. Pull out the connectors in case of the connector version.
- Loosen the fixing screws of the EA flange and coupling screws and disconnect the EA from the valve.
- While sending the EA to be repaired put it into a package solid enough to avoid damages of the EA during transportation.

# 4. Adjusting of actuator

***Abide by safety measures!***

After mechanical connection, electrical connection and checking of connection and function start setting and adjustment of the device. The adjustment can be performed at a mechanically and electrically connected EA. This part describes adjustment of EA to specified parameters in case that any unit of EA is reset. Laying of adjusters of the control board is shown on Fig. 3

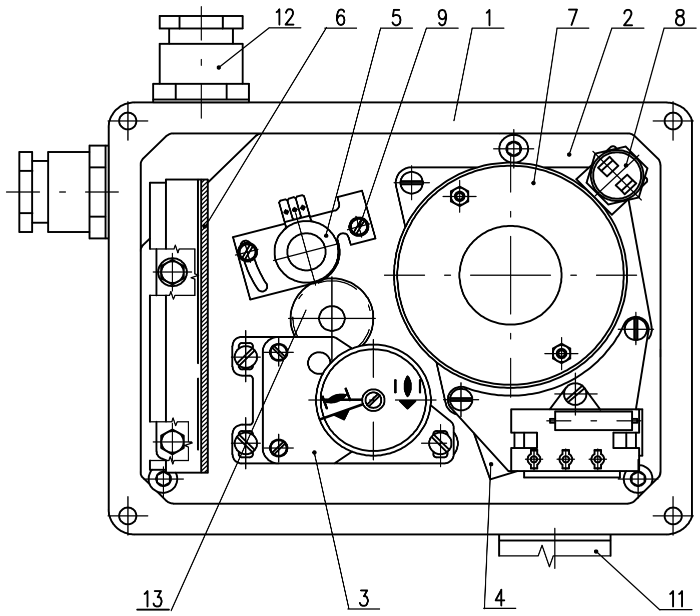



Fig.3

## *4.1 Gear unit adjustment*

In the production plant switching-off thrust for both the "opening" direction (the thrust switch S1) as well as for the "closing" direction (the thrust switch S2) are adjusted to specified value ±10%. If not agreed else they are adjusted to maximum value.

Adjustment and setting of the gear unit to other values without any testing device for thrust measuring is not possible.

## *4.2 Adjustment of position-indicating unit (Fig.4)*

The EA are in the production plant adjusted to a fixed angle (according to the specification), given on the nameplate. While setting, adjusting and resetting follow these steps (Fig. 4):

- In the version with a transmitter put the transmitter out of mesh.
- Loosen the nuts (23) fixing cams still having the Belleville spring creating axial pressure.
- Put the EA to the position "open" and turn the cam (29) clockwisely until the switch S3 (25) switches.
- Change setting of the EA by the angle, where the position "open" is to be indicated and turn the cam (31) clockwisely until the switch S5 (27) switches.
- Put the EA to the position "closed" and turn the cam (28) counterclockwisely until the switch S4 (24) switches.
- Turn the EA back by the angle, where the position "closed" is to be indicated and turn the cam (30) counterclockwisely until the switch S6 (26) switches.
- Having the EA adjusted lock the cams with the central milled nut and counter-nut (23).

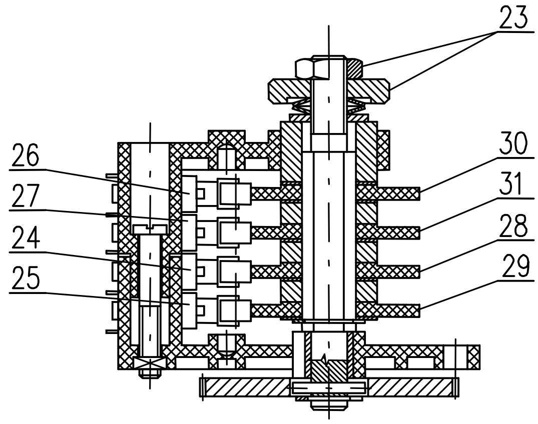



Fig. 4

If not agreed else the signalling cams are set next to the limit positions. The signal possibility is available along the whole operation angle in both directions, i.e. 100%.

## *4.3 Adjustment of resistant transmitter (Fig. 5)*

The **resistant transmitter** is in the EA **ST 1** used to function as a remote position indicator; in the EA **STR 1 with controller** to function as a feedback in the position controller and if needed also in the position of a remote resistant position indicator. Before the resistant transmitter adjustment the position switches have to be adjusted. Adjustment consists in setting of the resistance in the defined limit position of the EA.

<u>Notes:</u>
*In case that the EA is not used in the whole stroke range given on the nameplate, the resistance in the limit position "open" is proportionally reduced.*
*In the EA **STR 1 with controller** 2000W resistant transmitters are used. In the other cases if the resistant branch is lead to the terminal board the resistance of the transmitters is according to the customer's specification.*

To adjust the transmitter follow these steps:

- Loosen the fixing screws (9) of the transmitter holder and push the transmitter out of mesh.
- Connect a meter for resistance measuring to the terminals 71 and 73 of the EA **ST 1** terminal board, or to the terminals 6 and 7 of the EA **STR 1 with controller** terminal board.
- Put the actuator to the position "closed" (with the hand wheel, or with the local electric position control until the corresponding position switch S2 or S4 switches).
- Rotate the transmitter shaft until resistance of ≤5% of the nominal transmitter resistance can be read on the meter in case of EA **ST 1**, or 3 up to 7% of the nominal transmitter resistance in case of EA **STR 1,** or in case of EA **ST 1** with EPV, i.e. with the resistant transmitter with the converter PTK1
- In the position put the transmitter to mesh with the drive wheel and fix the fixing screws on the transmitter holder.
- Disconnect the meter from the terminal board.

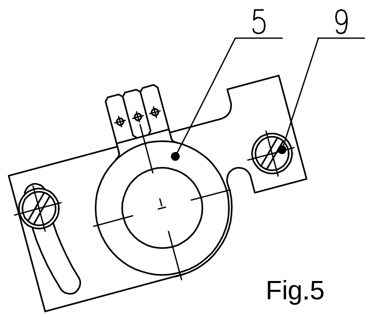



Fig.5

## *4.4 Adjustment of the Electronic Position Transmitter (EPV) - the Resistive Transmitter (Potentiometer) with the Converter PTK 1*

### *4.4.1 EPV – the 2-wire version (Fig. 6)*

The position transmitter with the converter PTK1 is in the plant adjusted to have the output current signal on the terminals 81-82 as follows:

- in the position „open" ........................................ 20 mA
- in the position „closed" ..................................... 4 mA

If the transmitter requires a new adjustment follow these steps:

***Adjustment of the EPV in EA ST:***

- Put the actuator to the position „closed" and switch the power supply off.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y (Fig. 6). The used transmitter resistance is 100 Ω.
- Switch the converter′s power supply on.
- Turn the adjusting trimmer ZERO (Fig. 6) to adjust the output current signal rate measured on the terminals 81-82 to 4mA.
- Set the actuator to the position „open".
- Turn the adjusting trimmer GAIN (Fig. 6) to adjust the output current signal rate measured on the terminals 81-82 to 20mA.
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.

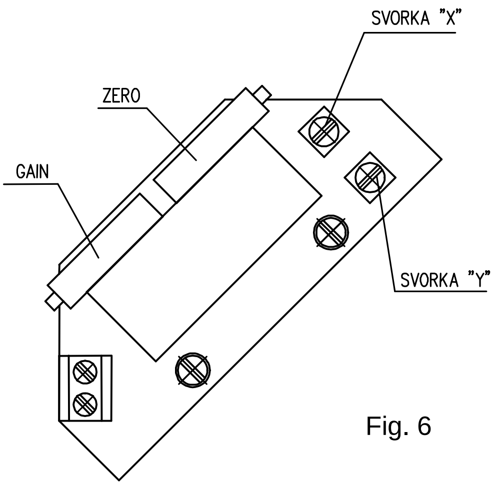



Fig. 6

<u>Note:</u>
*The output signal of 4-20mA can be adjusted at the range from 75 up to 100% of the rated stroke stated on the actuator¢s nameplate. At values less than 75% the value 20mA is reduced proportionally.*

***Adjustment of the EPV in EA STR 1 with controller***

- Disconnect the circuit with removing a jumper on the terminals 81 and 82.
- Disconnect the control signal from the terminals 86/87 and 88.
- Set the actuator to the direction ”OPENING“ or ”CLOSING“ with the hand wheel, or with connecting power to the terminals 1 and 20 for the direction ”OPENING„ or 1 and 24 for the direction ”CLOSING”.
- Set the actuator to the position “CLOSING“ and switch the converter off on the terminals 1 a 61.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y (Fig. 6).
- Connect power supply to the terminals 1 and 61.
- Turn the adjusting trimmer ZERO (Fig. 6) to adjust the output current signal rate measured on the terminals 81-82 to 4mA.
- Set the actuator to the position „open“.
- Turn the adjusting trimmer GAIN (Fig. 6) to adjust the output current signal rate measured on the terminals 81-82 to 20mA.
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.
- Having the transmitter adjusted put the jumper again on the terminals 81 and 82 in case that the output signal wont be used (the circuit through the terminals 81 and 82 should be closed).
- Connect the control signal to the terminals 86/87 and 88.

## *4.4.2 EPV – 3-wire version (Fig. 7)*

The resistive transmitter with the converter is in the plant adjusted to have the output current signal metered on the terminals 81-82 as follows:

- in the position „open“............................................. 20 mA or 5 mA
- in the position „closed“ .......................................... 0 mA or 4 mA

according to the specified version of the converter.

If the transmitter requires a new adjustment follow these steps:

- Put the actuator to the position ”closed“ and switch the power supply off.
- Adjust the resistive transmitter according to the previous chapter. The resistance is to be metered on the terminals X-Y (Fig. 7). The used transmitter resistance is *2000W or 100 W.*
- Switch the converter′s power supply on.
- Turn the adjusting trimmer ZERO (Fig. 7) to adjust the output current signal rate measured on the terminals 81-82 to 0 mA or 4mA.
- Set the actuator to the position „open“.
- Turn the adjusting trimmer GAIN (Fig. 7) to adjust the output current signal rate measured on the terminals 81-82 to 20mA or 5 mA..
- Check the output signal of the converter in the both limit positions, and repeat the procedure if needed.

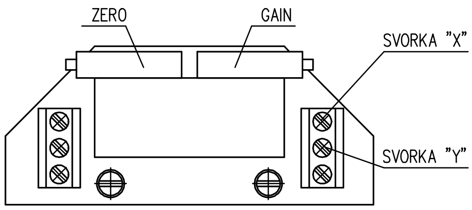



Fig.7

<u>*Note:*</u>

*The output signal of (0-20mA, 4-20mA or 0-5mA - according to the specification) can be adjusted at the range from 85 up to 100% of the rated stroke stated on the actuator's nameplate. At values less than 85% the value of the output signal is reduced proportionally.*

## *4.5 Adjustment of the Capacitive Transmitter CPT1/A (Fig.8)*

The chapter describes adjustment of the capacitive transmitter to the specified parameters (standard values of output signals) in case they are reset. The capacitive transmitter serves as a position transmitter of electric actuators with unified output signal of 4÷20 mA in electric actuators **ST**, or as a feedback of a position controller, or if required it functions also as a remote position transmitter of electric actuators with unified output signal of 4÷20 mA in electric actuators **STR with controllers.**

*Note:*
*In case that reversed output signals are needed (in the position ”OPEN” minimum output signal) contact personnel of service centres.*

The capacitive transmitter CPT1/A is adjusted by the producer to the fixed operation stroke according to the order and wired according to the wiring diagrams placed into the cover. Check the power supply of the user after connecting to terminal of the terminal board before the transmitter is electrically checked. Adjustment of the capacitive transmitter can be performed when the position switches are adjusted. The adjustment is performed with the power supply of 230 V/50 Hz and ambient temperature of 20±5°C.

The following versions of electric actuators with built capacitive transmitters can be specified :

**A) The version without any power supply** (2-wire version) for EA **ST**
**B) The version with a power supply** (2-wire version) for EA **ST**
**C) The version CPT as a feedback to the position controller** for EA **STR with controllers**

### A.) Adjustment of the Capacitive Transmitter without any Power Supply

Before connecting check the power supply. The measured voltage should be in range from 18 up to 28 V DC.

⚠ *The voltage of the power supply must not be in any case higher than 30 V DC. The transmitter can be irreversibly damaged*

While checking or adjusting the output signal of 4÷20 mA follow these steps:

- Connect a mA meter of precision class 0,5 and loading resistance lower than 500Ω serially with the transmitter (pole „-„; terminal 82)
- Put the actuator to the position ”CLOSED“, the signal value should decrease.
- Check the signal value for the position ”CLOSED“ (4 mA).
- Tune the signal with loosening the fixing screws (15) and turning the trimmer (10) until the required value of 4 mA is reached. Tighten the fixing screws.
- Put the actuator to the position ”OPEN“, the signal value should raise.
- Check the signal value for the position ”OPEN“ (20 mA).
- Tune the signal with turning the trimmer (20) until the required value of 20 mA is reached.
- Check the signal value for the position ”CLOSED“ and then for the position ”OPEN“.
- Repeat the procedure until the change from 4 to 20 mA is reached with deviation less then 0,5 %.
- Disconnect the meter and lock the screws with a varnish.

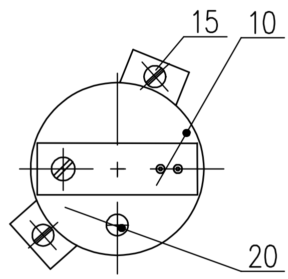


Fig. 8

### B.) Adjustment of the Capacitive Transmitter with the Power Supply:

1.) Check the power supply: 230 V AC ±10% on the terminals 78,79
2.) While checking or adjusting the output signal of 4÷20 mA follow these steps:

- Connect a mA meter of precision class 0,5 and loading resistance lower than 500Ω on the terminals 81,82.
- Follow the procedure described in the previous chapter A.

### C.) Adjustment of the Capacitive Transmitter Served as a Feedback of the Position Controller

While checking or adjusting the output signal of 4÷20 mA follow these steps:

- Disconnect the circuit on the terminals 81 and 82 removing the jumper.
- Connect power supply to the terminals 1 and 61.
- Disconnect the control signal from the terminals 86 and 88.
- Put the actuator to the direction ”OPENING“ or ”CLOSING“ with the hand wheel or connecting power supply to the terminals 1 and 200 for the direction ”OPENING“, or 1 and 24 for the direction ”CLOSING“.
- Connect a mA meter of precision class 0,5 (e.g. digital) and loading resistance lower than 500Ω on the terminals 81,82.
- Follow the procedure for the version without any power supply described in the previous chapter A.
- Having the transmitter adjusted put the jumper again on the terminals 81 and 82 in case that the output signal wont be used (the circuit through the terminals 81 and 82 should be closed).

- Connect the control signal to the terminals 86 and 88

⚠ *The user has to arrange grounding of the 2-wire circuit of the capacitive transmitter to the electrical ground of a joined controller, computer, etc. The grounding should be performed only in one place in any part of the circuit outside the electric actuator!*

*Note:*
*The trimmer (20) can be used to adjust the output signal of the capacitive transmitter to any value of operation stroke in range from ca 40% up to 100% of the value of the operation stroke adjusted by the producer and stated on the actuator's nameplate.*

## 4.6 *Adjustment of position controller* (Fig. 9)

The built-in position controller REGADA of new generation is a user-friendly control system to control actuators with an analogue signal. The controller takes advantages of high-power RISC processor MICROCHIP to perform all functions. It provides also continuous automotive diagnostics of the system, error messages as well as number of relay switching and number of controller's operation hours. Placing an analogue signal onto the input terminals of the terminal board 86/87 (GND, -) and 88 (+) causes that the EA output is reset.

Required parameters and functions can be programmed using function buttons SW1 - SW2 and LED diodes D3 - D4 placed directly on the controller, see Table 2.

### *4.6.1 Setting of controller*

The controller's microprocessor unit is in the production plant programmed to parameters given in **Table 2** (Note 2).

Setting of the controller is performed using buttons and LED diodes. Adjust the position and thrust switches and the position transmitter before adjustment of the controller.

Laying of adjusters and signalling elements on the board of the REGADA controller is shown on Fig.9:

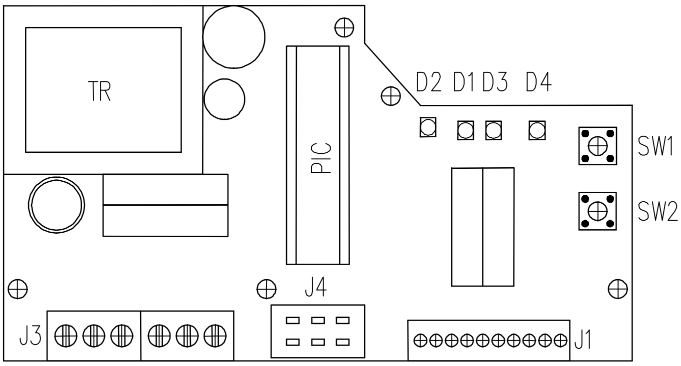



Fig. 9

| | |
|---|---|
| **SW1 button** | starts an initialisation routine an allows listing in the adjust menus |
| **SW2 button** | setting of parameters in the chosen menu |
| **D1 diode** | power on indication |
| **D2 diode** | motion to the direction "opening" indication (green) - "closing" (red) indication |
| **D3 diode** | (yellow light) number of blinking codes indicates chosen adjust menu |
| **D4 diode** | (red light) number of blinking codes indicates adjusted parameter of the controller from the chosen menu |

**Table 2**

| **D3 (yellow) diode** number of blinking | **Adjust menu** | **D4 (red) diode** number of blinking | **Adjusted parameter** |
|---|---|---|---|
| 1 blink | control signal | 1 blink | 0-20mA |
| | | 2 blinks | **4-20 mA (*) (**)** |
| | | 3 blinks | 0-10V DC |
| 2 blinks | response for signal SYS-TEST | 1 blink | EA opens receiving signal SYS |
| | | 2 blinks | EA closes receiving signal SYS |
| | | 3 blinks | **EA stops receiving signal SYS (*)** |
| 3 blinks | mirroring (ascending/descending characteristics) | 1 blink | EA CLOSING at increasing of control signal |
| | | 2 blinks | **EA OPENING at increasing of control signal (*)** |
| 4 blinks | insensitiveness of controller | 1 to 10 blinks | insensitiveness of controller of 1-10% (3% set by the producer) (*) |
| 5 blinks | way of regulation | 1 blink | narrow thrust |
| | | 2 blinks | **narrow position (*)** |
| | | 3 blinks | wide thrust |
| | | 4 blinks | wide position |

*Notes:*
1. *The controller at autocalibration automatically sets the feedback type - resistant/current*
2. *(*) Parameters set in the production plant, if customer has not stated else.*
3. *(**) Input signal 4 mA - position "closed"*
   *20 mA - position "open"*

**Standard setting of controller (programmed RESET of controller) -** in case of any problems with setting of the parameters it is possible with pressing both **SW1 and SW2** at the same time and then switching power on to set the standard parameters.

**Controller setting procedure:**

- Set the actuator into a mid-position.

The initialisation routine starts at the switched-on controller, zero system deviation and short pressing of the SW1 button for ca 2 sec (i.e. until the diode D3 got on). Loosing the button some of the default menus starts (usually control signal) what is shown with 1 blink on the D3 diode as well as one of the default parameters (usually control signal of 4-20mA) what is shown with 1 blink on the D4 diode. Then the required parameters of the controller can be changed according to Table 2:

- press shortly the SW1 button to list the menu shown with the blinking number on the D4 diode.
- press shortly the SW2 button to set parameters shown with the blinking number on the D4 diode.

After changing of the parameters according to user's wishes, put the controller to autocalibration with pressing the SW1 button for ca 2 sec (i.e. until the diode D3 got on). During this process the controller performs the feedback transmitter and turning sense checking, sets actuator to the positions "open" and "closed", measures inertia mass in the directions "opening" and "closing", and loads the adjusted parameters into the EEPROM memory. In case that during the initialisation process an error occurs (e.g. in connection or adjustment) the initialisation process will be interrupted and the controller with the D4 diode reports about the type of the error. Else after finishing the initialisation process the controller is put into the regulation mode.

***Error messages of the controller with D4 diode at initialisation:***

4 blinks..........improper connection of the thrust switches
5 blinks..........improper connection of the feedback transmitter
8 blinks..........bad sense of actuator's turning direction or adverse connection of the feedback transmitter

## *4.6.2 Watching operation and error states*

Watching operation and error states is possible with the EA open.

**a.)** ***Operation status with the D3 LED diode indicating*:**

- it is continuously lighting - the controller regulates
- it is continuously not lighting - system deviation in the insensitiveness range - the EA has stopped

**b.)** ***Error state with the D4 and D3 LED diodes indicating - D4 continuously lighting, D3 indicates error state with blinking***

| | |
|---|---|
| 1 blink (repeated): | - indication of the "TEST" mode - the EA is put to the position according to the signal in the "TEST" menu (at connecting the 66 and 86/87 terminals) |
| 2 blinks (repeating after short pause): | - missing of control signal - the EA is put to the position according to the signal in the "TEST" menu |
| 4 blinks (repeating after short pause): | - thrust switches activity indication (the EA switched-off with the thrust switches in a mid-position) |
| 5 blinks (repeating after short pause): | - failure of the feedback transmitter - the EA is put to the position according to the signal in the "TEST" menu |
| 7 blinks (repeating after short pause): | - control signal (current at range 4-20mA less than 4mA (3.5mA) |

# 5. Service, maintenance and troubleshooting

## 5.1 Service

*1. In general it is provided that service of the EA is performed by a qualified worker in accordance with requirement given in Chapter 1!*
*2. After putting the EA into operation it is needed to verify whether during manipulation any scratch on surface occurred, it is to be removed to prevent actuator against corrosion!*

The EA ST or STR requires just negligible service. Proper putting into operation is a recondition of reliable operation.

The service of the EA leads from the operation conditions and usually resides in information processing for further arranging of required functions.

The stuff has to perform prescribed maintenance to prevent the EA during operation against impacts of environment, which exceed the frame of allowed influences.

**Manual control:**

If needed (during adjusting, function checking, failure etc.) the stuff can change setting of the controlled body using the hand wheel. While rotating the hand wheel clockwisely the output part moves in the direction "Z - closed".

**Electric local control:** - additional equipment

In case of need (during adjusting, function checking etc.), but power supply must be provided, is possible to readjust actuator by electric local control. After switching the mode switch to the mode "LOCAL" it is possible by the direction switch to control motion of the output part to setting direction. Signal lights indicate achievement of limit position at relevant direction.

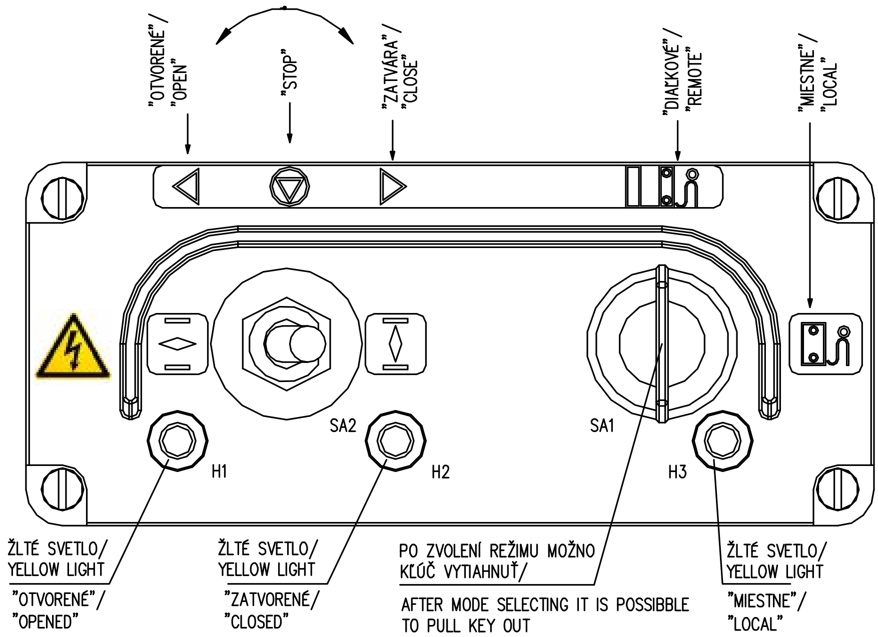



Fig.10

## 5.2 Maintenance - extent and periodicity

During inspections and maintenance is needed to tighten all screws and nuts that affect the tightness and coverage. Similarly, once a year should be checked and if necessary tighten mounting screws of the terminal wires and assuring of the slip-on joints with wires.

The interval between two preventive inspections is four years.

The replacement of cover gaskets and gasket of an oil filling is needed in case of damage or after 6 years of the operation.

The grease in the supplied actuators is designed for the lifetime of the product.
It is not necessary to change the grease during the operation of the actuator.

**Lubrication:**

- - gear part - in versions for climate with temperatures -25°C till +55°C – grease HF 401/0 (GLEIT-μ) resp. GLEITMO 585 K
  - in versions for climate with temperatures -50°C till +40°C grease ISOFLEX TOPAS AK 50.
- - linear adapter – grease GLEIT- μ - HP 520M (to –25°C) resp. HP 520S (to –40°C).

***Lubrication of the valve stem is independent on maintenance of the EA!***

After every potential flooding of the product check, whether there is no water inside. After eventual water penetration, dry the product before repeated putting into operation and replace damaged sealings, resp. other parts of EA. identically check also tightness of cable bushings and replace them, if they are damaged.

- Every six months it is recommended to perform one check move in frame of adjusted operation stroke to verify reliability of functioning with setting back to the original position.
- If the audit rules do not determine else the inspection of EA is performed ones a year and tightening of all connecting and grounded screws have to be checked to avoid overheating.
- After 6 months from putting of EA into operation and once a year it is recommended to check tightening of fixing screws between the EA and the valve. (Tighten the screws with the cross system.)

- While connecting and disconnecting of the EA check the tightness of cable glands – those with damaged sealings should be replaced by new ones of the approved type!
- Keep the EA clean and take care about removing impurities and dust. The cleaning has to be performed regularly according to the operation possibilities and requirements.

### 5.3 Troubleshooting

At failure of power supply the EA stops in the position where it was before the failure. If needed the EA can be set only with the manual control (the hand wheel). After restoration of power the EA is prepared for operation.

In case of failure of any element of the EA it can be changed by a new one. Entrust the change to a service centre.

In case of an EA failure, which cannot be eliminated directly in operation, follow instructions for under-guaranty and after-guaranty service. For controller repair a F1,6 A subminiature fuse for PCB should be used, alternativelly also F 2A, 250 V e.g. Siba type 164 050.1,6 or MSF 250, and for DB .... voltage source repair a M160 mA, 250V fuse, e.g. Siba, or MSF 250.

<u>Note:</u> *If the EA requires dismantling follow the chapter "Dismantling".*

***Taking the EA to pieces for repair purposes is allowed only by professionally qualified persons trained in the production plant or by a contracted service centre!***

## 6. Accessories and spare parts

### 6.1 Accesories

The EA is delivered with the hand wheel.

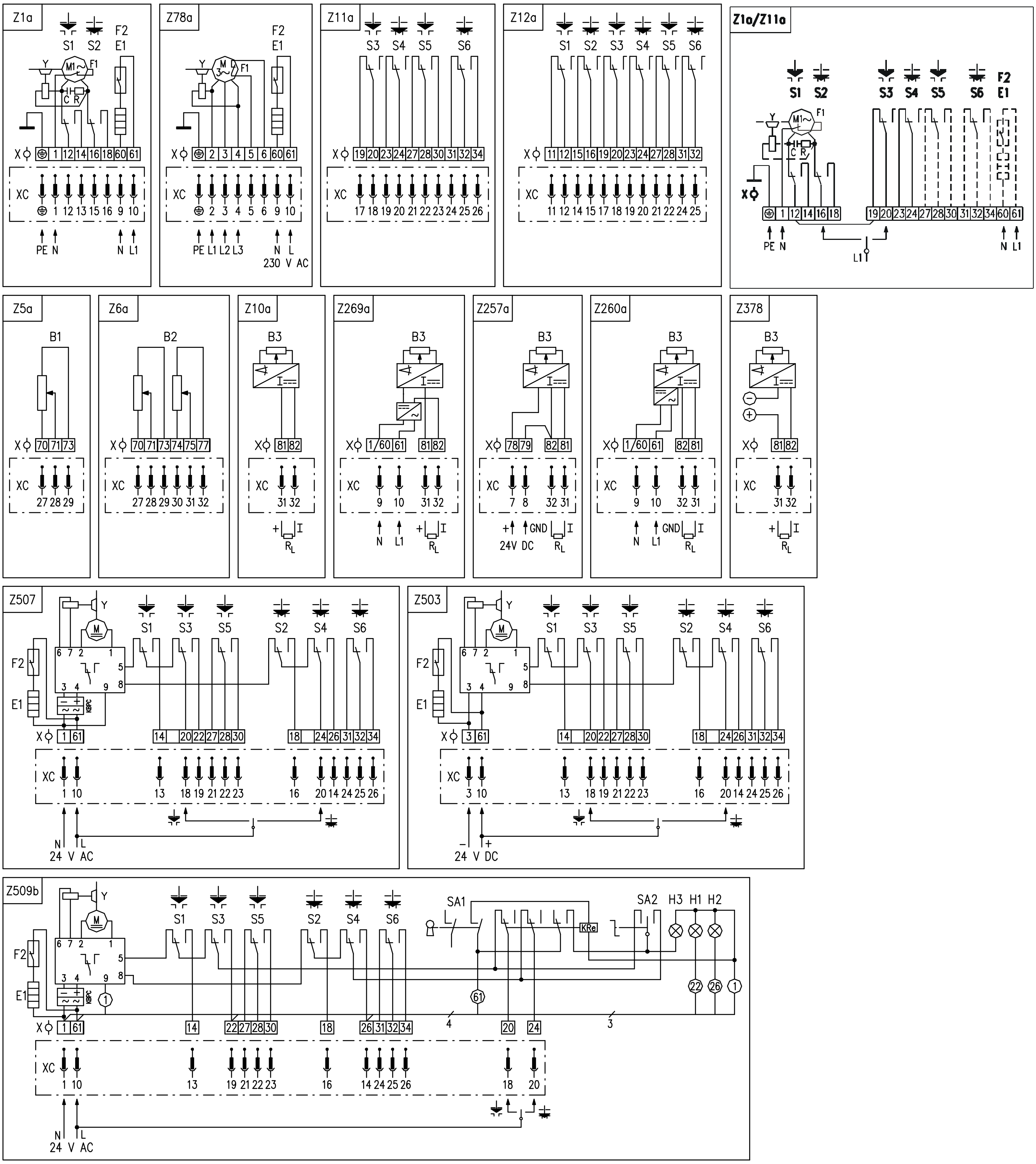
### 6.2 Spare parts list

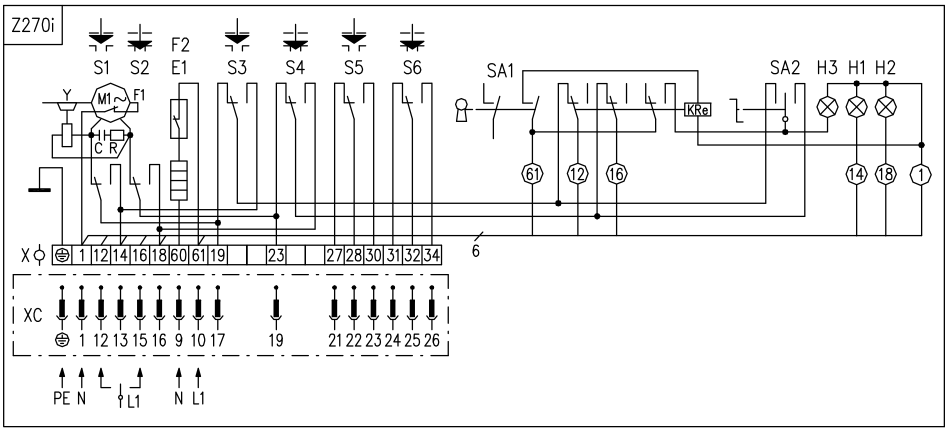
| Spare part | Order Nr. | Position | Figure |
|---|---|---|---|
| Electric motor; 15W/39 VA; 230V AC | 63 592 311,63592306 | 7 | 3 |
| Electric motor; 15W/40 VA; 3x400V AC | 63 592 332 | 7 | 3 |
| Electric motor; 20W/40 ; 24V AC/DC | 63 592 289 | 7 | 3 |
| Micro-switch CHERRY DB6G-B1RB | 64 051 220 | 3,4 | 3 |
| Resistant wire transmitter (potentiometer) 1x100Ω | 64 051 812 | 5 | 3 |
| Resistant wire transmitter (potentiometer) 2x100Ω | 64 051 814 | 5 | 3 |
| Resistant wire transmitter (potentiometer) 1x2000Ω | 64 051 827 | 5 | 3 |
| Resistant wire transmitter (potentiometer) 2x2000Ω | 64 051 825 | 5 | 3 |
| Capacitive transmitter | 64 051 499 | 10 | 8 |
| Sealing ST 1 | 04 709 000 | - | - |
| Sealing STR 1 | 62 732 376 | 1 | - |
| Cable glands M12 | 63 456 579 | 12 | 3 |
| Cable glands M16 | 63 456 595 | 12 | 3 |
| Cable glands M20 | 63 456 596 | 12 | 3 |
| Terminal board EKL | 63 456 710 | 6 | 3 |

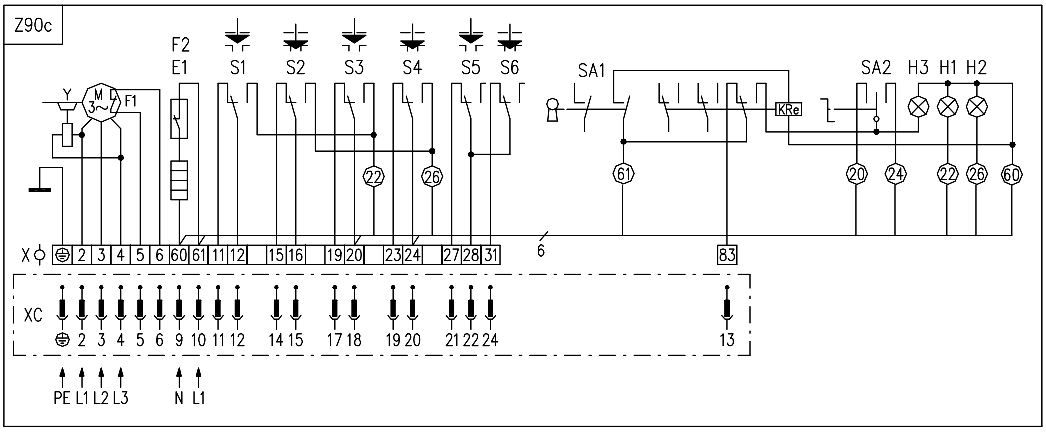
# 7. Enclosures

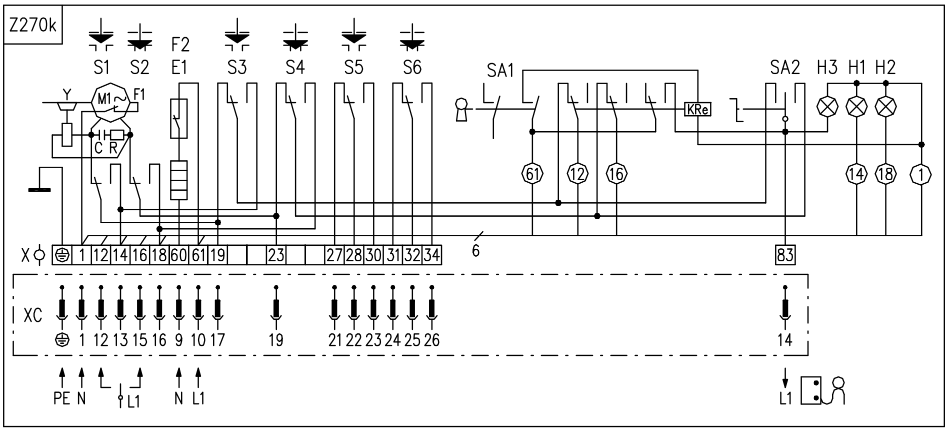
## 7.1 Wiring diagrams

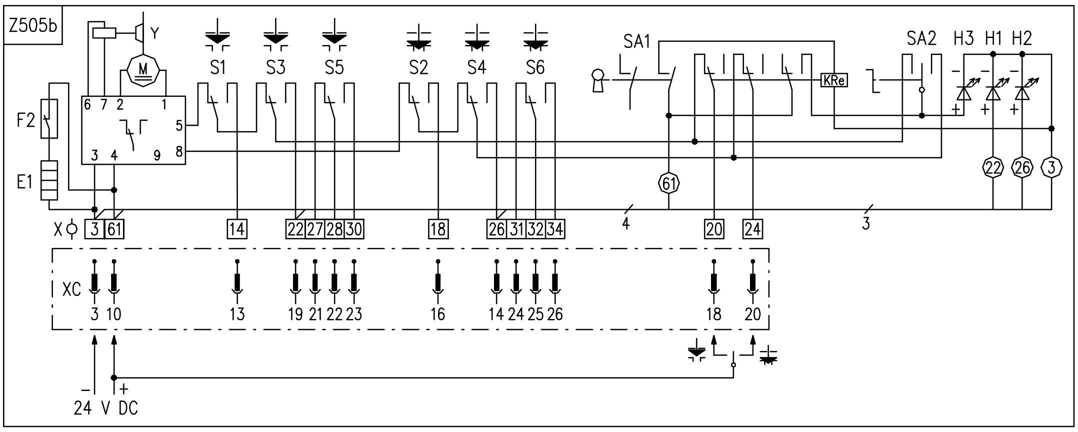
### Wiring diagrams ES ST 1



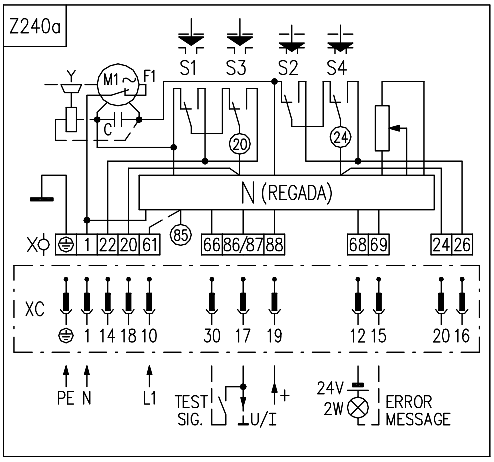

Z270i
S1 S2 F2 E1 S3 S4 S5 S6
SA1
SA2 H3 H1 H2
M1 F1 Y C R KRe
X 1 12 14 16 18 60 61 19 23 27 28 30 31 32 34
XC 1 12 13 15 16 9 10 17 19 21 22 23 24 25 26
PE N L1 N L1

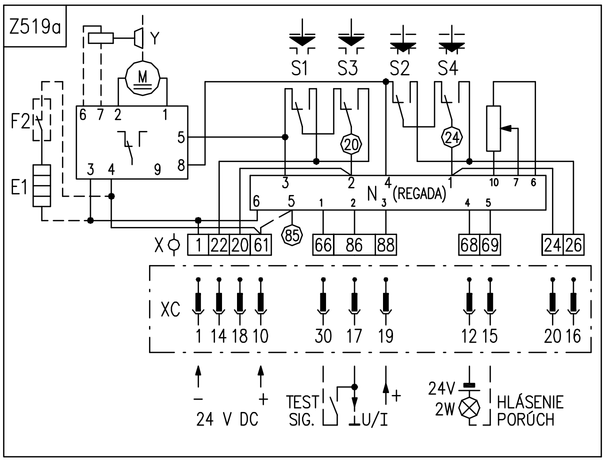

Z90c
F2 E1 S1 S2 S3 S4 S5 S6
SA1
SA2 H3 H1 H2
M 3~ F1 Y KRe
X 2 3 4 5 6 60 61 11 12 15 16 19 20 23 24 27 28 31 83
XC 2 3 4 5 6 9 10 11 12 14 15 17 18 19 20 21 22 24 13
PE L1 L2 L3 N L1

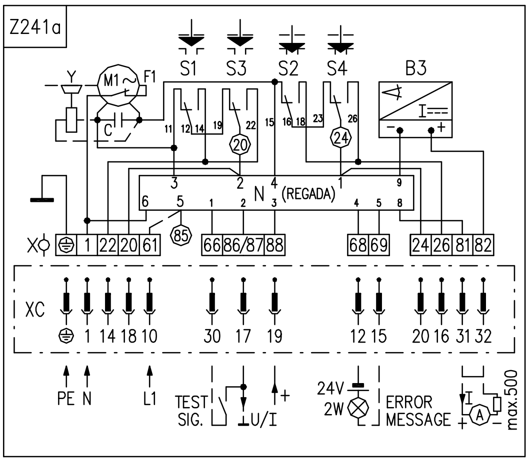

Z270k
S1 S2 F2 E1 S3 S4 S5 S6
SA1
SA2 H3 H1 H2
M1 F1 Y C R KRe
X 1 12 14 16 18 60 61 19 23 27 28 30 31 32 34 83
XC 1 12 13 15 16 9 10 17 19 21 22 23 24 25 26 14
PE N L1 N L1 L1

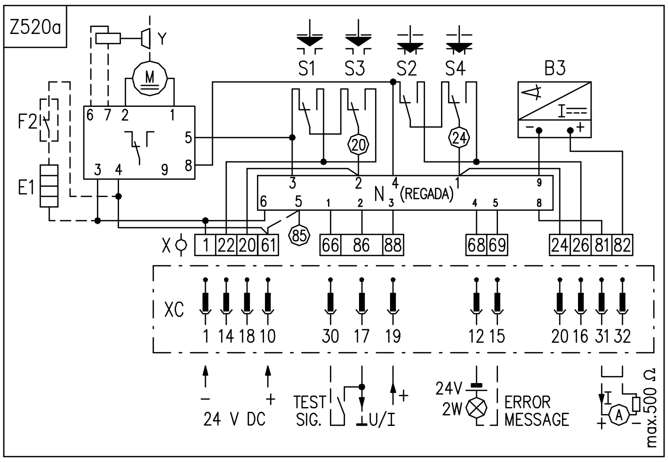

Z505b
Y M
S1 S3 S5 S2 S4 S6
SA1
SA2 H3 H1 H2
F2 E1 KRe
X 3 61 14 22 27 28 30 18 26 31 32 34 20 24
XC 3 10 13 19 21 22 23 16 14 24 25 26 18 20
24 V DC

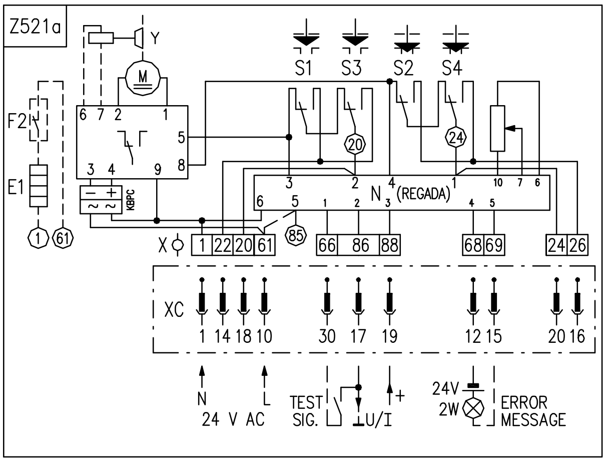
### *Wiring diagrams ES STR with controller*

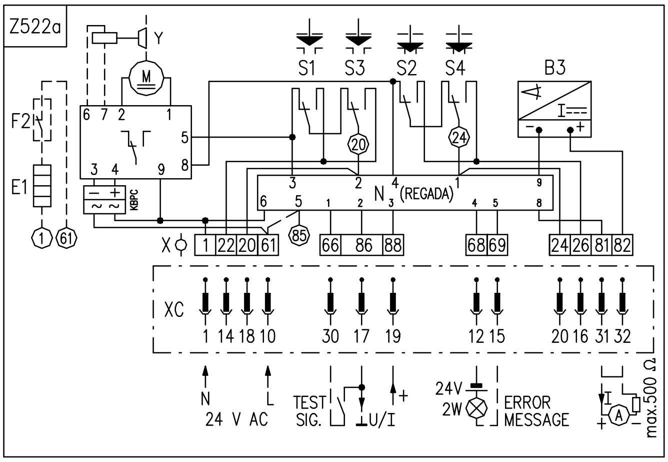


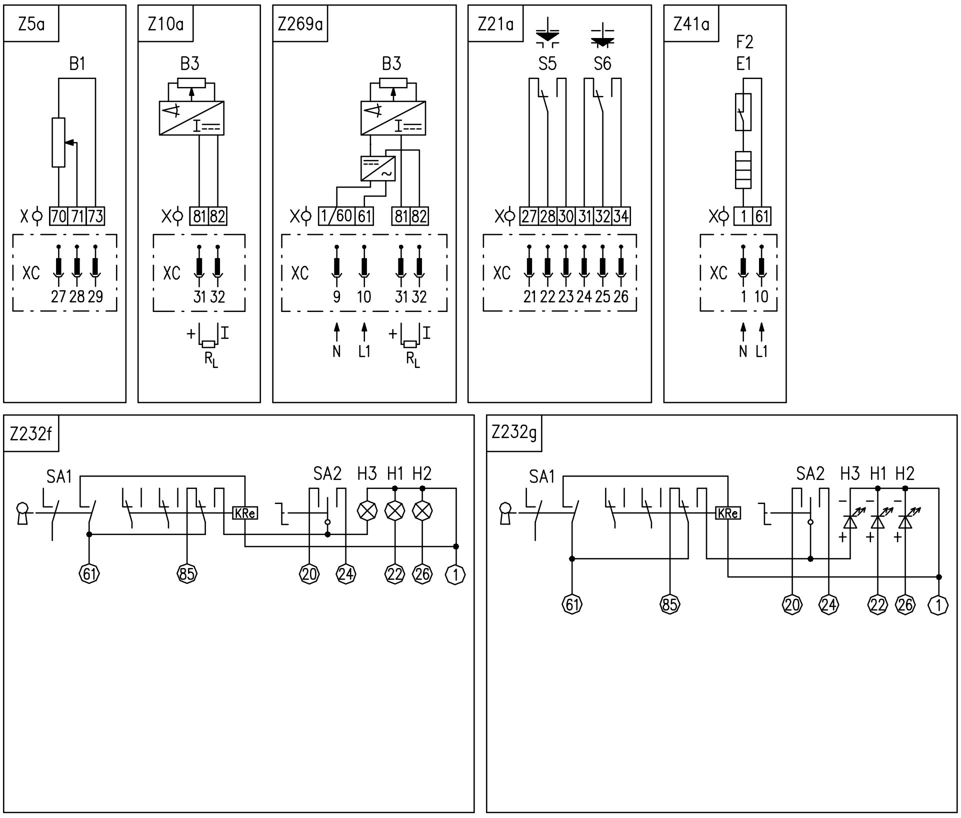
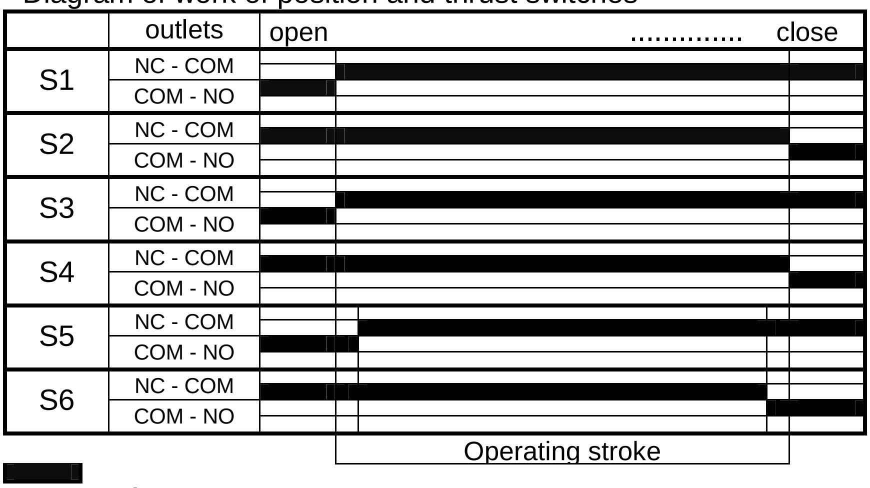
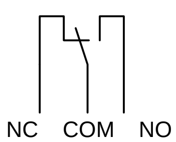


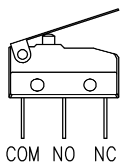

Diagram of work of position and thrust switches




**Connected contact**

**Microswitches:: S1, S2, S3, S4, S5, S6:**



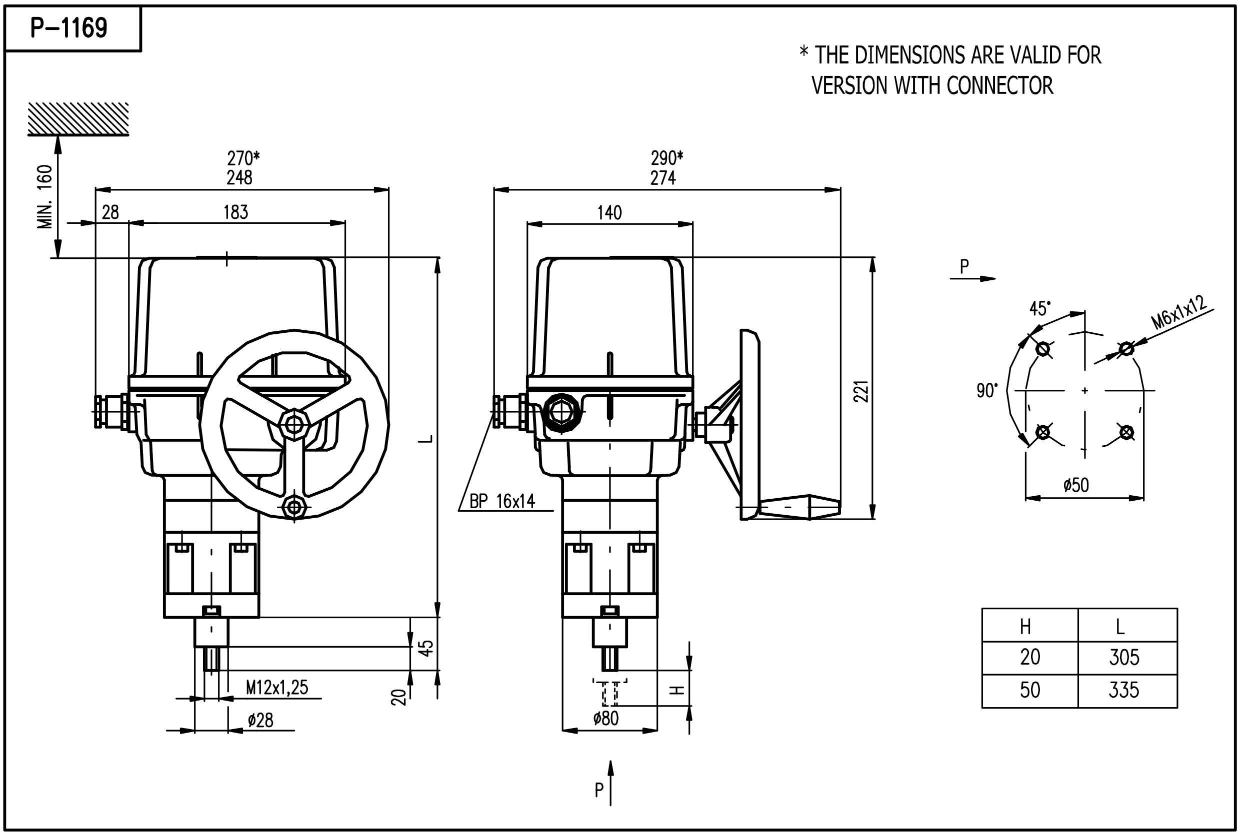
## Legend:

Z1a .............connection of single-phase electric motor
Z1a/Z11a ....connection of position switches for single-phase electric motor
Z5a.............connection of single resistive transmitter
Z6a.............connection of double resistive transmitter
Z10a...........connection of resistive transmitter with current converter or capacitive transmitter - 2-wire without power supply
Z11a ...........connection of position switches for single-phase electric motor
Z12a ...........connection of position switches for 3-phase electric motor
Z21a ...........connection of additional position switches for EA STR 1
Z41a...........connection of space heater and thermal switch for EA STR 1
Z78a ...........connection of 3-phase electric motor
Z90c ...........connection of 3-phase electric motor with local control
Z232f...........connection of local control for EA STR 1 - 230 V AC, 24 V AC
Z232g..........connection of local control for EA STR 1 - 24 V DC
Z240a..........connection of EA STR 1 with controller and with resistive feedback with 1~motor
Z241a..........connection of EA STR 1 with controller and with current feedback with 1~motor
Z257a..........connection of transmitter – 3 –wire without power supply
Z260a..........connection of transmitter with current converter – 3 –wire with power supply
Z269a..........connection of el. transmitter with current converter or capacitive transmitter -2-wire with power supply
Z270i...........connection of 1-phase electric motor with local control
Z270k..........connection of 1-phase electric motor with local control with status signalization of local control
Z378 ...........connection of resistive with current converter or capacitive transmitter 2 and 3 - wire with supply
Z503 ...........connection of electric motor 24V DC, torque, position and additional position switches
Z505b .........connection of EA ST 1 with electric motor 24 V DC and with local control
Z507............connection of EA ST 1- 24V AC with additional position switches, space heater with thermal switch
Z509b..........connection of EA ST 1 with electric motor 24 V AC and with local control
Z521a..........connection of EA STR 1 with controller, with resistive feedback, with voltage 24 V AC
Z522a...........connection of EA STR 1 with controller, with current feedback, with voltage 24 V AC
Z519a..........connection of EA STR 1 with controller, with resistive feedback, with voltage 24 V DC
Z520a..........connection of EA STR 1 with controller, with current feedback, with voltage 24 V DC

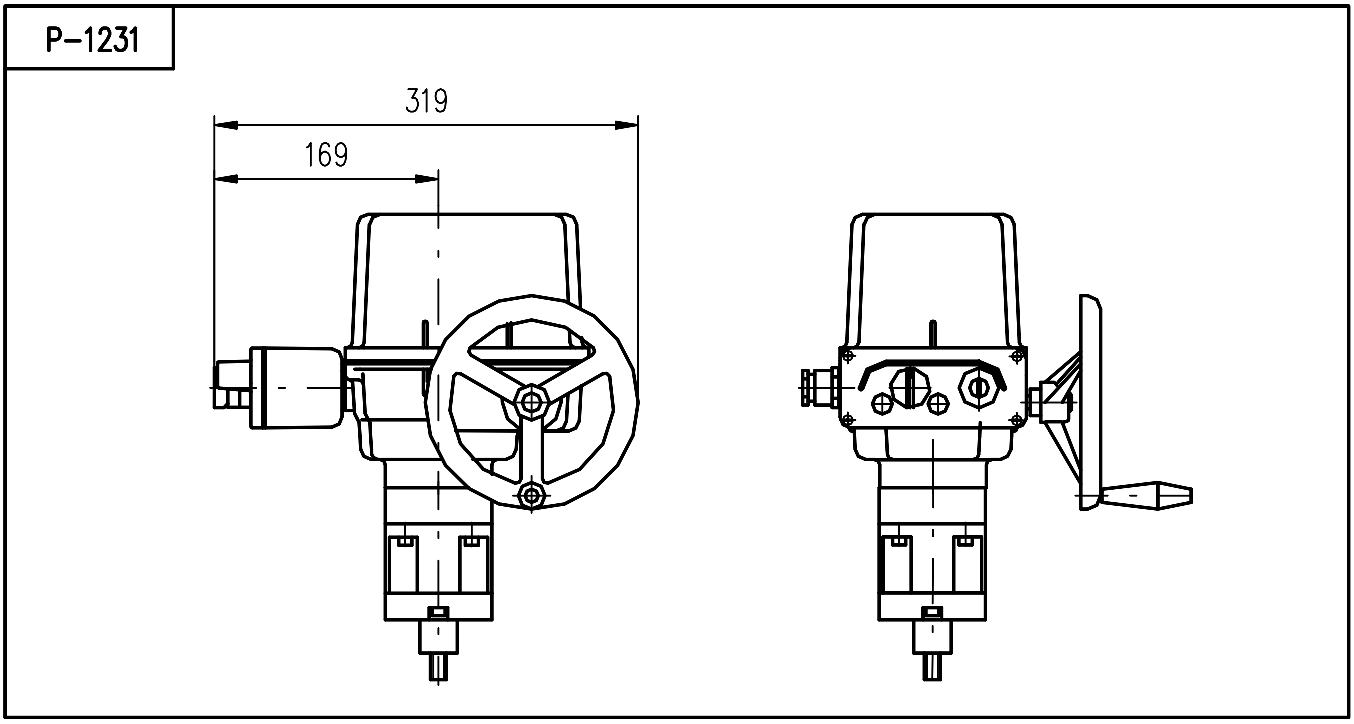
B1 ........... single resistive transmitter
B2............ double resistive transmitter
B3............ capacitive transmitter or resistive transmitter with current converter
S1............ torque switch "open"
S2............ torque switch "closed"
S3............ position switch "open"
S4............ position switch "closed"
S5............ additional position switch "open"
S6............ additional position switch "closed"
M ............. electric motor
C.............. capacitor
Y.............. brake of electric motor
E1............ space heater
F1............ thermal protection of electric motor
F2............ thermal switch of space heater
I/U............ input (output) current (voltage) signals
H1............ indication of “open” limit position
H2............ indication of “closed” limit position
H3............ indication of “electric local control”
N.............. position controller
SA1.......... rotary switch with key “remote-0-electric local” control
SA2.......... rotary switch “open-stop-closing”
R.............. dropping resistance)
$R_L$ ............ load resistance
X.............. terminal board
XC ........... connector

Notes:
*1. In case, that output signal from capacitive transmitter (wiring diagram Z241a) is unused (incomplete circuit between terminal 81 and 82), it is required to connect terminals 81 and 82 by jumper (jumper is connected at manufacturing plant for connecting to terminal board only). By using output current signal from capacitive transmitter it is needed to remove jumper.*
*2. In the version equipped with the controller device while using the feedback from transducer CPT; when using the output signal there has been no galvanic isolation of the signal from the input one!*
*3. In case that galvanically separated output signal is needed it is necessary to use galvanical separation element (is not part of delivery), e.g. NMLSG.U07/B (producer SAMO Automation s.r.o.). After discussion this module could be supplied by EA producer.*

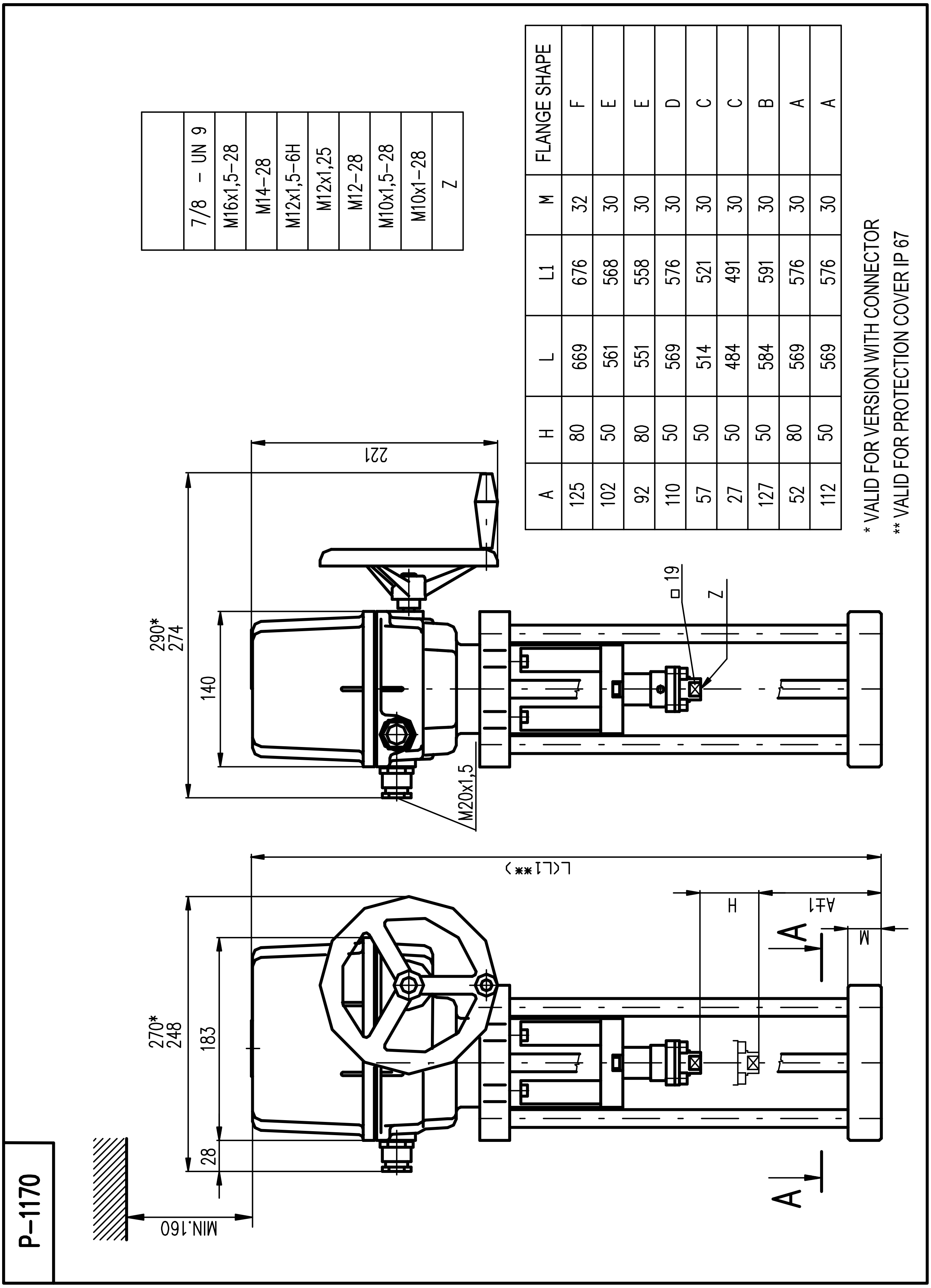
## 7.2 Dimensional drawings Flange ISO 5210




P-1169 Flange DIN 3358




P-1231 EA with local control




| |
|---|
| 7/8 - UN 9 |
| M16x1,5-28 |
| M14-28 |
| M12x1,5-6H |
| M12x1,25 |
| M12-28 |
| M10x1,5-28 |
| M10x1-28 |
| Z |

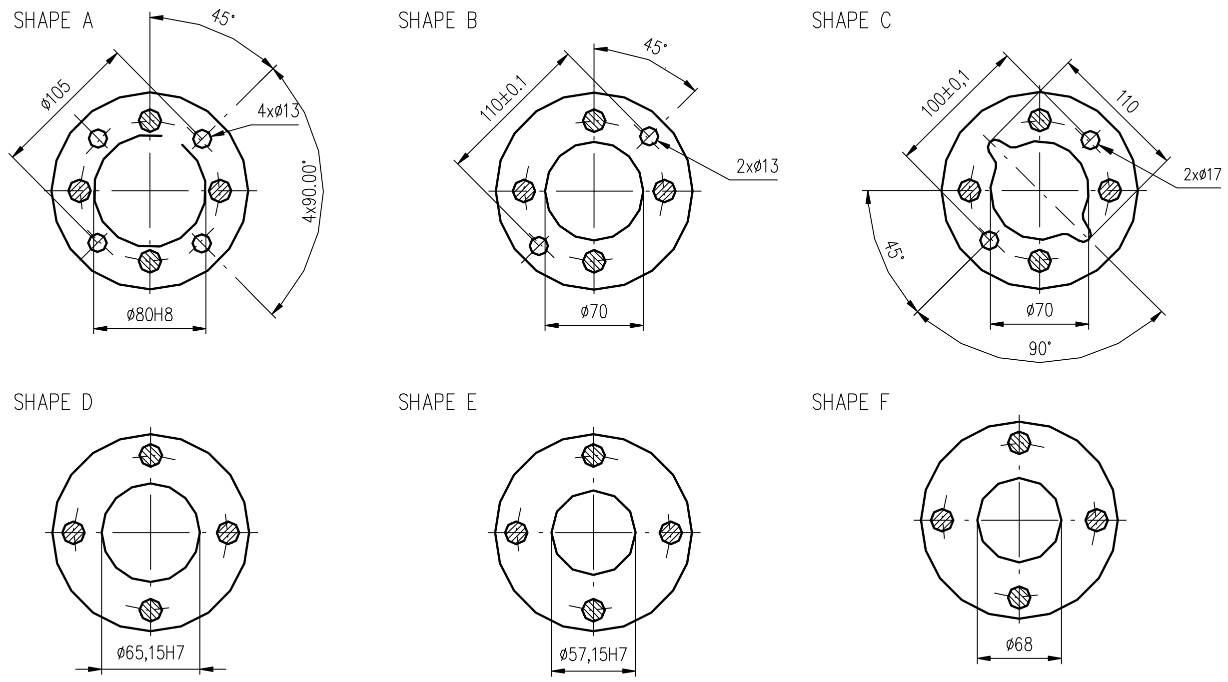
| A | H | L | L1 | M | FLANGE SHAPE |
|---|---|---|---|---|---|
| 125 | 80 | 669 | 676 | 32 | F |
| 102 | 50 | 561 | 568 | 30 | E |
| 92 | 80 | 551 | 558 | 30 | E |
| 110 | 50 | 569 | 576 | 30 | D |
| 57 | 50 | 514 | 521 | 30 | C |
| 27 | 50 | 484 | 491 | 30 | C |
| 127 | 50 | 584 | 591 | 30 | B |
| 52 | 80 | 569 | 576 | 30 | A |
| 112 | 50 | 569 | 576 | 30 | A |

* VALID FOR VERSION WITH CONNECTOR

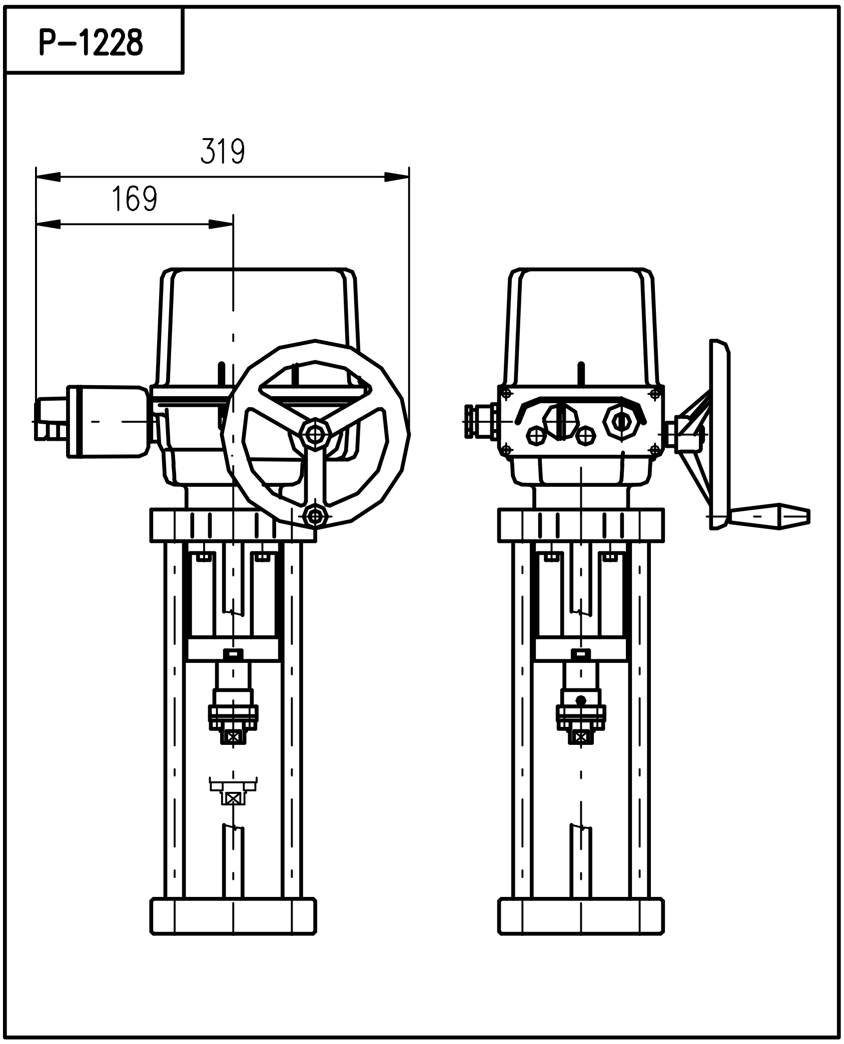
** VALID FOR PROTECTION COVER IP 67

P-1170 Pillars

P–1170


SHAPE A
45°
ø105
4xø13
4x90.00°
ø80H8
SHAPE B
45°
110±0.1
2xø13
ø70
SHAPE C
100±0,1
110
2xø17
45°
ø70
90°
SHAPE D
ø65,15H7
SHAPE E
ø57,15H7
SHAPE F
ø68

P-1228 The EA with local control



### *7.3 Guarantee service check report*

| | |
|---|---|
| ***Service center:D*** | |
| ***Date of repair:*** | ***Guarantee repair no.:*** |
| ***User of actuator:*** | ***Claim applied by:*** |
| ***Actuator type number:*** | ***Actuator production number:*** |
| ***Product claim fault:*** | ***Detected product fault:*** |
| ***Used spare parts:*** | |
| ***Remarks:*** | |
| ***Issued on a day:*** | ***Signature:*** |

## 7.4 *Post guarantee service check report*

| | |
|---|---|
| ***Service center:*** | |
| ***Date of repair:*** | |
| ***User of actuator:*** | ***Actuator operating place :*** |
| ***Actuator type number:*** | ***Actuator production number:*** |
| ***Detected product fault:*** | |
| ***Used spare parts:*** | |
| ***Remarks:*** | |
| ***Issued on a day:*** | ***Signature:*** |

## 7.5 Commercial representation

***Slovak Republic:***

**Regada, s.r.o.**,
Strojnícka 7,
080 01 Prešov
Tel.: +421 (0)51 7480 460,
Fax: +421 (0)51 7732 096,
E-mail: regada@regada.sk