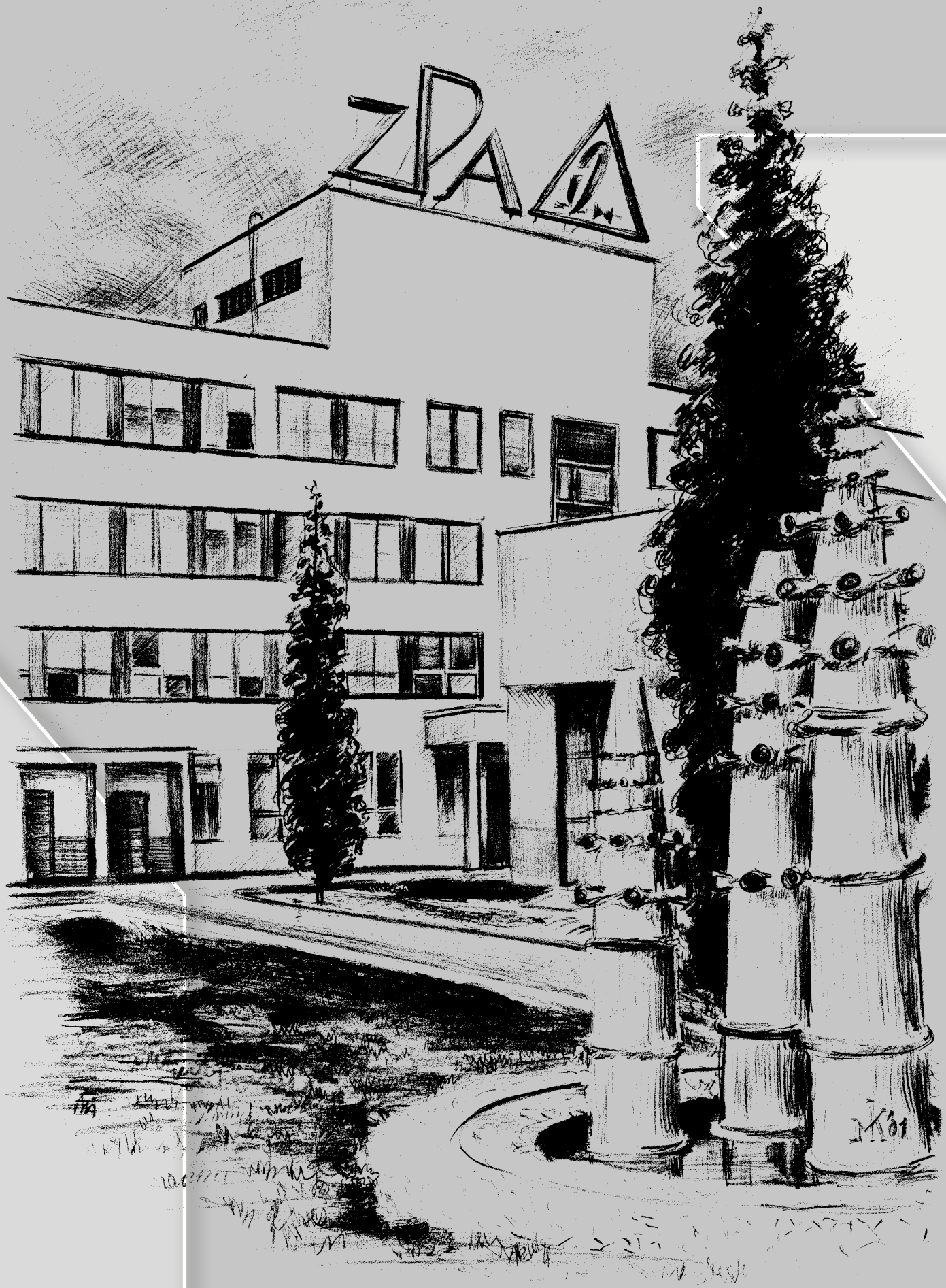
ZPA PEČKY, a.s.

INSTALLATION AND OPERATING INSTRUCTIONS

Electric Rotary (90°)
Part-turn Actuators

KP MINI
KP MINI CONTROL
Type number 52 997

KP MINI EEx
KP MINI CONTROL EEx
Type number 52 998



ZPA Pečky, a.s. is certified company in accordance with ISO 90001 as amended.

CONTENT

The Mounting and Operating Instructions specify basic principles for mounting, connection, adjustment, operation, maintenance, and repairs of **KP MINI** and **KP MINI EEx** actuators. A fundamental prerequisite is that assembly, operation, maintenance, and revisions are performed by skilled technicians qualified for operation and works on explosion-proof electric devices and the works are supervised by a professionally qualified expert instructed in a demonstrable way.

1. SAFETY INSTRUCTIONS

1.1 Range of use

The **KP MINI and KP MINI EEx** rotary *(90°)* electric actuators with constant speed of the output shaft motion *(hereinafter electric actuators only)* have been specially designed for actuating fittings *(ball and flapper valves),* louvers, air flaps and other devices for which they are in respect of their characteristics suitable. They can be used in remote and automatic control circuits.

When equipped with an electronic position regulator with position feedback, these actuators can act as a final power control element of continuous-action control circuits used for regulation of physical variables.

Electric actuators **KP MINI EEx** in the non-explosive version Ex d IIC T6 are intended for control and operation in the environment with a risk of explosion of an explosive gaseous atmosphere in zones 1 and 2 according to **ČSN EN 60079-10 *(332320);*** they are designed in compliance with the standards **ČSN EN 60079-0:2014** and **ČSN EN 60079-1:2015** for an explosive gaseous atmosphere in compliance with the standard **ČSN EN 60079-31:2014** for evironments with flammable dust.

This is about non-explosive electrical devices of Group II, category 2 in environment potentially explosive by gases, vapours and mist - "G". The actuators are marked by sign of protection against explosion and symbols and categories of devices Ex II 2GD.

Complete actuator is designed as fixed closure *„d“* with marking according to certification as follows: Ex II 2G Ex db IIC T6 Gb -25 ≤ Ta ≤ 55 °C.

Actuator label marking for explosional atmosphere formed by a cloud of flammable coal dust in the air (zone 22): **Ex II 3D Ex tc IIIC T55°C Dc.**

Electric actuator must not be exposed to heavy charging, e.g. intensive air-dust mixture streaming to prevent of creep electrostatic discharges.

Producer does not guarantee for damages caused by different use. Risk is carried by the user. Following these operation instruction belongs between correct condition of use.

Nomenclature:

Environment with explosion danger – environment in which an explosive atmosphere can be created

Explosive gaseous atmosphere – a mixture of flammable substances *(in the form of gases, vapours or mist)* with air under atmospheric conditions in which, after initialization, burning spreads out to non-consumed mixture.

Explosive dust atmosphere – mixture of flammable substance in a dust or fibre form with air during atmospheric conditions, in which combustion afetr ignition extends into an unused mixture.

Maximum surface temperature – The highest temperature created during operation under the most unfavourable conditions *(however within approved limits)* on any surface part of the electric device, which could induce ignition of surrounding atmosphere.

Closure – All walls, doors, covers, cable bushings, shafts, rods, pull-rods, etc. which contribute to the type of protection against explosion and/or to the level of protection *(IP)* of the electric device.

Explosion-proof closure "d" – Type of protection in which the parts capable of causing ignition of an explosive atmosphere are installed inside the closure; in case of internal explosion this closure should withstand pressure of the explosion and prevent spreading of the explosion into the surrounding atmosphere.

Zone 1 – is an area where, during usual operation, the probability of occurrence of an explosive atmosphere of a mixture of flammable substances in the form of gas, vapour or for with air is occasional.

Zone 22 – is defined as a environment, in which is creation of explosive atmosphere formed by a cloud of flammable coal dust in the air not probable. If explosional atmospher will rise up, it will be only rarely and only during short time period. *(attachement no. 1 NV no. 406/2004 Sb.)*

Standards

The following basic standards apply to **KP MINI EEx** explosion-proof actuators:

ČSN EN 60079-14	Regulations for electrical devices in areas with a danger of explosion of flammable gases and vapours.
ČSN IEC 60721	Types of environment for electrical devices.
ČSN EN 60079-0	Electrical devices for explosive gaseous atmosphere. General requirements.
ČSN EN 60079-1	Electrical devices for explosive gaseous atmosphere. Explosion-proof closure "d".
ČSN EN 60079-10	Electrical devices for explosive gaseous atmosphere. Specification of dangerous areas.
ČSN 33 0371	Non-explosive mixtures. Classification and testing methods.
ČSN 34 3205	Operation of electric rotating machines and work with them.
ČSN EN 60079-31	Explosive atmospheres. Devices protected against ignition of dust by a closure *„t".*

Designation of explosion-proof properties

It consists of the following symbols:

Ex Electric device complies with the standard ČSN EN 60 079-0 and related standards for various types of protection against explosion.

db Designation of the type of protection against explosion, explosion-proof closure according to ČSN EN 60 079-1.

tc Protection by a closure „t", according to standard ČSN EN 60079-31 ed. 2:20014.

IIC Designation of the group of explosion-proof electric device according to ČSN EN 60 079-0.

IIIC Mark a group containing conductive dusts for explosive amosphere with coal dust, according to ČSN EN 60079-0 ed 4:1013/Opr. 2:2014/A11:2014.

T6 Designation of temperature class of explosion-proof electric device of the Group II according to ČSN EN 60 079-0.

T55°C Maximum surface temperature.

Gb Designation of an explosion-proof electric device for explosive gas atmospheres with a "high" level of protection and is not a source of ignition in normal operation or during expected malfunctions, according to ČSN EN 60079-0.

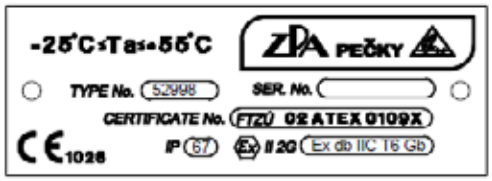
Dc Marking cover *"increased"* level protection is not source of initiation in normal operation and can have some additional protection for security, that device will remain passive as a source of initiation, at regularly expected events according to ČSN EN 60079-10-2:2010/Opr. 1:2011/Z1:2015.

IP 67 Marking cover level protection, according to standard ČSN EN 60079-0 and ČSN EN 60529.

Data on actuators KP MINI EEx

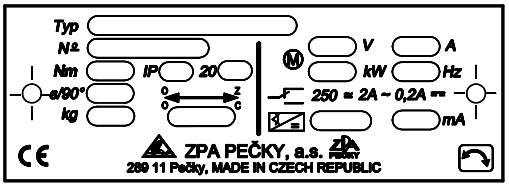
Actuators are labelled by following labels:

1) Plate with data of non-explosive closures

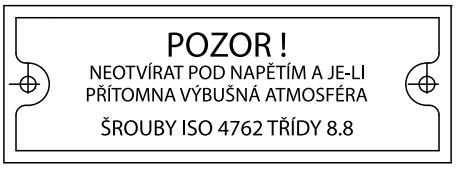


2) Rating and instrument plate contains:

- manufacture's name and address
- type designation of product *(type number)*
- serial number
- year of production
- rated value of tripping torgue Nm
- rated speed of shifting s/90°
- rated working stroke °
- designation of protective enclosure of actuator IP
- weight of actuator kg
- mark of conformity CE
- electrical data of power circuits *(voltage and frequency, current and output of electric motor)*
- electrical data of control circuit of micro-switches *(voltage, current)*
- position transmitter *(resistance, voltage and/or current)*



3) Warning plate



4) Plate on cover with marking of used protection against explosion

Non-explosive device label on a cover of actuator: **Ex tc IIIC T55°C Dc.**

1.2 Put into operation

Work in envirnment of explosion danger subjects to special provisions *(European Norm EN 60079-17)*, which must be observed. Work on opened actuators under the voltage can be done only if it is secured, that there will not be a danger of explosion. Respect all national provisions is obligatory as well. During operation of electric actuators some parts are necessarily under voltage. Work on electric devices or machines can be done according to valid electrotechnical regulations and only by expert or authorized person under teh leadership and supervision of an expert. This activity do in accordance with instructions according to chaper 6 of this manual.

1.3 Maintenance

It is obligatory to follow the instructions with no exceptions *(see chapter 8 of this manual)*, otherwise it is not guaranteed correct functionality of actuator

1.4 Elimination of risks in explosion danger environment

Producer of actuators according to this manual prescribes for ensure its safety for usage in explosion danger environment, that its installation, put into operation *(chapter 6)* and any maintenance or repairs performed at the place of its montage, especially cleaning or tightening clamps, will do in tim, when explosive gaseous atmosphere is not in space.

If operating isntructions does not allow to do any of these activities, it is necessary to prepare and approve specific procedures for this activity by authorized person. Adhering of these conditions will eliminate risk of explosion.

I any case must not be:

– Exceeded real specification surrounding atmosphere against performance label.
– Dismounted connection device or its cover or other part of actuator if actuator is not safely disconnected and locked for power on again.
– Actuator repaired by producer's nonauthorized repairer and followingly used in explosive danger environment.
– Mounted part, which was detected as corroded on the space of fixed closure or another damage, e.g. during seal replacement or demounting of any controls, engine or terminal block.

2. OPERATING CONDITIONS

The **KP MINI *(KP MINI Control, KP MINI EEx)*** electric actuators should withstand the effects of operating conditions and external influences, Classes AC1, AD7, AE6, AF2, AG2, AH2, AK2, AL2, AM-2-2, AN2, AP3, BA4, BC3 and BE3N2 according to ČSN 33 2000-5-51 ed. 3.

Surrounding temperature

Operating temperature for **KP MINI** actuators is from -25 °C to +70 °C and for **KP MINI EEx** actuators is from -25 °C to +55 °C.

Relative humidity from 10 to 100 %.

Classes of external influences – as extracted from ČSN Standard 33 2000-5-51 ed. 3.

Class:

1) AC1 – elevation above sea level ≤ 2000 m
2) AD7 – water occurrence - shallow dipping - short-time
3) AE6 – strong dustiness.
4) AF2 – occurrence of corrosive or polluting substances in the atmosphere. Presence of corrosive polluting substances is significant
5) AG2 – medium mechanical stress by impacts - common industrial processes
6) AH2 – medium mechanical stress by vibrations - common industrial processes
7) AK1 – occurrence of plant species or moulds without danger
8) AL2 – serious danger of the occurance of animals *(insects, birds, small animals)*
9) AM2-2 – harmful effects of escaping stray currents
10) AN2 – medium sun radiation. Intensity from 500 to 700 W/m^2
11) AP3 – medium seismic effects. Acceleration from 300 to 600 Gal
12) BA4 – staff capability. Instructed persons.
13) BC3 – frequent contact of persons with earth potential. Persons often touch foreign conductive parts or stand on conductive base.
14) BE3 – danger of explosion, production and storage of explosive substances.

Corrosion protection

Actuators are standardly delivered with surface treatment corresponding to category of corrosion aggressiveness C1, C2 and C3 according to ČSN EN ISO 12944-2.

On customer's request is possible to do surface treatment correcponding to category of corrosion aggressiveness C4, C5-I and C5-M.

In following table is provided and overview of environment for each categories of corrosion aggressiveness according to ČSN EN ISO 12944-2.

Corrosion aggressiveness level	Example of typical environment	
	Outdoor	Indoor
C1 (very low)		Heated buildings with clean atmosphere e.g. offices, shops, schools, hotels.
C2 (low)	Atmosphere with low level of pollution. Mostly outdoor areas.	Unheated buildings, in which may occur condensation, e.g. stocks, sports halls.
C3 (middle)	Urban industrial atmospheres, mild pollution of sulfur dioxide. Seaside areas with middle salinity.	Production areas with high humidity and low air pollution, e.g. food industry, processing factories, breweries.
C4 (high)	Industrial areas and seaside areas with middle salinity.	Chemical plants, swimming pools, seaside shipyard.
C5-I (very high – industrial)	Industrial areas with high humidity and aggressive atmosphere.	Buildings or areas with predominantly continuous condensation and high air pollution.
C5-M (very high – seaside)	Seaside areas with high salinity.	Buildings or areas with predominantly continuous condensation and high air pollution.

Supply voltage

Rated AC voltage	230 V
The permissible supply voltage fluctuations are from	-15 % to +10 % of the rated value
Nominal supply voltage frequency	50 Hz or 60 Hz
The permissible frequency variation is	±2 % of the nominal value

Protective enclosure

The type of protective enclosure of the actuator is IP 67, according to ČSN EN 60529 *(33 0330).*

Self-locking

Self-locking facility of the actuators is secured up to the rated torque due to the characteristics of the electric motor used.

Protection

The actuators are fitted with an external and an internal protective terminal. The protective terminals are provided with marks, according to ČSN IEC 417.

Operating position

The actuator can be n any operating position.

3. DESCRIPTION AND FUNCTION

The **KP MINI *(EEx, Control)*** electric actuators consist of the following basic units:

a) power gearing with output shaft and universal clamp
b) electric outfit
c) reversible synchronous motor with a permanently connected starting capacitor

a) The power gearing consists of a pinion attached to the output shaft of the electric motor, spur gearings and a geared segment coupled with the output shaft of the electric actuator. Supported on bearings, the output shaft is fitted on its outside with a universal clamp providing for connection to the driven shaft *(diameter of 12 to 22 mm or square s = 9 to 17 mm).* For control of the position-limit and signalling switches, adjustable cams are fitted at the other end of the output shaft, which is extended in length into the actuator control part. Position of the cams is secured by retightening the upper and lock nuts. The electric actuators are also fitted with manual control.

b) Electric outfit consists of four microswitches of which two are used for tripping the actuator when the end positions of the output shaft have been reached and two can be used for the position signalling of the output shaft, the actuator is also fitted with a position transmitter. When viewing from the top *(from the side of manual control)* the sequence of micro-switches is as follows: PO, SO, PZ, SZ.

In addition, the actuator is fitted with a position transmitter *(potentiometer or current transmitter).*

Outlets of the micro-switches, position transmitter, and electric motor are connected to a terminal board which serves for electric connection of the actuator to external circuits by means of a cable with conductors of maximum cross-section 1.5 mm^2. For sealing of inlet cables, the actuator is fitted with two cable bushings. Cable bushings PG 11 *(for cables ø 5 – 10 mm)* are used for the actuators of type 52 997. Cable bushings Peppers type CR-U/20 with threaded entries M20x1,5 *(for cables o 9,5 – 14,0 mm)* or cable bushings HAWKE type ICG 623/A with threaded entries M20x1,5 *(for cables o 11,0 – 14,3 mm)* are used for the actuators of the version EEx, type No. 52 998. Protection against shock voltage is provided for by internal and external protective terminals.

A heating element is installed for establishing a micro-climate in the space of the control section.

Note: *If the actuator works in the environment of temperature exceeding 35 °C the heating element will not be switched on. In other cases the heating element should be used.*

The actuators **KP MINI Type No. 52 998** are fitted with a reversible opening thermostat SM 4070; its role is to protect the motor in case of an abnormal operation. Using of this thermostat *(it opens at temperature 70 °C)* prevents increased surface temperature of the actuator.

A resistor of rating 10 W and resistance 18 kΩ is used as an anti-condensation heater.

Position transmitters

a) Resistance position transmitter is a potentiometer of nominal value 100 Ω. It is transferred to a transmitter by fitting a friction clutch for easy setting.

b) Resistance transmitter with converter RNI-RT. The converter RNI-RT is a supplement to the resistance transmitter. It transfers the signal from the resistance transmitter to the current output. The output signal is linear and proportional to the input signal. The converter is fed from the current loop; it requires no additional power source.

Technical parameters:

Feeding voltage	11 – 35 V DC, recommended 24 V DC
Measuring range	0 – 100 Ω
Output signal	4 – 20 mA
Measurement error	< 0.8 %

c) Transmitter DCPT2 is an electronic contact-less current transmitter of position. For its function, it uses magneto-resistant sensors. It is characterized by long service life and simple setting of working range by means of two push-buttons. It features a possibility of auto-diagnostics and error messages by a blinking code of the LED diode. The transmitter is fed from the source DCPZ.

Technical parameters:

Scanning of position	contact-less magneto-resistant
Working stroke	adjustable 60° – 360°
Non-linearity	max. ±1%
Loading resistance	0 – 500 Ω
Output signal	4 – 20 mA
Power supply	15 – 28 V DC, < 42 mA
Working temperature	-25 °C to +70 °C
Dimensions	ø 40 x 45 mm

4. TECHNICAL PARAMETERS

Basic technical parameters - table of design variants

Type	Rated torque [Nm]	Working stroke [°]	Adjusting time (90°) [s]			Electric motor	Type number	
			DC	50 Hz	60 Hz	Type	basic	supplementary
KP MINI + KP MINI EEx	30	90		30		SMR 300/1200 or RSM 63/10FDG	52 997 + 52 998	x x 1 x
				60	48			x x 2 x

Supply voltage, frequency			
AC 50 Hz	230 V	52 997 + 52 998	1 x x x
Position transmitter - electronic position transmitter ZP 2.RE			
with position transmitter 1x100 Ω	without regulator	52 997 + 52 998	x x x 4
	with regulator		x x x 5
without position transmitter	without regulator		x x x 6
with position transmitter 2x100 Ω	with regulator		x x x 7
with position transmitter 4 – 20 mA with source	without regulator		x x x B
with position transmitter 4 – 20 mA	with regulator		x x x C
union flange size	flange F03		x 1 x x
	flange F04		x 2 x x
	flange F05		x 3 x x
	flange F07		x 4 x x

Additional technical parameters

Duty:	S2 - 10 min.
	S4 - 30 % - 1,200 cycles/hour
Weight:	4 kg
Rated resistance of position transmitter:	1 x 100 Ω or 2 x 100 Ω *(or with another rated value)*
Linearity of position transmitter:	± 2 % of the resistance rated value
Hysteresis of position transmitter:	< 2 % of the resistance rated value
Output shaft play:	1.5°
Insulation resistance:	at least 20 MΩ under dry condition; at least 2 MΩ after a damp test
Actuator life:	at least $1x10^6$ operations with a running time of 0.75 s at the rated torque
Climatic resistance:	standard design
Design in respect of explosion-proofness:	standard design - Type No. 52 997
	explosion-proof design EExd II CT 6 - Type No. 52 998
Protective enclosure:	IP 67

Technical parameters of the electric motors used

Type of electric motor	Power [W]	Supply voltage [V]	Frequency [Hz]	Current [A]
SMR 300 - 1200	3,8	230	50	0,068
RSM 63/10FDG	4,2			0,045

Basic electric outfit:
- 2 position-limit switches *(OPEN and CLOSE)*
- 2 signalling switches *(OPEN and CLOSE)*
- 1 synchronous motor
- 2 cable bushings
- 1 terminal board
- 1 anti-condensation heater
- 1 handwheel

Additional electric outfit *(according to the customer's requirements):*
- 1 electronic position regulator
- 1 position transmitter

5. ZP2.RE POSITION REGULATOR, VERSION 4

5.1 Controller properties

The electronic regulators of output shaft position ZP2 are used in electric actuators **KP MINI Control** and **KP MINI EEx Control.** They provide for controlling the electric actuators in which they are built-in by an analog input signal supplied by a superior control system.

The core of the regulator is a micro-computer with a controlling program.

The regulator includes:

– A/D converters for processing the input and feedback signal,
– parameter memory,
– power supply source with a transformer,
– output relay for controlling the electric actuator *(switching of electric motor and power switches),*
– input circuits for connecting end-limit micro-switches and contacts of thermal relay,
– circuits for analog signal input,
– functional keys and signal lights which provide for setting regulation parameters *(signal lights serve also for indicating the state of regulation and types of errors),*
– connectors for connecting the regulator with the electric actuator,
– connector for connection of the regulator with PC for service purposes.

The regulator has the following functions:

– it enables the regulation parameters to be entered by means of functional keys on the regulator or from PC connected to the regulator via a communication module,
– after the regulation parameters have been entered, it performs auto-calibration during which the parameters of the electric actuator and the valve are detected by the regulator,
– after the auto-calibration is completed, it stores the entered and measured parameters in the parameter memory,
– it checks the input and feedback signals and conditions of end-limit micro-switches,
– it controls the electric actuator according to the input and feedback signals, state of end-limit micro-switches, regulation parameters, and parameters of the electric actuator,
– it monitors and stores in its parameter memory total operating time and total number of operations of the output relays,
– it checks whether a failure occurs during regulation or in adjusting the regulator; if so, it performs evaluation and indication of the failure type; it brings the output shaft of the actuator into position according to the set parameters and stores parameters of the detected failure in its memory,
– it provides for connection of PC which can be used for entering the regulation parameters and monitoring the regulator performance,

The program memory is of the ROM type; the memory of regulation parameters and parameters of the electric actuator is of the EPROM type; hence, the memory content is not damaged in case the supply voltage is switched off.

The speed of rotation of the actuator output shaft is given by the type and design of the electric actuator; it cannot be affected by the regulator.

Connection of the electric actuator with regulator to the supply voltage

When the supply voltage is connected to the electric actuator, the actuator can spontaneously start even when no control signal has yet been connected to the regulator; this is because the regulator evaluates this state as an error and brings the actuator output shaft into position according to the entered parameter.

If the electric actuator is connected in a wrong way the situation can occur that the electric actuator does not stop even after tripping of the end-limit switches.

During installation and commissioning of the electric actuator it is, therefore, necessary to adopt such measures that spontaneous starting of the electric actuator is prevented even in case that the supply voltage is incidentally switched on during connecting the electric actuator.

Note: *The regulators ZP2, version 4, operating in the auto-calibration mode perform tests of sense of rotation and report an incorrect sense as an error. In the regulation mode the sense of rotation is not tested.*

5.2 Technical parameters of the regulator

Supply voltages	A. 230 V	+10 % -15 %;	50 – 60 Hz
	B. 120 V	+10 % -15 %;	50 – 60 Hz
	C. 24 V	+10 % -15 %;	50 – 60 Hz
Input signals	analog	control signal 0 to 20 mA, 4 to 20 mA, 0 to 10 V	
	two-valued	TEST contact from superior system *(simulation of faulty condition)*	
		State of OPEN and CLOSE torque-limit switches of electric actuator*)	
Output signals	two-valued	2x contact of relay 8 A/230 V, protected by fuse F 1.6 A	
		signalization of failure - KOK contact *(24 V, 2 W)*	
	5x LED	feeding, failure, set parameters, opens, closes	
	4 – 20 mA	Maximum load impedance 350 Ω *(with rated feeding voltage).*	
		Maximum load impedance 100 Ω *(with feeding voltage reduced by 15 %)*	
Position transmitter	potentiometer 100 – 10,000 Ω **)		
	DCPT current transmitter **)		
Error report	TEST mode		
	failure of feedback transmitter		
	end-limit switches reversed*)		
	control signal missing		
	actuator switched off in intermediate		
	position by end-limit switch*)		
Response to failure	failure of feedback transmitter	actuator into position Test, error message	
	control signal missing	actuator into position Test, error message	
	TEST mode	actuator into position Test, error message	
Adjusting devices	2x functional key for setting parameters without PC		
	communication connector for connecting PC		
Regulator linearity	0.5 %		
Regulator insensitivity	1 – 10 % *(adjustable)*		
Operating temperature range	-25 °C to +75 °C		
Dimensions	75 x 75 x 25 mm		

**) The end-limit switch is the position-limit switch of the electric actuator connected so that the actuator motion is stopped in the given direction. During the auto-calibration, the regulator ZP2 me asures the feedback signal at which the end-limit switches make the electric actuator to switch off (for both directions of motion) and storesit in memory as parameter. During regulation, the state of end-limit switches is continuously monitored. If the electric actuator is switched off by the end-limit switch in a position different from that corresponding to the position found during the auto-calibration, the regulator shall evaluate this state as an error.*

***) Type of position transmitter (resistance / current) is set automatically during the auto-calibration.*

5.3 Setting the regulator parameters by means of functional keys

After mounting the electric actuator with the regulator onto the valve, correct function of the regulator is ensured by setting the regulator parameters and starting the auto-calibration procedure – the best moment for this is when the piping in which the valve with the actuator is fitted is filled with the working medium.

Parameters of the regulator can be set by functional keys on the regulator *(the set parameter is indicated by LCD diodes D3, D4 on the regulator)* or by PC connected to the regulator.

This manual serves as instructions for setting the parameters of the regulator ZP2.RE, version 4 *(designation on a self-sticking tape on the case of the single-chip PC of the regulator, e.g. EHL SERVO V4.28 © 2004)* by means of the functional keys. A special manual is to be issued for setting the regulator by means of PC *(PC can also be used for setting other parameters than those described in this manual and access is provided to different diagnostic data).*

Before setting the parameters, the end-limit switches must be connected to the electric actuator and adjusted together with the position transmitter.

IMPORTANT!

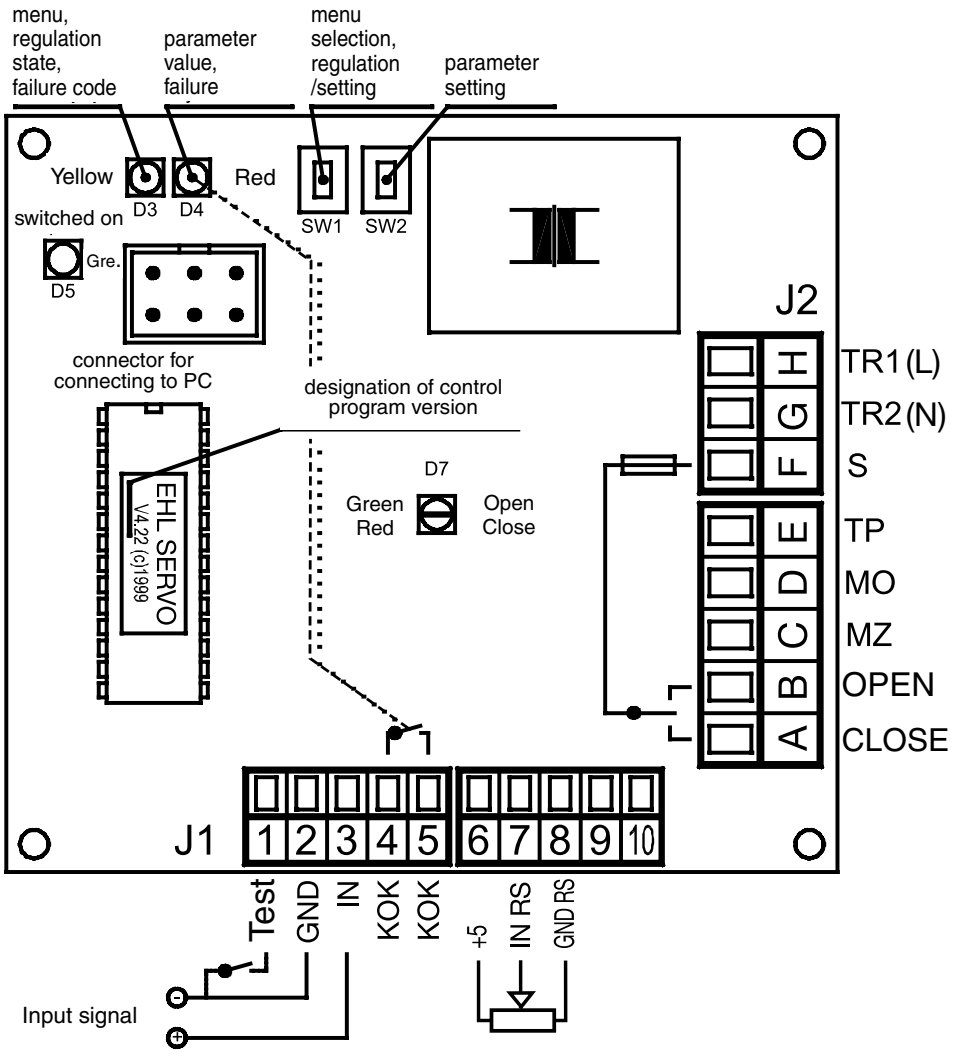
Basic setting of the resistance position transmitter should be observed:

Close position	min. 2.5 % of the transmitter rated value *(e.g. min 2.5 Ω for 100 Ω).*
Open position	min. 97.5 % of the transmitter rated value *(e.g. min 97.5 Ω for 100 Ω).*

In case this condition is not fulfilled the regulator will come to the state "Transmitter failure" in its extreme positions.

The regulator parameters cannot be set when the electric actuator is in one of its extreme positions and is switched off by the end-limit switch` the auto-calibration would not be accomplished and the regulator would report a failure. Therefore, before setting the parameters, the electric actuator should be adjusted – e.g. by the handwheel – so that the output shaft is in an intermediate position *(in a position in which the electric actuator is not switched off by any of the end-limit switches under normal conditions of operation).*

Layout of indicating diodes, functional keys, terminals and connectors on the regulator ZP2.RE4



J1 – Signal terminal board

1	TEST	Input of logic control signal Test
2	GND	Control signal – negative pole
3	IN	Control signal – positive pole
4	KOK	Switching contact of failure report
5	KOK	Switching contact of failure report
6	+5V	Power supply of potentiometerr
7	IN RS	Signal from potentiometer
8	GNDRS	Earth of potentiometer
9		Not connected in this version
10		Not connected in this version

J2 – Power terminal board

A	CLOSE	Power output Close
B	OPEN	Power output Open
C	MZ	Close end-limit switch
D	MO	Open end-limit switch
E	TP	Thermal cut-out
F	S	(L) Feeding of power outlets
G	TR1	(N) regulator feeding
H	TR2	(L) regulator feeding

Note:

The signals MO, MZ, TP and "Test" are input signals; the signal TP and "Test" need not be connected. Setting of the active level (a level which is evaluated by the regulator as an error state) of the signals TP and Test" to different value than that set by the regulator manufacturer or by ZPA Pečky a.s. is only possible by PC.

Setting of parameters

In setting the parameters according to this manual, select the setting mode by pressing the key **SW1** and holding it until the yellow diode **D3** on the regulator is lit on *(about 2 s).* Then, release the key **SW1** and the start setting the parameters of the regulator *(roll in the menu indicated by the yellow diode **D3** by shortly pressing the key **SW1**, set the parameters indicated by the red diode **D4** by shortly pressing the key **SW1**)* – see the description of Menu 1 – Menu 5 below. If, by pressing the key SW2, you select the last value of the parameter in the given menu, another depressing of the key SW2 will bring you back to the first value of this parameter. In this way, you can make cycles in selecting the parameter values according to the list for the given parameter. After the required value of the parameter has been selected, depress shortly the key SW1. The selected value of the parameter is thus confirmed and the following menu is displayed. If, by subsequent pressing the key SW1, the MENU 5 is displayed, another short depressing of the key SW1 will bring you back to the MENU 1 *(another depressing to the MENU 2, etc.).* In this way, the set parameters can be checked and changed during the setting procedure.

Each time the red diode D4 is lit on – during regulation, auto-calibration, and in setting the parameters – the contact KOK is closed *(terminals J1-4, J1-5).*

The diodes D3 and D4 give signals by the number of their blinking:

Menu 1 Setting of control signal

D3 *(yellow)*	☼	
D4 *(red)*	☼	0 – 20 mA
	☼☼	4 – 20 mA
	☼☼☼	0 – 10 V

Menu 2 Setting of response to test signal and in case of failure

D3 *(yellow)*	☼☼	
D4 *(red)*	☼	Opens
	☼☼	Closes
	☼☼☼	No response

Menu 3 Setting of mirroring *(ascending / descending characteristic)*

D3 *(yellow)*	☼☼☼	
D4 *(red)*	☼	Higher signal – CLOSE *(descending char. – mirrors)*
	☼☼	Higher signal – OPEN *(ascending char. – mirrors)*

Menu 4 Setting of regulator insensitivity

D3 *(yellow)*	☼☼☼☼	
D4 *(red)*	☼	1 %
	☼☼	2 %
		až
	☼☼☼☼☼☼☼☼☼☼	10 %

Menu 5 Setting of regulation method

D3 *(yellow)*	☼☼☼☼☼	
D4 *(red)*	☼	Narrow to torque
	☼☼	Narrow to position
	☼☼☼	Wide to torque
	☼☼☼☼	Wide to position

In the regulation "to position" the electric actuator shaft is brought to the position where the input and feedback signal are identical.

The regulation "to torque" means that by setting the input signal close to either of extreme values – i.e. for signal 4 – 20 mA this is up to 4.2 mA and from 19.8 mA up *(these values are fixed and cannot be changed)* – the electric actuator shaft does not stop at the moment of identical input and feedback signals but keeps moving until it is stopped by the action of particular end-limit switch. This setting is used in case that tight closing of the valve in its extreme position is to be ensured.

The "narrow" regulation means that, during the regulation, the electric actuator shaft is set so that the signal from the position transmitter corresponds exactly to the input signal. If, after the electric actuator has stopped, the feedback signal does not correspond to the input one the actuator changes over to the so-called step mode; it will be brought to the exact position by repeated switching the electric motor on and off.

The "wide" regulation means that the electric actuator shaft is set so that, after the actuator has stopped, the difference between the input and feedback signals is smaller than or equal to the set insensitivity range.

In case the regulator is not required to be set otherwise, it is recommended to set the regulation method as "wide to position".

After setting, verification, and correction of parameters, if necessary, the key **SW1** should be kept depressed for a while *(this can be carried out in any menu)* until the diode **D3** is lit on. Setting of the parameters is thus completed; you shall confirm that the set parameters are valid and can be stored in the regulator memory. After the key **SW3** is released, the auto-calibration is automatically started.

The auto-calibration is an automatic process in which the regulator checks the position transmitter and sense of rotation of the electric actuator output shaft, brings the actuator shaft into the position "OPEN" and "CLOSE"; in these positions it will measure the feedback signals, inertia in the directions "OPEN" and "CLOSE", and store the set and measured parameters in the regulator memory.

The auto-calibration should be started whenever a change occurs in the conditions which can influence the regulator performance, e.g. at retightening the packing.

Menu 6 Auto-calibration

D3 *(yellow)*	☼☼☼☼☼☼	Auto-calibration in progress
D4 *(red)*		**Does not blink**

Error message

D3 *(yellow)*	☼☼☼☼☼☼	
D4 *(red)*	☼☼☼	Auto-calibration starts at the end-limit switch, failure of end-limit switch
	☼☼☼☼	End-limit switches connected in wrong way
	☼☼☼☼☼	Position transmitter wrongly connected or faulty
	☼☼☼☼☼☼☼☼	Wrong sense of rotation of the shaft or the resistance position transmitter reversely connected

In case that the regulator is connected in a wrong way *(wrongly connected end-limit switches or position transmitter)* the auto-calibration will be interrupted the regulator gives an error message by means of the diodes **D3** and **D4**. If everything is O.K. then, after the auto-calibration is completed, the regulator will change over into the regulating mode.§

IMPORTANT!

If an error in the parameter setting and/or auto-calibration occurs the set parameters are not stored in the regulator memory. After the errors are removed the setting of parameters and the auto-calibration should be repeated.

If the regulator parameters were set sooner than the valve with the electric actuator is installed into the piping, then, after its installation and filling the working medium into the piping, the assembly properties can change to such an extent that the regulator setting and the auto-calibration will have to be repeated.

Program RESET of regulator

In case the regulator comes into a sate that you want to cancel (to perform RESET), e.g. return from the setting menu without auto-calibration, you can do that by pressing the key **SW1** and keeping it depressed for at least 6 s.

Note:

If an error in the auto-calibration occurs this procedure does not work: the error state is to be cancelled by switching off and on the supply voltage of the regulator. If it is impossible to start a new regulator or a regulator into which wrong parameters were loaded by mistake, it can be brought into the initial state by switching off the supply voltage for about half a minute (so that the filtration capacitors in the power supply section can be discharged); then press and keep depressed both keys on the regulator and, during this period, switch on the regulator power supply while keeping the key depressed for at least 6 s. In this way, the data are loaded into the regulator memory which enable you to start the regulator and carry out new setting of the parameters.

Important!

This procedure can also be used for setting parameters the setting of which cannot be changed without a connected PC *(e.g. voltage level at TP input at which the regulator changes over into the error state).* Therefore, the RESET button should not be used unless it is possible to set the parameters again by PC.

Operation and error messages of the regulator during regulation

Operation messages:

D3 *(red)* lit off		
D4 *(yellow)*	Lit on	The regulator regulates
	Lit off	Regulation deviation within the insensitivity range

Error messages:

If an error occurs which the regulator can detect, the contact KOK connected to the terminals J1-4 and J1-5 closes; the diode D4 is permanently lit on. The regulator response to the error is given by the set parameter "Response to the signal TEST". The diode D3 reports the error type by the blinking code.

D4 *(red)*	Permanently lit on	
D3 *(yellow)*	☼	TEST mode
	☼☼	Control signal in the range 0 – 10 V missing by action end-limit switches
	☼☼☼☼	Electric actuator was switched off in intermediate position
	☼☼☼☼☼	Position transmitter failure
	☼☼☼☼☼☼	Thermal protection failure
	☼☼☼☼☼☼☼	Control signal at the range 4 – 20 mA is smaller than 3 mA or is missing

After the cause of the error state is removed, the regulator changes over **automatically** into the regulating mode.

6. ATTACHMENT OF THE ACTUATOR TO A VALVE PUTTING INTO OPERATION AND MAINTENANCE

After unpacking, make sure that the actuator was not damaged during transport. Prior to installation, please make yourself acquainted with these mounting instructions.

Warning:

When working on the actuator, observe the ČSN safety regulations. Connection and adjustment of the actuator should only be made by a person who has been qualified in accordance with the valid ČSN Standards and authorized by the user.

Prior to connecting and adjusting the actuator, make sure that the actuator cannot be started by an unauthorized person.

It is recommended that, during actuator adjustment, a suitable cut-out switch is connected in the circuit of the electric motor *(terminal 2)* to permit the actuator to be stopped immediately, if required. On completion of the adjusting procedure, this switch should be removed from the motor circuit.

The actuator cover, together with the handwheel, can be removed after loosening of 4 screws M10 x 25. Extend the universal clamp of the output shaft to the required distance and attach the actuator to the valve. Next, tighten the clamp onto the controlled shaft. Check that the tightened output can freely move and cannot be held back anyway. Then, connect the actuator to external electrical circuits. With the actuator cover removed, put the actuator into operation and check that the output shaft rotates in the correct direction. The CLOSE direction of rotation corresponds to the output shaft rotation clockwise, when viewing the actuator from the manual control side, i.e., from above. If the actuator does not rotate in the correct direction the leads to terminals 15 and 18 should be reversed. Thereafter, make sure that the OPEN and CLOSE position-limit switches operate correctly. Finally, adjust the OPEN and CLOSE signalling switches.

6.1 Supply line and wiring

For the entry to the flameproof enclosure is the actuator equipped with 2 threaded holes M20x1,5. These entries are sealed by plugs or equipped with glands. The customer is obliged to establish electrical connection for direct entry to the flameproof enclosure, that corresponds to the requirements of ČSN EN 60079-14 and the protective enclosure is at least IP 67.

At the customer's request, the manufacturer can supply motors with cable bushing system that meets the requirements of ČSN EN 60079-14 Article 10.4.2.d for direct entry into flameproof enclosure of group IIC. For entry into flameproof enclosure of actuator, type No. 52 998 are used certified sealed bushings for temperature range from -60 °C to +80 °C.

It can be used Peppers *(type CR-U/20)* or HAWKE *(type 623 ICG/A)* glands according to the following table.

Gland type	Threaded entry	Cable diameter
CR-U/20	M20x1,5	9,5 – 14,0 mm
ICG 623/A		11,0 – 14,3 mm

Customer is obligated to follow the following instructions of installing inlet cables according to gland type when connecting the actuator.

CR-U* Compound-Filled Cable Gland
- ASSEMBLY INSTRUCTIONS FOR SAFE USE

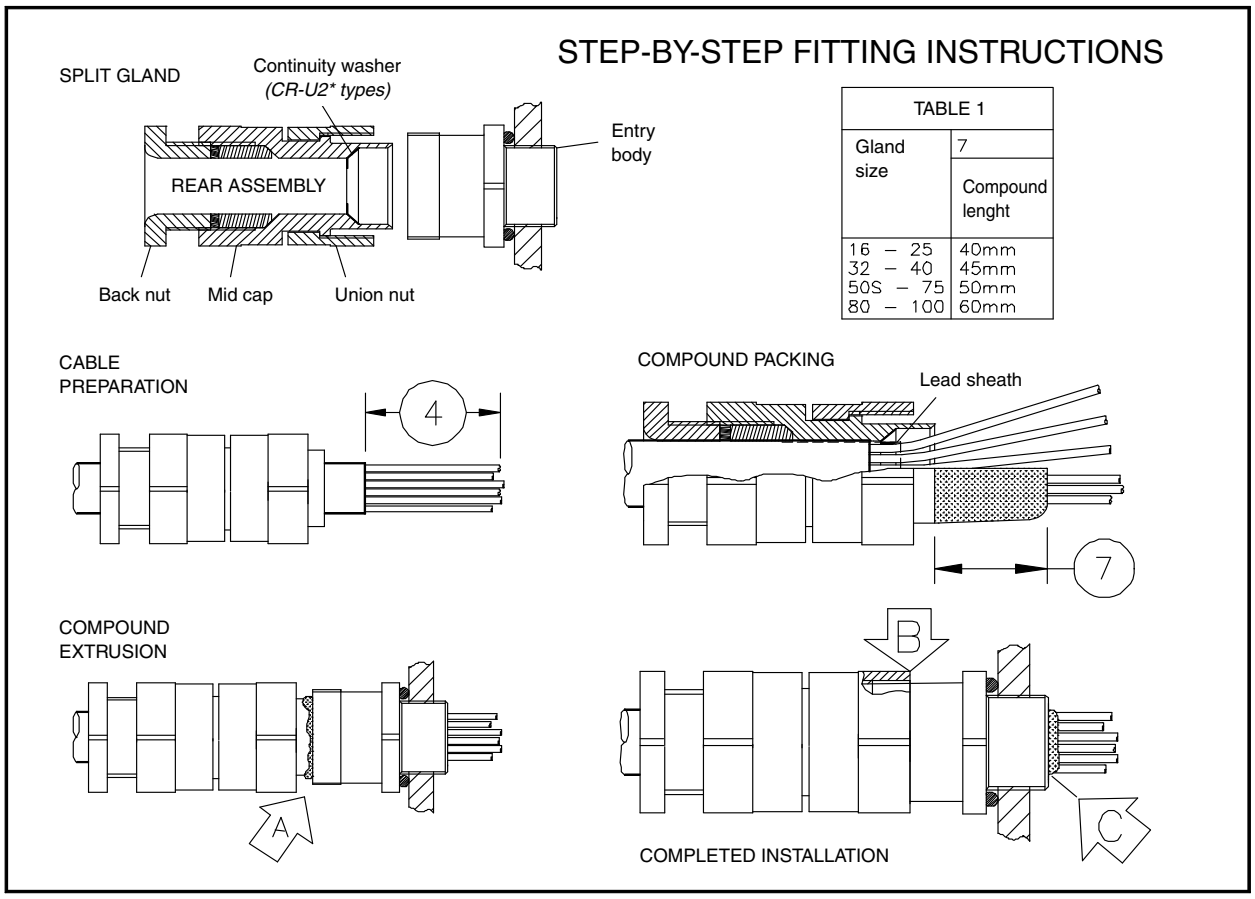
Where cable gland CR-U* is used customer is obliged to follow the following instructions with sealing individual cable cores when connecting the actuator.

Brief Description

The Peppers CR-U* type Compound-filled cable gland is for outdoor use in the appropriate Hazardous Areas with unarmoured cable of any construction, with or without braids or screens, where the braids or screens pass trough the compound. A variant giving electrical continuity to a lead sheath is available. It gives environmental protection to IP 66, IP 68 and Deluge.

Warning:

PLEASE STUDY CAREFULLY THESE INSTRUCTIONS BEFORE INSTALLATION. These glands should not be used in any application other than those mentioned here or in Peppers Data Sheets, unless Peppers states in writing that the product is suitable for such application. Peppers can take no responsibility for any damage, injury or other consequential loss caused where the glands are not installed or used according to these instructions. This leaflet is not intended to advise on the selection of cable glands. Further guidance can be found in the standards listed below.



STEP-BY-STEP FITTING INSTRUCTIONS

1. Split gland as shown.
2. Fit Entry Body. Hand-tighten, then using wrench tighten a further 1/2 turn. DO NOT EXCEED MAX TORQUE FOR ENCLOSURE.
3. Slide Rear Assembly *(Back Nut, Mid Cap and Union Nut)* onto cable as shown.
4. CABLE PREPARATION

   Strip jacket so that cores are fully exposed in the compound chamber, length to suit installation. Lead sheath must be cut to push through the continuity washer. Remove protective foils, and any cords/fillers from around and between the cores. Take care not to cut the insulating sleeves of the cores. Pigtail and sleeve any screens to be passed through compound.

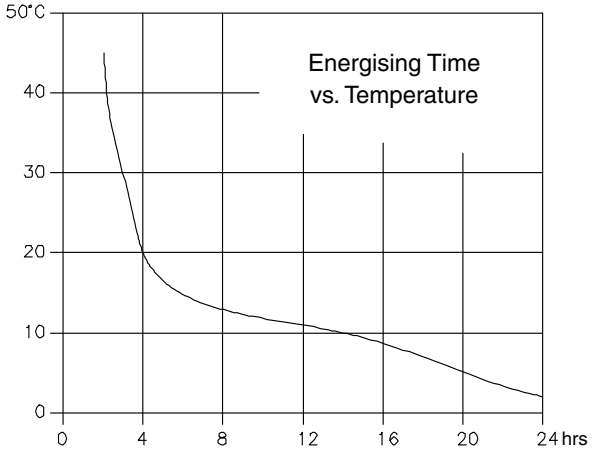
HEALTH AND SAFETY WARNING The resin used in the compound can cause eye and skin irritation. For your personal protection, wear the gloves supplied while mixing and applying. The uncured compound should not be allowed to come into contact with foodstuffs.

A COMPREHENSIVE SAFETY DATA SHEET PROVIDED BY THE COMPOUNDMANUFACTURER IS AVAILABLE ON REQUEST.

5. Check compound has not passed its "Use By" date. Installation at temperatures below 10 °C should be avoided if possible.
6. Trim any hardenes pieces from ends of stick. Mix the compound by rolling, folding and breaking. Ease mixing by cutting large sticks in half. Fully mixed compound has a uniform yellow colour with no streaks.
7. Support the cable and Rear Assembly, holding them roughly concentric. Any lead sheath should be pushed through the continuity washer - ensure that contact has been made. Splay out the cores. Starting at the middle, pack small amounts of rolled-out compound between the cores. Restraighten each core and work outwards untill all gaps are filled. Bundle the cores with cord or tape so they are not disturbed. Pack around the outside of the outer cores to completely fill the Rear Assembly cup. Build up compound around the outside of the cores, with a slight taper & to approximate compound lenght shown in diagram & Table 1 column 7.
8. Pass cores through & push compound into Entry Body until Rear Assembly engages. Remove squeezed out compound at arrow A. Screw Union Nut 7 full turns onto Entry Body *(arrow B).* Ensure that compound emerges at entry thread *(arrow C).*
9. Clean off excess compound from Entry Body to allow withdrawal when cured *(arrow C).* Cores may be disturbed after 1 hour. Leave to cure for 4 hours when working at 21 °C.
10. To release and pull back joint for inspection, unscrew Union Nut. Ensure that the compound is uniform and full form to fit into the entry body.
11. Hand-tighten Union Nut to remake joint. Then refer to table below table and tighten Union Nut using wrench to the given amount.
12. Hold Mid Cap with wrench and tighten Back Nut onto cable. Ensure seal makes full contact with cable sheath, then tighten 1 extra turn.
13. The equipment should not be energised until the compound has been left to cure for at least 4 hours when working at 21 °C. See chart ´Energising Time vs. Temperature´ for further guidance.

Wrench tightening information *(Instruction 11),* cable sizes *(mm)* & permitted cores

Gland size	Tighten Union Nut using wrench up to	Max Diameter over Cores	Max No of Cores	Outher sheath	
				Min.	Max.
16	½ -turn	8,4	7	3,4	8,4
20S	½ -turn	10,4	8	4,8	11,7
20	½ -turn	12,5	14	9,5	14,0
25	½ -turn	17,8	25	11,7	20,0
32	¼ -turn	23,5	50	18,1	26,3
40	¼ -turn	28,8	80	22,6	32,2
50S	½ -turn	34,2	100	28,2	38,2
50	½ -turn	39,4	100	33,1	44,1
63S	½ -turn	44,8	120	39,3	50,1
63	½ -turn	50,0	120	46,7	56,0
75S	½ -turn	55,4	140	52,3	62,0
75	½ -turn	60,8	140	58,0	68,0
80	½ -turn	64,4	160	61,9	72,0
85	¾ -turn	69,8	180	69,1	78,0
90	¾ -turn	75,1	200	74,1	84,0
100	¾ -turn	80,5	220	81,8	90,0



Installation Guidance

Point Advice

1. BS EN 60079-10:2003 Classification of Hazardous areas
   BS EN 60079-14:1997 Electrical Installations in hazardous areas *(other than mines)*
   BS 6121, Part 5 Selection, Installation and Maintenance of Cable Glands
   IEC 60079-31:2008 Ignitable dust - Protection by enclosure
2. Installation should only be carried out by a competent electrician, skilled in cable gland installation.
3. NO INSTALLATION SHOULD BE CARRIED OUT UNDER LIVE CONDITIONS.
4. To maintain Ingress Protection ratings above IP64, use IP washers or O-rings for parallel threads. For taper threads use thread sealand. Also see page 1 diagram and Hole Data above.

5. To ensure the stated IP rating is maintained, at the point of interface the surface of the enclosure should be flat, free from debris and rigid with the hole drilled straight and to an appropriate diameter.
6. Where an earth contact is required the surface of the enclosure should be sufficiently flat and rigid. With painted enclosures a serrated star washer should be fitted to break through the paint and make a satisfactory earth contact.
7. Once installed do not dismantle except for routine inspection. A detailed inspection should be conducted as per IEC/EN 60079-17. After inspection the gland should be re-assembled as detailed in points 11 and 12, ensuring the Mid Cap is fully tightened.
8. Parts are not interchangeable with any other design. If manufacturers parts are mixed, certification will be invalidated. The gland is not serviceable and spare parts are not supplied.

Limitations on Usage. Be sure your installation complies with the following:

Feature	**Comment**
Enclosure entry thread	The female thread in the entry enclosure must comply with clause 5.3 of IEC/EN 60079-1. Do not damage threads on assembly . Check that the number of fully engaged threads is at least 5.

Interpretation of Markings. Markings on the outside of this gland carry the following meanings:

Cable Gland Type and Size	
CR	Product range
U	Gland over the counter for unarmoured cable Seal type: epoxy resin-based sealant *(temperature -60 °C to +85 °C)*
2	Continuity washer option for lead sheathed cable
B	Main component material, B=brass, S=stainless steel
20S	Gland size
PG16	Entry thread type and size Year code: XX
ATEX marking *(directive 94/9/ES)*	
Ex	European explosive atmosphere symbol
I M2	Mining equipment, category 2
II 2	Non-mining equipment, suitable for use in category 2, zone 1, 2, 21, 22
G	Type of explosive atmosphere - gas
D	Type of explosive atmosphere - dust

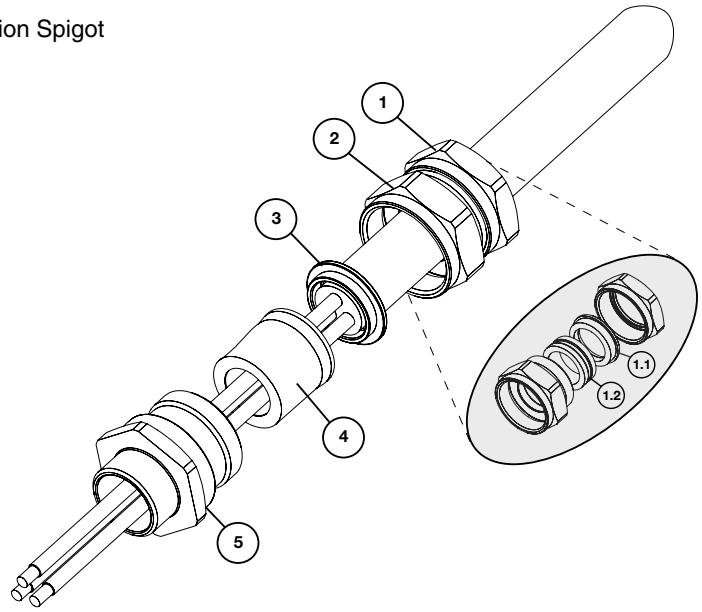
CENELEC certification marks	
E	Conformity with European standard
Ex	Symbol of protection against explosion
d	Type of protection: d=flameproof
I & IIC	Code for group of gases suitable for group I *(for example Methane)* and group IIC *(for example hydrogen)* flammable gases/ air mixtures and also groups IIA and IIB
03	Year of certifications
ATEX	Certified conformity with standard ATEX 94/9/ES
1479	Serial number of certification
X	These glands must not be used with enclosures where the temperature at the point of mounting exceeds -60 °C to +85 °C

Instruction for Use no. N740052 – issue no.1
Non-explosive cable bushings, type ICG 623

Assembly Instructions for cable gland: ICG 623 Exd IIC/Exe II
Certificate BASEEFA No. BAS 01 ATEX 2079X *(Ex)* II 2 GD IP66 CE 623 EExd I/EExe I
Certificate BASEEFxA No. BAS 02 ATEX 0177X *(Ex)* IM 2 IP66 CE
Operating temperature range -60 °C +80 °C

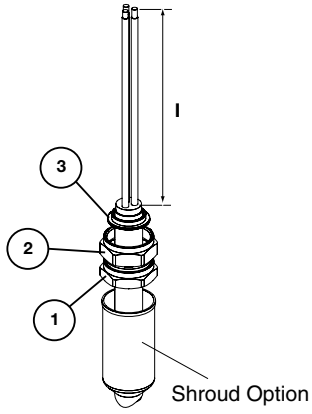
Assembly Instructions AI 305 / Issue L - 08/06
HAWKE International

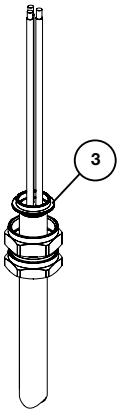
1. Backnut
   1.1 Rear Compression Spigot
   1.2 Rear Seal
2. Middle Nut
3. Pot Cap
4. Rubber Pot
5. Entry

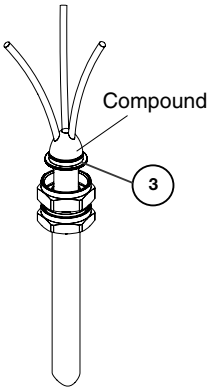


Detail for specification.
The parts 1 and 2 should not be dismounted.

Cable Preparation ***Gland Preparation***



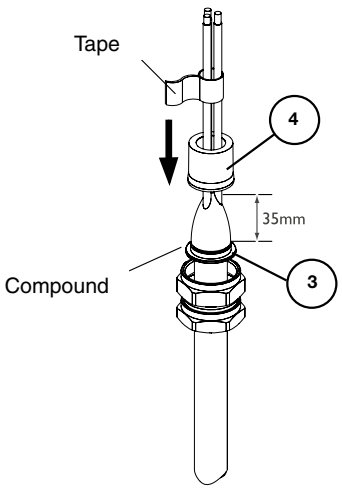




A
Strip Cable to suit equipment as shown above,
removing all cable fillers.
Length l to suit equipment.
If required, fit shroud.
See Notes re. Drain Wires.

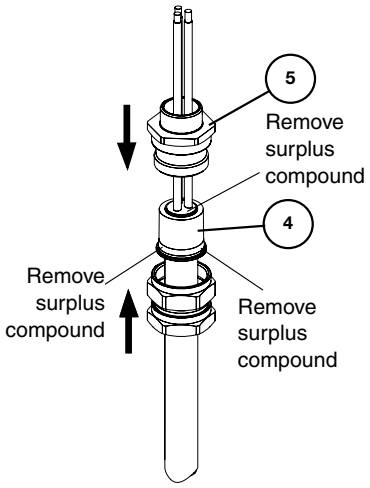
B
Position rear of pot cap *(3)* level with prepared face
of cable insulation, ensuring that the cap remains
concentric to cable at all times.

C
Spread the cable cores out for the compound packing.
Pack the compound between the cores as shown.
See notes overleaf and Fig. 7 for compound preparation.



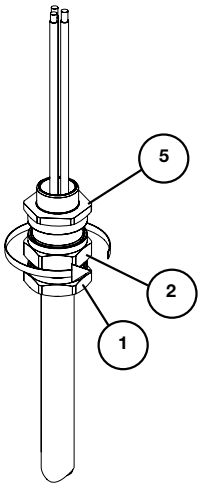
D

With all gaps and voids filled, bring the conductors back together and pack more compound around the outside of the conductors. Tape the conductors together to prevent disturbance of the compound seal. Pass the rubber pot *(4)* over pot cap *(3)* and remove any surplus compound from the top of rubber pot *(4)* and joint faces as indicated.



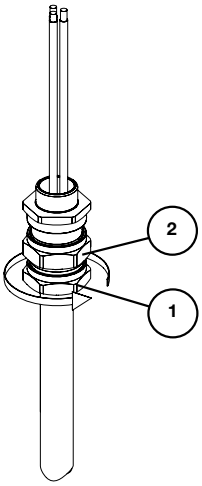
E

Replace the entry *(5)* over the rubber pot *(4)* ensuring that compound does not cover end of rubber pot *(4).*



F

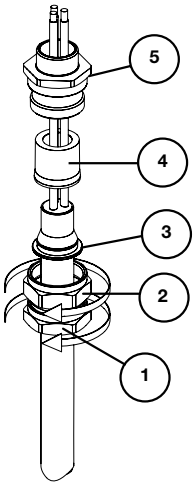
Locate and hand tighten the sub-assembly *(1)* and *(2)* to the entry *(5).*



G

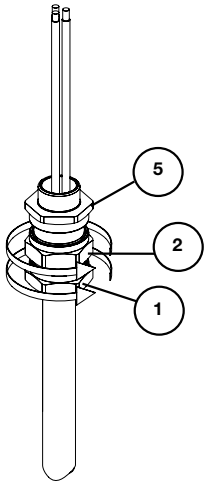
To further locate and support the compound and rubber pot assembly, while holding the middle nut *(2)* with a spanner/wrench, tighten the backnut *(1)* until the seal grips the cable to prevent movement of the cable gland.

Important note:
The conductors must not be moved for a minimum of four hours.



H

Allow the compound to cure. *(See Fig. 7 for Curing Times).*
Untighten firstly the backnut *(1)* from *(2)* and secondly the middle nut *(2)* from the entry *(5).* The rubber pot *(4)* may be removed for inspection to ensure that the packing is satisfactory. Add further compound if necessary.



I

Re-assemble rubber pot *(4)* and the entry *(5).* Hand tighten the sub-assembly *(1)* and *(2)* to the entry *(5)* and add half a turn to *(2)* with a spanner/wrench. Tighten the backnut *(1)* to form a seal around the cable, then tighten a further half to full turn using a spanner/wrench. Ensure that the middle nut *(2)* does not rotate when tightening the backnut *(1).* Locate the shroud over the cable gland if applicable.

EPOXY COMPOUND PREPARATION

When handling this material, the gloves supplied must be worn. The epoxy compound is supplied in the form of a two part package. These should be mixed into the ratio of I: I until both colours have blended into one, without any streaks. Rolling and folding is the most satisfactory method of obtaining an even blend. Once mixed, the compound must be used within 30 minutes. After this time it will begin to stiffen. The compound should be kept at an ambient temperature of no less than 20 °C prior to using.At lower temperatures it becomes difficult to mix. Should any compound come into contact with the skin it should be cleaned off with skin cleaner and not allowed to dry on the skin. Only compound for immediate terminations should be mixed.

The mixing and installation of the compound at an ambient temperature below 4 °C is not recommended due to extended curing period.

The following instructions are the various BASEEFA approved methods of passing drain wires etc. through the compound barrier and should be followed if permitted by cable installation specifications.

Drain wire preparation

1.0. Insulating drain wires with heat shrink or cold shrinktubing

1.1. Fold back the armour I braid and bend it to right angles from the inner sheath.

1.2. Remove foils and tape level with the outer sheath. exposing the drain wires and insulated conductors. Cut back a further 10 mm of inner sheath.

1.3. Pass 100 mm length of heat shrink or cold shrink tubing over the drain wire until it comes into contact with the foils, then shrink the tubing evenly down onto the drain wire so that no air pockets occur.

1.4. To insulate the joint between the foils and the tubing a suitable piece of 10 mm long shrink tubing or neoprene stretch tubing or a 10 mm wide lap of PVC tape may be used.

1.5. After completing 1.1 to 1.4 on each drain wire, lay the armour I braid parallel to the cable, if applicable, then carry out instruction B.

2.0. Insulating drain wires i screens with separate insulated crimped conductors or soldered connection

2.1. Fold back the armour I braid and bend to right angles from the inner sheath.

2.2. Remove a further I 5mm of inner sheath *(See Fig. I).*

2.3. Unravel one or two groups of wires from the screen wires, then remove the remainder of the screen wires *(See Fig. 2).*

2.4. Twist the group of screen wires into a pigtail and cut to 15 mm long.

2.5. Crimp an insulated conductor to the pigtail wih a suitable insulated butt ferrule *(or soldered connection),* leaving enough length of the insulated conductor to enable the remote end to be connected to the earth terminal in the equipment. *(See Fig. 3).*

Note: *There shall be a minimum of I Omm of compound on both ends of the crimped I soldered joint.*

2.6. To insulate the joint between the screen wires and the insulated conductor, place one lap of PVC insulating tape over the exposed metallic joint.

2.7. After completing 2.1 to 2.6 on each drain wire. lay the armour I braid parallel to the cable. Then carry out instruction B.

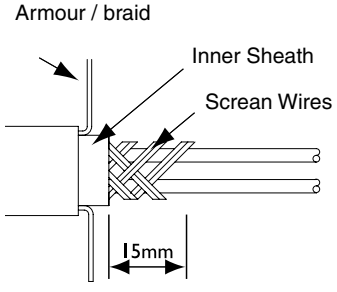


Fig. 1

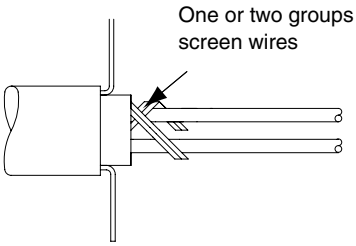


Fig. 2

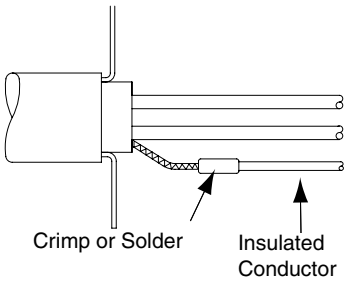


Fig. 3

3.0. Insulating drainwireswith insulating varnish or paint

3.1. Fold back the armour I braid and bend it at right angles from the inner sheath.

3.2. Remove the foil and tape level with the inner sheath exposing the drain wires and conductor pairs.

3.3. Cut back a further 10 mm of inner sheath *(See Fig. 4).*

3.4. Spray or paint the drain wires with insulating varnish or paint, then leave to dry *(See Fig. 5)*

3.5. To insulate the foil ends a suitable piece of 10 mm long shrink tubing or neoprene stretch tubing or a 10 mm wide lap of PVC tape may be used *(See Fig. 6).*

3.6. After completing 3.1 to 3.5 on each drain wire, lay the armour I braid parallel to the cable. Then carry out instruction B.

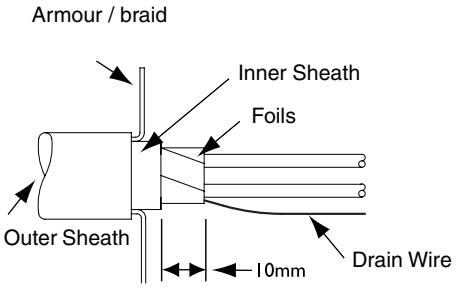


Fig. 4

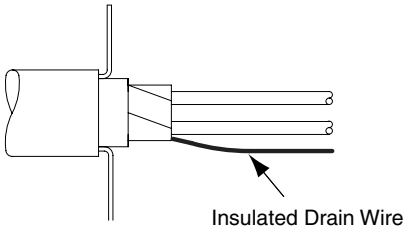


Fig. 5

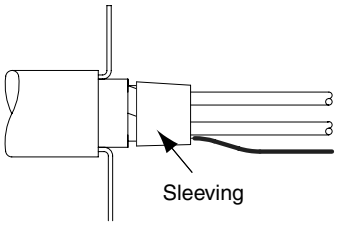


Fig. 6

Epoxy Compound Cure Time Vs. Temperature

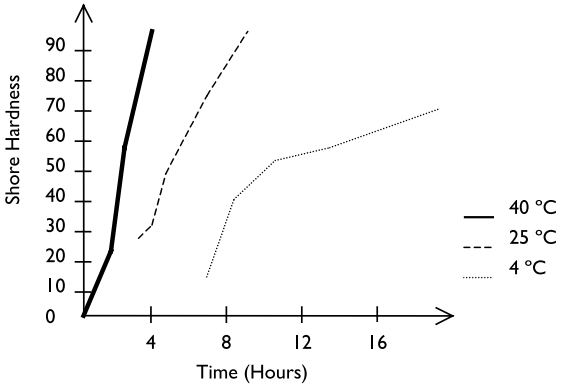


Fig. 7

- The compound may be adversely affected by some solvent vapours.If such vapours are likely to be present in the vicinity of the cable gland in service, suitable precautions may be necessary. *(Contact Hawke's Technical Dept).*

- The compound cures at a Shore D hardness of 85, when it can be handled. The compound when fully cured is suitable for use at a temperature range of -60 °C to +80 °C.

CABLE GLAND SELECTION TABLE

Size Ref.	Entry Thread Size		Cable Acceptance Details							Max. Length	Hexagon Dimensions	
			Inner Sheath/Cores			Outer Sheath						
						Standard Seal		Alternative Seal (5)				
	Metric	NPT	Max. Over Cores	Max. Inner Sheath	Max. No. of Cores	Min.	Max.	Min.	Max.		Across Flats	Across Corners
Os	M20	½"	8.0	8.0	6	3.0	8.0	-	-	66	24.0	27.7
O	M20	½"	8.9	10.0	6	7.5	11.9	-	-	66	24.0	27.7
A	M20	½" – ¾"	11.0	12.5	10	11.0	14.3	8.5	13.4	63	30.0	34.6
B	M25	¾" – 1"	16.2	18.4	21	13.0	20.2	9.5	15.4	68	36.0	41.6
C	M32	1" – 1¼"	21.9	24.7	42	19.0	26.5	15.5	21.2	70	46.0	53.1
C2	M40	1¼" – 1½"	26.3	29.7	60	25.0	32.5	22.0	28.0	72	55.0	63.5
D	M50	1½" – 2"	37.1	41.7	80	31.5	44.4	27.5	34.8	87	65.0	75.1
E	M63	2" – 2½"	48.8	53.5	100	42.5	56.3	39.0	46.5	90	80.0	92.4
F	M75	2½" – 3"	59.0	65,3/66,2	120	54.5	68.2	48.5	58.3	92	95.0	109.6

Limiting conditions:

1. Cable bushings OS and O can only be used for braided cables and firm instruments; the cable should be properly fixed to prevent its possible pulling out or twisting.
2. Operating temperature of the cable bushing is -60 °C to +80 °C.
3. The space between the equipment and the cable bushing should be sealed in order to preserve particular degree of protection against penetration of dust, solid particles, and water.

Accessories:

Before assembling or dismounting the cable bushing, become familiar with accessories of the cable bushing which include, for instance:

– coat providing additional protection against corrosion;
– safety nut securing position of the cable bushing;
– sealing washer under the additional protection of the cover of the cable bushing front part against penetration;
– knurled washer damping vibrations that could loosen the safety nut or the cable bushing assembly

6.2 Adjusting procedure of the actuator

The actuator has been adjusted at the factory. If no readjustment is required, e.g. a smaller working stroke or after a repair, it is inadvisable to make any adjustment.

Adjustment of the position-limit and signalling microswitches

Move the output shaft to the position in which the microswitch should operate. Loosen the bronze safety nut, which is also used as a guide bush for the camshaft first and then the milled nut securing the position of cams against angular displacement. By turning the respective cam in the direction in which it runs on the microswitch lever from its point turning, set such a position of the cam in which the microswitch just operates. After adjustment, secure the cam in position by retightening both the milled and the safety nuts. The signalling switch should be adjusted so that it operates before the corresponding position-limit switch.

***Warning*:**

The dead stops within the actuator have been designed to provide for the working stroke of 90° ±3°. Thus, when readjusting the position-limit cams, care should be taken to ensure that the position-limit microswitches open always before the output shaft bears on the dead stops. Due to the fact that the actuator incorporates no torque-tripping facility, it might be brought into short-circuit operation and thus damaged if the limit microswitch fails to operate.

Adjustment of position transmitter

a) Adjustment of resistance transmitter

The resistance position transmitter is adjusted by moving the output shaft from one end-limit position to the other. It is thus automatically adjusted.

b) Adjustment of resistance transmitter with converter RNI-TR

The converter requires no setting. Just the resistance transmitter is to be set as referred to in its manual.

c) Adjustment of transmitter DCPT2

1. Adjustment of limit positions

Before starting the setting, verification must be carried out that the end-limit positions are within the range of **60° – 340°** of DCPT2 rotation. Otherwise, an error occurs after the setting *(LED blinks 2x).*

1.1. Position "4 mA"

Set the drive to its required position *(e.g. Closed)* and keep depressed the push-button **"4"** until the LED blinks *(about 2 s).*

1.2. Position "20 mA"

Set the drive to its required position *(e.g. Open)* and keep depressed the push-button **"20"** until the LED blinks *(about 2 s).*

2. Setting of rotation sense

The sense of DCPT2 rotation is determined when viewing from the shaft side.

When the sense of rotation is changed the positions **"4 mA"** and **"20 mA"** are preserved but the working range *(track of DCPT2)* between these points is changed to a supplement of the previous working range. In this way, the permitted working range can be exceeded *(LED 2x).*

2.1. Right-hand

Press the push-button **"4"** and then the push-button **"20";** keep them depressed until LED blinks.

2.2. Left-hand

Press the push-button **"20"** and then the push-button **"4"**; keep them depressed until LED blinks.

3. Error messages

In case of an error the diode LED blinks an error code:

1x	Sensor position out of working range;
2x	Wrong setting of working range;
3x	Out of tolerance level of magnetic field;
4x	Wrong parameters in EEPROM;
5x	Wrong parameters in RAM.

4. Calibration of currents 4 mA and 20 mA

Switch on the power supply while keeping the push-buttons "4" and "20" depressed; release them after LED blinks once. Entry to the option 4.1 Calibration 4 mA is thus realized.

4.1. Calibration of current 4 mA

Connect an ammeter to the testing terminals. Press the push-button **"20".** Keep the push-button depressed to evoke repeated current decrease. Release the push-button to record the contemporary value.

4.2. Calibration of current 20 mA

Connect an ammeter to the testing terminals. Press the push-button **"4".** Keep the push-button depressed to evoke repeated current increase. Release the push-button to record the contemporary value.

4.3. Switching between the option of calibration 4 mA and 20 mA

Entry to the option of calibration 4 mA:

Press the push-button **"4"** and then the push-button **"20";** keep them depressed until LED blinks.

Entry to the option of calibration 20 mA:

Press the push-button **"20"** and then the push-button **"4";** keep them depressed until LED blinks.

5. Record of standard parameters

Switch on the power supply while keeping the push-buttons **"4"** and **"20"** depressed; release them after LED blinks twice.

ATTENTION! In this record, the transmitter calibration is also overwritten; it is thus necessary to carry it out again!!

7. UNPACKING AND STORING

The actuators are packed in such a way that, during transport, the risk of damage is completely avoided; different types of packing are used, depending on the method of transport and the distance to the place of destination. For delivery of the actuators to the areas with difficult operating conditions, their packing should be hermetically sealed with desiccants therein.

Upon receipt of the actuators from the manufacturer, it is essential to check that no damage was caused during transport and to compare the data on the actuator rating plates with those contained in the order and accompanying documentation. Any discrepancies, defects or damages should immediately be reported to the supplier.

When the actuator, after it has been unpacked, is not installed outright it should be stored at a dust-free location with a temperature range of -25 °C to +55 °C and relative humidity up to 80% aggressive gases or vapours and free of secured against harmful effects of climatic conditions.

8. OPERATION AND MAINTENANCE

Depending on the operating conditions, the operation of electric actuators usually involves only the transmission of pulses, as required for the individual functions. In the event of a power supply failure, readjust the controlled device by the handwheel. Manul control is only possible with the actuator at rest. During operation of the electric motor, the handwheel is rotating. Care should be taken to ensure that the handwheel cannot be held back anyway.

It is the operator's duty to ensure that the electric actuator is given the specified maintenance attention and that the rating plate values of the actuator are not exceeded.

Maintenance of the actuator involves replacing faulty parts, if required. Moreover, it is essential that the teeth of the transmitter drive gear and slide bearing are lightly smeared with grease every two years. The actuator gearbox has been packed with grease for its service life of 6 years. If the actuator is capable of operating even after 6 years of operation the gearbox should be filled with fresh grease again after old grease has been removed from it.

The **KP MINI EEx** electric actuators, Type No. 52 998, should be kept clean, taking care to ensure that they are not clogged with dirt and dust. It is essential to make sure, from time to time, that all connecting and earth terminals are properly tightened so that they cannot heat up during operation.

It is recommended that the actuator is subjected to an overhaul at least yearly, unless otherwise specified in the inspection regulations of electrical equipment.

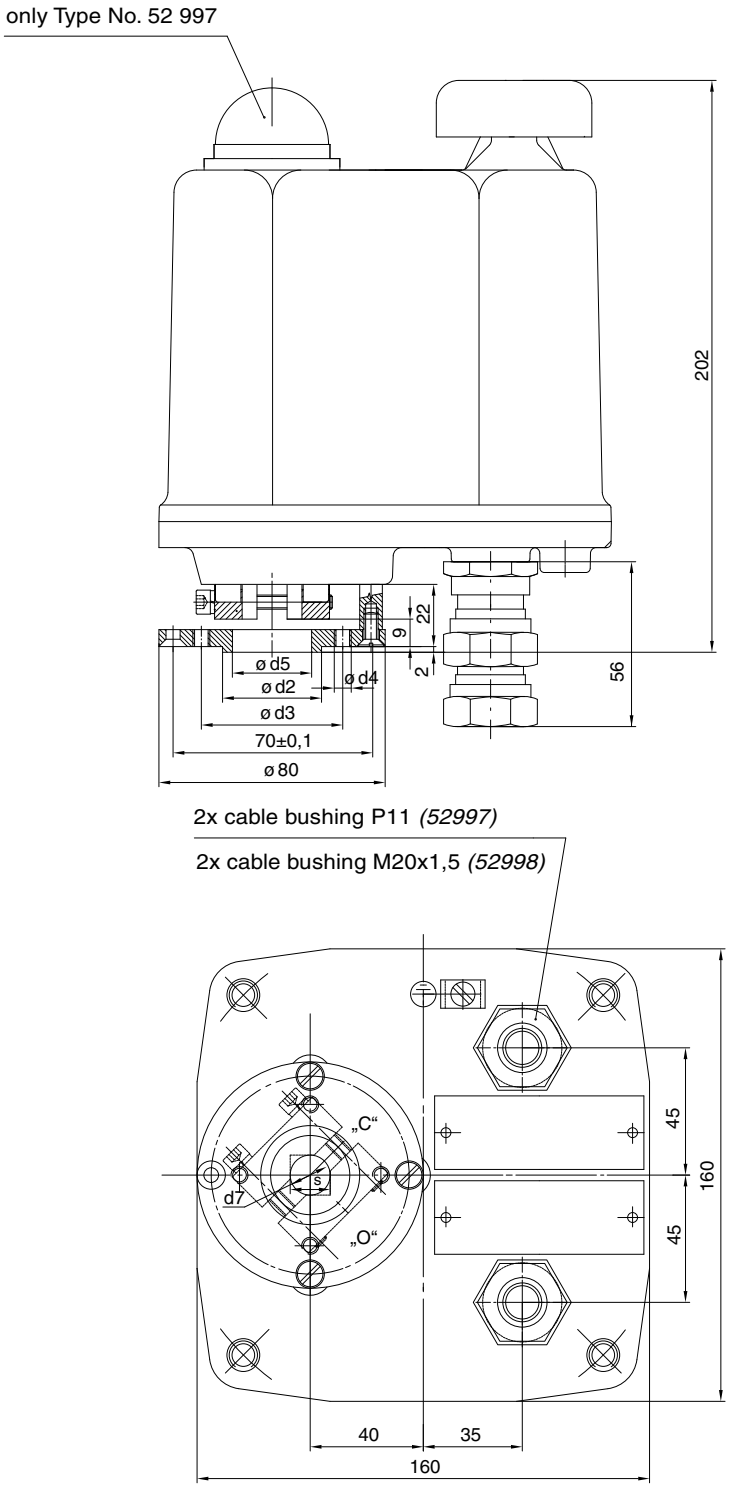
The actuator parts constituting a fixed closure *(gear cover and box)* should be checked to ensure that they have not been broken or damaged anyway *(corroded, rubbed out, and the like).*

After disconnecting the electric actuator, the sealing rings of cable bushings should be checked. No faulty parts of the closure should reused during mounting of the actuator. In the event of any major repair of the explosion-proof closure that might adversely affect actuator safety, it is advisable to forward the KP MINI EEx electric actuator to the manufacturer for repair, who can put the closure back into the state corresponding to EC 50014 and EN 50018, according to the approved documentation and specified tests ČSN EN 60079-0:2004 and ČSN EN 60079-1:2004 for explosive gaseous atmosphere.

9. SPARE PARTS *(recommended for current maintenance)*

Designation	Use
Microswitch DB1G - A1LC	PO, PZ, SO, SZ
O-ring 140 x 3 ČSN 02 9281.2	Packing between the cover of the control section and gearbox
O-ring 8 x 4 ČSN 02 9280.2	Sealing of the shaft in the cover of the control section
ICG 623/A M20x1,5	Sealing of the power supply cable for design variant EEx, Type No. 52 998

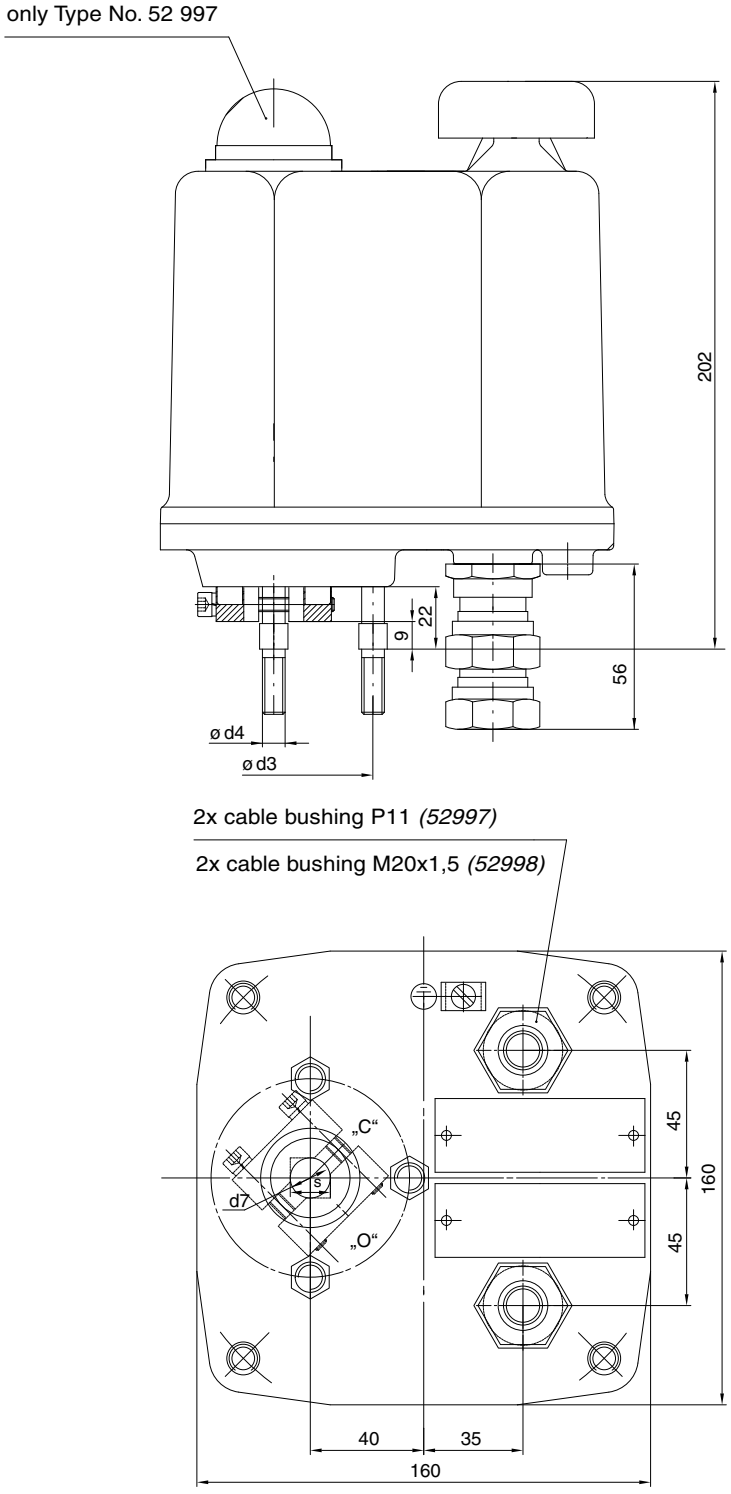
Dimensional sketch of the **KP MINI** electric actuators, Type No. 52 997, 52 998
design with flange F03, F04, F05 *(actuator in OPEN position)*



Connecting dimensions for actuator connection to a valve
(any other connection should be consulted with the manufacturer beforehand).

Flange	Dimension					
	d2	**d3**	**d4**	**d5**	**s**	**d7**
FO3	25	36	M5	20	9–14	12–20
FO4	30	42	M5	25	9–17	12–22
FO5	35	50	M6	28	9–17	12–22

Dimensional sketch of the electric actuators, Type No. 52 997, 52 998
design with flange F07 *(actuator in OPEN position)*



Connecting dimensions for actuator connection to a valve
(any other connection should be consulted with the manufacturer beforehand).

Flange	Dimension					
	d2	**d3**	**d4**	**d5**	**s**	**d7**
FO7	-	70	M8	-	9–17	12–22

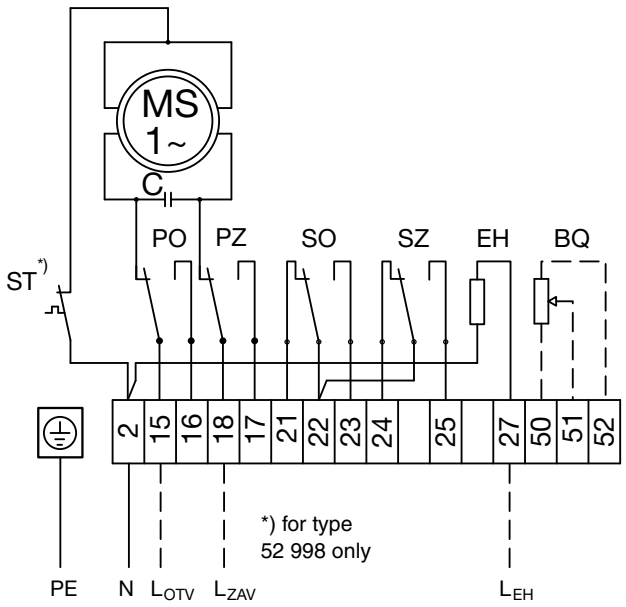
Internal wiring diagrams of theelectric actuators

Legend:

PO	open position-limit switch
PZ	close position-limit switch
SO	open signalling switch
SZ	close signalling switch
EH	anti-condensation heater
BQ	position transmitter
MS1~	single-phase motor
C	motor capacitor
M~	direct current electric motor
ST	thermostat *(only Type No. 52 998)*
DO, DZ	diodes for connecting respective position -limit switches *(according to sense of rotation of the motor)*
ZP2.RE	three-position motor regulator

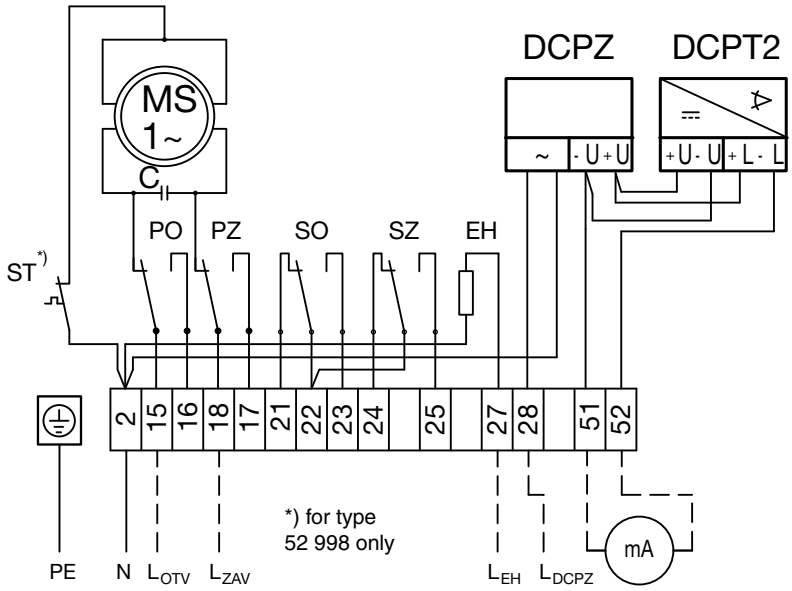
Internal wiring diagram of electric actuators **KP MINI**

P0853



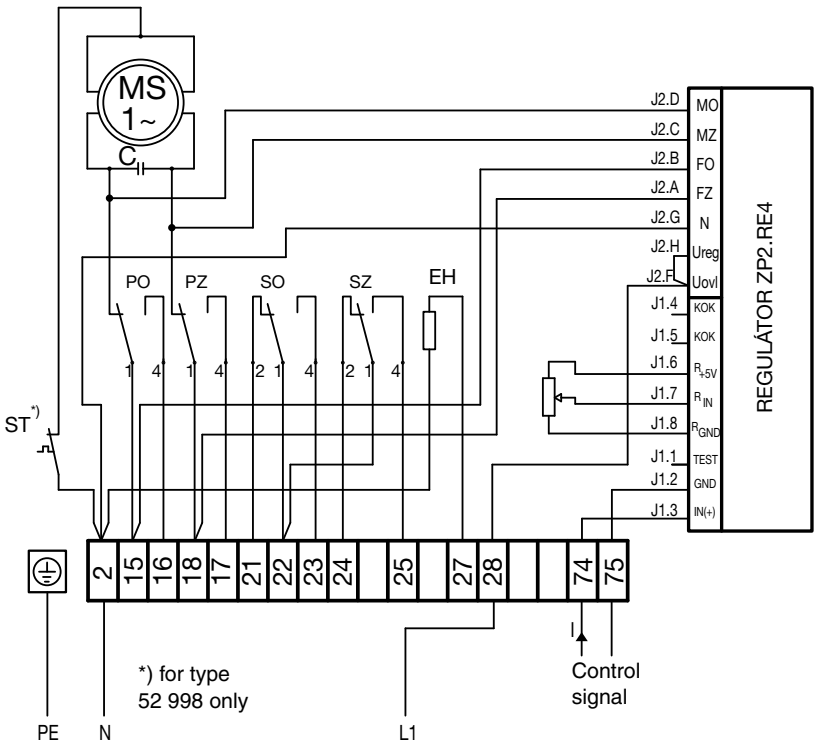
Internal wiring diagram of electric actuators **KP MINI**
with current transmitter of position DCPT2

P0853-E



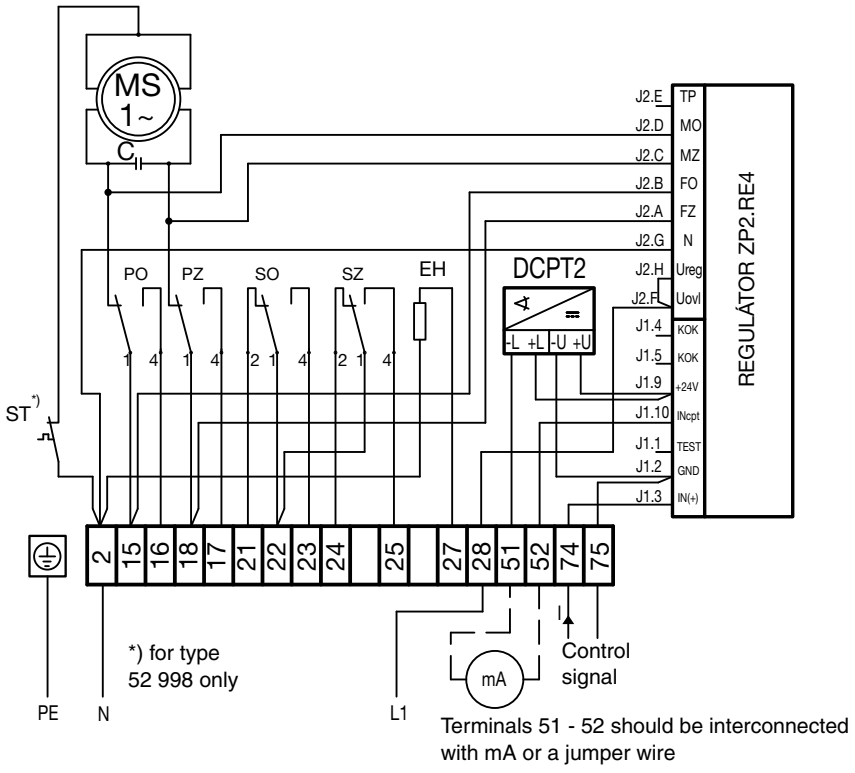
Internal wiring diagram of electric actuators **KP MINI**
with position regulator and resistance transmitter

P0850



Internal wiring diagram of electric actuators **KP MINI**
with position regulator and current transmitter DCPT2

P0850-E



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

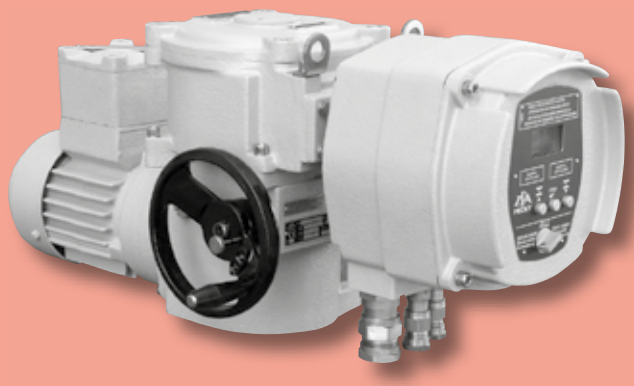
MODACT MPR Variant
Electric rotary (160°) lever actuators with a variable output speed

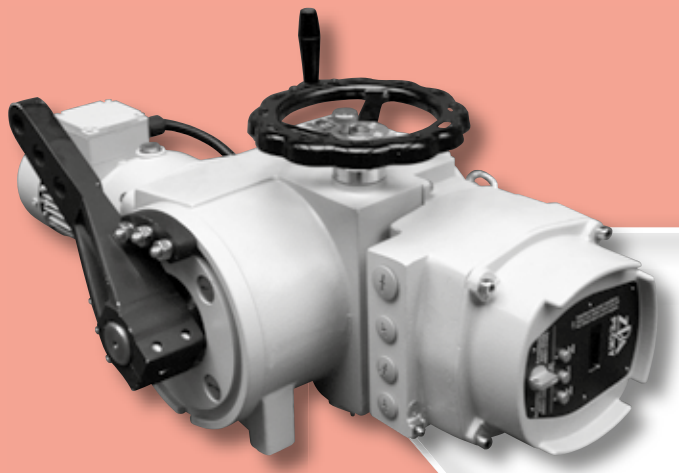
MODACT MPS, MPSP, MPSED, MPSPED
Electric rotary (160°) lever actuators with a constant output speed

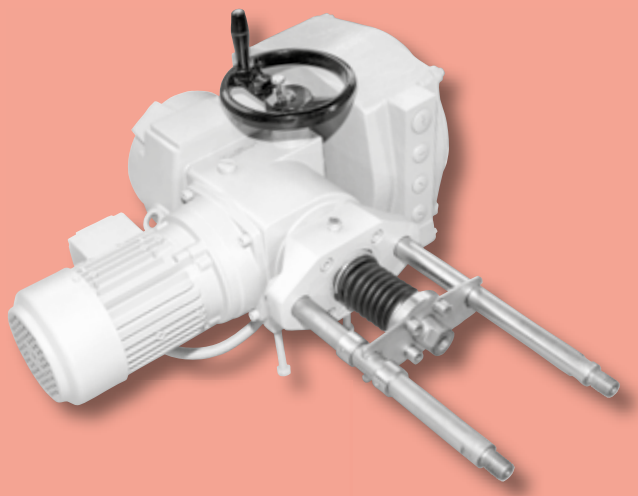
MODACT MTN, MTP, MTNED, MTPED
Electric linear thrust actuators with a constant output speed

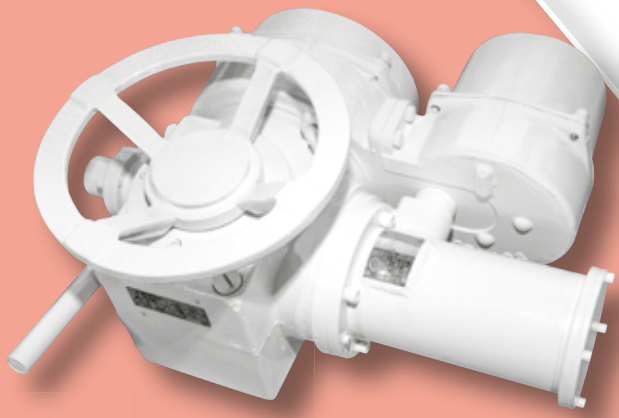
Deliveries of assembled actuator + valve (or MASTERGEAR gearbox) combinations

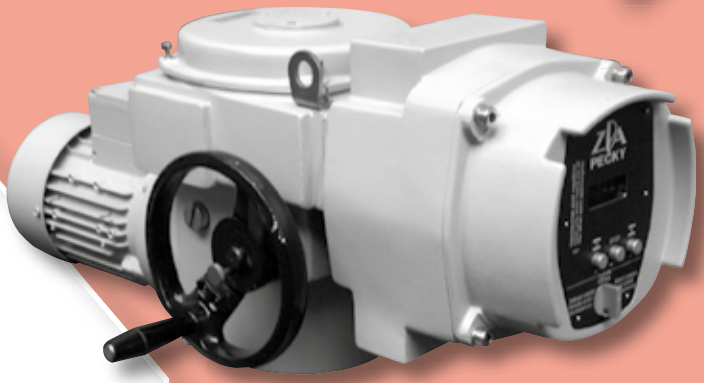
TRADITION • QUALITY • RELIABILITY

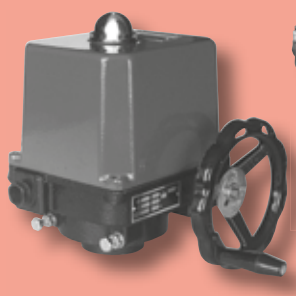


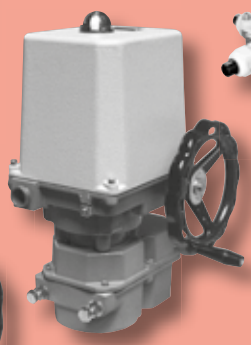












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