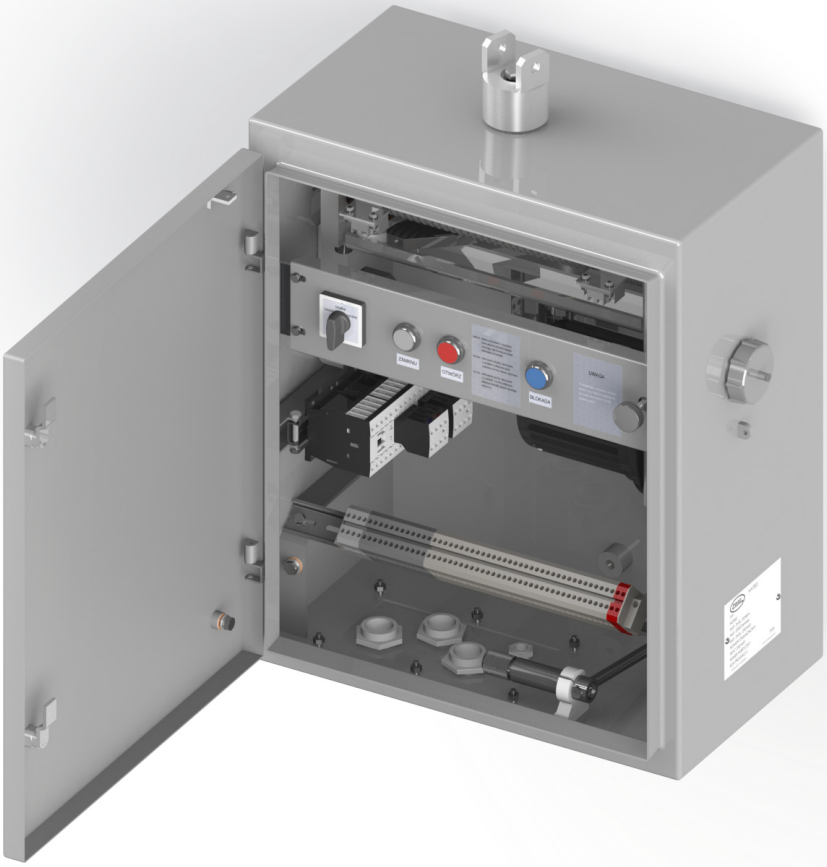
Zakład Wytwórczy Aparatów Elektrycznych Sp. z o.o.

Installation and Service Manual



NSO80

Motor operating mechanism

Manual No. DTR.05.07.07.EN

We connect with ENERGY

WARNING!

During the operation of electrical equipment, certain parts of these devices are normally under dangerous voltage, and mechanical parts, also remotely controlled, can move quickly.

Failure to follow the warning instructions can result in serious personal injury or material damage.

Only suitably qualified personnel can work on or near the device. This personnel must know exactly all safety rules and rules for maintaining the device in accordance with these instructions.

The problem-free and safe operation of this device requires proper transport, proper storage, construction and assembly as well as careful service and maintenance.

Table of contents

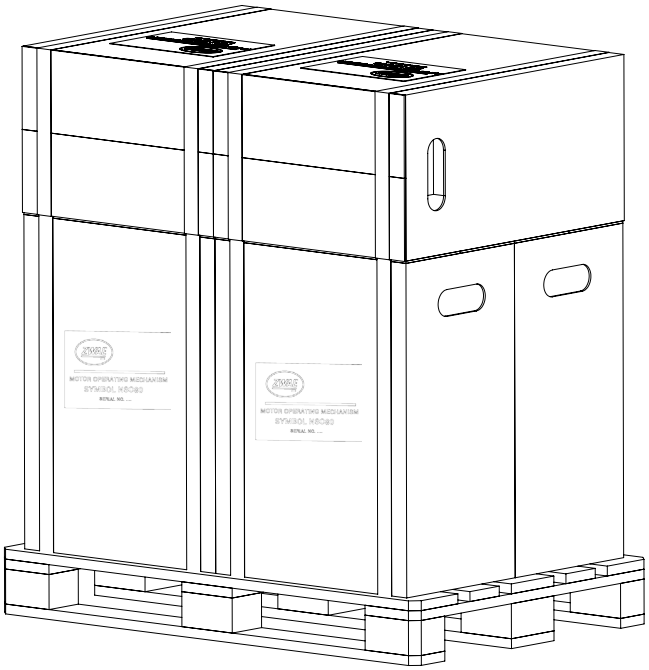
1. TRANSPORT

1.1. Unpacking and inspection

Immediately after receiving the operating mechanism the recipient should check delivery compliance with the packing list. Then the recipient should check whether the operating mechanism has not been mechanically damaged during transport and the data on the nameplate match the order.

The operating mechanism is transported in cardboard box. They are delivered to the recipient in completely assembled condition.

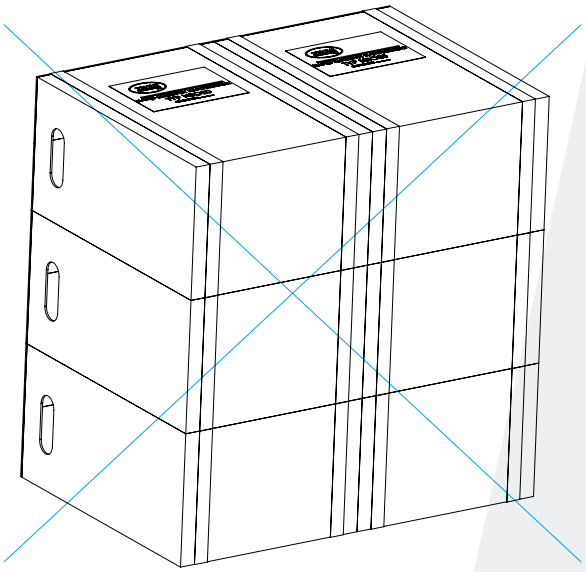
The operating mechanisms are delivered to the customer on a pallet (figure below). We suggest moving cardboards by grabbing the tapes used to pack the operating mechanisms.



1.2. Storage and transport

The operating mechanisms can be transported / moved to a place of storage and installation by any means of transport, provided they are secured from moisture. During transport they should be secured against moving and colliding with each other and vehicle's parts. An additional protection for a longer transport or storage is a bag with a moisture-absorbing substance. It must be removed from the operating mechanism immediately before switching on the heater.

It is forbidden to store operating mechanisms on their backs on top of one another. The operating mechanisms should be laid vertically as per the sketch in point 1.1. This is the only acceptable storage system for operating mechanisms.

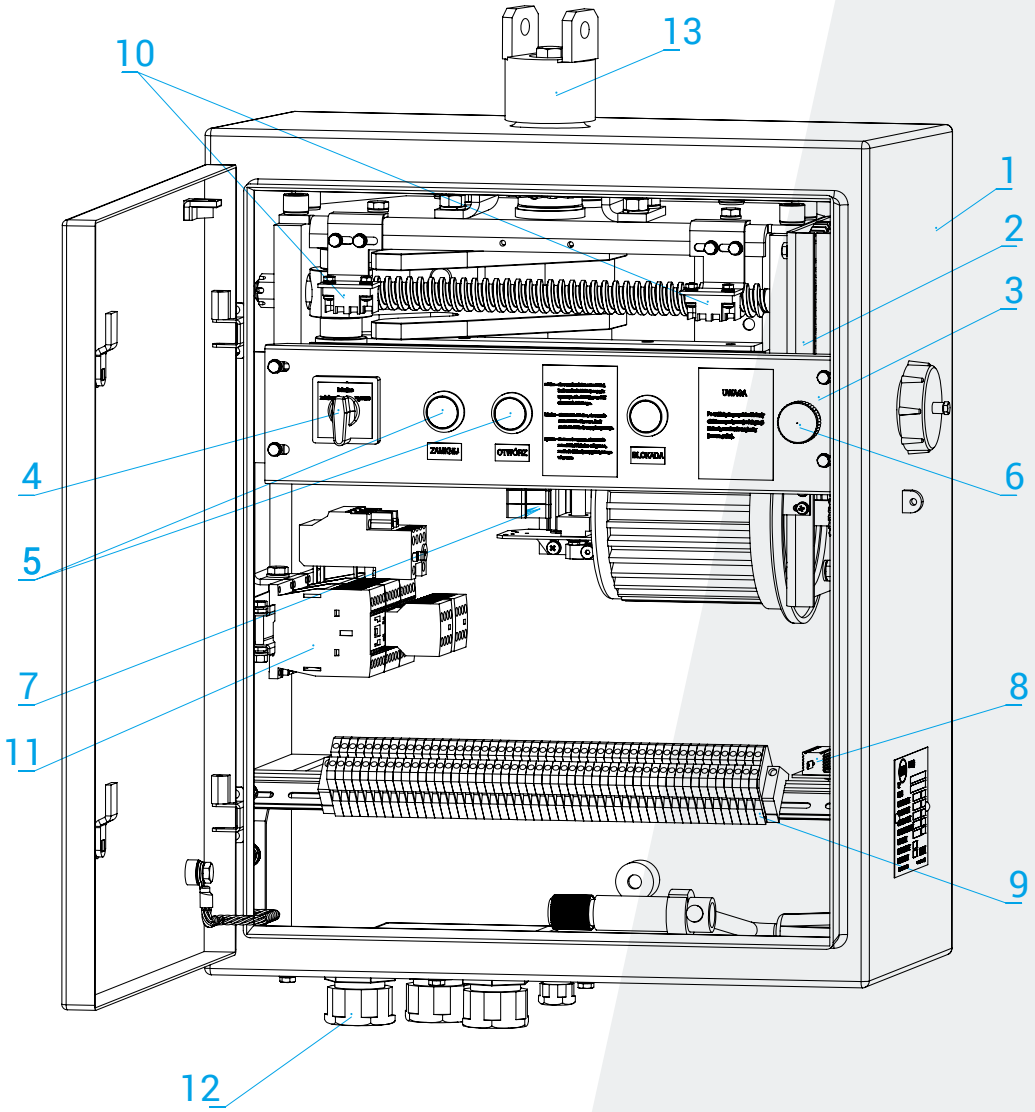


2. DESCRIPTION

NSO80 motor operating mechanisms are intended for maneuvering HV outdoor disconnectors and earthing switches which angular displacement is up to 192° and both closing and opening operations anti-torque is up to 800 Nm. The operating mechanisms are compatible with disconnectors and earthing switches produced by ZWAR, operating at 110, 220 and 400 kV voltage (e.g. ONIII110..., ONI220, ONS..., UNIII110...). They replace manual or pneumatic operating mechanisms as an upgrade of existing HV disconnectors.

2.1. Construction and principal of operation

1. housing,
2. multi-stage gearing mechanism,
3. control panel,
4. control mode switch,
5. control buttons,
6. electromagnetic locking,
7. auxiliary contact switch (NO + NC),
8. heater,
9. terminal strip for connecting control and power circuits,
10. limit switches,
11. motor supply control system,
12. cable gland,
13. driving shaft.



2.2. Housing

The housing is made of aluminium metal sheet, grade PA4, covered by powder painting epoxy color. Doors are stuffed with silicone seal. The construction of housing is on protection level IP55 with simultaneous ventilation of the interior air. It has been achieved thanks by labyrinth seal of drive shaft's output on the top of housing and using net-protected gland hole in the bottom of housing.

2.3. Driving mechanism

Driving mechanism consists:

- electric motor,
- multi-stage gearing,
- helical gear,
- gearing.

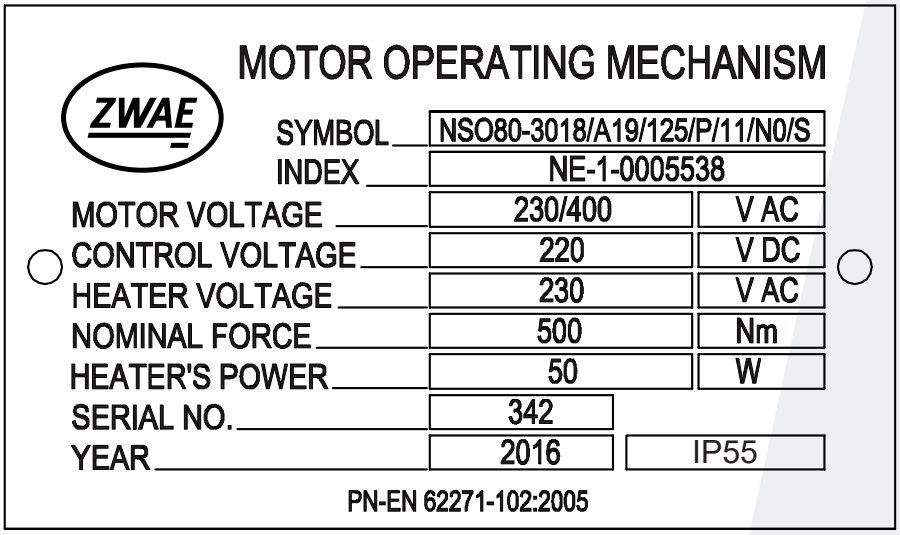
The electric motor drives a lead screw through a two-stage gearing. As a result of rotation of the screw, the nut mounted on the screw moves along the screw causing rotation of the cooperating forks. A gear wheel is mounted on the shaft of the fork, cooperating with the gear mounted on the driving shaft. As a result of using a helical gear unit, the angle of rotation of the output shaft is limited to 192 °. The maximum torque is about 800 Nm.

2.4. Climatic conditions

Operating mechanisms are dedicated to outdoor switchgears in the following conditions:

a) temperature (from – 50°C to + 40°C),
b) air humidity (up to 100% at 20°C),
c) altitude (up to 1000 m),
d) wind speed (up to 30 m/s).

2.6. Nameplate



2.6. Basic technical parameters

No.	Parameter	Value
1.	Rated voltage / rated current: - squirrel-cage motor - series motor	3x 400 VAC / 4,5 A 220 VDC / 4 A 110 VDC / 10 A
	- contactor coil of motor supply voltage control (depending on motor rated voltage)	220 VDC 110 VDC
	- contactor coil	220 VDC 230 VAC 110 VDC 110 VAC
	- heater	230 VAC 220 VDC
	- electromagnetic lock	220 VDC 110 VDC

No.	Parameter	Value
2.	Rated power: - squirrel-cage motor - series motor	750 W 500 W
	- contactor coil	7W
	- heater	25W
	- electromagnetic coil	7W
3.	Shaft torque - rated - maximum	300/500/1000 Nm 500/800/1600 Nm
4.	HV switching time	7s; 11s; 16s
5.	Main shaft angular displacement	90°; 125°; 192°
6.	Maximum conductor cross section	4 mm^2
7.	Enclosure protection rating	IP 55
8.	Operating mechanism's weight	ca. 56 kg
9.	Rated mechanical strenght	2000 cycles

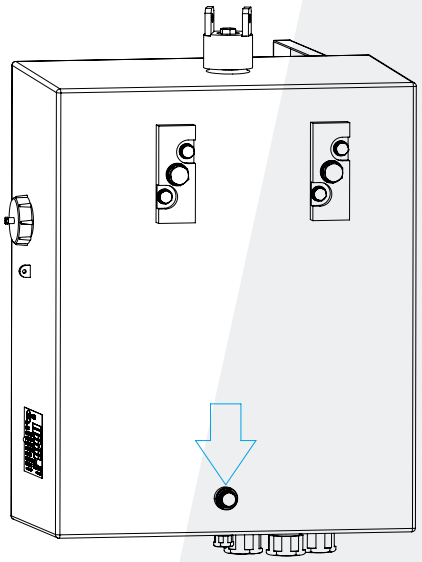
3. INSTALLATION AND ADJUSTMENT

3.1. Coupling with disconnectors ONIII 110 and 220kV

For coupling operating mechanism with disconnectors is used coupling shaft with a joint.
The end of the shaft is adapted to a particular type of apparatus. To fasten the operating mechanism are used lattice structures adapted to the customer's needs.

3.2. Protective earthing connection.

For earth connection is used a terminal shown on dimensional drawing. The terminal consists M12 screw and a washer. The cross-section of the rail connecting operating mechanism to the switchgear's earth connections ought to be chosen in accordance with legal regulation in force.
Prior to connecting of protective grounding to the operating mechanism's housing, carefully clean the earthing terminal's surface. At the end of earthing rail ø13 hole for fastening screw ougth to be drilled. After smoothing the surface and lubricating the hole, using petroleum jelly, it's allowed to assembly the rail to earthing terminal, with paying attention to precise bolting on the screw.



3.3. Connection of control and auxiliary circuits

Control cable should be entered into housing through the gland in operating mechanism's duct plate. Connection of control cable's wires with an operating mechanism's terminal strip should be performed in accordance with proper switchgear's project. When connecting the motor supply voltage, pay special attention to maintain correct phase sequence.
The electrical scheme is set individually, its paper version is supplied with the operating mechanism and its number is indicated on the nameplate.

3.4. Tests before first run

Before putting the operating mechanism into service, the quality of its assembly and the correct interaction with the apparatus must be checked. For that purpose, 10 - 20 electrically controlled shifts should be made, carefully observing the interaction of the parts. In the case of any irregularities in the operation of the operating mechanism or the apparatus cooperating with it, a re-adjustment of the respective assemblies should be carried out and the tests should be repeated.

4. OPERATING MANUAL

4.1. Manual maneuvring

Set control mode switch in 'manual' position. In that switch's position, remote and local control is disconnected. Manual drive's electromagnetic locking is ready to work.
In order to start manual drive one should:
• unscrew manual crank's socket cap (nut on the right side of operating mechanism);
• push “blockade” button;
• pull mechanical lock (black knob);
• release “blockade” button;
• insert the crank;
• turn the crank clockwise or counter-clockwise until the nut on the screw reaches the position where it switches the microswitch;
• pull mechanical lock (black knob);
• pull out the crank;
• skrew the crank's socket cap.

4.2. Local maneuvring

Set control mode switch in 'local' position. In that switch's position, remote control is disconnected and manual drive's locking is not power supplied. Local control's buttons are working. Pressing „on” button causes apparatus closing. Pressing „off” buttong causes apparatus opening. Improper buttons using does not cause apparatus damage or improper functioning.

4.3. Remote maneuvring

Set control mode switch in “remote” position. In this position buttons are unavailable and there is no power supply to the manual drive's locking.

5. INSPECTION AND MAINTENANCE

5.1. Visual inspection

It is recommended to carry out visual inspections once a year and after each failure or short circuit in the switchgear.

Check in particular:
a) condition of earthing terminal,
b) condition of coupling mechanisms,
c) condition of external parts (housing),
d) connection of wires with terminal strip, fixing of limit switches.

5.2. Spare parts and recommended maintenance materials

The use of high-quality components and operational experiences indicate the long service life of operating mechanisms (about 40 years). In case of damage to the operating mechanism due to improper assembly or operation, there is a possibility of paid repair by the manufacturer.

WHITE PHARMACEUTICAL PETROLEUM JELLY (acid-free) used for lubrication of electric contacts (earthings, contacts of HV switches);

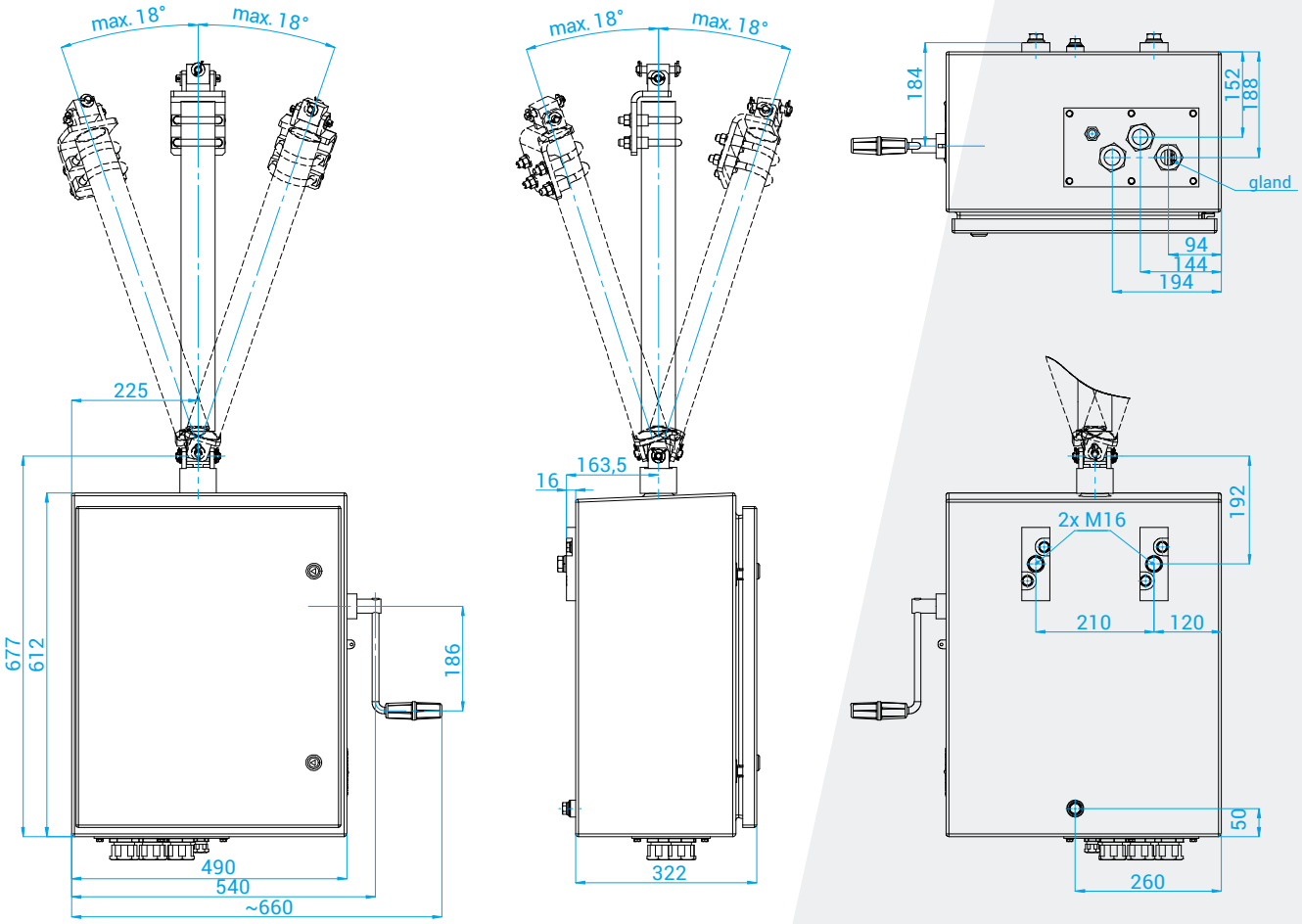
PROTECTIVE LUBRICANT TDM, in accordance with PN-64/C-96146 used for maintenance metal surfaces (articulated shaft components and coupling mechanism).

5.3. Periodic inspections

Periodic and maintenance inspections should be carried out once every 5 years. During inspection and maintenance the using of energetic devices rules and health and safety at work rules have be respected to protect carrying out the job maintenance personnel.
Check in particular:

- condition of the earthing terminal and earthing installation,
- condition of mechanisms, bearings and connection components,
- correctness of reaching limit positions,
- condition of auxiliary switches contacts,
- condition of anti-corrosion protective coatings,
- adhesion of the door cover's sealing to the housing edge,
- heater unit.

6. DIMENSIONAL DRAWING (STANDARD VERSION - 192°)



7. UTILIZATION

NSO80 type operating mechanisms are made of materials that are recyclable. The main materials from which the operating mechanisms are built are:

- steel (painted, galvanized);
- aluminium;
- plastics (epoxy mix, polyamide).

The operating mechanisms do not contain any dangerous substances. In accordance with applicable regulations, it is possible to return a worn-out, complete disconnector to the manufacturer.

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