ZPA PEČKY, a.s.

Functional Description of Actuator
Electronic Sensor
and Position Regulator

CONTROL BLOCK
WITH REGULATOR ZP2RE6

CERTIFICATE TÜV NORD

Management system as per
EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures, it is hereby certified that

ZPA Pečky, a.s.
Třída 5. května 166
289 11 Pečky
Czech Republic

applies a management system in line with the above standard for the following scope

Development and production of electric actuators,
switch boards and sheet metal working.

Certificate Registration No. 04 100 950161   Valid until 2012-09-24
Audit Report No. 624 362/300   Initial certification 1995-03-01

Certification Body   Praha, 2009-09-25
at TÜV NORD CERT GmbH

This certification was conducted in accordance with the TÜV NORD CERT auditing and certification procedures and is subject to regular surveillance audits.

TÜV NORD CERT GmbH   Langemarckstrasse 20   45141 Essen   www.tuev-nord-cert.com

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1 DOCUMENT VERSIONS

Version	Date	FW zp2_re6	Modified by	Changes

2 TABLE OF CONTENTS

3 BASIC SETTINGS OF ALL PARAMETERS

- Tripping always depending on inertia; identified by AUTOCALIBRATION.
- If no calibration takes place, the motor might rotate in wrong direction and cause an error. In case of an error, it must be removed without delay.
- The regulator has 1 sec for identifying the correct rotation direction.
- If it identifies wrong rotation direction within 0.95 sec → an ERROR is triggered.
- Pace length must be set up so that it never exceeds one half of the internal insensitivity range.
- CPT transmitter automatically defines functional range within CLOSED – OPEN setting.
- Feedback signal is retrieved from regulator software setting.

4 APPLICATION

Control Block 1, 2 can be part of the actuator or it can be delivered separately and interconnected with the controlled actuator by wiring.

It includes:

assembly unit with regulator ZP2RE6 with supply transformer,
assembly unit for electric motor actuation (SSR or contactors) with optional electro-dynamic brake BR2,
terminal strip.

Actuator torque and position micro switches are connected to Control Block 1, 2. Resistance or current position sensor may be connected to Control Block 1, 2. If motor thermal protection needs to be applied, this information must be specified in the purchase order (24/230V).

5 ELECTRIC EQUIPMENT

Switching block

For output values exceeding 4 kW, the electric motor is switched by Lovato BF25 01D actuators, with coil control voltage of 24V DC. Up to the output of 4kW, SSR Celduc SV969500 are used for switching, with control voltage ranging from 12 to 30 V DC. SSR switching elements are secured by two fast fuses FF1 and FF2. Third phase is not a switched phase, but a permanently interconnected one. For electric motors with output up to 2.2 kW, electro-dynamic brake BR2BK2,2 can be added in order to improve regulation.

Switching block enables three-state electric motor control, i.e. running in both directions of rotation and electric motor power off. Switching is controlled by ZP2RE6 regulator. Depending on applied switching elements, it is supplied in the three following versions:

261520890   BLOK CONTROL 1,   SSR with brake (electric motor max. 2.2 kW)
261520891   BLOK CONTROL 1,   SSR without brake (electric motor max. 4 kW)
261520892   BLOK CONTROL 2,   contactor BF25(electric motor over 4kW).

Electronic elements feeding

Regulator ZP2RE6 is supplied from transformer with doubled secondary winding of 9V and 18V. 9V winding is dedicated for regulator feeding, 18V winding is used for output control voltage. 18V output voltage can be also used for feeding heating resistor, through fuse F2, 1A T. Primary winding is secured by fuse F1, 100 mA T.

Electrical connection

Electrical connection of Control Block 1,2 is provided by cable bushings to connection block. Control Block 1,2 can be an integral component of the actuator or it can be connected externally, while maintaining the maximum length of connection wires of 100m.

6 REGULATOR ZP2RE6

Function:

The regulator controls the actuator output shaft position and thus also the controlled valve, depending on the analogue control signal value. The regulator's fundamental component is a microcontroller, programmed to regulate the actuator, to handle error statuses and to easily set regulation parameters.

Inside the regulator circuits, the output signal value is compared with feedback signal value coming from the actuator output shaft position transmitter. If a regulation deviation is identified, the regulator uses KO or KZ signals to activate the corresponding electric motor switch, until the output shaft is aligned to a position corresponding to the control signal value.

The required regulator functions can be programmed as follows:

using functional buttons and LEDs on the regulator,
using a service PC through RS 232 interface

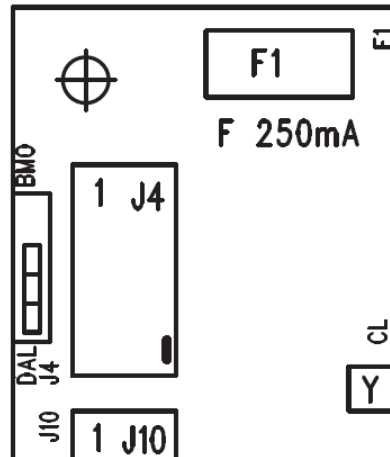Using a PC you can also monitor all operational statuses of the regulator.

DPS REGULATOR DESCRIPTION
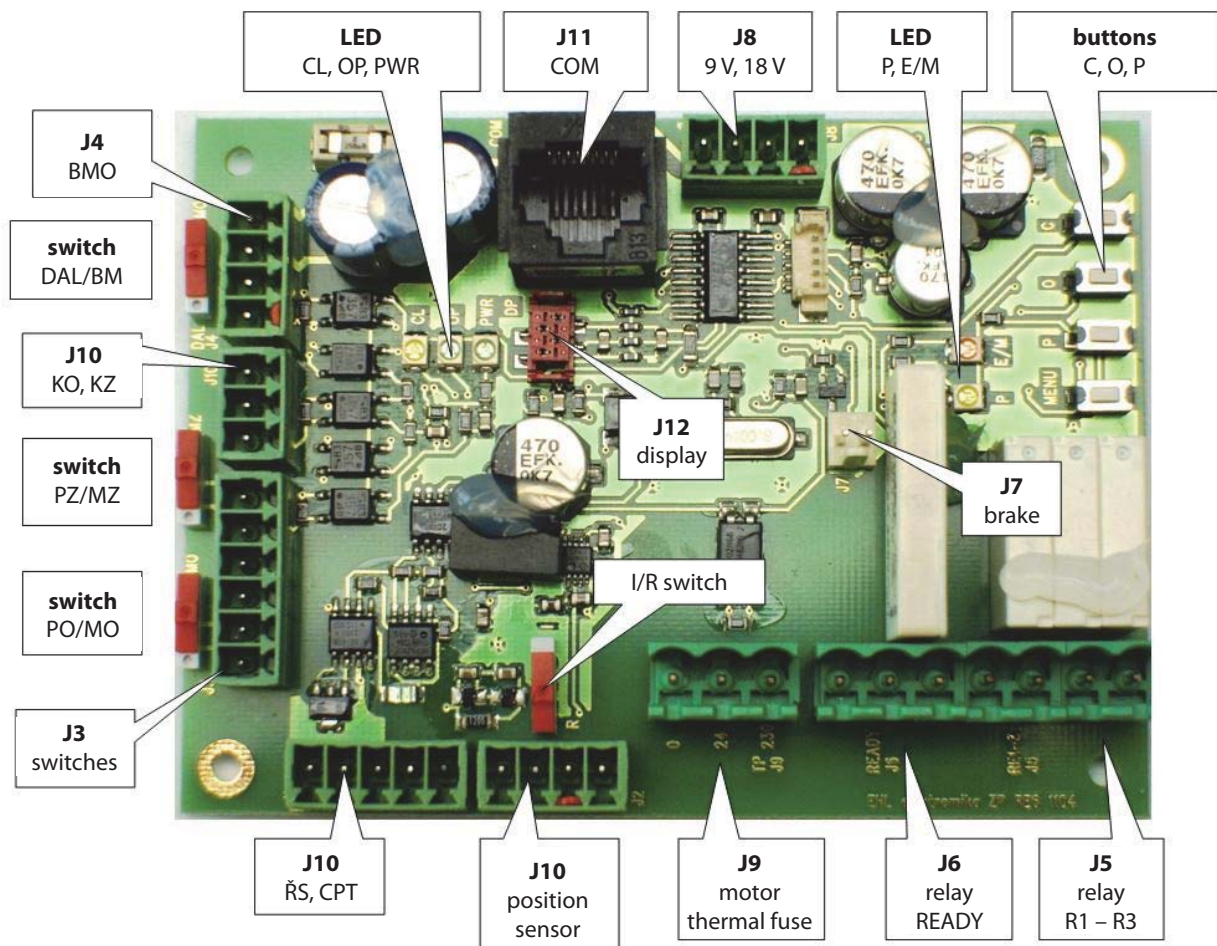
6.1 CONFIGURATION SWITCH

1 Constant remote control

Using J4 connector switch, you can set constant remote control mode, or local control block control.

2 Torque/position tripping

Using connector J3 switches, you can adjust tripping method in end positions from **MO, MZ** or **PO, PZ** torques. Tripping from **MO**, **MZ** is always active. To secure correct function, it is necessary to set **End Position** parameter in regulator menu.
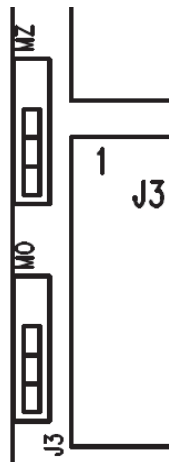
       End tripping PZ (see End Position parameter)

PZ   - PZ or MZ tripping

       - MZ tripping

       End tripping PO (see End Position parameter)

PO   - PO or MO tripping

       - MO tripping

3 Position sensor type

Use J2 connector switch to set the type of installed position switch in the course of actuator configuration process. Switch in **R** position stands for resistance transmitter, position **I** means current transmitter. To ensure correct display of value from sensor, you must adjust the **Position Switch** parameter.
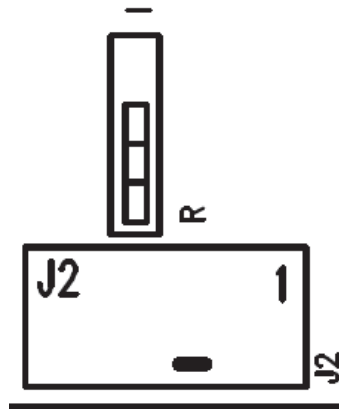
Position sensor (see Position Sensor parameter)

R   - resistance sensor

I   - current sensor

SETTING BUTTONS

Entering and scrolling the menu

P   - scrolling through and confirming parameters

O, C   - position setting

LED INDICATORS

Operation LED

CL	- motor closing	(yellow)
OP	- motor opening	(green)
PWR	- power supply on	(green)

Setting / error LED

E/M	- error indication (ERROR)/ MENU	(red)
P	- parameter indication	(yellow)

6.2 *CONNECTOR SIGNALS*

J1 **Control signal 4-20mA, position 4-20mA**

J1.1	(-IN)	- control signal-
J1.2	(+IN)	- control signal+
J1.3	(COM)	- output position active 4-20mA
J1.4	(-L)	- output position common
J1.5	(+L)	- output position passive 4-20mA

J2 **Input of resistance or current position sensor**

J2.1	(+15V)	-	DCPT	-
J2.2	(+ 5V)	- R sensor	-	-
J2.3	(IN)	- R sensor	DCPT	CPT
J2.4	(GND)	- R sensor	DCPT	CPT

J3 **Micro switches connection**

J3.1	(LO)	- open position PO (output)
J3.2	(PO)	- common PO-MO
J3.3	(MO)	- torque open MO
J3.4	(LZ)	- closed position PZ (output)
J3.5	(PZ)	- common PZ-MZ
J3.6	(MZ)	- torque open MO

J4 **Local control block**

J4.1	(LO)	- open locally
J4.2	(LZ)	- close locally
J4.3	(FERN)	- phase for remote (regulator function)
J4.4	(+24V)	- control phase

J5 **Software adjustable signalling relays:**

J5.1	(R1)	- output relay1 (e.g. remote control)
J5.2	(R2)	- output relay 2 (e.g. closed position)
J5.3	(R3)	- output relay 3 (e.g. open position)
J5.4	(COMM2)	- 1, 2, 3 relay contact interconnected

J6 **Ready relay**

J6.1	(NO)	- closing contact
J6.2	(COMM1)	- common contact
J6.3	(NC)	- opening contact

J7 **Brake control**

J7.1	(BR+)
J7.2	(BR-)

J8 **Feeding**

J8.1	(9V)
J8.2	(9V)
J8.3	(18V)
J8.4	(18V)

REGULATION PROCESS

- By changing the control signal (required position), a difference between the actual and the required value will arise (control deviation). If such deviation exceeds value pre-set by Insensitivity parameter, a regulation intervention is triggered.

100% open

inertia rundown

inner insensitivity

inertia

insensitivity

motor off

required position

actual position

motor start up

inner insensitivity range = 2x Inner Insensitivity parameter
insensitivity range = 2 x Insensitivity parameter
inertia range = 2 x Inertia parameter

position

actual actuator position starts to change

insensitivity

0% closed

time

- Regulator will set the actuator to the required position, reduced by Inertia parameter, and switch electric motor off.
- After a timeout determined by Inertia Rundown parameter, regulator will evaluate position. If a narrow range close (determined by Inner Insensitivity) to the required position is achieved, regulation intervention is terminated.
- If the actual value is outside the Inner Insensitivity range, stepping mode with short motor switching phases (Step parameter) will be activated. Once the Inner Insensitivity range is achieved by such short steps, regulation intervention is terminated.

Note: Regulator will evaluate inner insensitivity → this will terminate the regulation process.

REGULATION IN END POSITIONS

To ensure tight closure or full opening of valves, regulation mode changes when close to the end positions (adjustable from 0 to 5 percent by Tolerance O and C parameter).

O and Z tolerance
0..5%

O and Z tolerance
0..5%

0%
closed

5%

95%

100%
open

- If End Position parameter is set to switch off "at position", actuator will be switched off exactly in 0 percent or 100 percent of position determined by sensor.
- If End Position parameter is set to switch off "at torque", actuator will be switched off by limit switches.

7 DISPLAY

The display consists of four seven-segment display LED units with decimal points and two-coloured LED indicator. It displays Reset, Position, Torques and Errors. It further displays situation during Calibration and O and C Position Setting.

Displayed statuses

Status	Display	LED	Status	Display	LED
power supply activation, Reset	r E S	-	Error, alternates with position display	E 1 2 3 4	-
PC setting	S E t	-	End pos. C setting start	C	-
Position	3 4	-	End pos. O setting start	O	-
Torque O	⁻ 5 6	-	Opening	3 4	**green**
Torque C	_ 5 6	-	Closing	3 4	**red**
Calibration start	C.A.L. .	-	End pos. setting start	P	-
Calibration successful	C E n d	-	Setting successful	PE n d	-
Calibration failed	C E 3 4	-	Setting failed	PE 4 4	-

8 CONTROL BLOCK CONNECTION

Control Block regulator has an integrated rotation direction control function. E.g. if phases are swapped, this function will identify wrong rotation direction and stop the actuator. *Default (factory) regulator setting is in non-calibrated condition.* **In such case, it does not allow automatic end position reading.** This would cause the valve to be loaded with the maximum torque that the electric motor is able to provide. This load would last until over-current relay disconnect the motor. The active torque is higher than the set-up rated torque and could damage the valve or the actuator.

Note: After connecting actuator to voltage supply, you must pay attention to make sure that the actuator is not uncontrollably running to either end positions and that the relevant limit switches switch correctly.

The wiring of CONTROL Block corresponds to the wiring diagram at the end of this document - choose wiring diagram corresponding to your version. Power supply must be connected as the last wires, only after connecting all other conductors!

⚠️ **DO NOT CONNECT CONTROL SIGNAL 0/4 – 20mA
UNTIL YOU HAVE CHECKED THE DIRECTION OF ROTATION!!!** ⚠️

9 ADJUSTING ACTUATOR WITH VALVE

- Adjust end position micro switches and position transmitter according to Installation Manual of the relevant actuator
- Set end position switches according to the valve's motion range
- Set range of position transmitter. This can slightly exceed the end position switch range
- Depending on the required tripping method, set End Position parameter.
- Carry out calibration
- Carry out End Positions C and O Setting, or End Position C Setting and End Position O Setting.

When setting these parameters using buttons, you can set the actuator to the required position by means of hand wheel or by local control.

When setting them using EHL Explorer application, you can also set the actuator from Display – Motor menu. When setting them outside the currently set range, the actuator will stop at the range limit and will continue to run only after new command. If End Position parameter is set to "at torque", only the limit switches represent a limitation. If End Position parameter is set to "at position", limit switches and 0 percent or 100 percent position transmitters represent limitations.

10 REGULATOR SETTINGS

To set regulator, you can use setting by buttons, or by PC (more comfortable). When setting using buttons, LED indicators on the regulator board serve for indication purposes. In case of attached display, information is also displayed using seven-segment display unit and two-colour LED. For setting using PC (EHL Explorer application), you must also have connecting cable to connect PC with regulator.

Regulator calibration

Regulator calibration is a process, during which the control unit measures the actuator's inertia. The inertia value is then stored as two parameters: Inertia and Inertia Rundown. Regulator calibration can be triggered by pushing P button or from EHL Explorer.
Non-executed regulator calibration is signalized as a warning - see Chapter 15. List of Errors and Warnings.
Non-executed regulator calibration may result in unstable regulation, while the actuator:
Runs over the required position – Inertia parameter is lower than actual inertia; Stops far before the required position and steps for a long time - Inertia parameter is higher than actual inertia;
If an actuator with completed calibration also shows the above-stated unstable regulation, this probably means that inertia has changed so much (e.g. piping without medium and with medium) that a new regulator calibration must take place.

Inertia Rundown parameter serves for two purposes:

For regulation intervention - see Chapter Description of regulation intervention;
For a pause when reversing actuator's motion - this pause ensures that the electric motor stops before the opposite rotation direction is activated.

END POSITIONS C AND O SETTING

- To accelerate Position C and Position O parameter setting you can use a function that will automatically adjust these parameters according to position and torque switches.
- To activate this function, push buttons C and O, see 11.1.8. Setting C and O end positions or by EHL Explorer in PARAMETERS window.
- Activation is possible only provided that regulator calibration has taken place.
- Position O parameter will be set to a position smaller by Inertia From Position parameter, which corresponds to the position of position or torque switch O.
- Position O parameter will be set to a position greater by Inertia From Position parameter, which corresponds to the position of position or torque switch C.

LOCAL CONTROL IN MENU

- If the actuator is equipped with a local control block, you can use the local control for position changes when setting end positions for instance.
- When switching to local control, menu transcription will alternate with position indication on the display.

ROTATION CHECK

- After every motor start-up, a constant check is carried out after a time interval determined by Check Time parameter to make sure that the actuator (position switch) is rotating.
- If actuator (position switches) stop for instance as result of torque tightening, time determined by Check Time is counted again, before a rotation error is reported.

ROTATION DIRECTION CHECK

- After every motor start-up, a constant check is carried out after a time interval determined by Direction Check Time parameter to determine actuator (position switch) rotation direction.
- If for a certain constant time, rotation direction identical with motor direction is identified, correct rotation direction is confirmed and no further check is carried out.
- A new rotation direction check takes place after regulator power off and on again, or after parameter setting.

11 MENU

⚠️

- ▪ Menu enables parameters to be set using setting buttons.
- ▪ Menu will disable normal actuator operation.
- ▪ If no button is pushed and no communication is sent by serial connection for 4 minutes, menu will be automatically terminated and system will switch back to normal operation.

Menu	Title	Button	Flashing P	Parameter value
	Position C	C		set current position as end position C
	Position O	O		set current position as end position O
	Regulator calibration	P		regulator calibration start
	Position C and O	C+O		automatic setting of position O and C according to torque and position switches
1	End position	P	1	C=torque O=torque
			2	C=torque O=position
			3	C=position O=torque
			4	C=position O=position
2	Relay Ready	P	1	errors
			2	warnings or errors
			3	errors or no remote
			4	warning or errors or no remote
3	Relay 1	C or O		set current position as Position Relay 1 parameter
		P	1	Inactive
			2	Position O
			3	Position C
			4	Torque O
			5	Torque C
			6	Torque O or Torque C
			7	Torque O or Position O
			8	Toque C or Position C
			9	Opening
			10	Closing
			11	Motion
			12	Motion – flash lamp
			13	To position
			14	From position
			15	Warning
			16	Control - remote
			17	Control - local
4	Relay 2	C or O		set current position as Position Relay 2 parameter
		P	1..18	same as Relay 1
5	Relay 3	C or O		set current position as Position Relay 3 parameter
		P	1..18	same as Relay 1
6	CPT	P	1	4 – 20 mA
			2	20 – 4 mA
7	Analogue control signal	P	1	4 – 20 mA
			2	20 – 4 mA
			3	0 – 20 mA
			4	20 – 0 mA
8	Insensitivity	P		1 to 10 percent (in 1 percent increments)
9	Fault	C or O		set current position as Safe Position parameter

		P	1	Position O
			2	Position C
			3	Stop
			4	Safe position

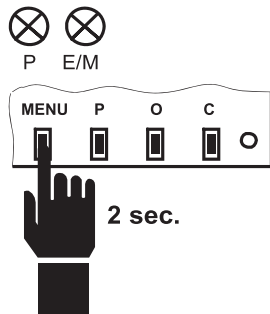## *11.1 SETTING REGULATOR USING BUTTONS*

For an error-free regulator function, limit switches must be adjusted first, and position sensor must be set up. You can set parameters and activate switch Calibration and End Position Setting as described below.
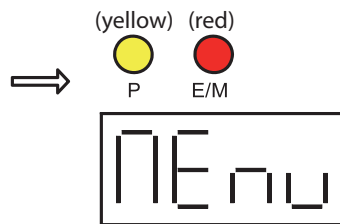
APPLIED SYMBOLS FOR LED INDICATIONS

② —— flashes (double flash) (yellow)

⬤ —— constant light (yellow)

⊗ —— light off

11.1.1 MENU – entering menu

| Push and hold button MENU | MENU text will appear, LED P and E/M are lit | Release button |
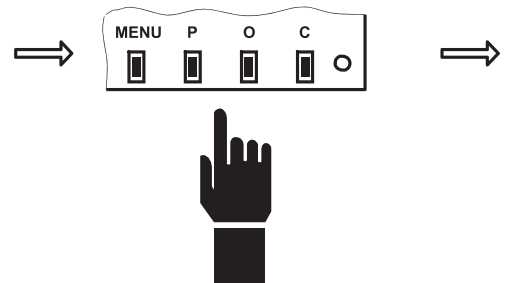
Text 1M will appear,
LED P flashes, LED E/M flashes 1x

16

11.1.2 MENU – menu and parameter selection

| Push MENU button shortly, repeatedly	LED E/M will increase the number of flashes, or texts with other numbers will appear	LED P (by number of flashes) and text indicate parameter value
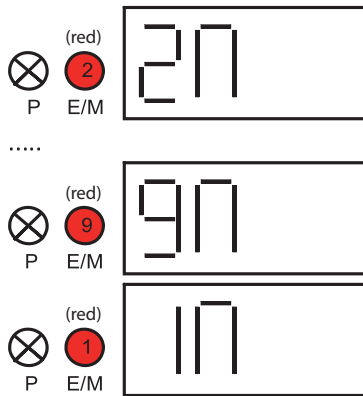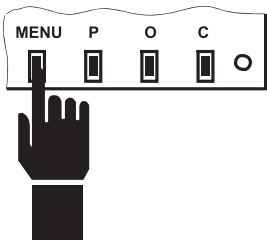
11.1.3 MENU – parameter change and setting

Push P button
shortly, repeatedly
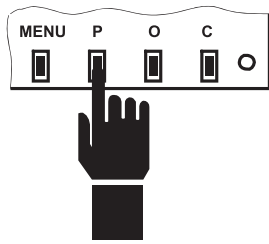
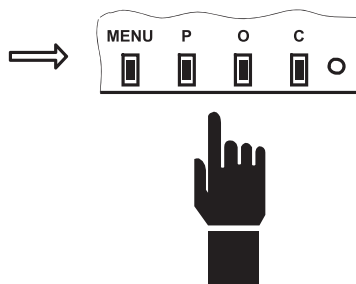LED E/M flashes to indicate menu number, and LED P indicates parameter value, or a text with parameter value appears
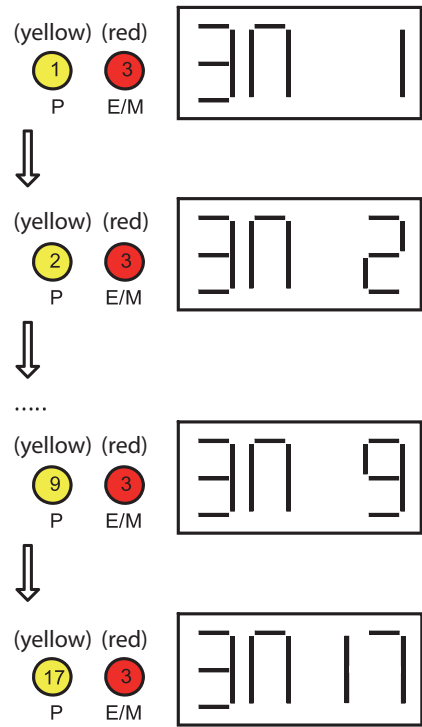
Set the selected parameter value by pressing and holding P button

(yellow) (red)

①
P

③
E/M

J∩ 1

(yellow) (red)

②
P

③
E/M

J∩ 2

.....

(yellow) (red)

⑨
P

③
E/M

J∩ 9

(yellow) (red)

⑰
P

③
E/M

J∩ 17

2 sec.
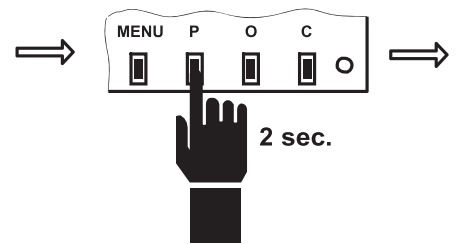
Push and hold button until LED P lights up or until decimal points appear
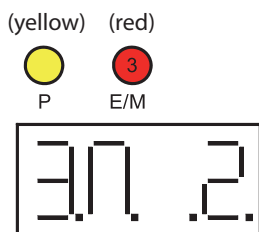
Release button

LED E/M flashes to indicate menu number, and LED P indicates parameter value, or a text with parameter value appears

(yellow) (red)

◯
P

③
E/M

**J.∩. .2.**

(yellow)   (red)

②
P

③
E/M

J∩ 2
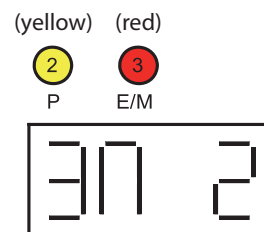
11.1.4 MENU – parameter or function temporarily unavailable

If two dash signs are in menu on display, the parameter or function has no relevance for the current system configuration, or is currently unavailable.

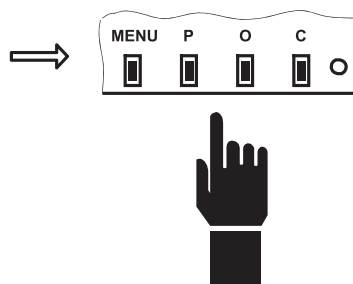## MENU - termination

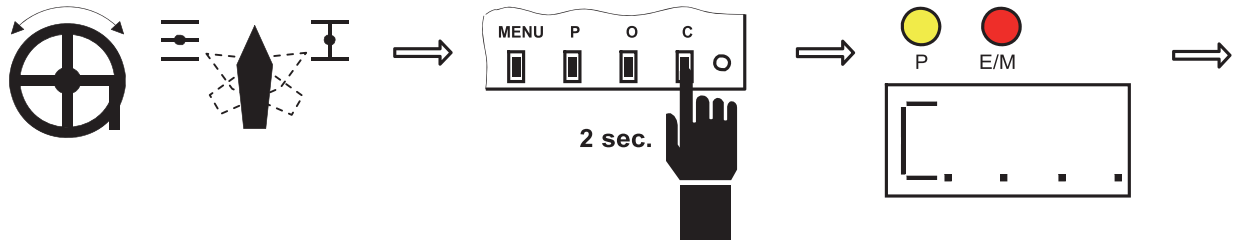| Push and hold MENU button	Hold button until LED P and E/M lights up or until the following text appears	Release button
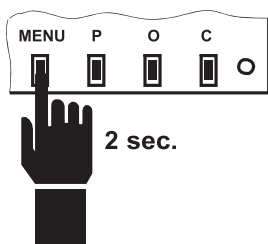
11.1.5 End position C setting

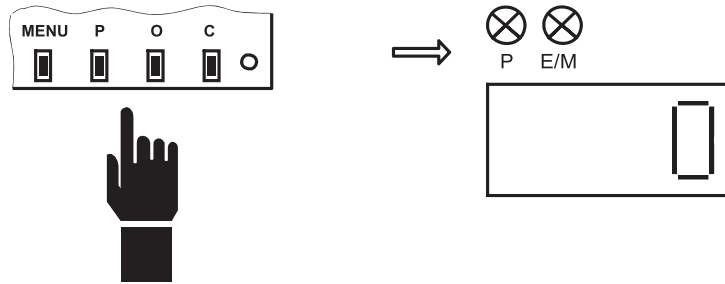| Set new position manually or by local control	Push and hold C button to input setting	Hold button until LED P and E/M lights up or until the following text appears

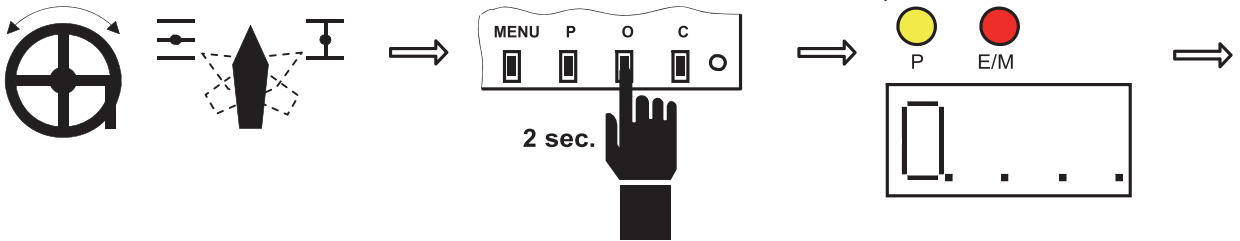| Release button	Position C set-up

11.1.6 End position O setting

Set new position manually or
by local control

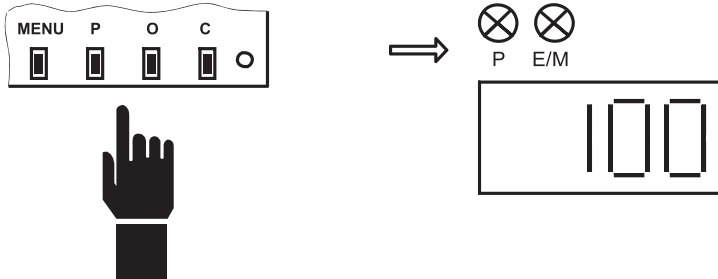Push and hold O button
to input setting

Hold button until LED P
and E/M lights up or
until the following text
appears

2 sec.

(yellow)   (red)

P   E/M

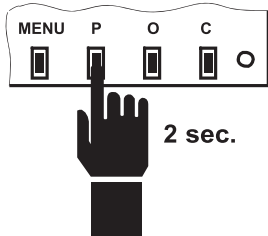Release button

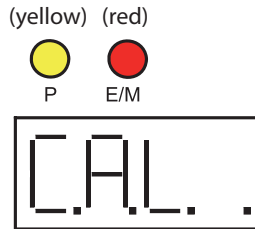Position O set-up

P   E/M

11.1.7 Regulator calibration

⚠ ■ During regulation calibration, the actuator will rotate in both direction.
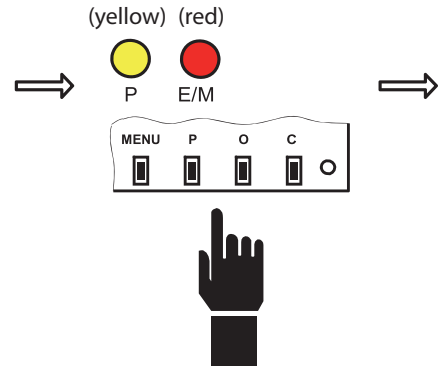
■ Ensure conditions for free actuator motion.

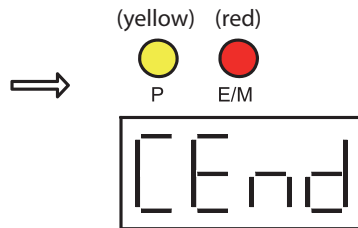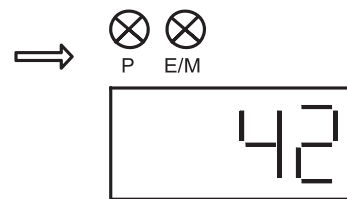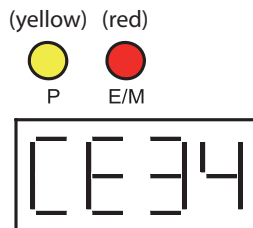| Press and hold P button	Hold button until LED P and E/M lights up or until the following text appears	Release button

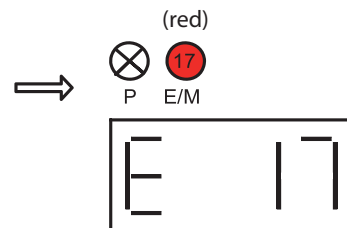| Actuator travels. Wait!	Calibration successful, indication for 2.5 seconds	Position and error indication

Calibration failed, indication for 2.5 seconds

CE (calibr. error) 34=error code	E17 =calibration error

For explanation of various errors see chapter 15. List of Errors and Warnings.

11.1.8 End positions C and O setting

⚠️
- While setting C and O positions, the actuator will rotate in both directions.
- Ensure conditions for free actuator motion.
- Setting can be carried out only if regulator calibration has taken place.

Press and hold O and C buttons	Hold button until LED P and E/M lights up or until the following text appears	Release button
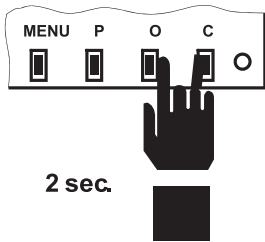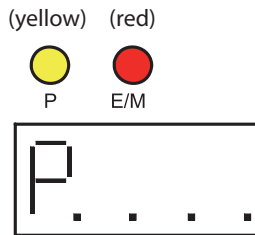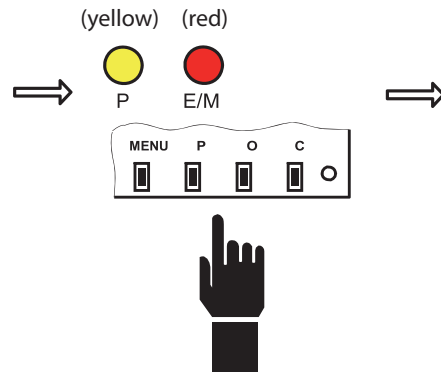
Actuator travels. Wait!	Setting successful, indication for 2.5 seconds	Position and error indication
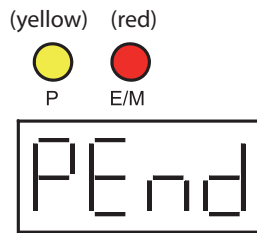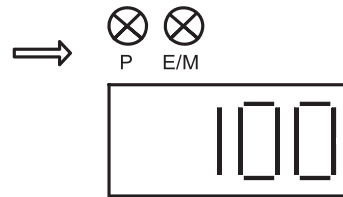
Setting failed, indication for 2.5 seconds

(yellow)   (red)
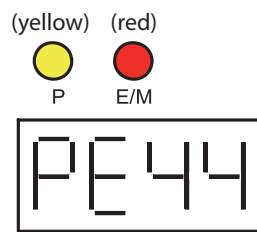
PE (position error)
44=error code
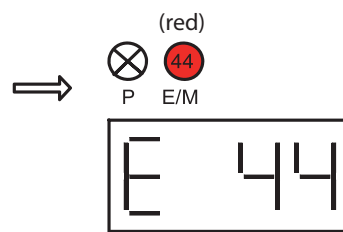
E44 = error code

For explanation of various errors see chapter 15. List of Errors and Warnings.

- **Deviations are described in the following chapters.**

11.2 Relay position

It is only possible to set *Relay Position 1..3* if *Relay 1..3* parameter = *To position* or *From position.*

Set new position manually or by local control

Set new position by pressing and holding C or O

Record is confirmed if LED P lights up or if decimal points appear

(yellow) (red)

P   E/M

2 sec.

Release button

Value will appear on display

(yellow) (red)

14   3

P   E/M
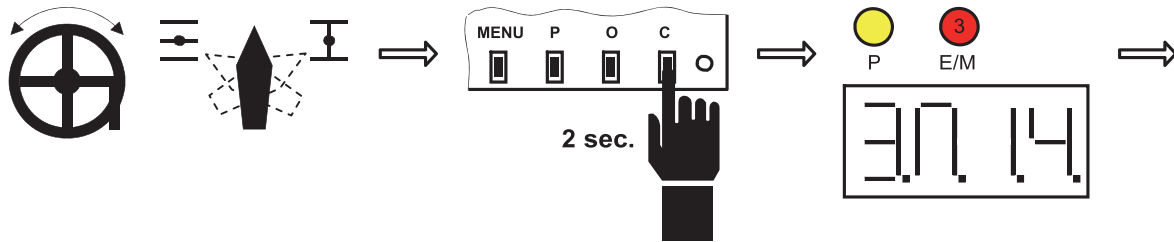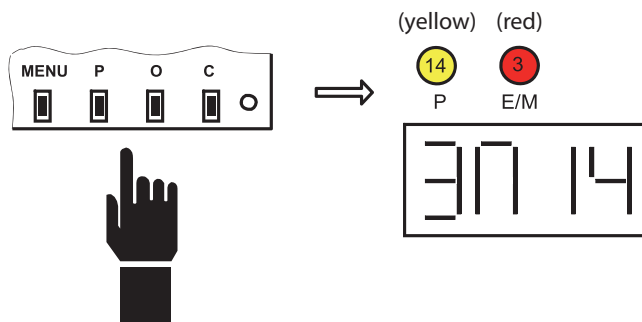
11.2.1 MENU 9 – Safe position

Safe position setting is only possible if Reaction to error parameter = *Safe position*.

Set new position manually or by local control	Set new position by pressing and holding C or O	Record is confirmed if LED P lights up or if decimal points appear
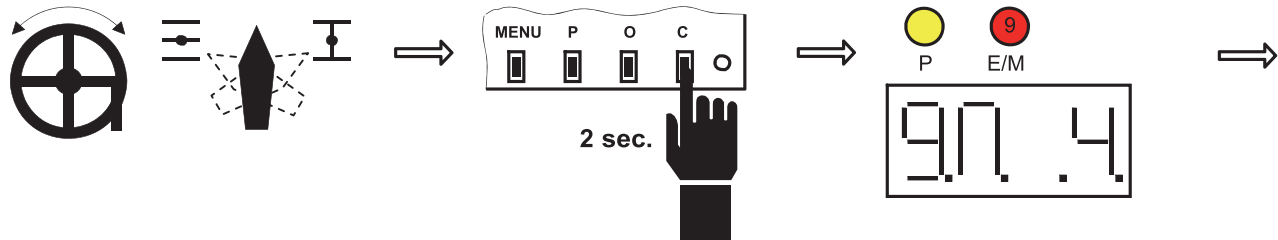
Release button	Value will appear on display *Reaction to fault*
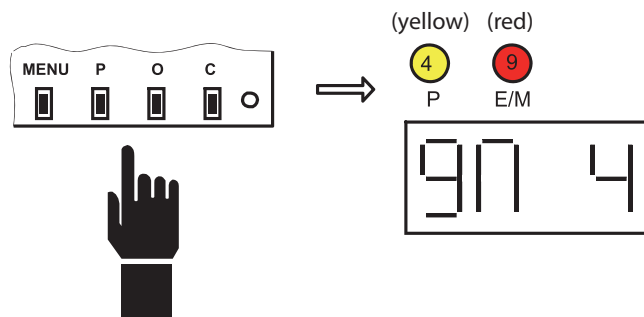
12 EHL EXPLORER APPLICATION

- tool for complete regulator setting
- real time display of regulator status
- import and export of regulator parameters
- offline mode for viewing and editing the saved regulator status
- configurable display of various display
- possible saving of desktop setting

The application requires following configuration to run:

OS: Windows XP, Vista, 7

HDD: min 20 MB

RAM: min 512MB

Note: For OS Vista and Windows 7, do not install application into Program Files folder.

The application also needs RE6 regulator database. Application and database can be downloaded from www.zpa-pecky.cz.

Application start—establishing communication

If PC is connected to regulator, the application will try to establish communication. In case of communication failure, the application will offer scanning other COM ports. Once communication has been established successfully, the application will verify product type and will search for database type, which it will use for generating various windows with parameters. If no database exists in the PC, user will be asked to download it from ZPA website or contact sales department. If all is OK, the application will start to communicate with regulator and to display information to the various windows.

1 Main application window

You can use the application for setting usual functions for working with parameter file, set communication properties and display windows with information which may represent inputs, outputs, parameters, errors, or launch operations. Possible display appearance is attached on picture below.
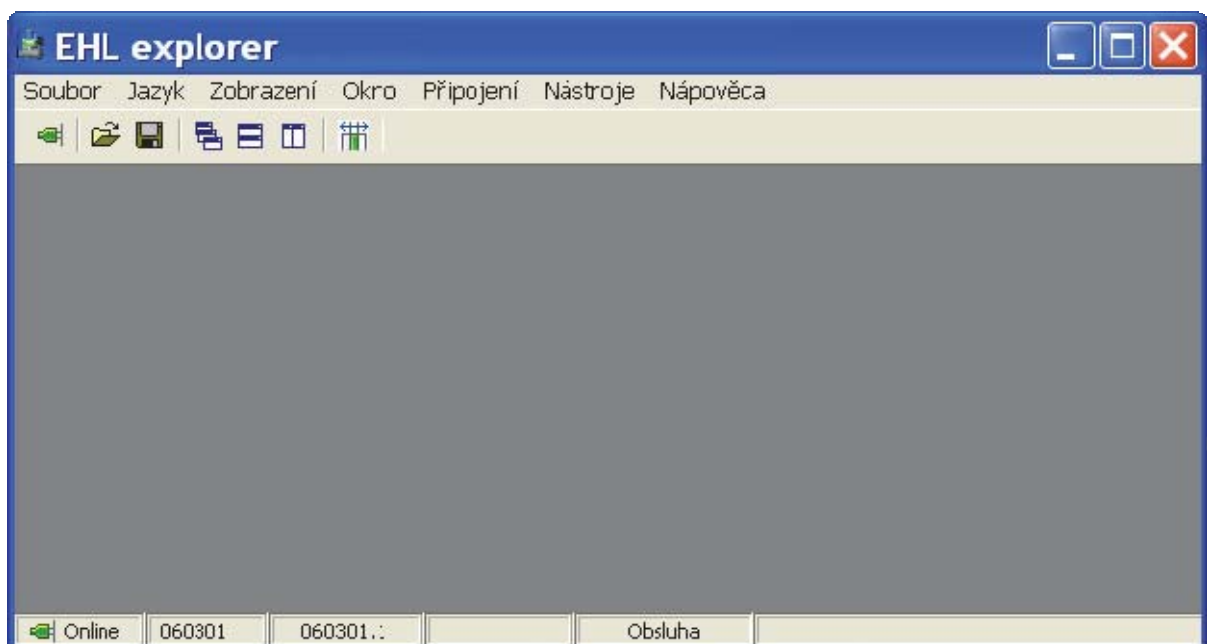
Status bar

Status bar in the bottom section of the main application window shows selected information. Icon on the left-hand side indicates if application is connected to the device or works offline. Beware! When reading parameters from file, the application will go offline. The second field shows device code – e.g. 020402. The third field shows database version – e.g. 020602.22. The following field shows key number when in use – e.g. 08301A91. The last displayed information shows user's rights level - e.g. Operator, Service, Manufacturer, EHL.

2 File menu

File – read parameters (offline)

This option allows saved data to be viewed without connection to device. Data is displayed including coloured indications. To be able to view data in offline mode, you must have downloaded the relevant system database. In this mode, you can edit and re-save or directly upload data into device. Data changed in offline mode is indicated with blue text. Data modification in offline mode is controlled by the same rules as in online mode. A demo file dms3.par with application testing parameters is distributed along with the installation in case user has no device available. File is located in application folder, e.g. C:\Program Files\EHL elektronika\EHL explorer\dms3.par.

File – upload parameters into device

This operation will set the stored data. Upload stored data – see File – Upload parameters (offline) section; then use command "Upload parameters to device" in main menu. Select one of the following two options: With limitation – imports basic part of parameters, or – in case of precedent sensor exchange – select the second option Sensor exchange, when other variables necessary for sensor set-up will be loaded too.

File – save parameters

This operation will save parameters from device to file. Data can be used for restoring device set up or for a device of the same type, or to analyze actuator faults. Therefore, DO NOT ADJUST data manually.

File – save parameters for tester

Modify data read from system; this data is intended for EHL Tester application.

File – database import

This operation serves for connection from offline mode.

3 Language menu

Choose one of the available languages. Communication with device will be restarted.

4 Display menu

Windows for the selected device are available in this menu.

EHL explorer

Soubor Jazyk Zobrazení Okno Připojení Nástroje Nápověda

Konfigurace

Název	Hodnota	Jednotka
= SNÍMAČ POLOHY =		
Snímač polohy	Odporový	
= KONFIGURACE =		
Aktivní tepelná pojistka	Vysoká úroveň	
Krok	0,05 s	
Čas kontroly otáčení	4 s	
Čas kontroly směru otáčení	0,5 s	
Relé životnost	1000000	
== KALIBRACE ==		
Řídící signál 20 mA	874	
Analogový řídicí signál	0 mA	
Řídicí signál	1	
CPT 4 mA	147	
CPT 20 mA	885	
CPT	147	

Motor

Název	Hodnota	Jednotka
Poloha	0 %	
Motor Zavírat	Zavírat	
Motor Zastavit	Zastavit	
Motor Otevírat	Otevírat	
Nastavovací režim	Ukončí	

Parametry

Název	Hodnota	Jednotka
Poloha Z	120	
Poloha Z	Nastav	
Poloha O	672	
Poloha O	Nastav	
Poloha O a z		
Poloha O a z	Nastav	
Tolerance O a z	1 %	
Kalibrace regulátoru		
Kalibrace regulátoru	Provedena	

Chyby a varování

Název	Hodnota	Jednotka
Analogový řídicí signál	1	
Moment	0	
Kalibrace regulátoru	0	
Zdvih	0	
Otáčení	0	
Směr otáčení	0	
RAM	0	
ROM	0	
EEPROM	0	

Provozní údaje

Název	Hodnota	Jednotka
= OVLÁDÁNÍ =		
Ovládání	Dálkové	
Poloha	0,54 V	
Poloha	0 mA	
Poloha absolutní	106	
Poloha	0 %	
= ŘÍDÍCÍ SIGNÁL		
Řídící signál	0 %	
Analogový řídicí sign	0 mA	

Online 060301 060301.1 Obsluha

5 Window menu

This menu allows window layout to be set to pre-set configurations.

6 Connection menu

Connection - connect

This command will attempt to establish communication with device. This choice can be selected quickly using icon.

Connection – set-up

This command will open selection of available COM ports. See fig.

7 Tools menu

Tools – font; request confirmation

Several font sizes can be chosen from in Font menu. To update font sizes in windows, you must close and re-open the windows or restart the application.

Values editing

Inserting values to components is done in the same way as in other applications for Windows.

Saving record changes

Changes are saved only after pressing "**ENTER**" button.

Note: If "request confirmation" is activated, this confirmation will be required after pushing the button.

Cancelling changes

Changes can be cancelled by pushing "ESC" button or by clicking in another part of the form.

Operation - buttons

A pre-set operation is performed upon pushing button.

Note: If "request confirmation" is activated, this confirmation will be required after pushing the button.

12.1 SETTING USING EHL EXPLORER

Actuator manual (for mechanical setting) is necessary to carry out setting.

1   Start EHL Explorer > Connect.

2   When turning the setting wheel towards closed position (looking at actuator from the top, the shaft rotates clockwise (1 – 2 – 3), value on resistance transmitter will decrease.

3   It is important to check in program that position indicator sinks (Display > Operation data > Position).

4   Display > MOTOR (motor control).
     Run Closed > actuator shaft rotates clockwise – otherwise, you must swap electric motor phases.

Note: The whole setting process takes place starting from central motor position, so that potential wrong rotation direction does not damage actuator or valve.

5   Use program to turn motor, or manually set valve to

(CLOSED – OPEN) position; align PZ and PO micro switches according to Actuator Manual.

6   Resistance transmitter setting (mechanical)

Transmitter works in the range from 0° to 340° - this range should not be fully utilized. E.g. CLOSED – value close to zero; OPEN - value close to 340°. According to valve stroke, set gear ratio on signalling unit (pursuant to actuator manual).

SETTING ON PC

7   Display > Parameters

        Position > Closed > Set

        Position > Open > Set

        Calibration > Execute

8   Set tripping (by position, by torque, or by combination)

        Parameters > End position

        Display > Motor > Setting mode > Terminate

9   Control signal setting (of current supply 0/4 to 20mA)

Note: After connecting current supply as per wiring diagram at the end of the present document
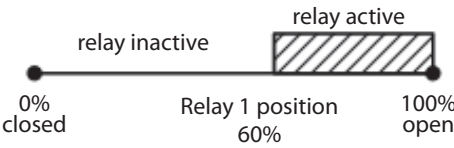
After connecting, you can test correct function by letting the actuator travel in its full range (4 to 20 mA). Potentially, you can also test (measure) feedback signal.

With this step, you have concluded the basic settings. All other settings are equal to possible settings using buttons.

13 LIST OF PARAMETERS

Parameter title	Menu	Min… Max[1]	Temporarily unavailable	Value[1]	Description
Position O	O	6..1023		Position sensor absolute value	End position Open
Position C	C	6..1023			End position Closed
Tolerance O and C		0.0..5.0		%	Tolerance for end positions recognition. Example: At 1%, the control signal value of 0..1% is considered a regulation requirement up to end position O, and the value of 99..100% is considered a regulation requirement up to end position C.
Regulator calibration	P	-		Completed	Regulator calibration successful
				Not completed	Regulator calibration must be carried out
Inertia	P	0..254		Position sensor absolute value	Inertia rundown position Parameter has been measured and registered during regulator calibration
Inertia rundown	P	0,10..5,00		s	Inertia rundown time Parameter has been measured and registered during regulator calibration
Analogue control signal	7	-		4..20mA	Working range of analogue control signal
				20..4mA	
				0..20mA	
				20..0mA	
CPT	6	-		4..20mA	Working range of output current transmitter
				20..4mA	
Insensitivity	8	1..10		%	Parameter determines insensitivity range of 3P regulator.
Inner insensitivity		0.5..3,0		%	Parameter determines inner insensitivity range of 3P regulator.
End position	1			C= torque, O= torque	In end position C, tripping by current C, In end position O, tripping by current O.
				C=torque, O=position	In end position C, tripping by current C, In end position O, tripping by position 100%.
				C= position, O= torque	In end position C, tripping by position 0%, In end position O, tripping by current O.
				C= position, O= position	In end position C, tripping by position 0%, In end position O, tripping by position 100%.
Reaction to fault	9	-		Position O	In case of analogue control signal failure, actuator opens up to end position O.
				Position C	In case of analogue control signal failure, actuator opens up to end position C
				Stop	In case of analogue control signal failure, actuator will stop.
				Safe position	In case of analogue control signal failure, actuator will travel into position defined by *Safe position* parameter.
Safe position	9	0,00..100.00	yes	%	Position, the actuator will travel into in case of analogue control signal failure, and parameter setting *Reaction to fault=Safe position*
End position	1			C= torque O= torque	With control signal 0 or 100%, actuator will always travel up to a position where it is interrupted by micro switch

Parameter title	Menu	Min...Max[1]	Temporarily unavailable	Value1	Description
				C= torque O= position	With control signal 0%, actuator will always travel up to a position where it will be stopped by micro switch; with control signal 100%, actuator will travel up to 100% position and switch off on position
				C=position O= torque	With control signal 100%, actuator will always travel up to a position where it will be stopped by micro switch; with control signal 0%, actuator will travel up to 0% position and switch off on position
				C=position O= position	With control signal 0 or 100%, actuator will travel to position 0 or 100% and switch off on position
Relay READY	2	-		Errors	Relay is inactive in case of error
				Warnings or errors	Relay is inactive in case of warning or error
				Errors or no remote	Relay is inactive in case of error or other than remote control
				Warning or errors or no remote	Relay is inactive in case of error or warning or other than remote control
Relay 1	3	-		Inactive	Relay is constantly inactive
				Position O	Relay is active in open 100% position.
				Position C	Relay is active in closed 0% position
				Torque O	Relay is active with open torque
				Torque C	Relay is active with closed torque
				Torque O or torque C	Relay is active with open or closed torque
				Torque O or position O	Relay is active with open torque or open position 100%
				Torque C or position C	Relay is active with closed torque or closed 0% position.
				Opening	Relay is active when actuator moves in opening direction (position sensor direction)
				Closing	Relay is active when actuator moves in closing direction (position sensor direction)
				Motion	Relay is active with any actuator movement (position sensor motion)
				Motion – flash lamp	Relay is activated interruptedly (1s active, 1s inactive) with any actuator motion (position sensor motion)
				To position	Relay is active from position C (0%) up to *Relay 1 Position* parameter value (2..3 for other relays).

Parameter title	Menu	Min…Max[1]	Temporarily unavailable	Value1	Description
				From position	Relay is active from *Relay 1 position* parameter (2..3 for other relays) up to position O (100%).
				Warning	Relay is active in case of warning.
				Control - remote	Relay is active when switching to remote control
				Control - local	Relay is active when switching to local control
Relay position 1	3	0,00..100.00	yes	%	Position, according to which Relay 1 works at parameter setting: *Relay 1=To position* or *Relay 1=From position.*
Relay 2	4	-		Identical with *Relay 1* parameter	Same as *Relay 1* parameter
Relay position 2	4	0,00..100.00	yes	%	Same as *Relay 1 position* parameter
Relay 3	5	-		Identical with *Relay 1* parameter	Same as *Relay 1* parameter
Relay position 3	5	0,00..100.00	yes	%	Same as *Relay 1 position* parameter
Position sensor		-		Resistance	Position sensor type
				Current	
Active thermal fuse		-		Low level	Input is active without voltage.
				High level	Input is active upon voltage supply.
Step		0,05..1,00		s	Minimum motor running time.
Rotation check time		0,01..60.00		s	Time of rotation check from motor start up.
Rotation direction check time		0,01..0,90		s	Time of rotation direction check from motor start up.
Service life relay		0..10 000 000			Maximum permitted number of relays' (contactors') switching actions. Increase by 1,000; increments by hundreds, tens or units will not be saved.
Control signal 20 mA		800..1000		AD converter value	AD converter value for control signal 20 mA
CPT 4 mA		0..200		DA converter value	DA CPT converter value for current of 4 mA
CPT 20 mA		800..1020		DA converter value	DA CPT converter value for current of 20 mA
Position 20 mA		900..1020		AD converter value	AD converter value for 20 mA from current sensor
Position 5 V		900..1020		AD converter value	AD converter value for 5 V from resistance sensor
EEPROM		0..65535		-	Check sum EEPROM. Only for reading; recording takes place automatically in case of parameter chase.
Errors and warnings		-		Analogue control signal	Error message is activated by setting up the various parameters.

Parameter title	Menu	Min... Max[1]	Temporarily unavailable	Value[1]	Description
				Torque	
				Torque calibration	
				Stroke	
				Rotation	
				Rotation	
				RAM	
				ROM	
				EEPROM	
				Reset	
				Parameters	
				Setting mode	
				Relay	
				Thermal fuse	
				Position sensor	

[1]Values may change depending on control unit firmware version.

14 LIST OF ERRORS AND WARNINGS

No.	Title	Warning	Error	Cause	Solution
2	Analogue control signal	X		Analogue control signal < 3.5 mA	1. Correctly connect control signal to clamps +IN - IN 2. Use measuring instrument to check control signal. 3. Check Analogue Control Signal parameter; when using a control signal of 0-20mA or 20-0mA, parameter value must be=0-20mA or 20-0mA. 4. Recalibrate control signal input, *Control Signal 20mA* parameter.
4	Torque	X		Triggering torque outside end positions	1. Verify setting of end positions O and C. End positions must lie between torque values 2. Make sure no mechanical obstacle hinders the actuator's movement.
5	Position sensor		X	Position sensor fault	1. Check connection.
6	Thermal fuse		X	Activated thermal fuse	1. Wait until motor cools down. 2. Check connection. 3. Check setting of Active Thermal Fuse parameter.
7	Rotation direction		X	Opposite rotation direction	1. Check position sensor rotation direction. 2. Check motor for correct connection. 3. Check three-phase actuator on output terminal board for correct phase connection.
8	EEPROM		X	Incorrect EEPROM check sum	1. Check parameter values and upload any parameter without changing its value.

No.	Title	Warning	Error	Cause	Solution
9	RAM		X	RAM check sum error	1. Error will be removed automatically by repeated parameter reading. 2. Should error be indicated repeatedly, replace control unit.
10	Parameters		X	Parameters in EEPROM lie outside tolerance range	1. For parameter that indicates error (red), use EHL Explorer to upload the required value for permitted range.
11	Setting mode	X		System is in setting mode	1. Leave MENU. 2. Terminate setting mode in EHL Explorer, e.g. after CPT calibration. 3. Switch power supply off and on again.
17	Regulator calibration	X		Regulator calibration not executed	1. Start regulator calibration.
19	Stroke		X	Stroke adjusted incorrectly	1. Increase or decrease stroke (*Position O* and *Position C* parameters*)*, which lies outside the working range of the position sensor in use.
29	Relay	X		Relay service life exceeded	1. Replace relay (contactor) and reset counter *Number of motor switching actions O* and *Number of motor switching actions C.*
31	ROM		X	Incorrect ROM check sum	1. Switch power supply off and on again; if error recurs, replace control unit.
34	Inertia	-	-	Regulator calibration has measured inertia incorrectly	1. Re-start regulator calibration.
35	Inertia - Rundown	-	-	Regulator calibration has measured rundown incorrectly	1. Re-start regulator calibration.
44	Rotation		X	Actuator is not rotating	1. Check if motor is rotating. If not, remove the cause of this failure. 2. Check if the value of *Absolute Value* parameter changes. If, during rotation or closing, the value is not changing, check if position sensor shaft is rotating.
45	Reset	X		Processor has been reset in a non-standard manner	1. Error is recorded by fault counter and does not need to be deleted. If the same error is generated repeatedly, contact manufacturer.
58	End position	-	-	Regulator end position has been achieved during calibration	1. Re-start regulator calibration, further from end position if possible.

15 ERRORS AND WARNINGS

- ZP2RE6 constantly runs self-diagnosis and indicates a warning or error in case any problem is identified.

- Warning and error is signalled by means of LED, display and potentially also Ready Relay.

15.1 ERRORS

- Error will stop the actuator.

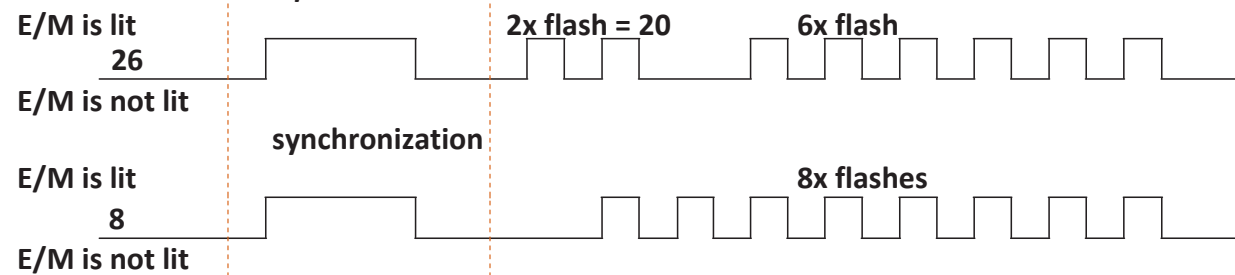- Error allocation or cancellation is set-up by **Error 1** to **4** parameters

Error indication

Errors are indicated by **E/M** LED as follows:

error indication is commenced by E/M LED lighting up for a longer time

following numbers of flashings indicate firstly tens and then single units of error codes (see Chapter 15 List of Errors and Warnings)

Error indication examples No. 26 and No. 8:

15.2 WARNING

- No impact on system activity.

- Warning allocation or cancellation is set-up by **Warning 1** to **4** parameters

15.3 MEMORY OF NUMBER OF TRIGGERED WARNINGS AND ERRORS

- For all identified warnings and errors, ZP2RE6 uses a counter of such warnings and errors in the course of system activity.

- Counter values are stored in EEPROM memory and are maintained even in case of power supply interruption.

- The content of counter memory can be read using PC program.

- Counter memory can be deleted using PC program with "SERVICE" authorization level.

## 15.4 MEMORY OF LATEST TRIGGERED WARNINGS AND ERRORS

- ZP2RE6 saves 3 last warnings and errors in EEPROM memory.

- Last warnings and errors can be displayed and deleted using PC program.

16 CHECKING PROCEDURE

1) Mechanical connection to valve and actuator stroke adjustment.

2) Electrical connection and setting.

3) OPEN - CLOSED torque setting, micro switch setting – tripping bypass in certain position. Motor start-up using BMO (manually). Resistance transmitter operates in open position from 3.5 to 5 V; in closed position, the voltage lies between 0V and 2V.

4) Control signal parameter setting: when setting position and changing by 2 percent, error will be triggered. For insensitivity setting, it is preferable to set it to 3 percent; it is not recommendable to set insensitivity to 1 percent. Hysteresis should be around 4 percent. Non-linearity should reach 2.5 percent.

5) Using SSR, the regulator can transmit system statuses.

17 WIRING DIAGRAMS

Connection of Control Block to actuator with resistance transmitter
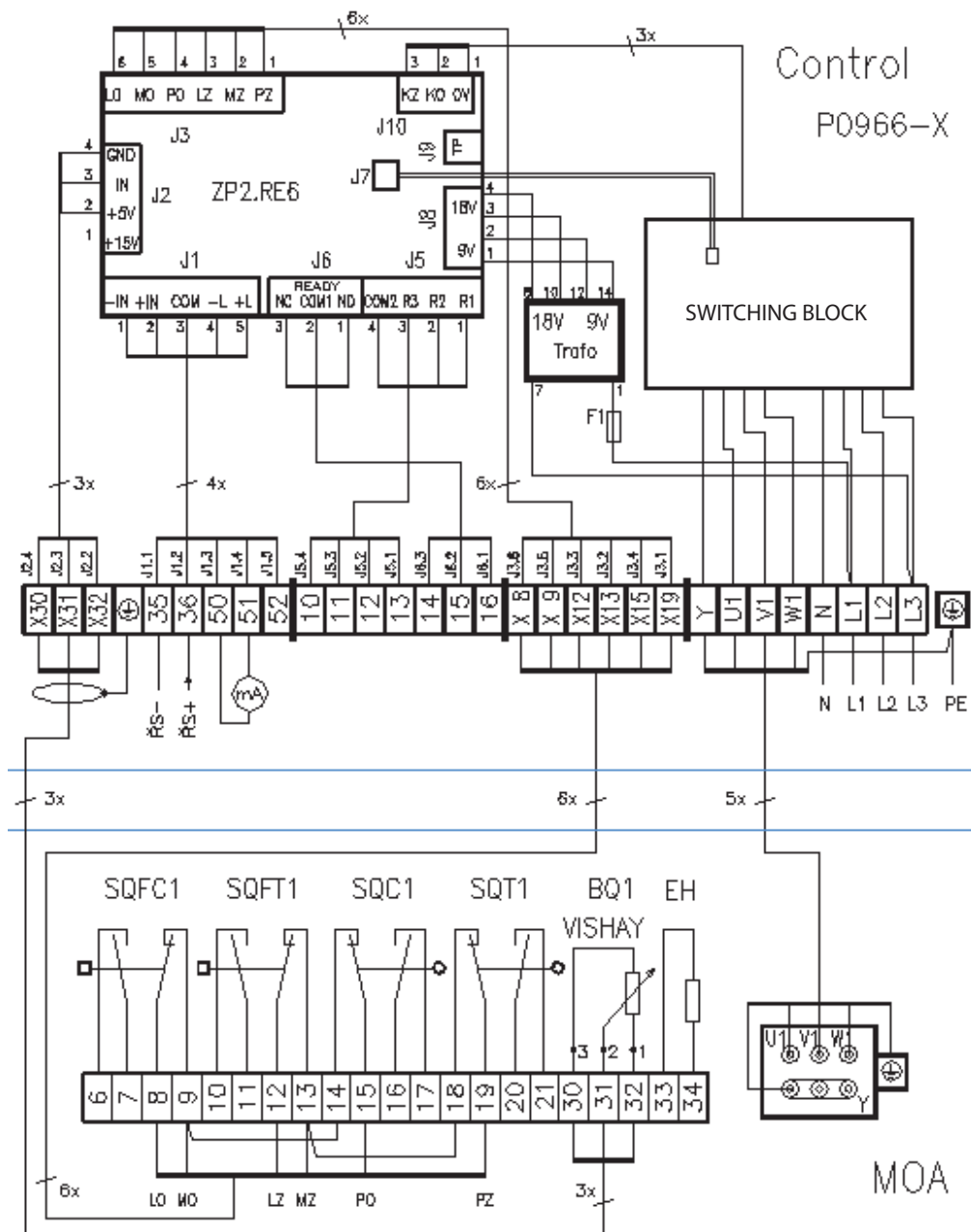
Note: Position sensors and torque sensors are connected in series. Resistance transmitter must be conducted through a screened cable. A minimum distance of 10 cm must be maintained between resistance transmitter conductor and power supply to avoid signal disruption and interference.

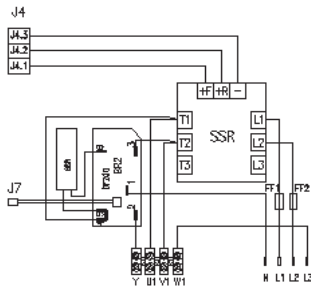## Connection of actuator with Control Block; resistance position sensor
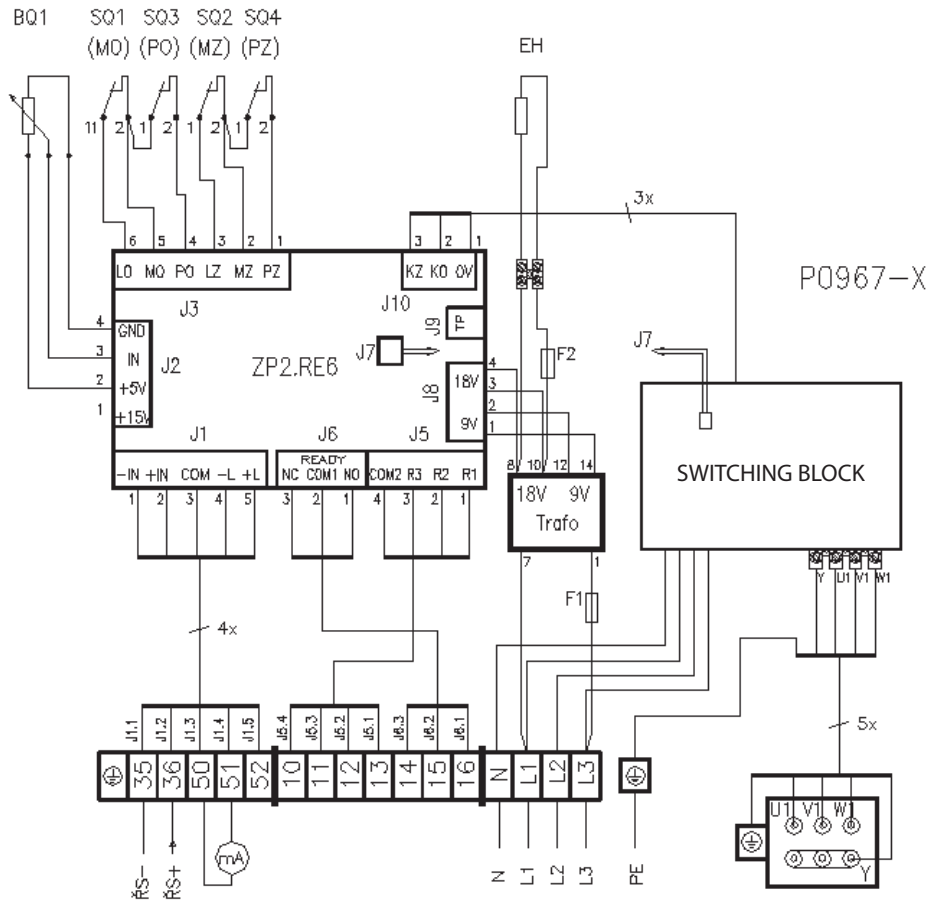
Connection of actuator with Control Block; current position sensor

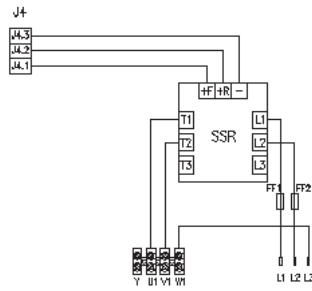# Internal wiring of switching block
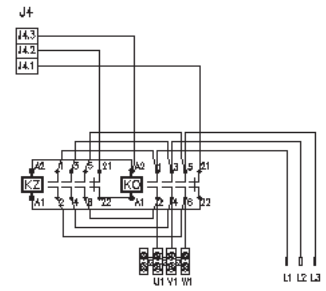
Blocks in Cabinet 21253571 Control RE6 〈MON〉
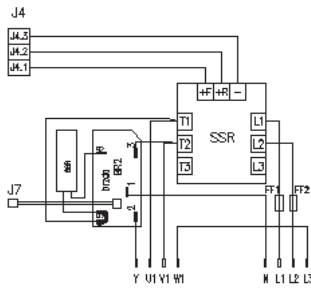

213545672 block wiring

213545673 block wiring
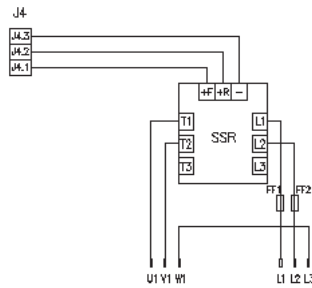
213545790 block wiring

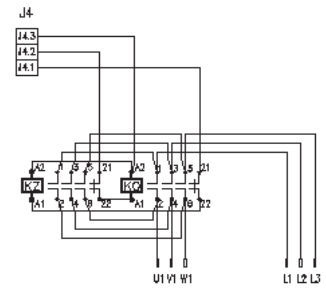## Blocks in Cabinet 21253571 Control RE6 External 〈MOA〉

213545670 block wiring

213545671 block wiring

213545790 block wiring

18 TECHNICAL SPECIFICATIONS

Supply voltage   - 9VAC, 18VAC/ 50Hz

Current consumption - 9VAC, max 250mA

Position sensor   - resistance sensor: 100 – 10 000 Ohms; input resist. approx. 50kΩ

                                      - current sensor 4-20 mA, 20-4 mA; input resistance 250Ω

Control signal   -0-20 mA, 4-20 mA, 20-0 mA, 20-4 mA

                                      - input resistance 120Ω

                                      - max. input current 30mA

Position output – galvanically separated

                                      - 4-20 mA, 20-4 mA

                                      - active, load resistance max. 500 Ω

                                      - passive, external supply 15V to 30V

Double-value outputs – 3 x controlling output – transistor 0.2 A (OPEN, CLOSED, brake)

                                      - 1x fault relay   – 230VAC 2A, 30VDC 2A (READY)

                                      - 3 x signal relay - 230 V AC 2A, 30V DC 2A (R1, R2, R3)

                                      - 5x LED (feeding, fault/MENU, parameter, opening, closing)

Regulator linearity   - 0.5%

Regulator insensibility -1 to 10% (adjustable by program)

Error messages   - control signal missing

LED   - torque in intermediate position

                              - temperature sensor fault

                              - electromotor thermal protection fault

                              - wrong rotation direction

                              - actuator fails to rotate

Reaction to fault   - sensor fault – actuator is stopped, LED error message
                    control signal missing – actuator in SAVE position, LED error
                    message

Operating temperatures
                    -40°C to +85°C

Dimensions   76 x 104 x 21 mm

ZPA PEČKY, a.s.
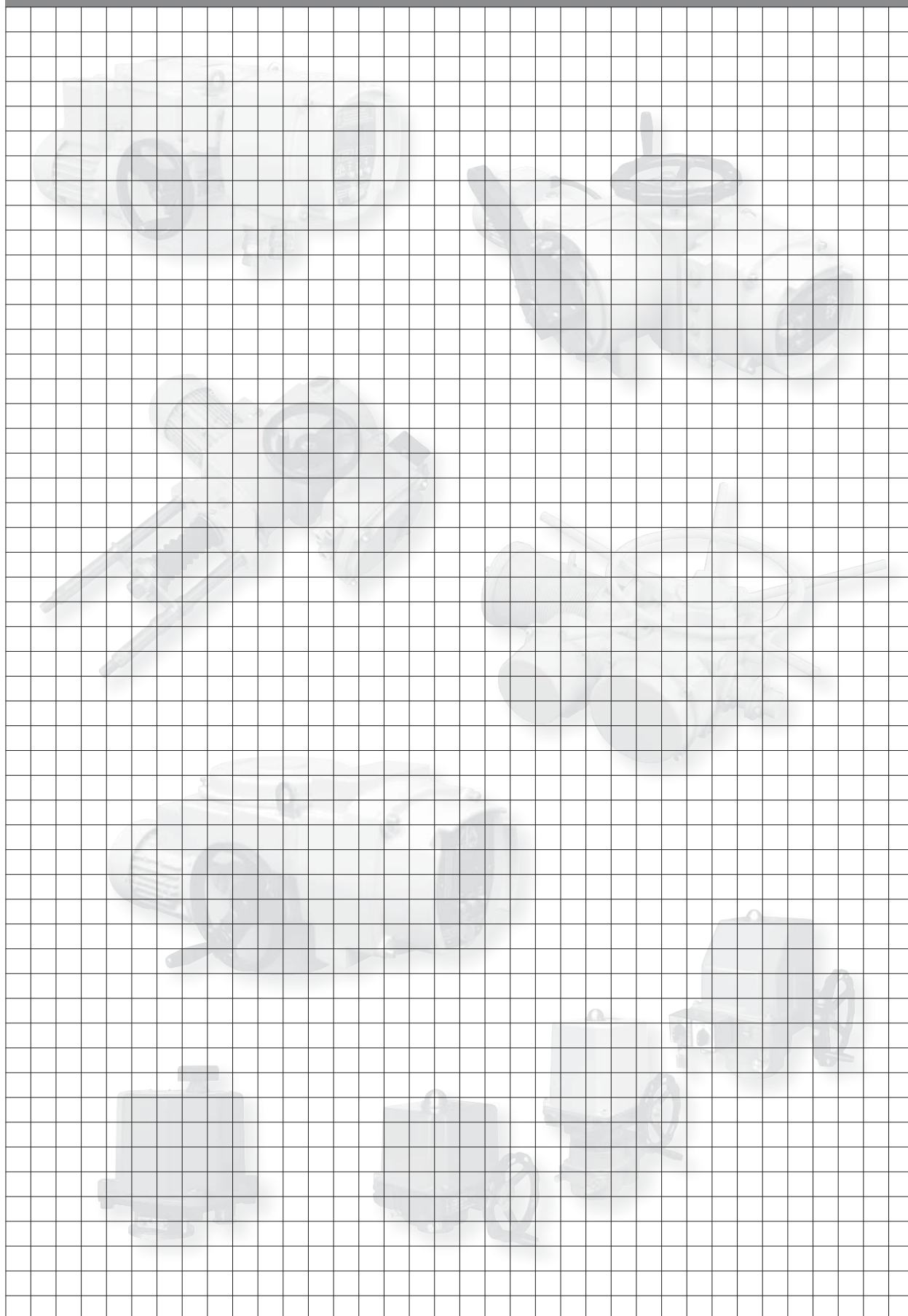
Development, production and services of electric actuators and switchboards.
Top-quality sheet-metal processing (TRUMPF equipment), powder paint shop.

SURVEY OF PRODUCED ACTUATORS

KP MINI, KP MIDI
Electric rotary (90°) actuators (up to 30 Nm)

MODACT MOK, MOKED, MOKP Ex, MOKPED Ex
Electric rotary (90°) actuators for ball valves and flaps

MODACT MOKA
Electric rotary (90°) actuators for nuclear power stations application outside containment

MODACT MON, MOP, MONJ, MONED, MOPED, MONEDJ
Electric rotary multi-turn actuators

MODACT MO EEX, MOED EEX
Explosion proof electric multi-turn actuators

MODACT MOA
Electric multi-turn actuators for nuclear power stations application outside containment

MODACT MOA OC
Electric multi-turn actuators for nuclear power stations application inside containment

MODACT MPR VARIANT
Electric rotary (160°) lever actuators with a variable output speed
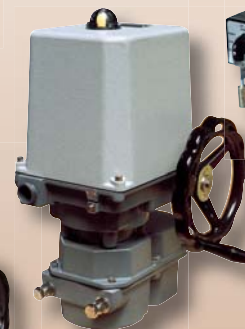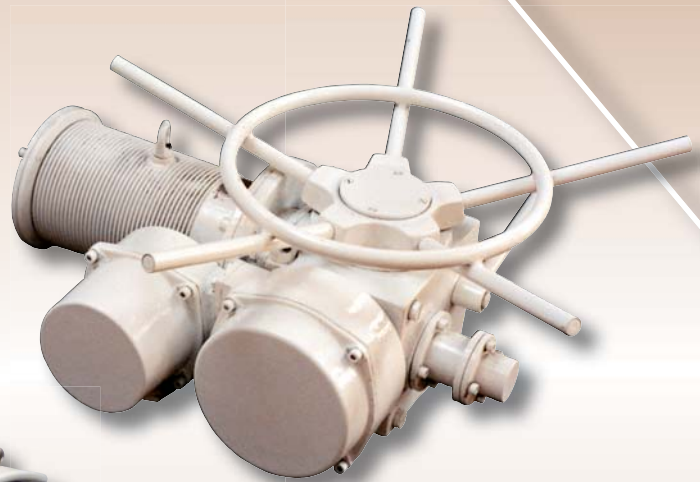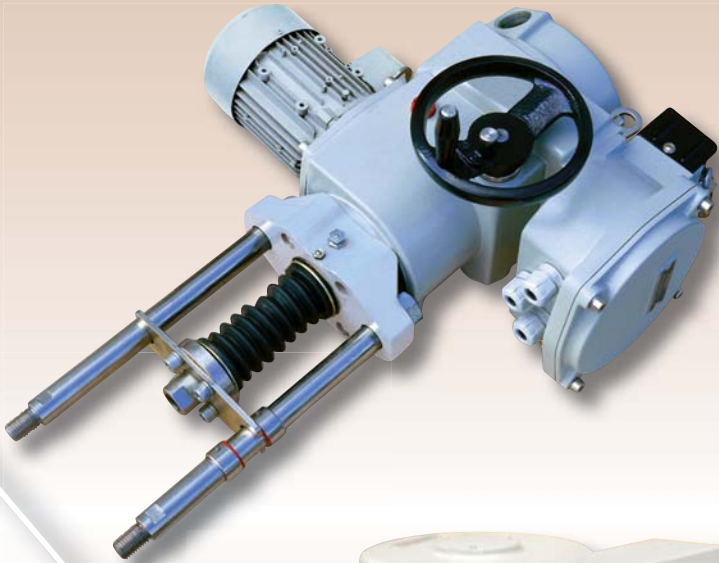
MODACT MPS, MPSP, MPSED, MPSPED
Electric rotary (160°) lever actuators with a constant output speed

MODACT MTN, MTP, MTNED, MTPED
Electric linear thrust actuators with a constant output speed

Deliveries of assembled actuator + valve (or MASTERGEAR gearbox) combinations

TRADITION • QUALITY • RELIABILITY