



CATALOG

OVERHEAD MV ISOLATING SWITCHES
OVERHEAD MV CUT-OFF SWITCHES
HAND OPERATED DRIVES
AND MOTOR DRIVES
MV FUSE BASES





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CHAPTER 1

OVERHEAD ISOLATING SWITCHES

- ON III SA 24/4 (K, S)
- OUN III SA 24/4 (K, S)
- ONp III SA 24/4 (K, S)
- OUNp III SA 24/4 (K, S)
- ONM III SA 24/4 (K, S)
- OUNM III SA 24/4 (K, S)
- ONMp III SA 24/4 (K, S)
- OUNMp III SA 24/4 (K, S)
- ONp III SA 24/4o (K, S)
- OUNp III SA 24/4o (K, S)
- ONM III SA 24/4o (K, S)
- OUNM III SA 24/4o (K, S)
- ONMp III SA 24/4o (K, S)
- OUNMp III SA 24/4o (K, S)

1. CHARACTERISTICS AND INTENDED USE

The subject of the study is design documentation of overhead triple pole isolating and earthing switches manufactured by ALPAR Artur i Piotr Kowalscy Spółka Jawna.

The switches are mounted on a shared frame intended for horizontal (ON, OUN) or vertical (ONp, OUNp) installation and on one support frame (ONM, OUNM). Each pole of a switch consists of two stand-off insulators - one fixed and one moveable. There are current circuits installed on the insulators.

The switches can be equipped with porcelain, composite, or silicone insulators.

Overhead isolating switches ON (OUN) are used in power transmission networks of 15, 20, and 30 kV voltage. They are designed for connecting and disconnecting unloaded transmission lines.

Isolating earthing switches (OUN) additionally earth disconnected sections of the line.

Isolating switches ON (OUN) III SA 24/4 can also be used in branch lines powering one or more transformer stations.

ON III SA 24/4 (K, S)
OUN III SA 24/4 (K, S)
ONp III SA 24/4 (K, S)
OUNp III SA 24/4 (K, S)
ONM III SA 24/4 (K, S)
OUNM III SA 24/4 (K, S)
ONMp III SA 24/4 (K, S)
OUNMp III SA 24/4 (K, S)
ONp III SA 24/4o (K, S)
OUNp III SA 24/4o (K, S)
ONM III SA 24/4o (K, S)
OUNM III SA 24/4o (K, S)
ONMp III SA 24/4o (K, S)
OUNMp III SA 24/4o (K, S)

2. TECHNICAL DATA

Isolating and isolating/earthing switches were tested. The tests were conducted in accordance with the following standards:

IEC 62271-1:2011 High-voltage switchgear and controlgear

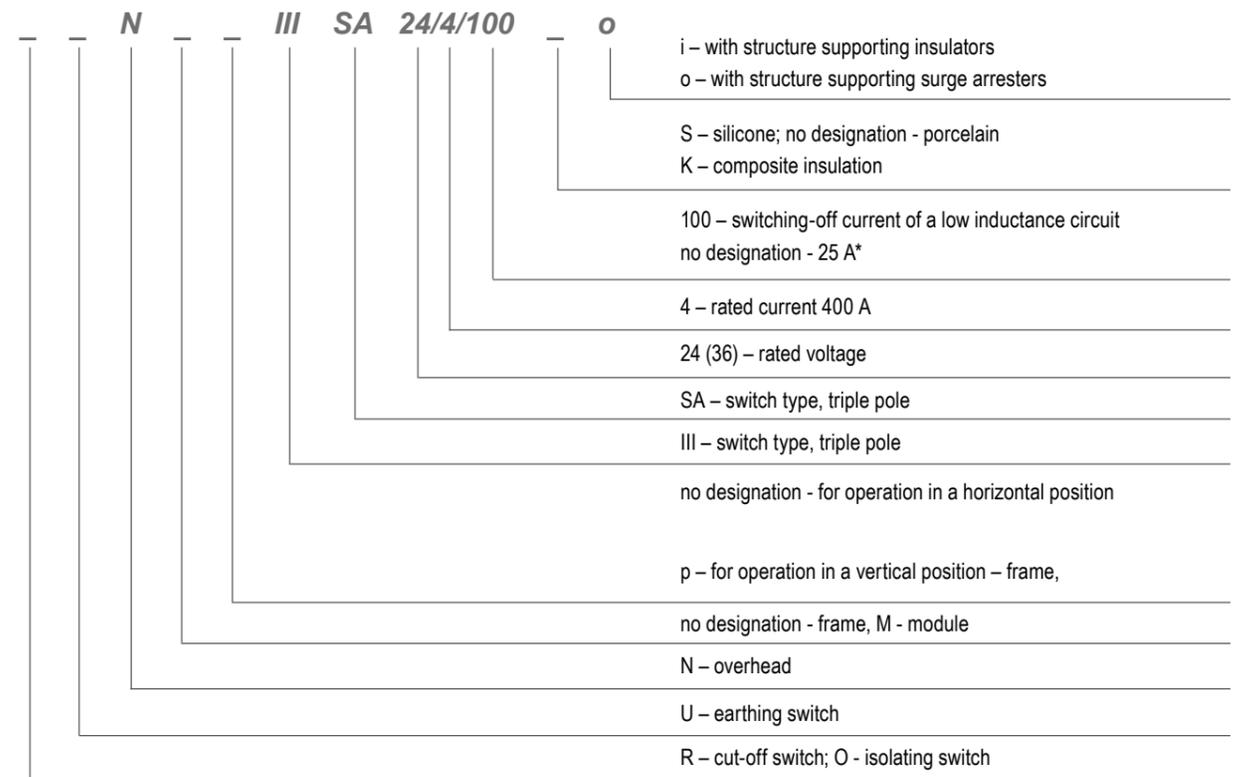
Part 1: Common specifications

IEC 62271-103:2011 High-voltage switchgear and controlgear

Part 102: Alternating current disconnectors and earthing switches

Technical data of isolating and isolating/earthing switches:	
1. Rated voltage	24 kV
2. Insulation rated level	125 kV / 50 kV
3. Insulation rated level of contact disconnection	145 kV / 60 kV
4. Rated frequency	50 Hz
5. Rated continuous current	400 A
6. Rated withstand current of the isolating and earthing switches:	
– peak value	40 kA
– short-duration within 1 second	16 kA
7. Mechanical endurance	2000 cycles Z/W
8. Number of poles	3
9. Type	overhead
Isolating switch operating conditions:	
1. Air humidity	< 100 %
2. Ambient temperature	-40 °C do + 40 °C
3. Installation height above sea level	< 1000 m

3. ISOLATING OR CUT-OFF SWITCH DESIGNATION



Designation examples:

OUN III SA 24/4

– overhead triple pole isolating earthing switch 24 kV / 400 A with porcelain insulation

RUNMp III SA 24/4

– overhead triple pole vertical module cut-off earthing switch 24 kV / 400 A with porcelain insulation

ONp III SA 24/4 S

– overhead triple pole vertical isolating switch 24 kV / 400 A with silicone insulation

RUNM III SA 24/4 Ko

– overhead triple pole module cut-off earthing switch 24 kV / 400 A with composite insulation and structure supporting surge arresters

RNM III SA 24/4/100S

– overhead triple pole module cut off switch 24 kV / 400 A / 100 A with silicone insulation

*the research is ongoing at the Institute

4. TYPES AND STRUCTURE

4.1. Frame isolating switches - horizontal installation on a pole.

Overhead isolating switches ON (OUN) III SA 24/4 have a triple pole structure with a base (frame) and a drive shared by all poles. Each pole of the switch consists of two stand-off insulators. One insulator is fixed to the base frame, the other one - to the moving bearing frame. This ensures simultaneous connection and disconnection of all poles.

The isolating switches normally include porcelain insulators. They can be additionally equipped with insulators:

ON (OUN) III SA 24/4 K – composite insulators

ON (OUN) III SA 24/4 S – silicone insulators

It is possible to use different insulators holding a valid certificate on customer's request.

The current circuit of each pole consists of main contacts. They are mounted on support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two profiled moving contacts coiled together. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts

are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated.

Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. A cord or a power supply cable with cross-section up to 95 (120) mm² can be connected to the clamp. To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord with cross-section up to 95 (120) mm².

Switches' frame was made of closed steel sections and cold-formed steel sections. The product is protected against corrosion by a hot dip zinc layer. Switches ON (OUN) III SA 24/4 are designed for the horizontal installation on all standard electrical structures used in professional power engineering.

The switch is controlled by means of hand operated drive NRA(u) or motor drive NEA. The drives are coupled with the switch driving mechanism using 2 screws M10.

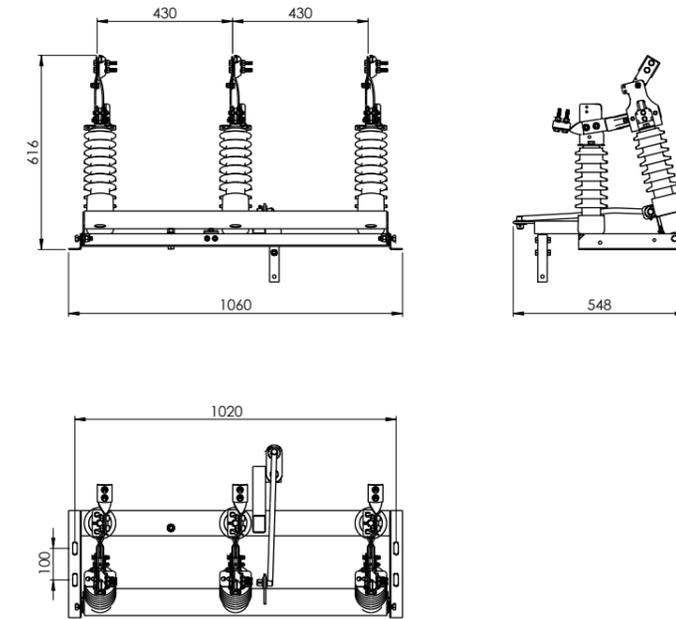
Basic solutions

◇ Isolating switch ON III SA 24/4

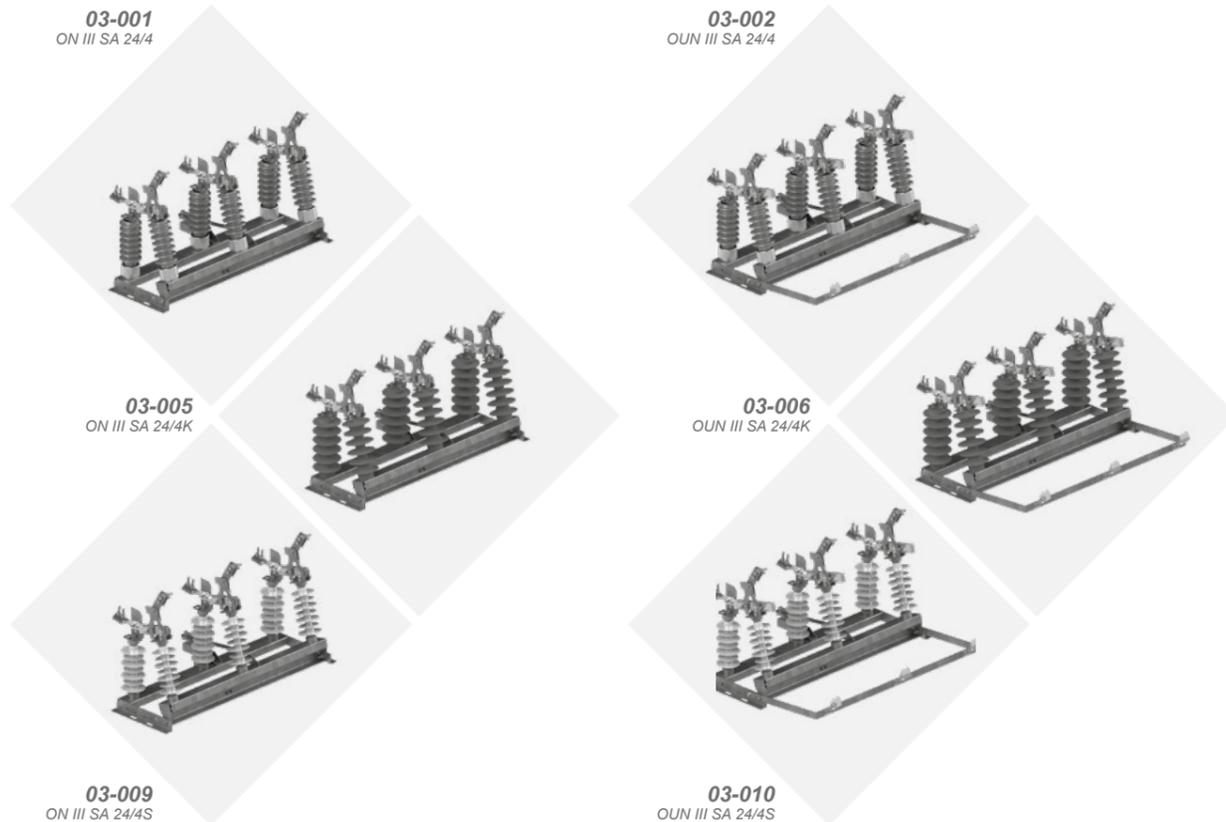
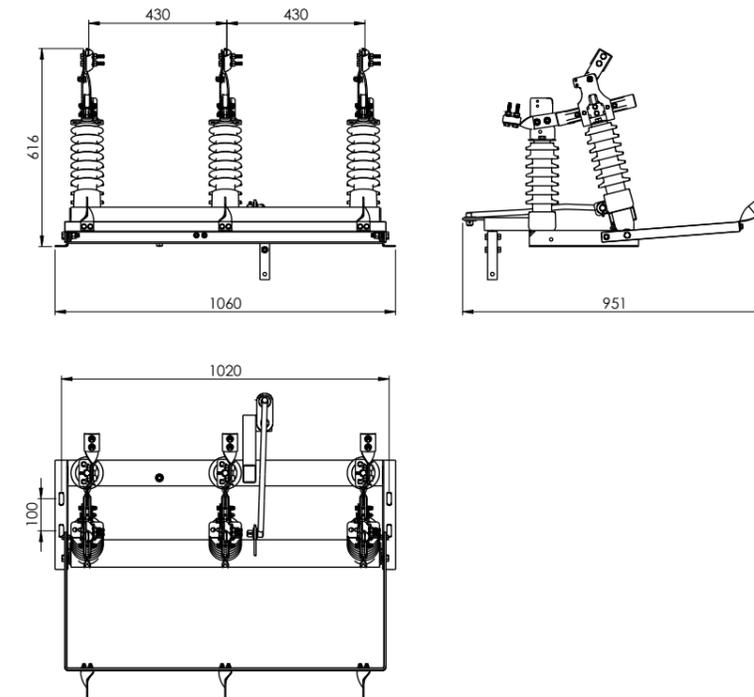
◇ Isolating/earthing switch OUN III SA 24/4

Basic dimensions

◇ Isolating switch ON III SA 24/4



◇ Isolating/earthing switch OUN III SA 24/4



4.2. Frame isolating switches - vertical installation on a pole.

Overhead isolating switches ONp (OUNp) III SA 24/4 have the triple pole structure with a base (frame) and a drive shared by all poles. The integral part of every vertical switch is the structure attaching it to the pole post. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the base frame, the other to the moving bearing frame. This ensures simultaneous connection and disconnection of all poles.

The isolating switches normally include porcelain insulators. They can be additionally equipped with insulators: ONp (OUNp) III SA 24/4 K – composite insulator ONp (OUNp) III SA 24/4 S – silicone insulator

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main contacts. They are mounted on support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two coiled together profiled moving contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts

are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated.

Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. A cord or a power supply cable of cross-section up to 95 (120) mm² can be connected to the clamp. To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm².

Switches' frame was made of closed steel sections and cold-formed steel sections. The product is protected against corrosion by a hot dip zinc layer. Switches ONp (OUNp) III SA 24/4 are designed for the installation directly on a pole post.

The switch is controlled using hand operated drive NRA(u) or motor drive NEA. The drives are coupled with the switch driving mechanism using 2 screws M10.

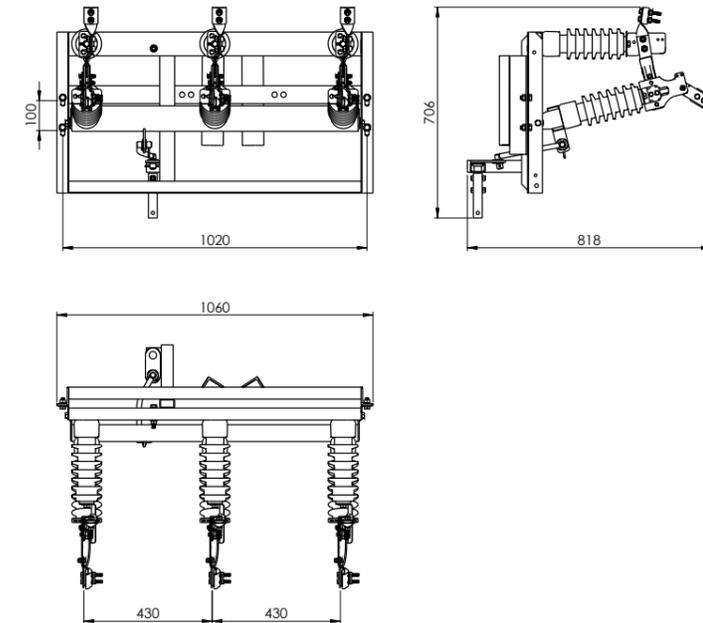
Basic solutions

◇ Isolating switch ONp III SA 24/4

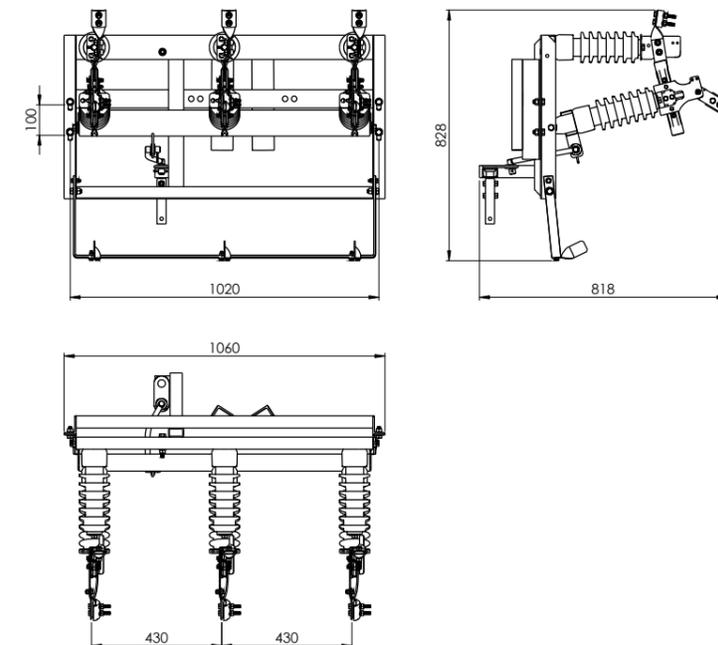
◇ Isolating/earthing switch OUNp III SA 24/4

Basic dimensions

◇ Isolating switch ONp III SA 24/4



◇ Isolating/earthing switch OUNp III SA 24/4



03-033
ONp III SA 24/4

03-034
OUNp III SA 24/4

03-037
ONp III SA 24/4K

03-038
OUNp III SA 24/4K

03-041
ONp III SA 24/4S

03-042
OUNp III SA 24/4S

4.3. Module isolating switches - horizontal installation on a pole.

The module structure of isolating switches ONM (OUNM) III SA 24/4 allows to set the pole position in relation to one another independently while maintaining the minimal safe distance. The switches can be installed on the top (over pole wires) and on the pole post in a horizontal position.

In the case of ordering a module isolating/earthing switch intended for installation on the pole top, enter the structure type to which the switch will be attached (see: Book 4: Installing switches on the MV overhead lines). In the case of ordering a module isolating/earthing switch intended for installation on pole post, enter the spun pole top diameter.

Overhead isolating switches ON (OUN) III SA 24/4 have the asymmetrical triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed structure, the other to the moving bearing structure. Moving structures of all three poles are connected with one section. The handle of the switch drive is attached to the section, which ensures simultaneous connection and disconnection of all poles.

Module switches typically include porcelain insulators. They can be additionally equipped with insulators: ONM (OUNM) III SA 24/4 K - composite insulators ONM (OUNM) III SA 24/4 S - silicone insulators

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main contacts. They are mounted on support frames placed directly on the stand-off insulators. The main current circuit consists of a flat fixed contact and two coiled

together profiled moving contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated.

Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. A cord or a power supply cable of cross-section up to 95 (120) mm² can be connected to the clamp. To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm².

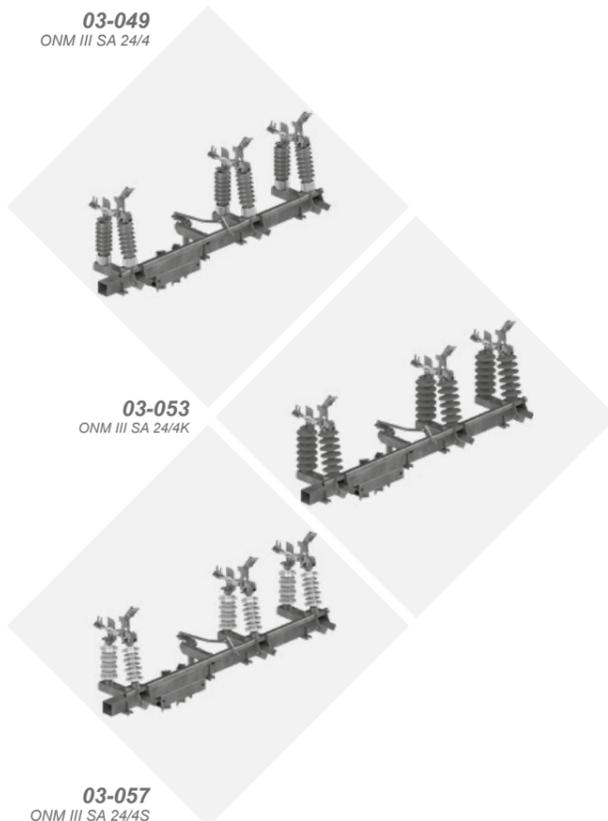
The product is protected against corrosion by a hot dip zinc layer.

The switch is controlled using hand operated drive NRA(u) or motor drive NEA. The drives are coupled with the switch driving mechanism using 2 screws M10.

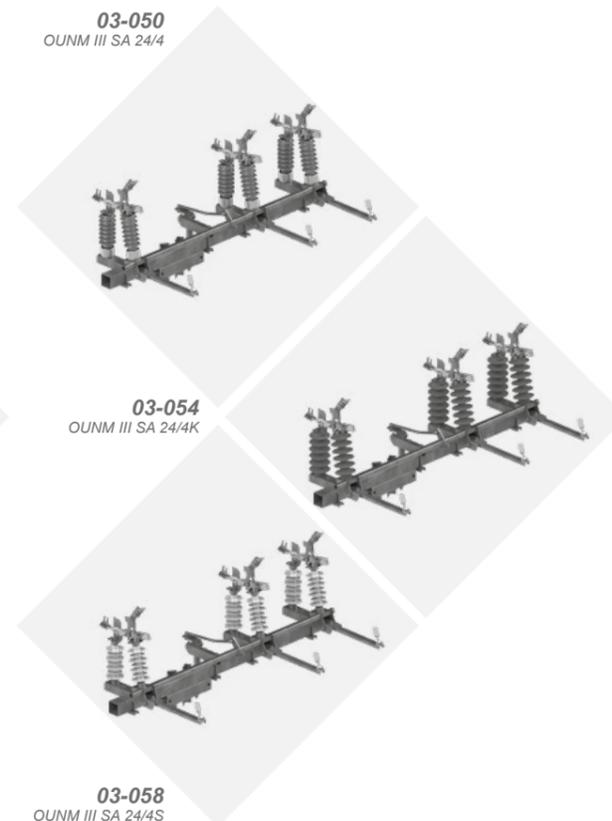
The module switches can be controlled with drive NRMA(u) of reciprocal motion. Installation and operation details are presented in chapter 4, Hand operated drives NRMA, NRMAu.

Basic solutions

◇ Isolating switch ONM III SA 24/4

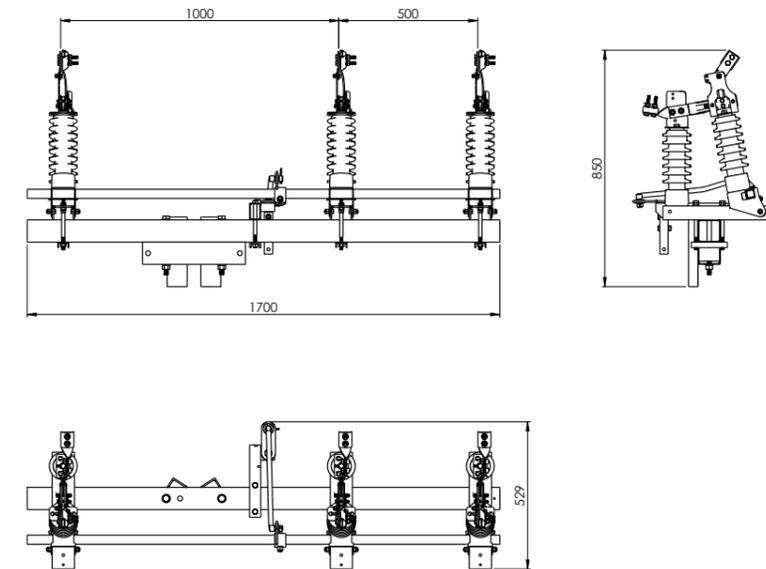


◇ Isolating/earthing switch OUNM III SA 24/4

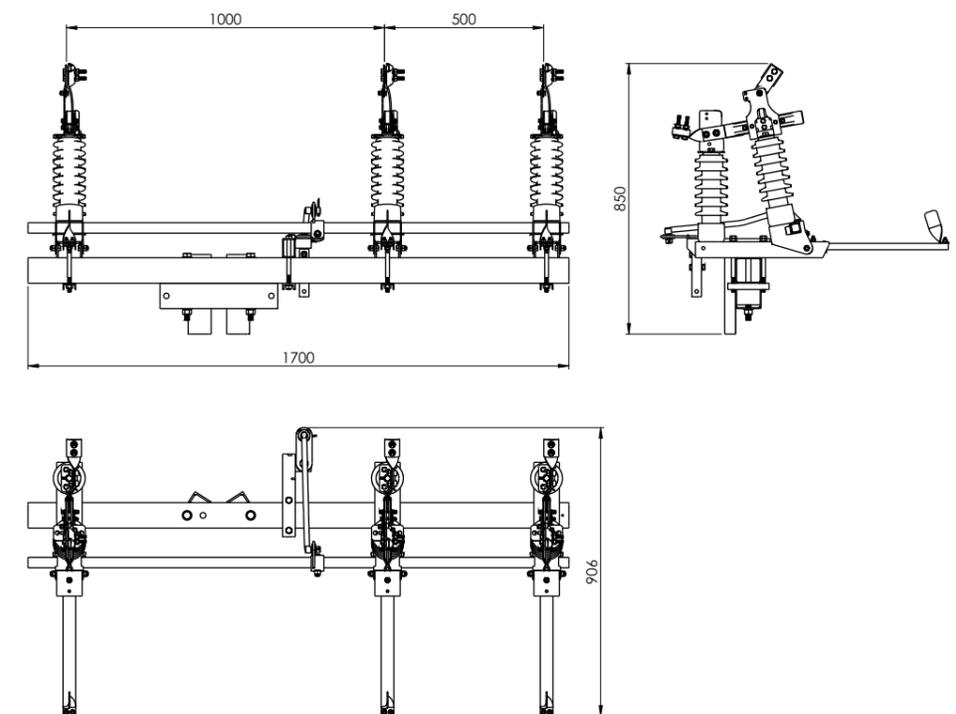


Basic dimensions

◇ Isolating switch ONM III SA 24/4



◇ Isolating/earthing switch OUNM III SA 24/4



4.4. Module isolating switches - vertical installation on a pole.

The module structure of isolating switches ONMp (OUNMp) III SA 24/4 allows to set the pole position in relation to one another independently while maintaining the minimal safe distance. The switches can only be installed on a pole post in a vertical position.

In the case of ordering a module isolating/earthing switch, enter the spun pole top diameter. Overhead isolating switches ONMp (OUNMp) III SA 24/4 have the asymmetrical triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed structure, the other to the moving bearing structure. Moving structures of all three poles are connected with one section. The handle of the switch drive is attached to the section, which ensures simultaneous connection and disconnection of all poles.

Module switches typically include porcelain insulators. They can be additionally equipped with insulators: ONMp (OUNMp) III SA 24/4 K – composite insulators ONMp (OUNMp) III SA 24/4 S – silicone insulators

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main contacts. They are mounted on support frames placed directly on the stand-off insulators. The main current circuit consists of a flat fixed contact and two coiled together profiled moving contacts.

Moving contacts of the current circuit were profiled in a shape ensuring

the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated.

Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. A cord or a power supply cable of cross-section up to 95 (120) mm² can be connected to the clamp. To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm².

The product is protected against corrosion by a hot dip zinc layer.

The switch is controlled using hand operated drive NRA(u) or motor drive NEA.

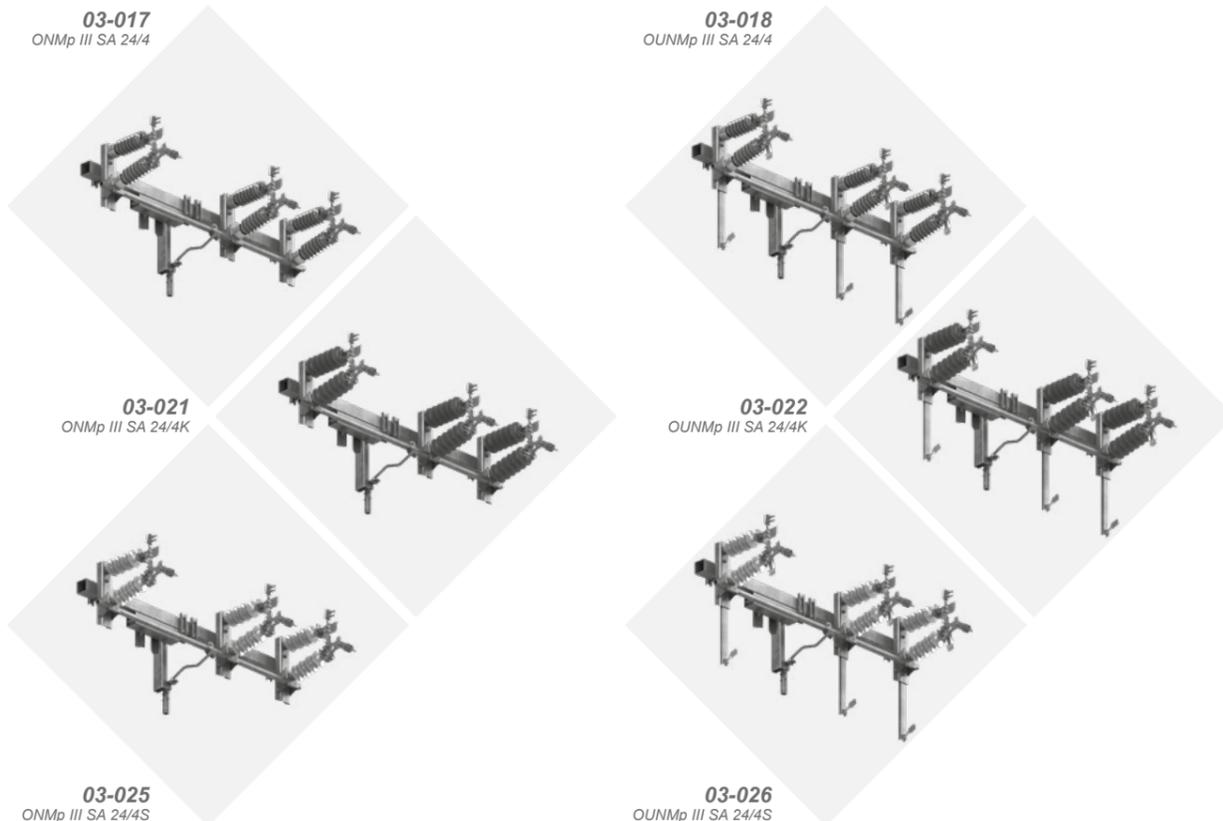
The drives are coupled with the switch driving mechanism using 2 screws M10.

The module switches can be controlled with drive NRMA(u) of reciprocal motion. Installation and operation details are presented in chapter 4, Hand operated drives NRMA, NRMAu.

Basic solutions

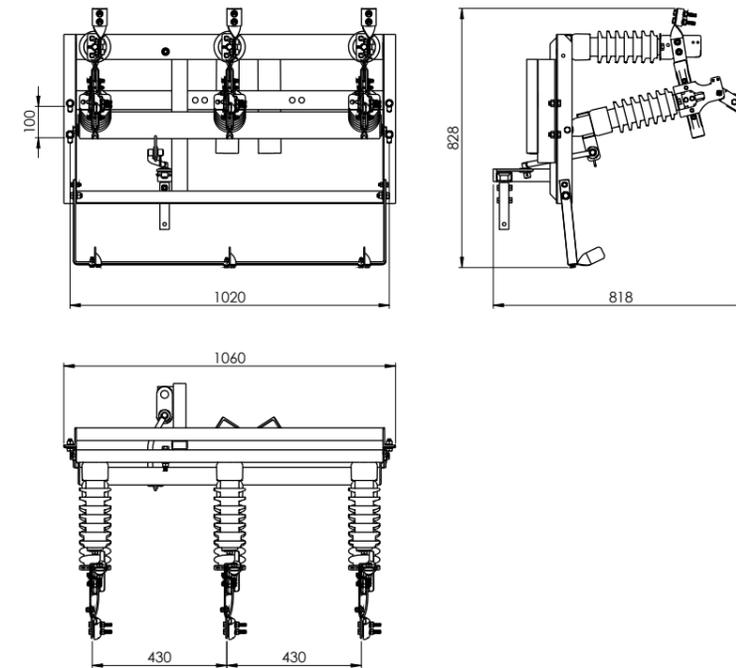
◇ Isolating switch ONMp III SA 24/4

◇ Isolating/earthing switch OUNMp III SA 24/4

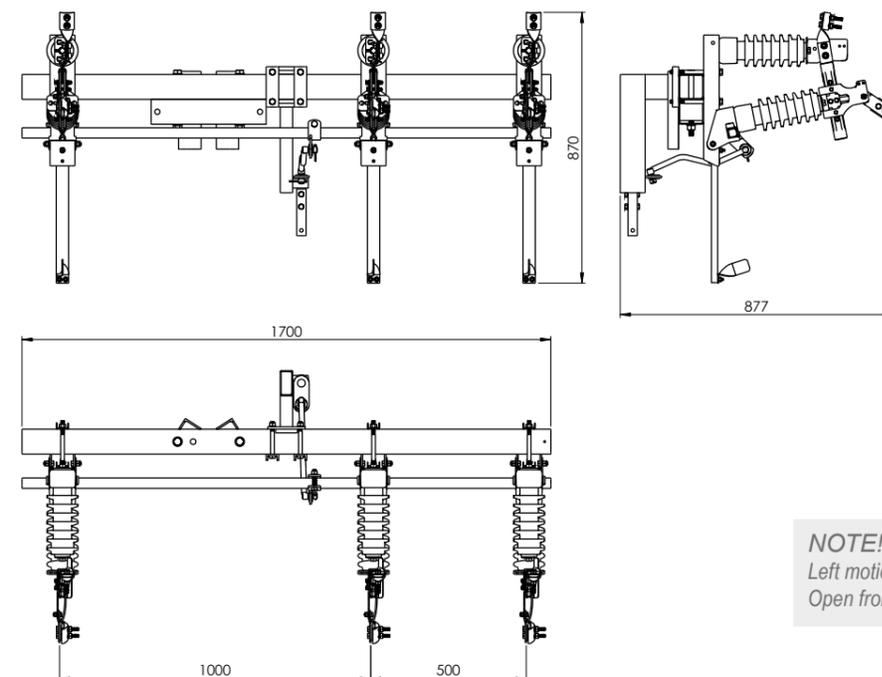


Basic dimensions

◇ Isolating switch ONMp III SA 24/4



◇ Isolating/earthing switch OUNMp III SA 24/4



NOTE!
Left motion isolating switches.
Open from left to right.

4.5. Frame isolating switches with their own structure supporting MV surge arresters - vertical assembly on a pole.

Overhead isolating switches ONp (OUNp) III SA 24/4o have the triple pole structure with a base (frame) and a drive shared by all poles. The integral part of every vertical switch is the structure attaching it to the pole post. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the base frame, the other to the moving bearing frame. This ensures simultaneous connection and disconnection of all poles.

The isolating switches normally include porcelain insulators. They can be additionally equipped with insulators:

ONp (OUNp) III SA 24/4 K - composite insulators ONp (OUNp) III SA 24/4 S - silicone insulators

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main contacts. They are mounted on support frames placed directly on the stand-off insulators. The main current circuit consists of a flat fixed contact and two coiled together profiled contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated.

Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. An LGY bridge ending with a copper back plane is attached to the feeder clamp. The back plane has holes necessary for installation of a bridge with a surge arrester and a cable head terminal. To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm². Switches frame was made of closed steel sections and cold-formed steel sections. The product is protected against corrosion by a hot dip zinc layer.

Standard isolating switches frame has a frame for surge arresters or stand-off insulators attached, due to which there is no need for the additional structure supporting surge arresters. This solution ensures more space on the pole and decreases the completion time and cost of a project.

Switches ONp (OUNp) III SA 24/4o are designed for the installation directly on a pole post.

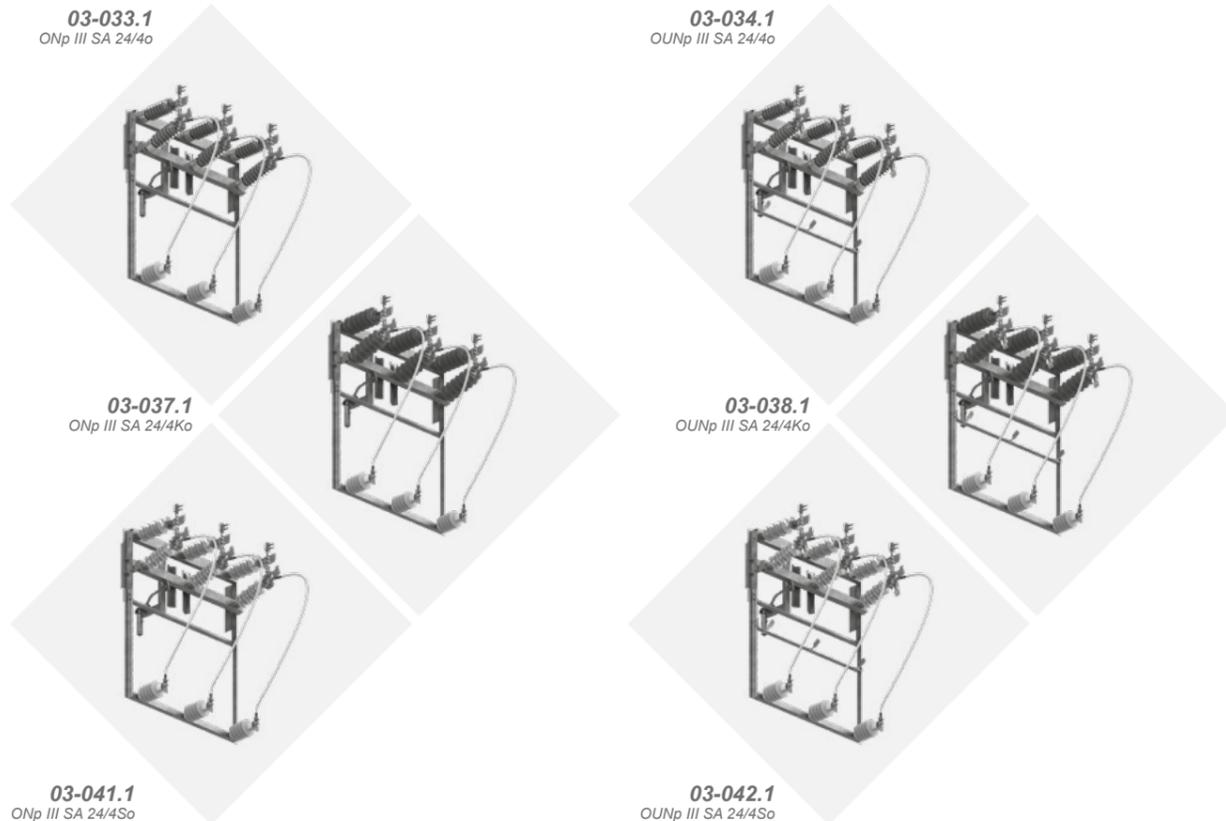
The switch is controlled using hand operated drive NRA(u) or motor drive NEA.

The drives are coupled with the switch driving mechanism using 2 screws M10.

Basic solutions

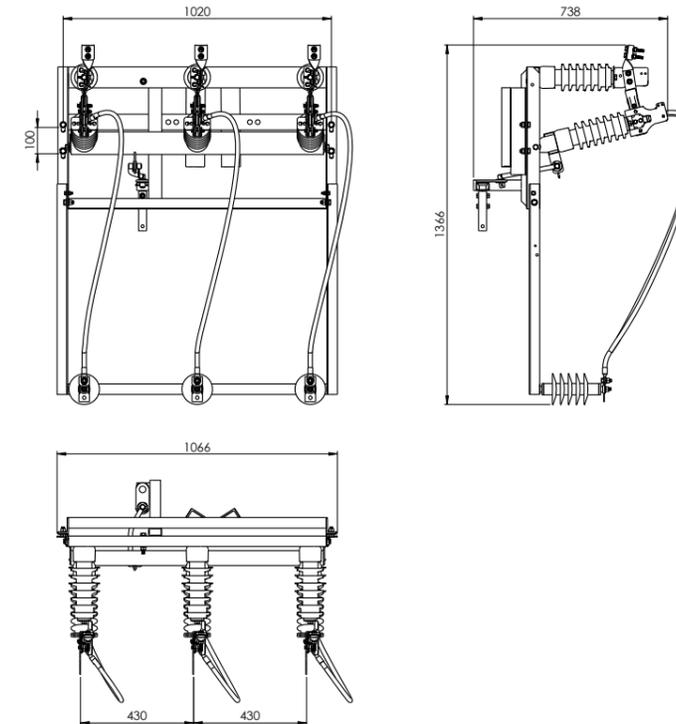
◇ Isolating switch ONp III SA 24/4o

◇ Isolating/earthing switch OUNp III SA 24/4o

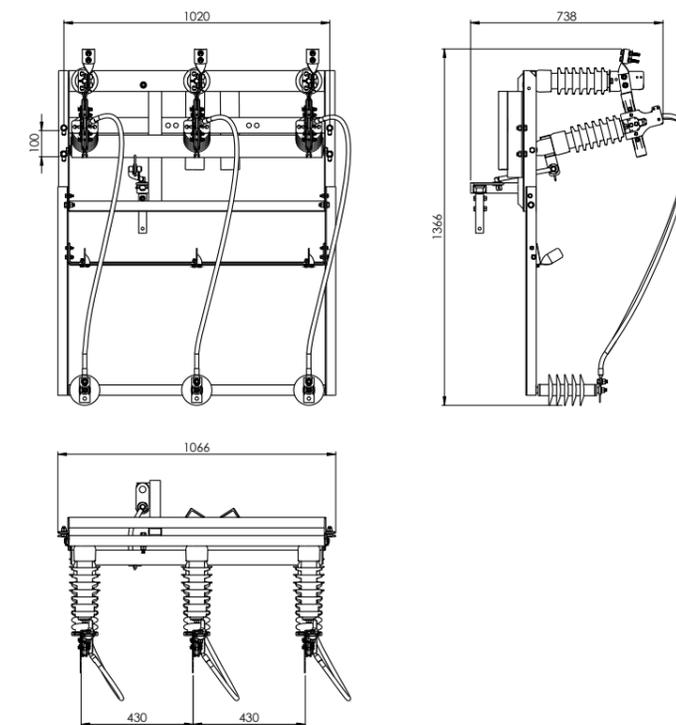


Basic dimensions

◇ Isolating switch ONp III SA 24/4o



◇ Isolating/earthing switch OUNp III SA 24/4o



NOTE!
Surge arresters and stand-off insulators are not included in the product price!

4.6. Module isolating switches with their own structure supporting MV Surge arresters
- vertical assembly on a pole.

The module structure of isolating switches ONM (OUNM) III SA 24/4o allows to set the pole position in relation to one another independently while maintaining the minimal safe distance. The switches can be installed on the top (over pole wires) and on the pole post in a horizontal position.

In the case of ordering a module isolating/earthing switch intended for installation on the pole top, enter the structure type to which the switch will be attached (see: Book: 4 Installing switches on the MV overhead lines). In the case of ordering a module isolating/earthing switch intended for installation on pole post, enter the spun pole top diameter.

Overhead isolating switches ONM (OUNM) III SA 24/4o have the asymmetrical triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed structure, the other to the moving bearing structure. Moving structures of all three poles are connected with one section. The handle of the switch drive is attached to the section, which ensures simultaneous connection and disconnection of all poles.

Module switches typically include porcelain insulators. They can be additionally equipped with insulators:

ONM (OUNM) III SA 24/4Ko – composite insulators

ONM (OUNM) III SA 24/4So – silicone insulators

The current circuit of each pole consists of main contacts. They are mounted on support frames placed directly on the stand-off insulators. The main current circuit consists of a flat fixed contact and two coiled together profiled moving contacts.

Moving contacts of the circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting

of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated. Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable.

An LGY bridge ending with a copper back plane is attached to the feeder clamp. The back plane has holes necessary for installation of a bridge with a surge arrester and a cable head terminal.

To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm².

The isolating switch main frame has a standard structure for surge arresters or stand-off insulators attached, due to which there is no need for the additional structure supporting surge arresters. This solution ensures more space on the pole and decreases the completion time and cost of a project.

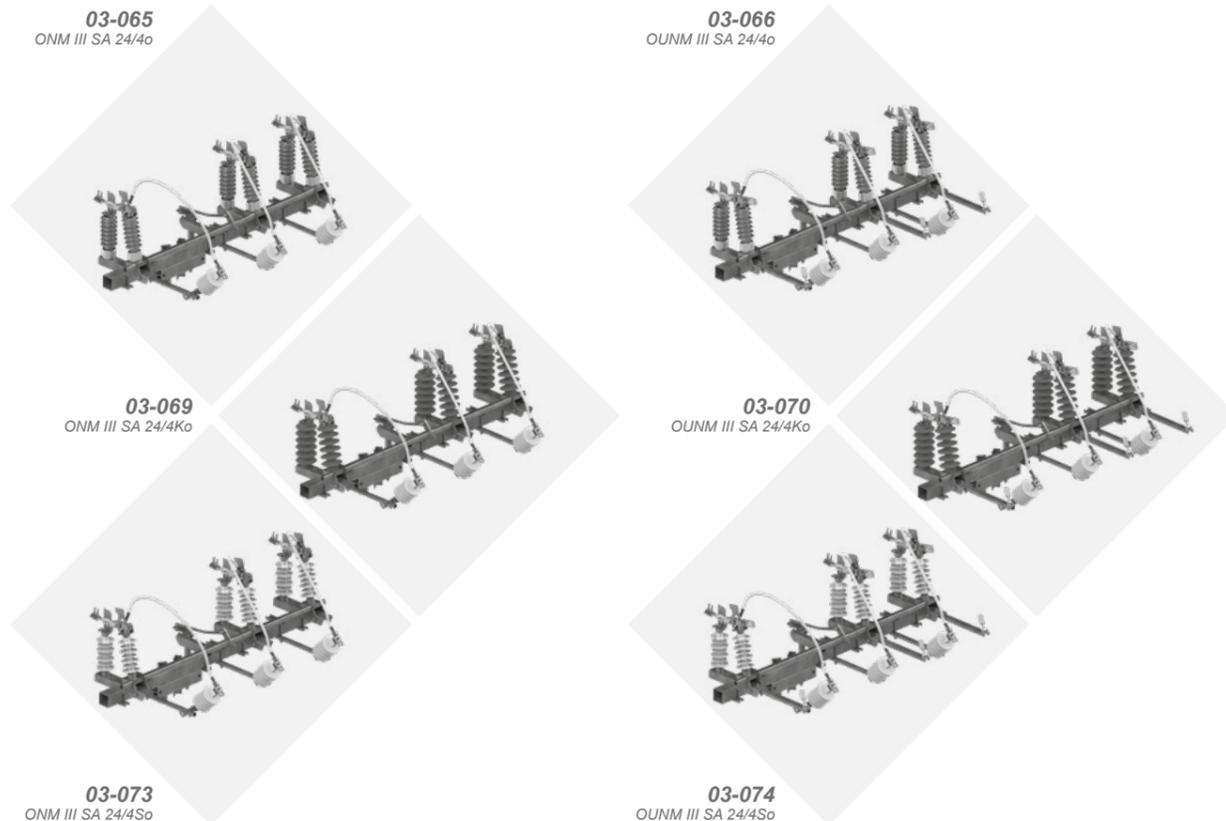
The switch is controlled using hand operated drive NRA(u) or motor drive NEA.

The module switches can be controlled with drive NRMA(u) of reciprocal motion. Installation and operation details are presented in chapter 4, hand operated drives NRMA, NRMAu.

Basic solutions

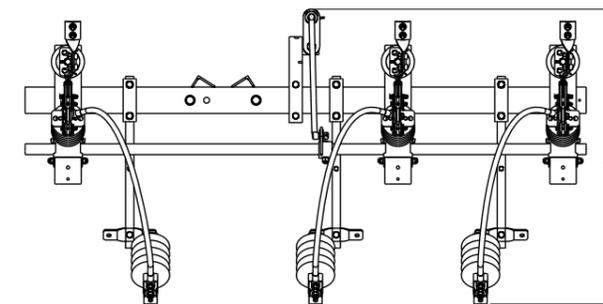
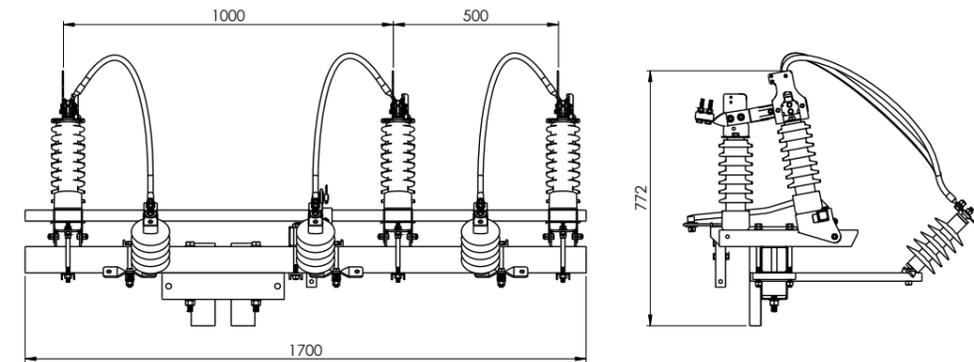
◇ Isolating switch ONM III SA 24/4o

◇ Isolating/earthing switch OUNM III SA 24/4o



Basic dimensions

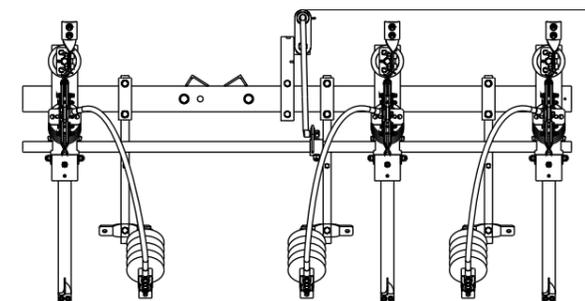
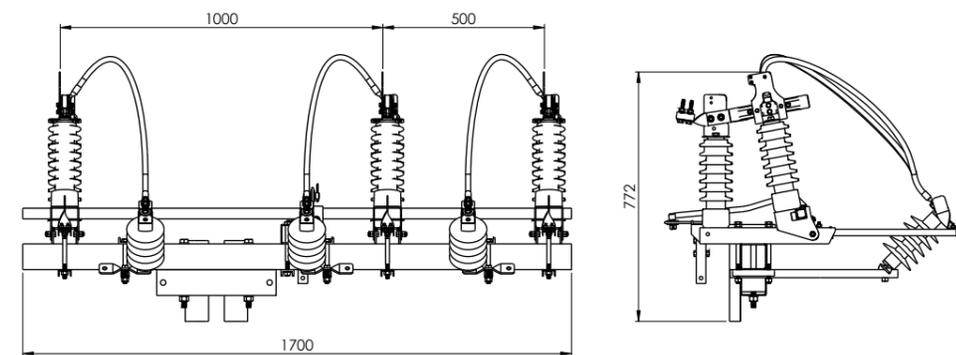
◇ Isolating switch ONM III SA 24/4o



NOTE!
ALPAR offers also isolating switches (ONM) and isolating earthing switches (OUNM) with their own structure mounting the stand-off insulators.

NOTE!
Surge arresters and stand-off insulators are not included in the product price!

◇ Isolating/earthing switch OUNM III SA 24/4o



4.7. Module isolating switches with their own structure supporting MV Surge arresters
- vertical assembly on a pole.

The module structure of isolating switches ONMp (OUNMp) III SA 24/4o allows to set the pole position in relation to one another independently while maintaining the minimal safe distance. The switches can only be installed on a pole post in a vertical position. In the case of ordering a module isolating/earthing switch, enter the spun pole top diameter. Overhead isolating switches ONMp (OUNMp) III SA 24/4o have the asymmetrical triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed structure, the other to the moving bearing structure. Moving structures of all three poles are connected with one section. The handle of the switch drive is attached to the section, which ensures simultaneous connection and disconnection of all poles.

Module switches typically include porcelain insulators. They can be additionally equipped with insulators: ONMp (OUNMp) III SA 24/4Ko – composite insulators ONMp (OUNMp) III SA 24/4So – silicone insulators

The current circuit of each pole consists of main contacts. They are mounted on support frames placed directly on the stand-off insulators. The main current circuit consists of a flat fixed contact and two coiled together profiled moving contacts.

Moving contacts of the circuit were profiled in a shape ensuring the reliable self-direction and large contact surface.

In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made

of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated. Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable.

An LGY bridge ending with a copper back plane is attached to the feeder clamp. The back plane has holes necessary for installation of a bridge with a surge arrester and a cable head terminal.

To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm².

Standard isolating switch main frame has a frame for surge arresters or stand-off insulators attached, due to which there is no need for the additional structure supporting surge arresters. This solution ensures more space on the pole and decreases the completion time and cost of a project.

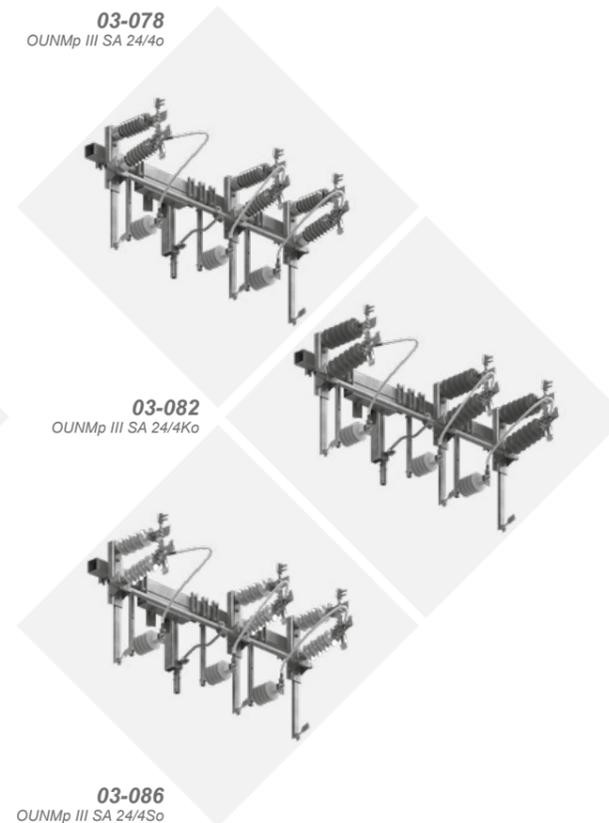
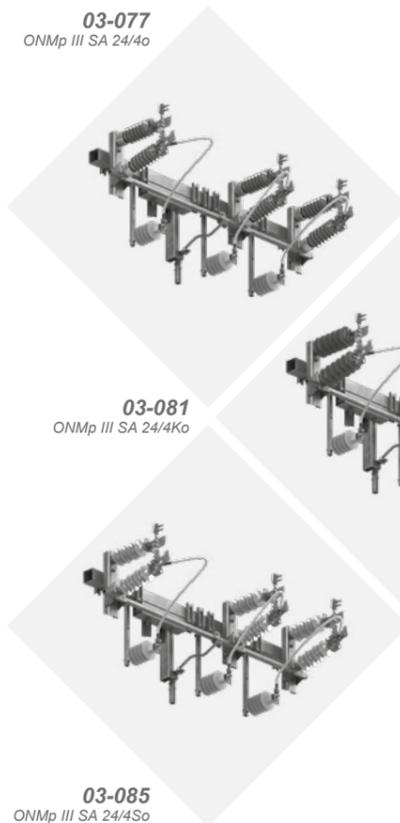
The switch is controlled using hand operated drive NRA(u) or motor drive NEA.

The module switches can be controlled with drive NRMA(u) of reciprocal motion. Installation and operation details are presented in chapter 4, Hand operated drives NRMA, NRMAu.

Basic solutions

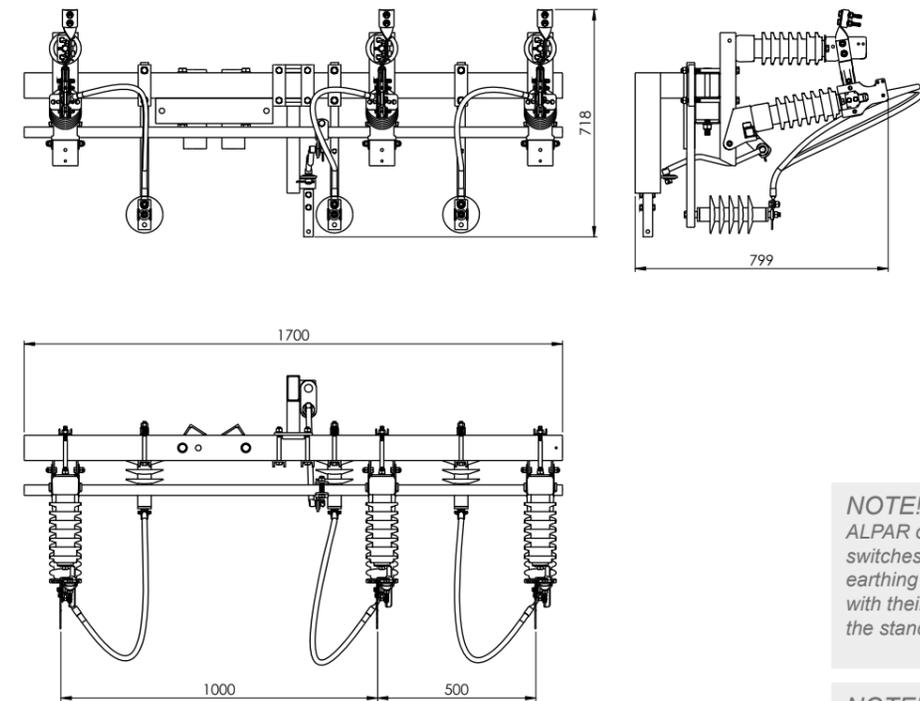
◇ Isolating switch ONMp III SA 24/4o

◇ Isolating/earthing switch OUNMp III SA 24/4o



Basic dimensions

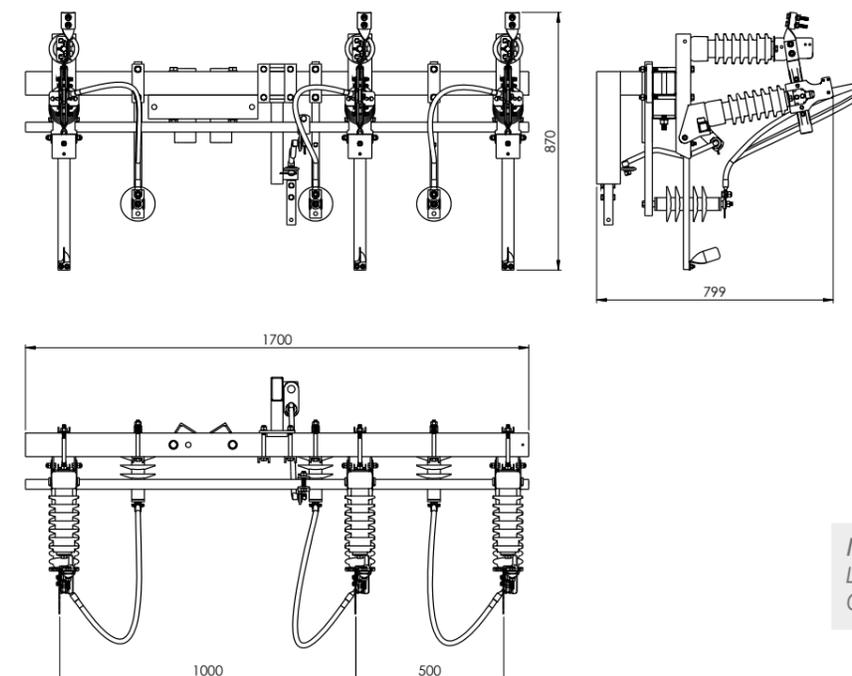
◇ Isolating switch ONMp III SA 24/4o



NOTE!
ALPAR offers also isolating switches (ONM)p and isolating earthing switches (OUNMp) with their own structure mounting the stand-off insulators.

NOTE!
Surge arresters and stand-off insulators are not included in the product price!

◇ Isolating/earthing switch OUNMp III SA 24/4o



NOTE!
Left motion isolating switches. Open from left to right.

5. EXPLOITATION OF ISOLATING SWITCHES

Directly after receiving the switch, check delivery against the order and the general state of the switch.

During loading, unloading, and installation, the devices should be moved only by grabbing their base (frame).

NOTE!

Do not touch the circuit elements or switch stand-off insulators under any circumstances.

The switches are delivered to the recipient completely assembled and tuned - always in the disconnected position. After unpacking check if the device suffered no mechanical damage in the transport and if all data on the rated plate is correct.

During installation of the switch on a pole and coupling it with hand operated drive NRA(u) or NRMA(u), the device should be in the disconnected position. During hand operated drive installation, its key should be on the right side in the disconnected switch position.

NOTE!

Does not apply to vertical module isolating switches. In this group of isolating switches, the key should be on the left side.

NOTE!

Installation of a drive other than NRA(u) or NRMA(u) is only possible after contacting the Manufacturer beforehand.

The isolating switches are adjusted to connect wires of 95 mm² cross-section. Before the connection, it is recommended to clean connection elements (connection clamps) contact surfaces of possible pollution and cover them with a thin layer of (acid-free) conductive grease.

Before switch hand-over to operation, check the device state, correctness of coupling with the drive, and operation correctness. Carry out a visual inspection of the switch, checking insulators state (pollution, cracks, etc) and correctness of screw tightening - this particularly applies to wires, drive connection, and mounting of the device on the support frame. Then perform several connection cycles, paying attention to correct operation of the main contacts (arming at disconnection).

6. INSPECTIONS AND MAINTENANCE

6.1. Inspections

Switch inspection should be carried out once every five years in the case of failure-free operation, and also:

- After every main contacts replacement
- After short-circuit connection of the switch

During inspection, pay extra attention to:

- Insulators state (scratches, cracks, etc)
- Main contacts state (dirt, signs of partial melting)
- Switch screws (wires connections, drive connection, mounting of the device on the support frame)
- Switch drive state
- Protective covers state

6.2. Maintenance

It is recommended to carry out maintenance of the switch after every inspection.

Maintenance includes:

- Cleaning insulators
- Cleaning main contacts
- Covering main with current (acid-free) grease
- Tightening potentially loosened screws
- Filling in damaged protective layers (with cold zinc spray)

CHAPTER 2

OVERHEAD CUT OFF SWITCHES

RN III SA 24/4 (K, S)
 RUN III SA 24/4 (K, S)
 RNp III SA 24/4 (K, S)
 RUNp III SA 24/4 (K, S)
 RNM III SA 24/4 (K, S)
 RUNM III SA 24/4 (K, S)
 RNMp III SA 24/4 (K, S)
 RUNMp III SA 24/4 (K, S)
 RNp III SA 24/4o (K, S)
 RUNp III SA 24/4o (K, S)
 RNM III SA 24/4o (K, S)
 RUNM III SA 24/4o (K, S)
 RNMp III SA 24/4o (K, S)
 RUNMp III SA 24/4o (K, S)

1. CHARACTERISTICS AND INTENDED USE

The subject of the document is design documentation of overhead triple pole cut off and earthing switches manufactured by ALPAR Artur i Piotr Kowalscy Spółka Jawna.

The switches are mounted on a shared frame intended for horizontal (RN, RUN) or vertical (RNp, RUNp) installation and on one support frame (RNM, RUNM).

Each pole of a switch consists of two stand-off insulators - one fixed and one moveable. There are circuits installed on the insulators.

The switches can be equipped with porcelain, composite, or silicone insulators. Overhead cut-off switches RN (RUN) are used in power transmission networks of 15, 20, and 30 kV voltage. They are intended for connecting and disconnecting transmission lines under load up to 25 A. Cut-off earthing switches (RUN) additionally earth disconnected sections of the line.

Isolating switches RN (RUN) III SA 24/4 can also be used in branch lines powering one or more transformer stations. since in an (open position) they create visible and safe insulation break, thus meeting requirements for insulating switches.

RN III SA 24/4 (K, S)
RUN III SA 24/4 (K, S)
RNp III SA 24/4 (K, S)
RUNp III SA 24/4 (K, S)
RNM III SA 24/4 (K, S)
RUNM III SA 24/4 (K, S)
RNMp III SA 24/4 (K, S)
RUNMp III SA 24/4 (K, S)
RNp III SA 24/4o (K, S)
RUNp III SA 24/4o (K, S)
RNM III SA 24/4o (K, S)
RUNM III SA 24/4o (K, S)
RNMp III SA 24/4o (K, S)
RUNMp III SA 24/4o (K, S)

2. TECHNICAL DATA

Cut-off and cut-off/earthing switches were tested. The tests were conducted in accordance with the following standards:

IEC 62271-103:2011 *High-voltage switchgear and controlgear*

Part 1: Common specifications.

IEC 62271-103:2011 *High-voltage switchgear and controlgear*

Part 103: Switches for rated voltages above 1 kV up to and including 52 kV

IEC 62271-102:2011 *High-voltage switchgear and controlgear*

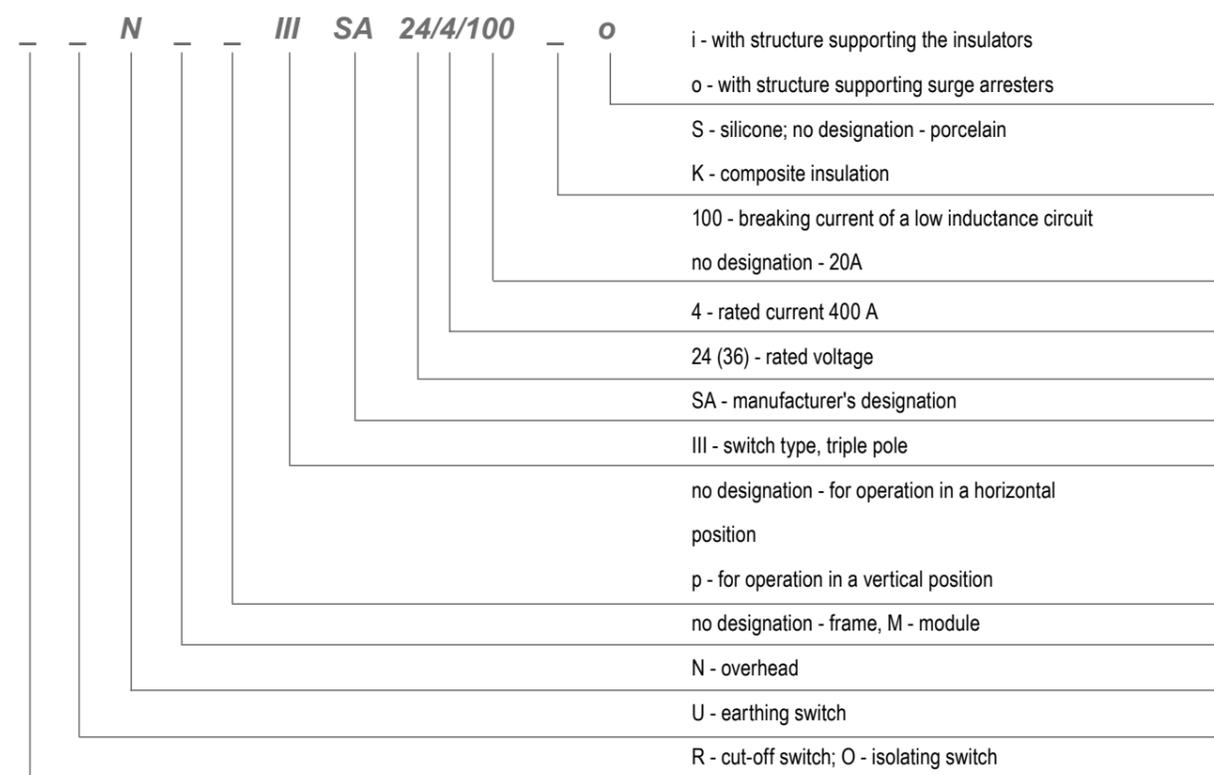
Part 102: Alternating current disconnectors and earthing switches

Technical data of cut-off and cut-off/earthing switches:	
1. Rated voltage	24 kV
2. Rated frequency /number of phases	50 Hz/3
3. Rated continuous current	400 A
4. Withstand voltage of power line frequency	50 kV/60kV
5. Lighting impulse withstand voltage	125 kV/145kV
6. Rated breaking current of a low inductance circuit:	25A*
7. Rated closed loop breaking current	25A*
8. Unloaded transformer rated breaking power	up to 630 kVA
9. Rated line-charging breaking current	2A
10. Rated cable-charging breaking current	16A
11. Connecting earth-fault short circuit	48A
12. Connecting cables and lines during earth-fault short circuit	27A
13. Rated short-time withstand current	16kA (1s)
14. Rated peak withstand current	40kA
15. Electrical class of cut-off switch	E3
16. Mechanical endurance	2000 cycles Z/W
17. Class of earthing switch	E2

*research is ongoing in the Institute

Cut-off switch operating conditions:	
1. Air humidity	< 100 %
2. Ambient temperature	-40 °C to + 40 °C
3. Installation height above sea level	< 1000 m

3. ISOLATING OR CUT-OFF SWITCH DESIGNATION



Designation examples:

OUN III SA 24/4

– overhead triple pole isolating earthing switch 24 kV / 400 A with porcelain insulation

RUNMp III SA 24/4

– overhead triple pole vertical module cut-off earthing switch 24 kV /400 A with porcelain insulation

ONp III SA 24/4 S

– overhead triple pole vertical isolating switch 24 kV / 400 A with silicone insulation

RUNM III SA 24/4 Ko

– overhead triple pole module cut-off earthing switch 24 kV /400 A with composite insulation and mounting structure supporting surge arresters

RNM III SA 24/4/100S

– overhead triple pole module cut off switch 24 kV / 400 A / 100 A with silicone insulation

4. TYPES AND STRUCTURE

4.1. Cut-off switches attached to a frame - horizontal installation on a pole.

Overhead cut-off switches RN (RUN) III SA 24/4 have the triple pole structure with a base (frame) and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the base frame, the other to the moving bearing frame. This ensures simultaneous connection and disconnection of all poles.

The switches normally include porcelain insulators. They can be additionally equipped with insulators:

RN (RUN) III SA 24/4 K – composite insulators

RN (RUN) III SA 24/4 S – silicone insulators

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main and auxiliary (changeover) contacts. They are mounted on support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two coiled together profiled moving contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning.

They can additionally be silver-plated.

The auxiliary (changeover) contact consists of a dog and a spring. The dog is made of galvanized steel sheet, and the changeover contact spring is made of stainless spring steel.

Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. A cord or a power supply cable of cross-section up to 95 (120) mm² can be connected to the clamp. To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm².

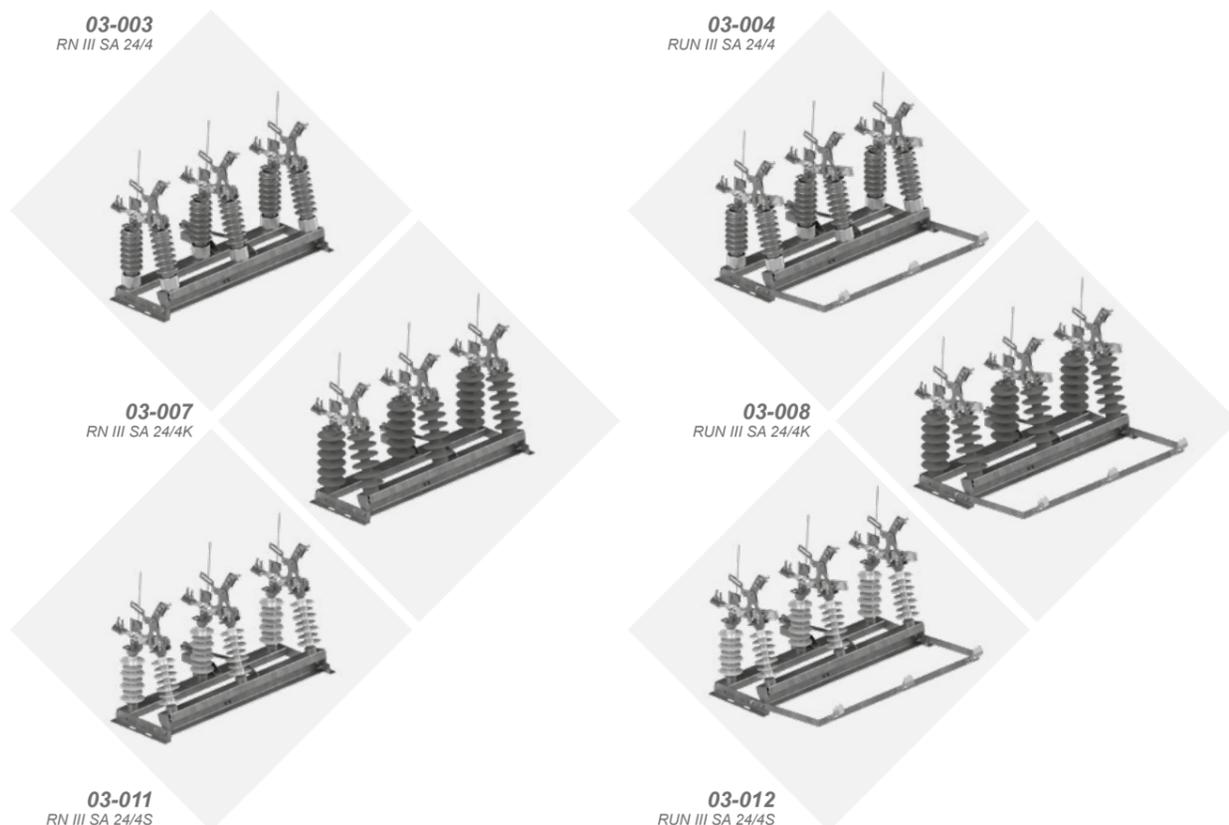
Switches' frame was made of closed steel sections and cold-formed steel sections. The product is protected against corrosion by a hot dip zinc layer. Switches RN (RUN) III SA 24/4 are designed for the horizontal installation on all standard electrical structures used in professional power engineering.

The switch is controlled using hand operated drive NRA(u) or motor drive NEA. The drives are coupled with the switch driving mechanism using 2 screws M10.

Basic solutions

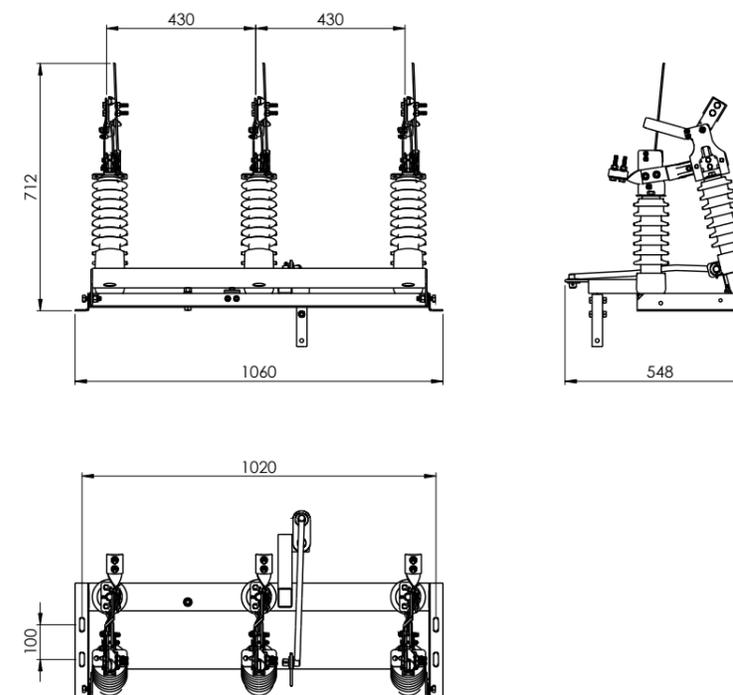
◇ Cut-off switch RN III SA 24/4

◇ Cut-off earthing switch RUN III SA 24/4

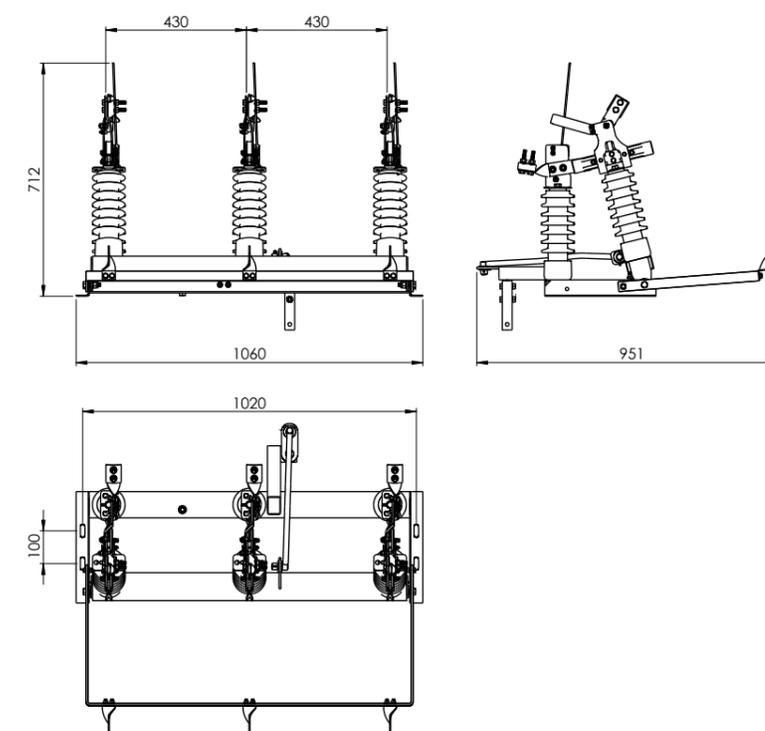


Basic dimensions

◇ Cut-off switch RN III SA 24/4



◇ Cut-off earthing switch RUN III SA 24/4



4.2. Cut-off switches attached to a frame - vertical installation on a pole.

Overhead cut-off switches RNp (RUNp) III SA 24/4 have the triple pole structure with a base (frame) and a drive shared by all poles. The integral part of every vertical switch is the structure attaching it to the pole post. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the base (frame), the other to the moving bearing beam. This ensures the simultaneous connection and disconnection of all poles.

The switches normally include porcelain insulators. They can be additionally equipped with insulators: RNp (RUNp) III SA 24/4 K - composite RNp (RUNp) III SA 24/4 S - silicone

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main and auxiliary (changeover) contacts. They are mounted on support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two coiled together profiled moving contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning.

They can additionally be silver-plated.

The auxiliary (changeover) contact consists of a dog and a spring. The dog is made of galvanized steel sheet, and the changeover contact spring is made of stainless spring steel.

Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. A cord or a power supply cable of cross-section up to 95 (120) mm² can be connected to the clamp. To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm².

Switches frame was made of closed steel sections and cold-formed steel sections. The product is protected against corrosion by a hot dip zinc layer. Switches RNp (RUNp) III SA 24/4 are designed for the installation directly on a pole post.

The switch is controlled using hand operated drive NRA(u) or motor drive NEA. The drives are coupled with the switch driving mechanism using 2 screws M10.

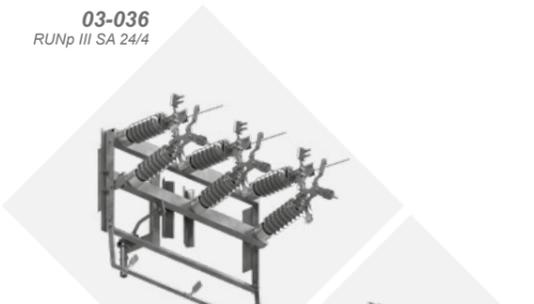
Basic solutions

◇ Cut-off switch RNp III SA 24/4

◇ Cut-off earthing switch RUNp III SA 24/4



03-035
RNp III SA 24/4



03-036
RUNp III SA 24/4



03-039
RNp III SA 24/4K



03-040
RUNp III SA 24/4K



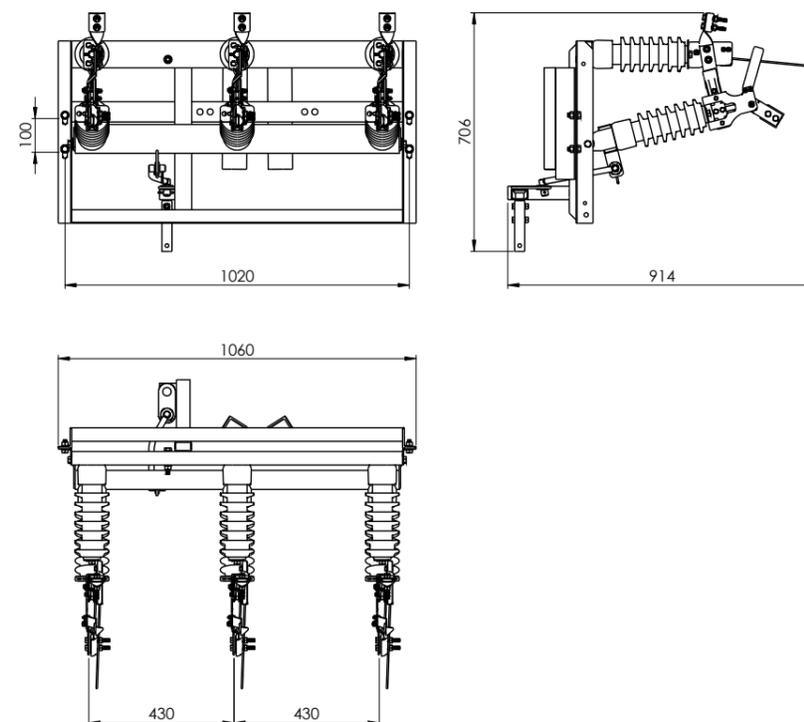
03-043
RNp III SA 24/4S



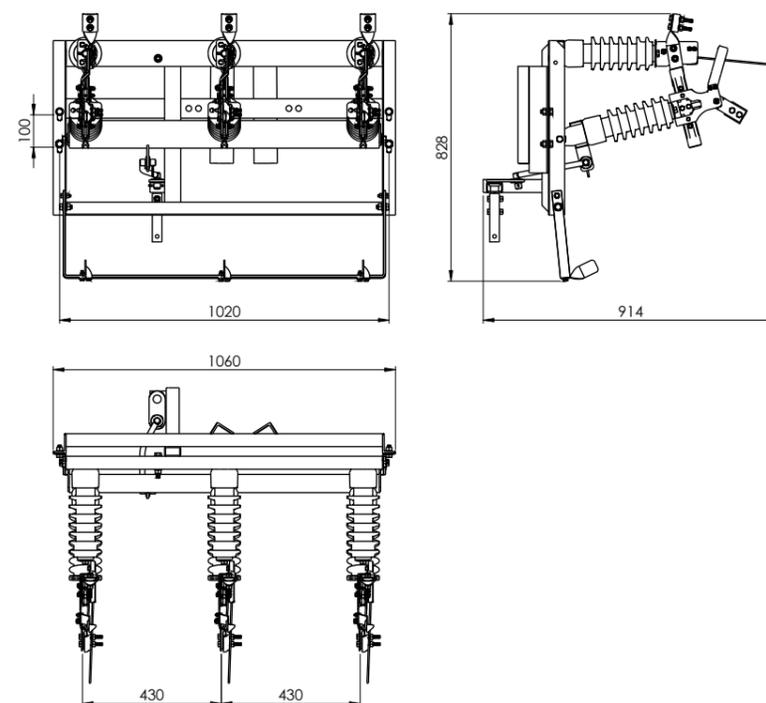
03-044
RUNp III SA 24/4S

Basic dimensions

◇ Cut-off switch RNp III SA 24/4



◇ Cut-off earthing switch RUNp III SA 24/4



4.3. Module cut-off switches - horizontal installation on a pole.

The module structure of cut-off switches RNM (RUNM) III SA 24/4 allows to set the pole position in relation to one another independently while maintaining the minimal safe distance.

The switches can be installed on the top (over pole wires) and on the pole post in a horizontal position. In the case of ordering a module cut-off/earthing switch intended for installation on pole top, enter the type of structure to which the switch will be attached (see: Book 4: Installing switches on the MV overhead lines). In the case of ordering a module cut-off/earthing switch intended for installation on pole post, enter the spun pole top diameter.

RNM (RUNM) III SA 24/4 overhead cut-off switches have the asymmetrical triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed structure, the other to the moving bearing structure. Moving structures of all three poles are connected with one section. The handle of the switch drive is attached to the section, which ensures simultaneous connection and disconnection of all poles.

The module cut-off switches normally include porcelain insulators. They can be additionally equipped with insulators:

RNM (RUNM) III SA 24/4K – composite insulators

RNM (RUNM) III SA 24/4S – silicone insulators

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main and auxiliary

(changeover) contacts. They are mounted on support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two coiled together profiled moving contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated. The auxiliary (changeover) contact consists of a dog and a spring. The dog is made of galvanized steel sheet, and the changeover contact spring is made of stainless spring steel. Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable.

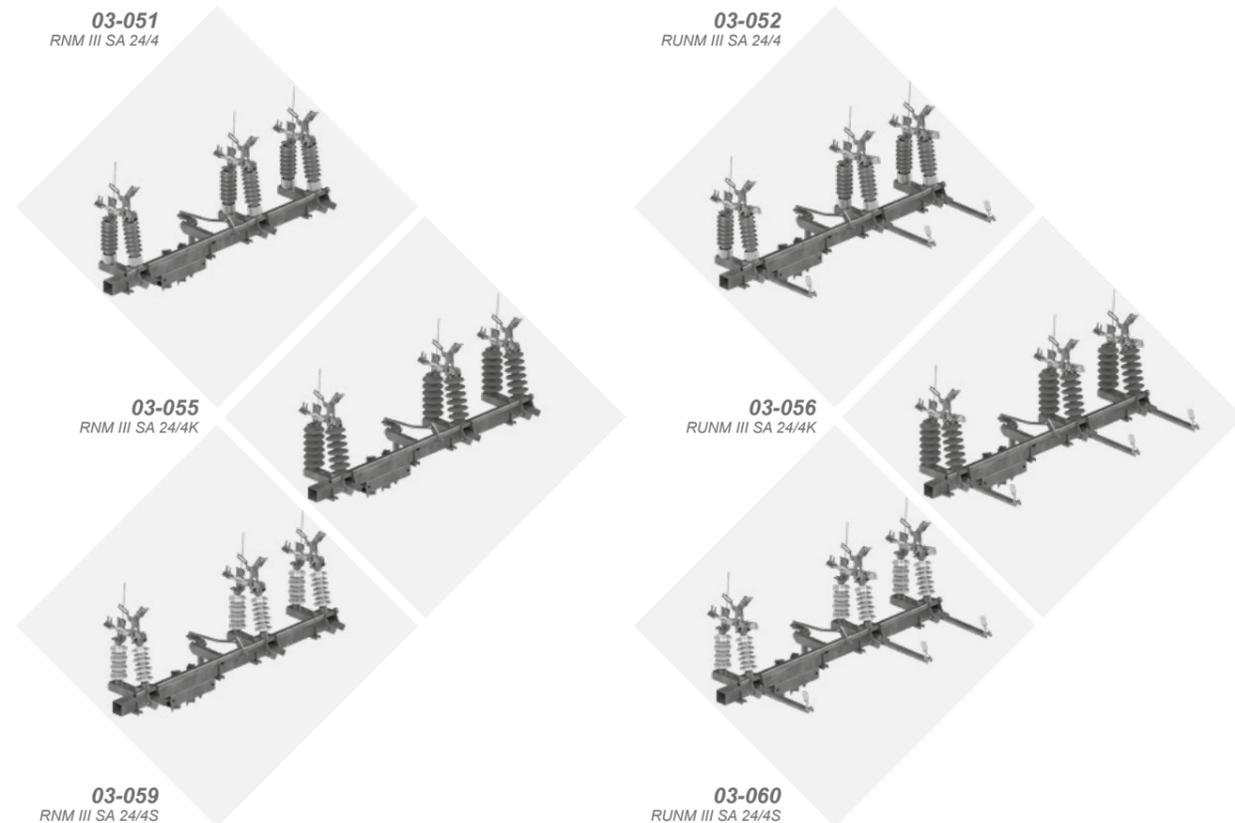
To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm².

The product is protected against corrosion by a hot dip zinc layer. The switch is controlled using hand operated drive NRA(u) or motor drive NEA. The drives are coupled with the switch driving mechanism using 2 screws M10.

Basic solutions

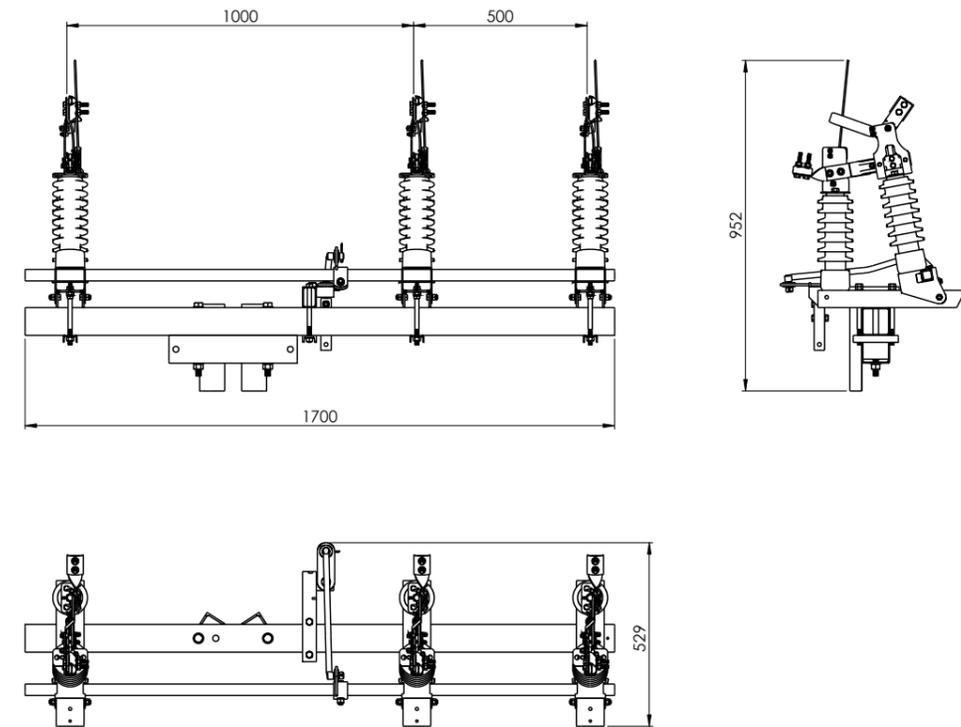
◇ Cut-off switch RNM III SA 24/4

◇ Cut-off earthing switch RUNM III SA 24/4

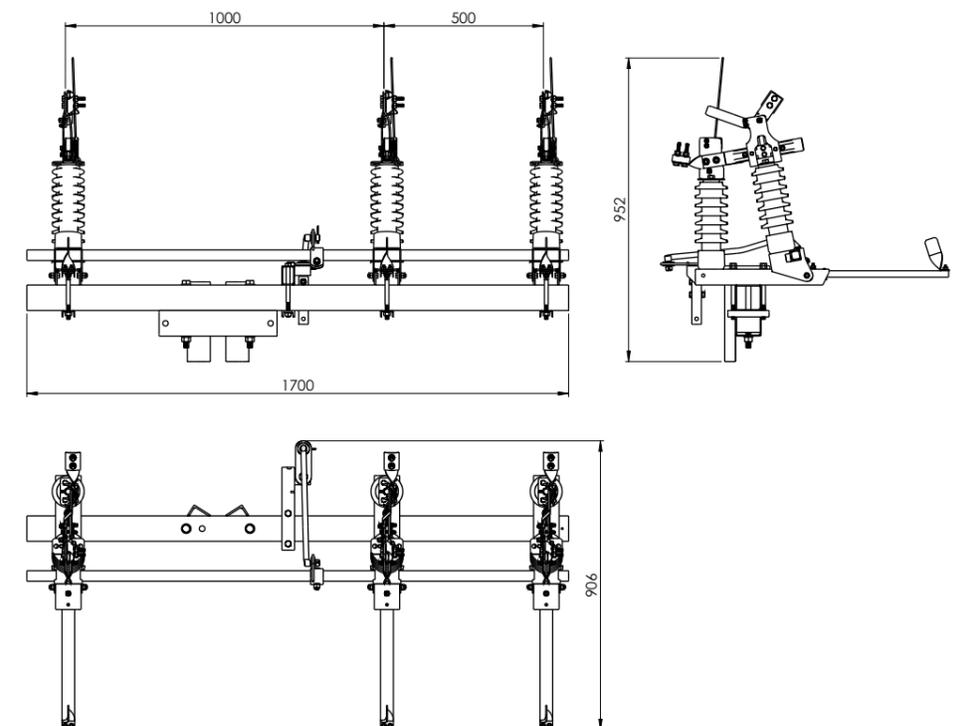


Basic dimensions

◇ Cut-off switch RNM III SA 24/4



◇ Cut-off earthing switch RUNM III SA 24/4



4.4. Module cut-off switches - vertical installation on a pole.

The module structure of isolating switches RNMP (RUNMp) III SA 24/4 allows to set the pole position in relation to one another independently while maintaining the minimal safe distance.

The switches can only be installed on a pole post in a vertical position. In the case of ordering a module cut-off/earthing switch intended for installation on pole post, enter the spun pole top diameter. Overhead cut-off switches RNMP (RUNMp) III SA 24/4 have the asymmetrical triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed structure, the other to the moving bearing structure. Moving structures of all three poles are connected with one section. The handle of the switch drive is attached to the section, which ensures simultaneous connection and disconnection of all poles.

The module cut-off switches normally include porcelain insulators. They can be additionally equipped with insulators:

- RNM (RUNM) III SA 24/4K - composite
- RNM (RUNM) III SA 24/4S - silicone

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main and auxiliary (changeover) contacts. They are mounted on support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two coiled together profiled moving contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated. The auxiliary (changeover) contact consists of a dog and a spring. The dog is made of galvanized steel sheet, and the changeover contact spring is made of stainless spring steel. Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable.

To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm².

The product is protected against corrosion by a hot dip zinc layer. The switch is controlled using hand operated drive NRA(u) or motor drive NEA. The drives are coupled with the switch driving mechanism using 2 screws M10.

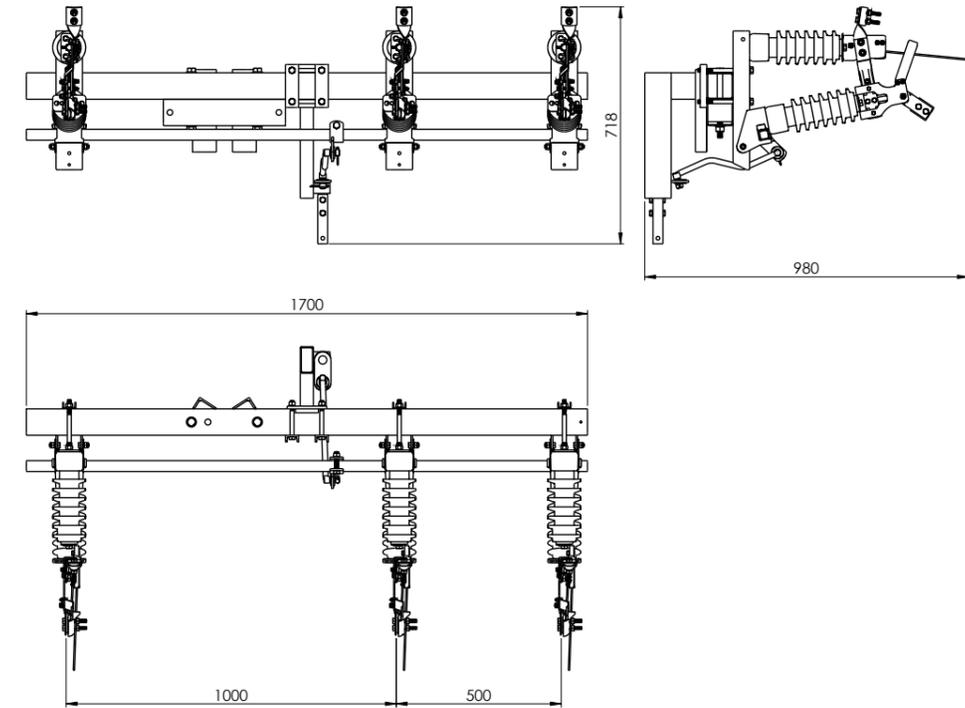
Basic solutions

◇ Cut-off switch RNMP III SA 24/4

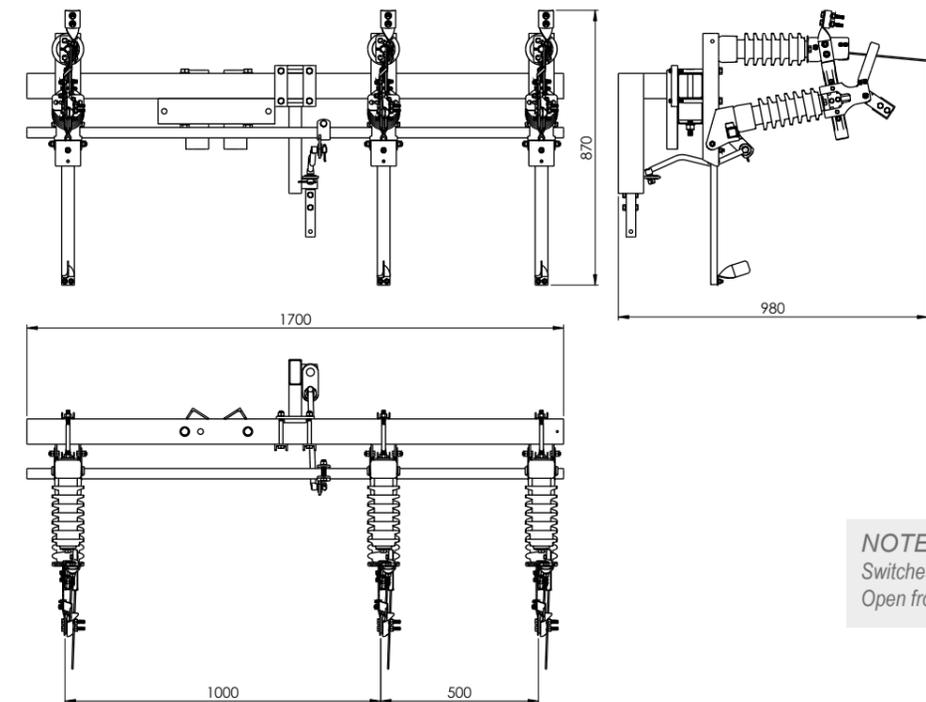
◇ Cut-off earthing switch RUNMp III SA 24/4

Basic dimensions

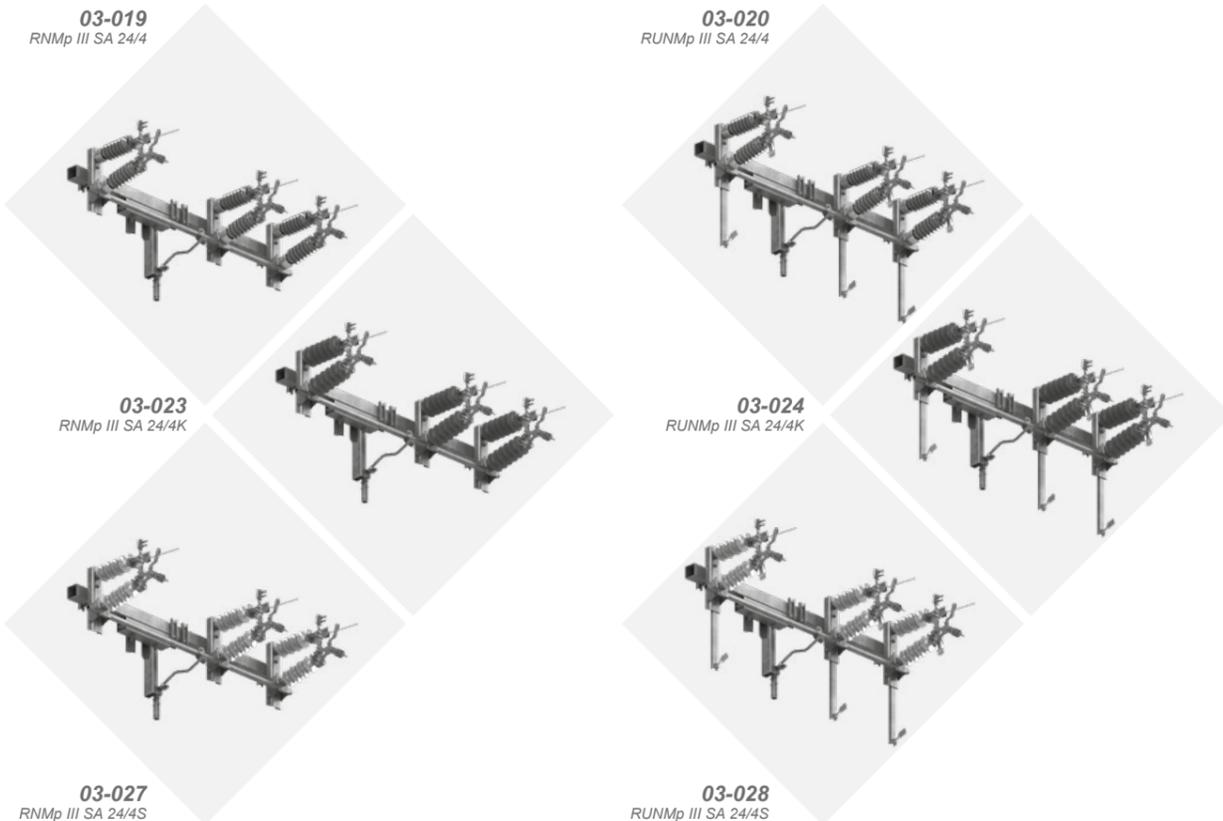
◇ Cut-off switch RNMP III SA 24/4



◇ Cut-off earthing switch RUNMp III SA 24/4



NOTE!
Switches with left side movement.
Open from left to right.



4.5 Frame isolating switches with their own structure supporting MV surge arresters
- vertical assembly on a pole.

Overhead cut-off switches RNp (RUNp) III SA 24/4o have the triple pole structure with a base (frame) and a drive shared by all poles. The integral part of every vertical switch is the structure attaching it to the pole post. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the base frame, the other to the moving bearing frame. This ensures simultaneous connection and disconnection of all poles.

The switches normally include porcelain insulators. They can be additionally equipped with insulators:

RNp (RUNp) III SA 24/4Ko – composite insulators

RNp (RUNp) III SA 24/4So – silicone insulators

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main and auxiliary (changeover) contacts. They are mounted on support frames placed directly on the stand-off insulators. The main current circuit consists of a flat fixed contact and two coiled together profiled contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated. The auxiliary

(changeover) contact consists of a dog and a spring. The dog is made of galvanized steel sheet, and the changeover contact spring is made of stainless spring steel. Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable.

An LGY bridge ending with a copper back plane is attached to the feeder clamp. The back plane has holes necessary for installation of a bridge with a surge arrester and a cable head terminal.

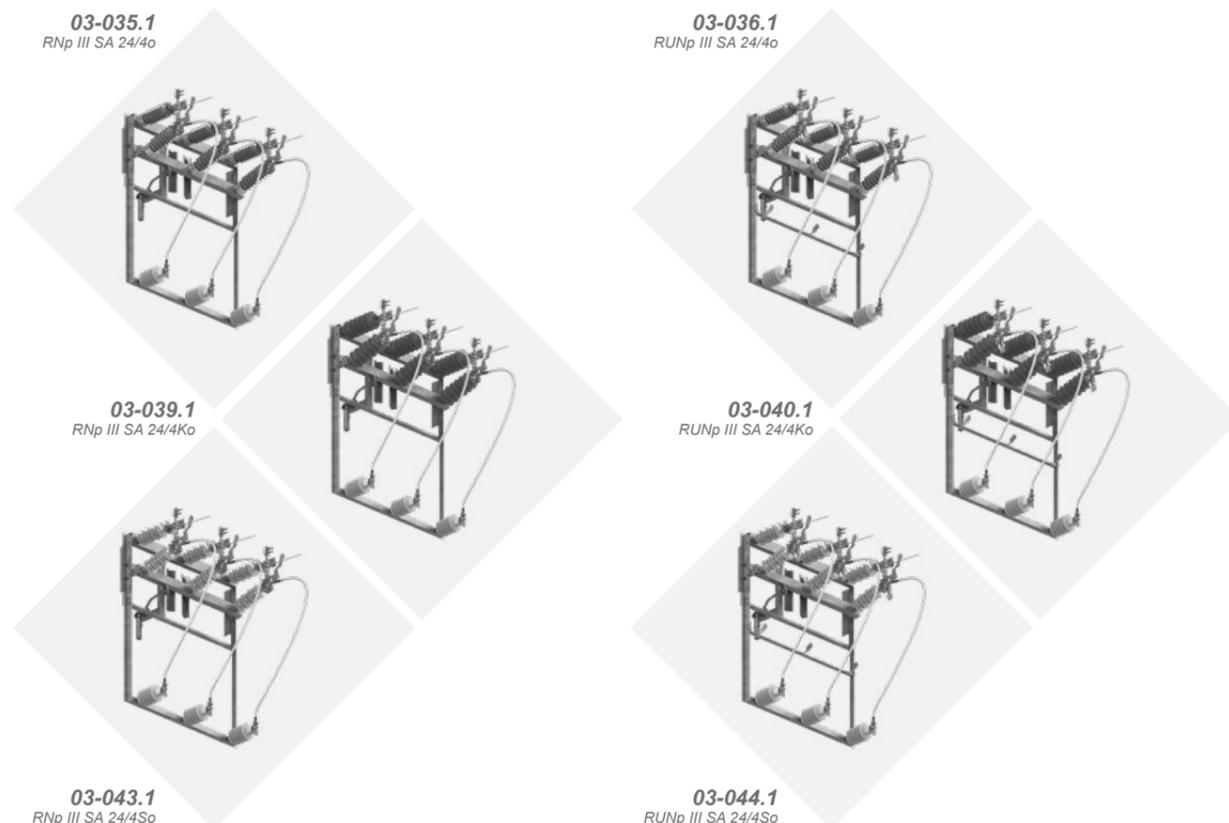
To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm². Switches frame was made of closed steel sections and cold-formed steel sections. The product is protected against corrosion by a hot dip zinc layer. Standard cut-off switches frame has a frame for surge arresters or stand-off insulators attached, due to which there is no need for the additional structure supporting surge arresters. This solution ensures more space on the pole and decreases the completion time and cost of a project.

The switch is controlled using hand operated drive NRA(u) or motor drive NEA.

Basic solutions

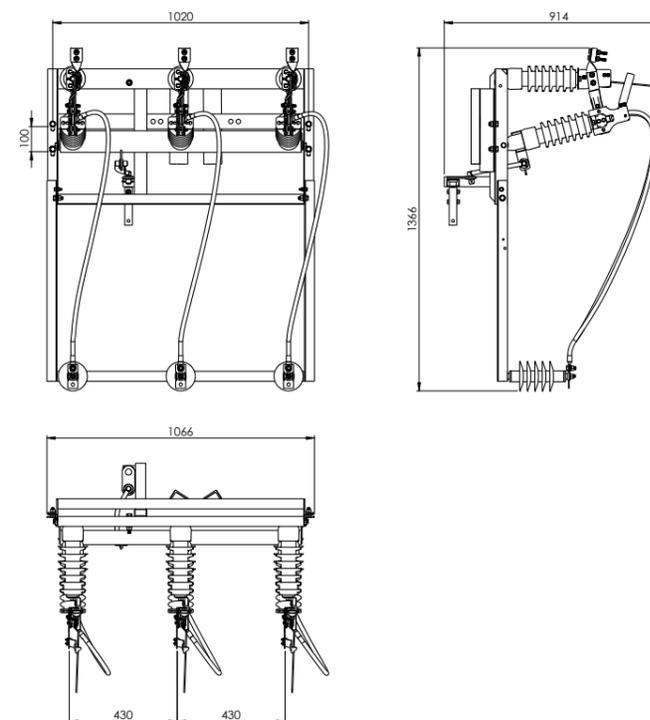
◇ Cut-off switch RNp III SA 24/4o

◇ Cut-off earthing switch RUNp III SA 24/4o

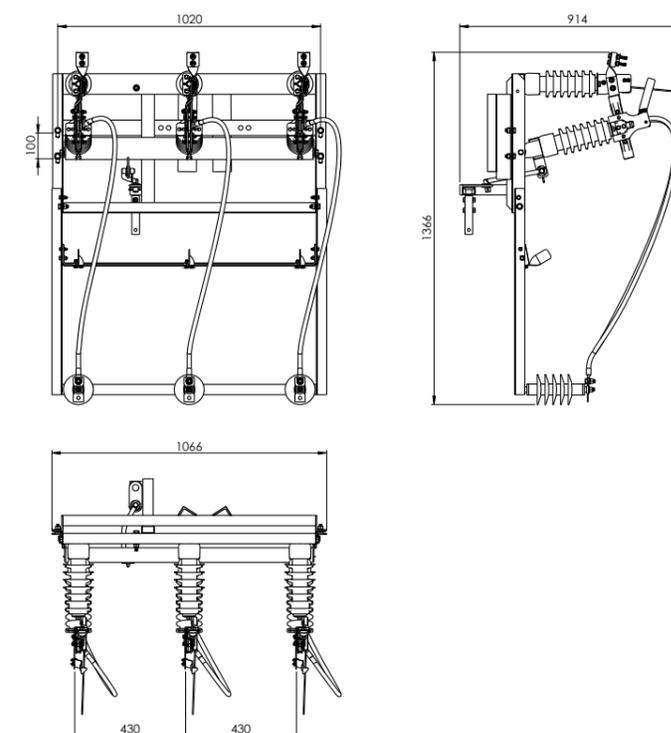


Basic dimensions

◇ Cut-off switch RNp III SA 24/4o



◇ Cut-off earthing switch RUNp III SA 24/4o



NOTE!
Surge arresters and stand-off insulators are not included in the product price!

4.6. Module cut-off switches with their own structure supporting MV Surge arresters
- vertical assembly on a pole.

The module structure of isolating switches RNM (RUNM) III SA 24/4o allows to set the pole position in relation to one another independently while maintaining the minimal safe distance.

The switches can be installed on the top (over pole wires) and on the pole post in a horizontal position. In the case of ordering a module cut-off/earthing switch intended for installation on pole top, enter the type of structure to which the switch will be attached (see: Book 4: Installing switches on the MV overhead lines). In the case of ordering a module cut-off/earthing switch intended for installation on pole post, enter the spun pole top diameter.

Overhead cut-off switches RNM (RUNM) III SA 24/4o have the asymmetrical triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed structure, the other to the moving bearing structure. Moving structures of all three poles are connected with one section. The handle of the switch drive is attached to the section, which ensures simultaneous connection and disconnection of all poles.

The module cut-off switches normally include porcelain insulators. They can be additionally equipped with insulators: RNM (RUNM) III SA 24/4Ko – composite insulators RNM (RUNM) III SA 24/4So – silicone insulators

The current circuit of each pole consists of main and auxiliary (changeover) contacts. They are mounted on support frames placed directly on the stand-off insulators. Moving contacts of the circuit were

profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated. The auxiliary (changeover) contact consists of a dog and a spring. The dog is made of galvanized steel sheet, and the changeover contact spring is made of stainless spring steel.

Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. An LGY bridge ending with a copper back plane is attached to the feeder clamp. The back plane has holes necessary for installation of a bridge with a surge arrester and a cable head terminal. To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm². Standard cut-off switch main frame has a structure for surge arresters or stand-off insulators attached, due to which there is no need for the additional structure supporting surge arresters.

The switch is controlled using hand operated drive NRA(u) or motor drive NEA.

Basic solutions

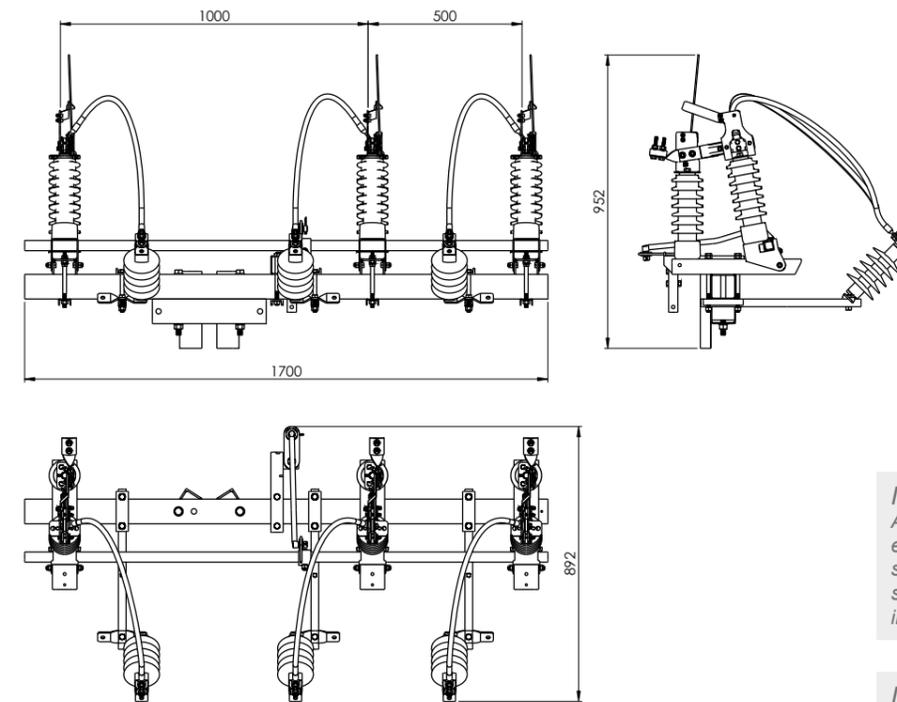
◇ Cut-off switch RNM III SA 24/4o

◇ Cut-off earthing switch RUNM III SA 24/4o

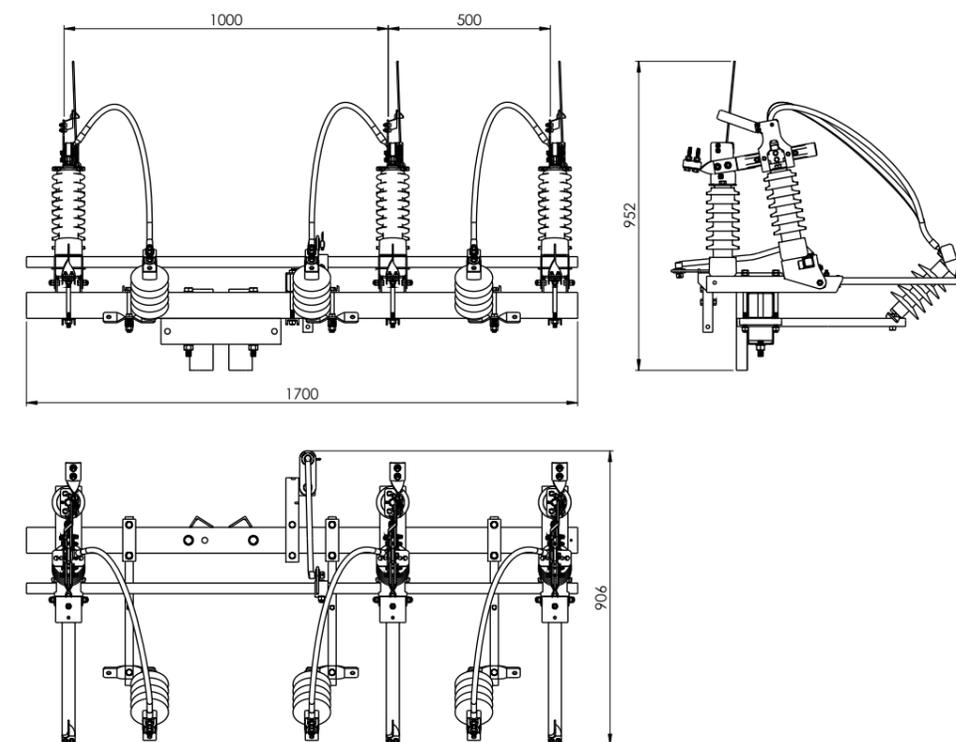


Basic dimensions

◇ Cut-off switch RNM III SA 24/4o



◇ Cut-off earthing switch RUNM III SA 24/4o



NOTE!
ALPAR offers also cut-off switches (RNM) and isolating earthing switches (RUNM) with their own structure mounting the stand-off insulators.

NOTE!
Surge arresters and stand-off insulators are not included in the product price!

4.7. Module cut-off switches with their own structure supporting MV surge arresters
 - vertical assembly on a pole.

The module structure of isolating switches RNMP (RUNMP) III SA 24/4o allows to set the pole position in relation to one another independently while maintaining the minimal safe distance. The switches can only be installed on a pole post in a vertical position. In the case of ordering a module cut off/earthing switch, enter the spun pole top diameter.

Overhead cut-off switches RNMP (RUNMP) III SA 24/4o have the asymmetrical triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed structure, the other to the moving bearing structure. Moving structures of all three poles are connected with one section. The handle of the switch drive is attached to the section, which ensures simultaneous connection and disconnection of all poles.

The module cut-off switches normally include porcelain insulators. They can be additionally equipped with insulators: RNMP (RUNMP) III SA 24/4Ko – composite insulators RNMP (RUNMP) III SA 24/4So – silicone insulators

It is possible to use different insulators holding valid certificate on customer's request.

The current circuit of each pole consists of main and auxiliary (changeover) contacts. They are mounted on support frames placed directly on the stand-off insulators. The main current circuit consists of a flat fixed contact and two coiled together profiled moving contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting

of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning. They can additionally be silver-plated. The auxiliary (changeover) contact consists of a dog and a spring. The dog is made of galvanized steel sheet, and the changeover contact spring is made of stainless spring steel.

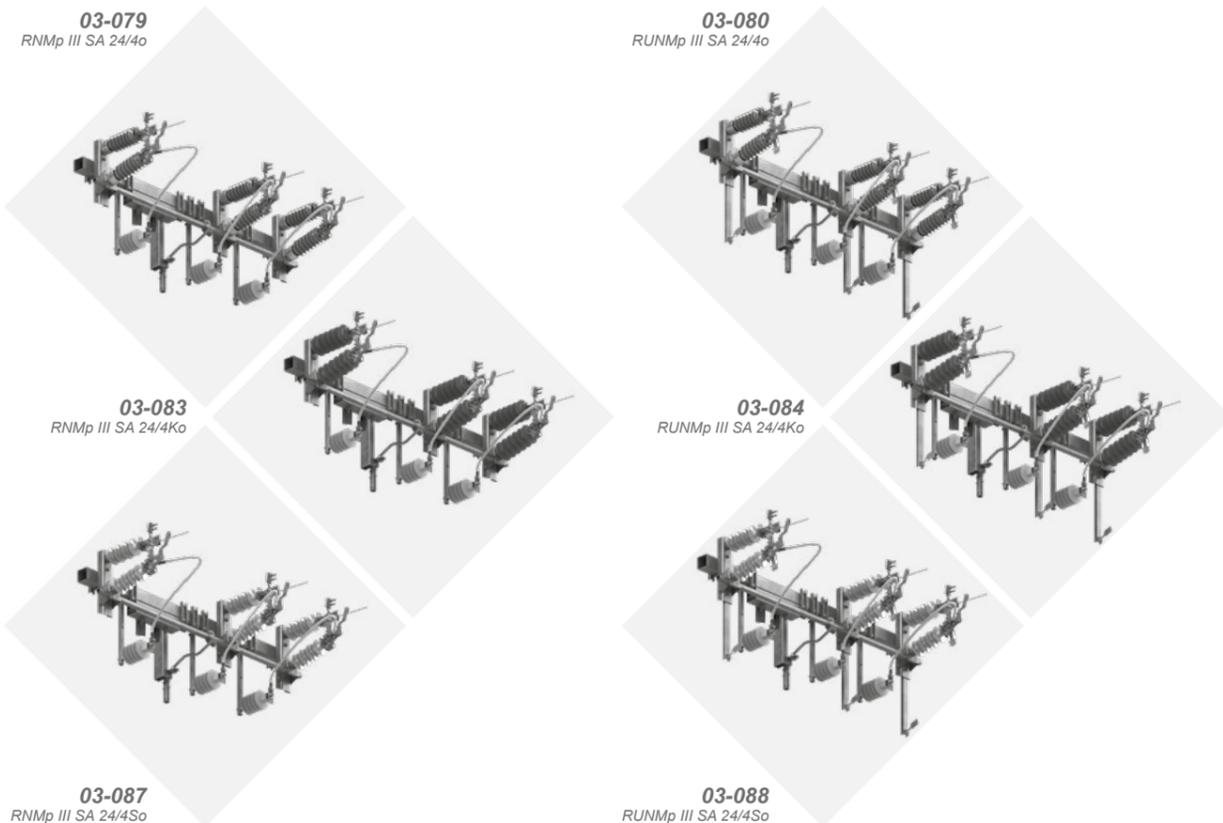
Each moving pole of a switch is by design equipped with an articulated joint with a 16-95 mm² (120 mm² on request) feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. An LGY bridge ending with a copper back plane is attached to the feeder clamp. The back plane has holes necessary for installation of a bridge with a surge arrester and a cable head terminal. To ensure the optimal current path, the connection clamp is connected to the main contact via a copper flexible connector. A feeder clamp was used in order to connect a cord or a power supply cable from the side of the fixed contact. It also allows to connect a cord of cross-section up to 95 (120) mm². Standard cut-off switch main frame has a structure for surge arresters or stand-off insulators attached, due to which there is no need for the additional structure supporting surge arresters. This solution ensures more space on the pole and decreases completion time and cost of a project.

The switch is controlled using hand operated drive NRA(u) or motor drive NEA

Basic solutions

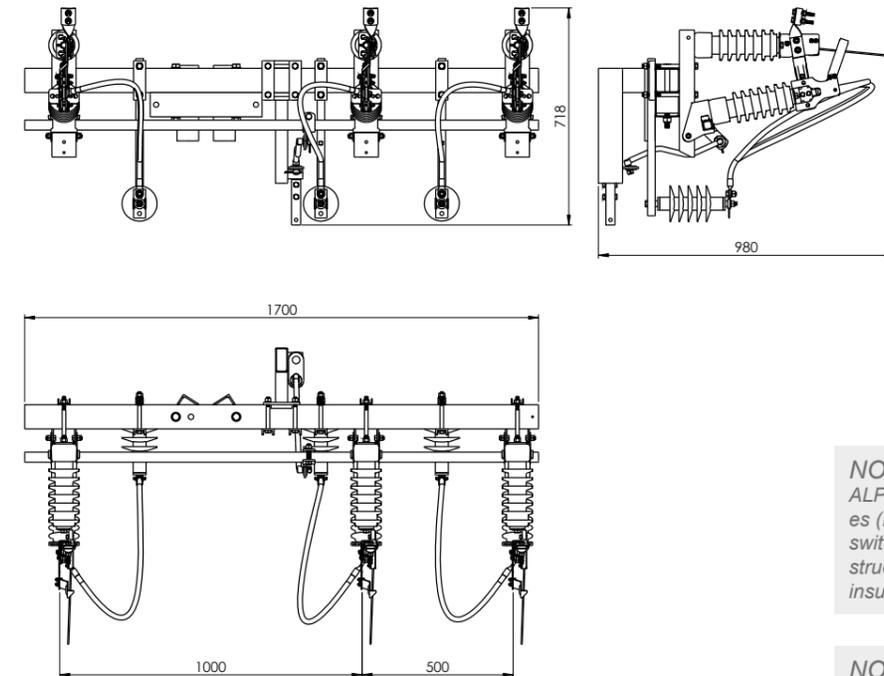
◇ Cut-off switch RNMP III SA 24/4o

◇ Cut-off earthing switch RUNMP III SA 24/4o



Basic dimensions

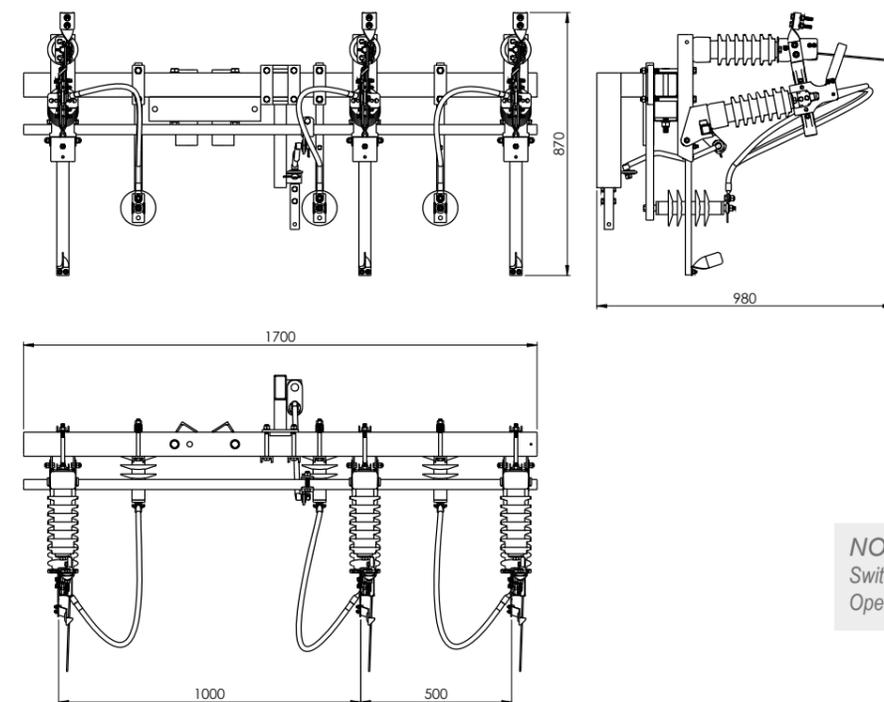
◇ Cut-off switch RNMP III SA 24/4o



NOTE!
 ALPAR offers also cut-off switches (RNM) and isolating earthing switches (RUNM) with their own structure mounting the stand-off insulators.

NOTE!
 Surge arresters and stand-off insulators are not included in the product price!

◇ Cut-off earthing switch RUNMP III SA 24/4o



NOTE!
 Switches with left side movement. Open from left to right.

5. EXPLOITATION OF CUT-OFF SWITCHES

Directly after receiving the switch, check the delivery against the order and the general state of the switch. During loading, unloading, and installation, the devices should be moved only by grabbing their base (frame).

NOTE!

Do not touch the circuit elements or switch stand-off insulators under any circumstances.

The switches are delivered to the recipient completely assembled and tuned - always in the disconnected position. After unpacking check if the device suffered no mechanical damage in the transport and if all data on the rated plate is correct.

During installation of the switch on a pole and coupling it with hand operated drive NRA(u) or NRMA(u), the device should be in the disconnected position. During hand drive installation, its key should be on the right side in the disconnected switch position.

NOTE!

Does not apply to vertical module cut-off switches. In this group of isolating switches, the key should be on the left side.

NOTE!

Installation of a drive other than NRA(u) or NRMA(u) is only possible after contacting the Manufacturer beforehand.

The cut-off switches are adjusted to connect wires of up to 95 mm² cross-section. Before carrying out the connecting, it is recommended to clean connection elements (connection clamps) contact surfaces of possible pollution and cover them with a thin layer of (acid-free) conductive grease.

Before switch hand-over to operation, check the device state, correctness of coupling with the drive, and operation correctness. Carry out a visual inspection of the switch, checking insulators state (pollution, cracks, etc) and correctness of screw tightening - this particularly applies to wires, drive connection, and mounting of the device on the support frame. Then perform several connection cycles, paying attention to correct operation of the main contacts (arming at disconnection).

CHAPTER 3

OVERHEAD CUT OFF SWITCHES 100A

RN III SA 24/4/100 (K, S)
 RUN III SA 24/4/100 (K, S)
 RNp III SA 24/4/100 (K, S)
 RUNp III SA 24/4/100 (K, S)
 RNM III SA 24/4/100 (K, S)
 RUNM III SA 24/4/100 (K, S)
 RNMp III SA 24/4/100 (K, S)
 RUNMp III SA 24/4/100 (K, S)

6. INSPECTIONS AND MAINTENANCE

6.1. Inspections

Switch inspection should be carried out once every five years in the case of failure-free operation, and also:

- After every auxiliary contacts replacement
- After short-circuit connection of the switch

During inspection, pay extra attention to:

- Insulators state (scratches, cracks, etc)
- Main contacts state (dirt, signs of partial melting)
- Auxiliary contacts state (signs of partial melting on contact spring, attachment to the fixed contact frame)
- Switch screws (wires connections, drive connection, mounting of the device on the support frame)
- Switch drive state
- Protective covers state

6.2. Maintenance

It is recommended to carry out maintenance of the switch after every inspection.

Maintenance includes:

- Cleaning insulators
- Cleaning main and auxiliary contacts
- Covering main with current (acid-free) grease
- Tightening potentially loosened screws
- Filling in damaged protective layers (with cold zinc spray)

1. CHARACTERISTICS AND INTENDED USE

The subject of the document is design documentation of overhead triple pole cut off and earthing switches manufactured by ALPAR Artur i Piotr Kowalscy Spółka Jawna.

The cut-off switches are available in two basic types:

Frame - the switches are mounted on a shared frame and intended for horizontal installation on typical steel structures (RN; RUN), or they have their own structure attaching them to the post and are intended for vertical installation (RNp; RUNp)

Module - the switches are mounted on a shared frame and intended for both horizontal and vertical installation; they have their own structure attaching them to the post or cross-arm (RNM, RNMp; RUNM, RUNMp).

Each pole of a switch consists of two stand-off insulators - one fixed and one moveable. There are circuits and special extinguishing chambers installed on the insulators. The switches can be equipped with porcelain, composite, or silicone insulators.

Overhead cut-off switches RN (RUN) III SA 24/4/100 (K,S) and RNM (RUNM) III SA 24/4/100 (K,S) are used in power transmission networks of 15 and 20 kV voltage. They are intended for connecting and disconnecting transmission lines under load up to 100 A.

Cut-off earthing switches (RUN) additionally earth disconnected sections of the line. Cut-off switches RN (RUN) III SA 24/4 can also be used in branch lines powering one or more transformer stations. since in an (open position) they create visible and safe insulation break, thus meeting requirements for insulating switches.

RN III SA 24/4/100 (K, S)
RUN III SA 24/4/100 (K, S)
RNp III SA 24/4/100 (K, S)
RUNp III SA 24/4/100 (K, S)
RNM III SA 24/4/100 (K, S)
RUNM III SA 24/4/100 (K, S)
RNMp III SA 24/4/100 (K, S)
RUNMp III SA 24/4/100 (K, S)

2. TECHNICAL DATA

PN-EN 62271-1:2018-02 *High-voltage switchgear and controlgear*

- Part 1: Common specifications

IEC 62271-1:2007+AMD1:2011 *High-voltage switchgear and controlgear*

- Part 1: Common specification

PN-EN 62271-103:2011 *High-voltage switchgear and controlgear*

- Part 103: Switches for rated voltages above 1 kV up to and including 52 kV

IEC 62271-103:2011 *High-voltage switchgear and controlgear*

- Part 103: Switches for rated voltages above 1 kV up to and including 52 kV

PN-EN IEC 62271-102:2018-10 *High-voltage switchgear and controlgear*

- Part 102: Alternating current disconnectors and earthing switches

IEC 62271-102:2001+AMD1:2011+AMD2:2013 *High-voltage switchgear and controlgear*

- Part 102: Alternating current disconnectors and earthing switches

Technical data of cut-off and cut-off/earthing switches:		
Rated voltage	Ur	24 kV
Rated frequency	fr	50 Hz
Rated continuous current	Ir	400 A
Number of phases		3
Rated lightning impulse withstand voltage (1.2 / 50) (peak value):		
Up:		
phase to earth and between phases		125 kV
across opened contacts		145 kV
Rated short-duration power frequency with-stand voltage (1 min) (r.m.s. value):		
Ud:		
phase to earth and between phases		50 kV
across opened contacts		60 kV
Rated short-time withstand current	Ik	16 kA
Rated peak withstand current	Ip	40 kA
Rated duration of short-circuit	tk	1 s
Rated mainly active load breaking current	Iload	100 A
Rated closed loop breaking current	Iloop	100 A
Rated line-charging breaking current	Ilc	2 A
Rated cable-charging breaking current	Icc	16 kA
Rated earth-fault breaking current	Ief1	48 A
Rated cable- and line-charging breaking current under earth fault conditions	Ief2	27 A
* Rated short-circuit making current	Ima	5 kA
Electrical endurance class		E3
Mechanical endurance class		5000 cycles C-0
Electrical endurance class of earthing switch		E2
Motor drive		NEA
Hand operated drive		NRA(u), NRMA(u)

* Research is ongoing in the Institute

3. TYPES AND STRUCTURE

3.1. Frame cut-off switches - horizontal installation on a pole.

Overhead cut-off switches RN (RUN) III SA 24/4/100 have the triple pole structure with a base (frame) and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the base frame, the other to the moving bearing frame. This ensures simultaneous connection and disconnection of all poles.

The switches normally include porcelain insulators.

They can be additionally equipped with insulators:

RN (RUN) III SA 24/4/100K – composite insulators

RN (RUN) III SA 24/4/100S – silicone insulators

The current circuit of each pole consists of main contacts and an extinguishing chamber. They are mounted on specifically profiled support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two coiled together profiled contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning or silver plating. Each moving pole of a switch is by design equipped with an articulated joint with a 16-120 mm² feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. All connecting elements (screws, caps) of the main and auxiliary circuit are made of stainless steel.

The extinguishing chamber is made of a special material resistant to electric arc and UV radiation. Inside and outside the chamber there is a special mechanism allowing to disconnect and connect auxiliary contacts, which are intended for extinguishing electric arc during disconnecting a line under load.

To ensure the optimal current path, the connection clamps are connected to the main and auxiliary contacts via copper flexible connectors. Connection clamps enable connection of a wire or a cable of cross-section up to 120 mm². Switches' frame was made of closed steel sections and cold-formed steel sections. Each moving element of the frame is equipped with a slide bearing made of precious metals or abrasion resistant and UV-resistant material. This solution ensures many years of failure-free operation of the switch.

The product is protected against corrosion by a hot dip zinc layer, in accordance with the following standard: ISO standard 1461:2009 - Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.

Switches RN (RUN) III SA 24/4/100 are designed for the horizontal installation in overhead power lines on typical steel structures in a horizontal position.

The switch is controlled using hand operated drive NRA or motor drive NEA. The cut-off earthing switch can only be controlled using hand operated drive NRA(u).

The drives are coupled with the switch driving mechanism using 2 screws M10.

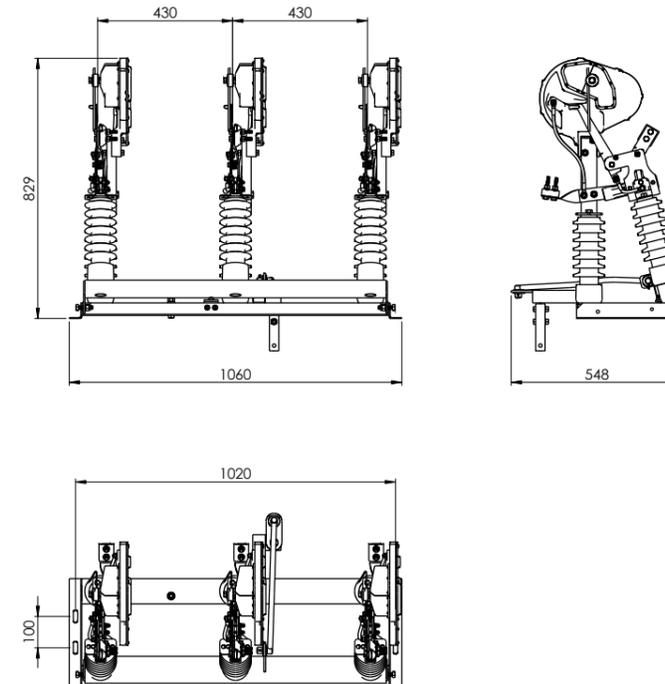
Basic solutions

◇ Cut-off switch RN III SA 24/4/100

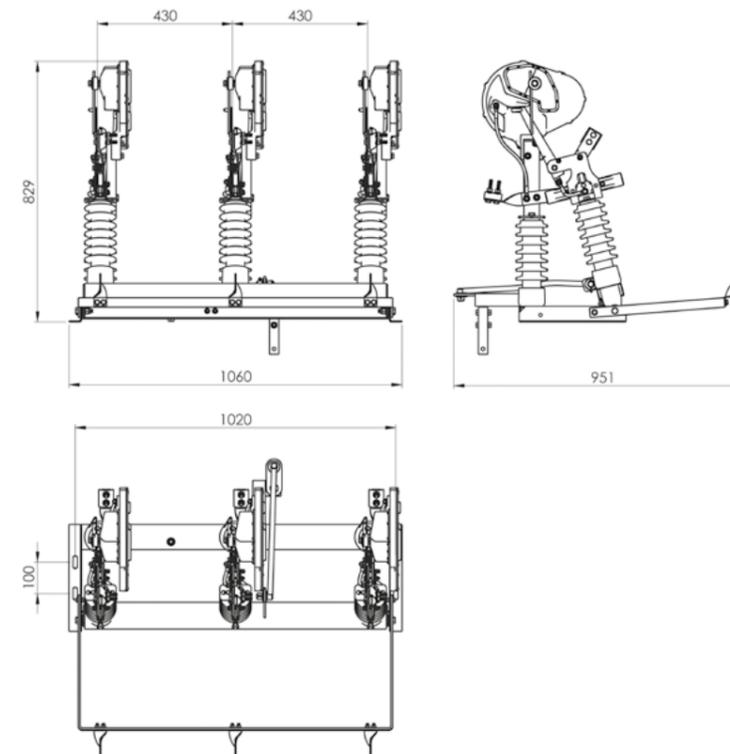
◇ Cut-off earthing switch RUN III SA 24/4/100

Basic dimensions

◇ Cut-off switch RN III SA 24/4/100



◇ Cut-off earthing switch RUN III SA 24/4/100



3.2. Frame cut-off switches - vertical installation on a pole.

Overhead cut-off switches RNp (RUNp) III SA 24/4/100 have the triple pole structure with a base (frame) and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the base frame, the other to the moving bearing frame. This ensures simultaneous connection and disconnection of all poles.

The switches normally include porcelain insulators. They can be additionally equipped with insulators: RNp (RUNp) III SA 24/4/100K – composite insulators RNp (RUNp) III SA 24/4/100S – silicone insulators

The current circuit of each pole consists of main contacts and an extinguishing chamber. They are mounted on specifically profiled support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two coiled together profiled contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal. Standard main contacts are made of a copper flat bar and protected against corrosion by tinning or silver plating. Each moving pole of a switch is by design equipped with an articulated joint with a 16-120 mm² feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. All connecting elements (screws, caps) of the main and auxiliary circuit are made of stainless steel.

The extinguishing chamber is made of a special material resistant to electric arc and UV radiation. Inside and outside the chamber there is a special mechanism allowing to disconnect and connect auxiliary contacts, which are intended for extinguishing electric arc during disconnecting a line under load.

To ensure the optimal current path, the connection clamps are connected to the main and auxiliary contacts via copper flexible connectors. Connection clamps enable connection of a wire or a cable of cross-section up to 120 mm². Switches' frame was made of closed steel sections and cold-formed steel sections. Each moving element of the frame is equipped with a slide bearing made of precious metals or abrasion resistant and UV-resistant material. This solution ensures many years of failure-free operation of the switch.

The product is protected against corrosion by a hot dip zinc layer, in accordance with the following standard: ISO standard 1461:2009 - Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.

Switches RNp (RUNp) III SA 24/4/100 are designed for the installation in overhead power lines with their own mounting structure in a vertical position.

The switch is controlled using hand operated drive NRA or motor drive NEA. The cut-off earthing switch can only be controlled using hand operated drive NRA(u).

The drives are coupled with the switch driving mechanism using 2 screws M10.

Basic solutions

◇ Cut-off switch RNp III SA 24/4/100

◇ Cut-off earthing switch RUNp III SA 24/4/100



03-735
RNp III SA 24/4/100



03-739
RNp III SA 24/4/100K



03-743
RNp III SA 24/4/100S



03-736
RUNp III SA 24/4/100



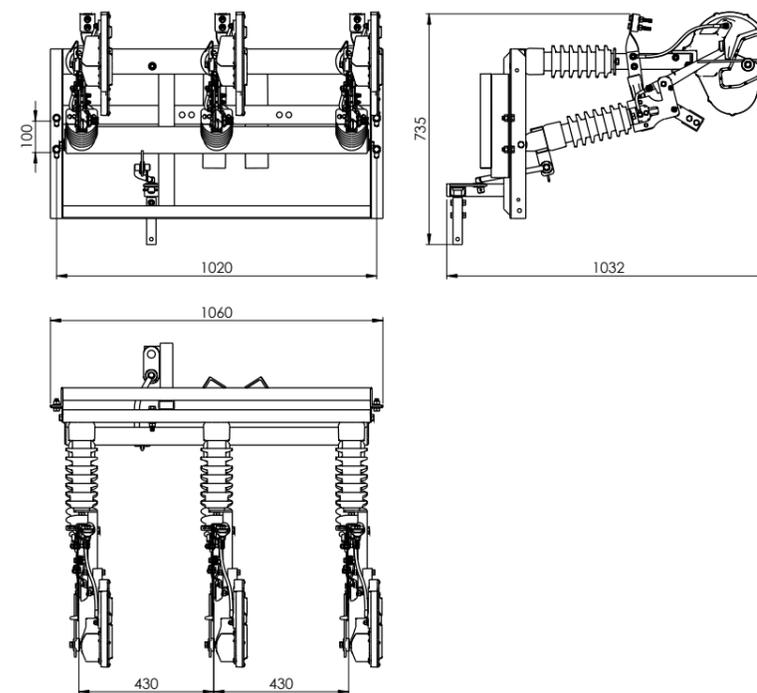
03-740
RUNp III SA 24/4/100K



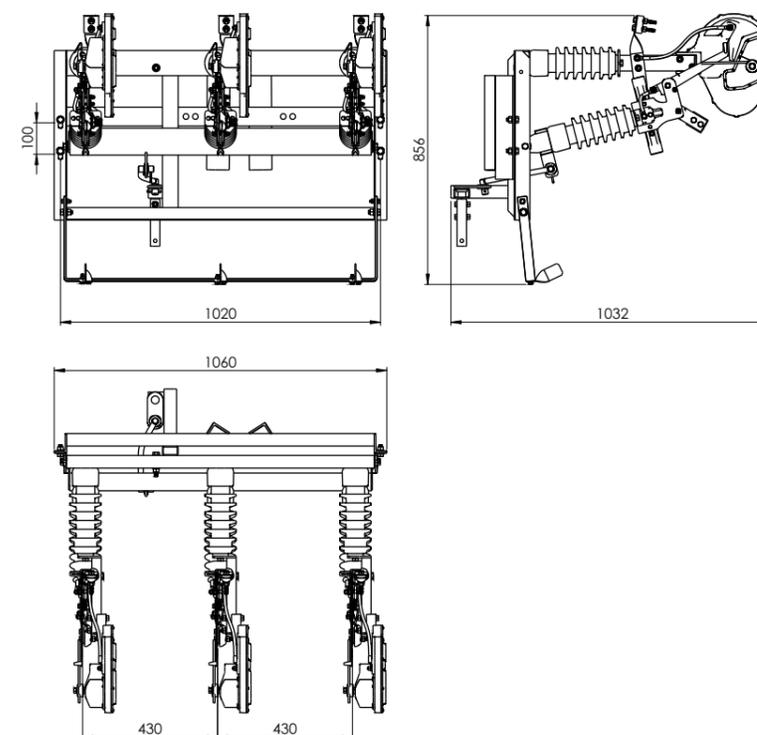
03-744
RUNp III SA 24/4/100S

Basic dimensions

◇ Cut-off switch RNp III SA 24/4/100



◇ Cut-off earthing switch RUNp III SA 24/4/100



3.3. Module cut-off switches - horizontal installation on a pole.

Overhead cut-off switches RNM (RUNM) III SA 24/4/100 have the triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed base, the other to the moving bearing frame. This ensures simultaneous connection and disconnection of all poles. The module structure of cut-off switches RNM (RUNM) III SA 24/4/100 allows to set the pole position in relation to one another independently while maintaining the minimal safe distance. The switches can be installed on the top (over pole wires) and on the pole post in a horizontal position.

In the case of ordering a module isolating/earthing switch intended for installation on pole top, enter the type of structure to which the switch will be attached (see: Book 4: Installing switches on the MV overhead lines). In the case of ordering a module cut off/earthing switch intended for installation on pole post, enter the spun pole top diameter.

The module cut-off switches normally include porcelain insulators. They can be additionally equipped with insulators:

- RNM (RUNM) III SA 24/4/100K – composite insulators
- RNM (RUNM) III SA 24/4/100S – silicone insulators

The current circuit of each pole consists of main contacts and an extinguishing chamber. They are mounted on specifically profiled support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two coiled together profiled contacts. Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal.

Standard main contacts are made of a copper flat bar and protected against corrosion by tinning or silver plating. Each moving pole of a switch is by design equipped with an articulated joint with a 16-120 mm² feeder clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. All connecting elements (screws, caps) of the main and auxiliary circuit are made of stainless steel.

The extinguishing chamber is made of a special material resistant to electric arc and UV radiation. Inside and outside the chamber there is a special mechanism allowing to disconnect and connect auxiliary contacts, which are intended for extinguishing electric arc during disconnecting a line under load.

To ensure the optimal current path, the connection clamps are connected to the main and auxiliary contacts via copper flexible connectors. Connection clamps enable connection of a wire or a cable of cross-section up to 120 mm². The main frame and support elements of the switches were made of closed steel sections and cold-formed steel sections. Each moving element of the frame is equipped with a slide bearing made of precious metals or abrasion resistant and UV-resistant material. This solution ensures many years of failure-free operation of the switch.

The product is protected against corrosion by a hot dip zinc layer, in accordance with the following standard: ISO standard 1461:2009.

The switch is controlled using hand operated drive NRA or motor drive NEA. The cut-off earthing switch can only be controlled using hand drive NRA(u).

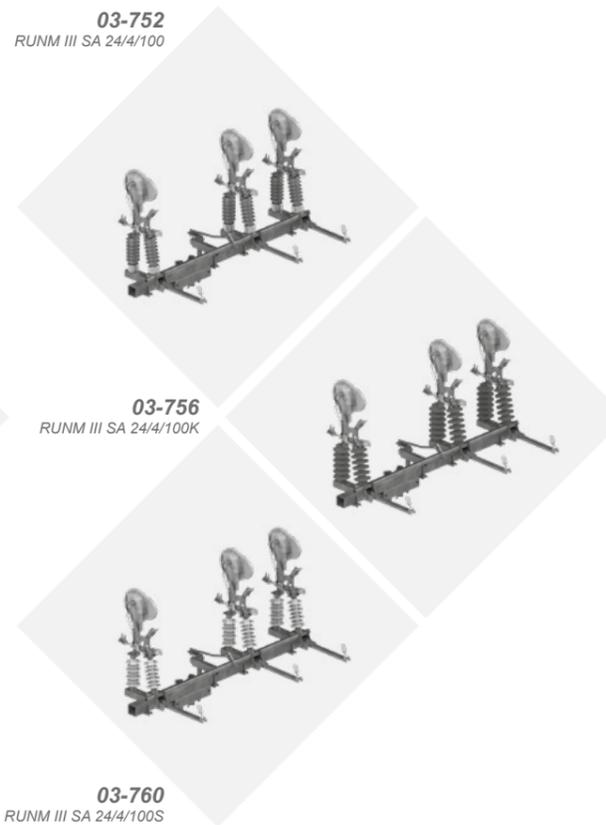
The module switches can be controlled with drive NRMA(u) of reciprocal motion. Installation and operation details are presented in chapter 4, Hand operated drives NRMA, NRMAu.

Basic solutions

◇ Cut-off switch RNM III SA 24/4/100

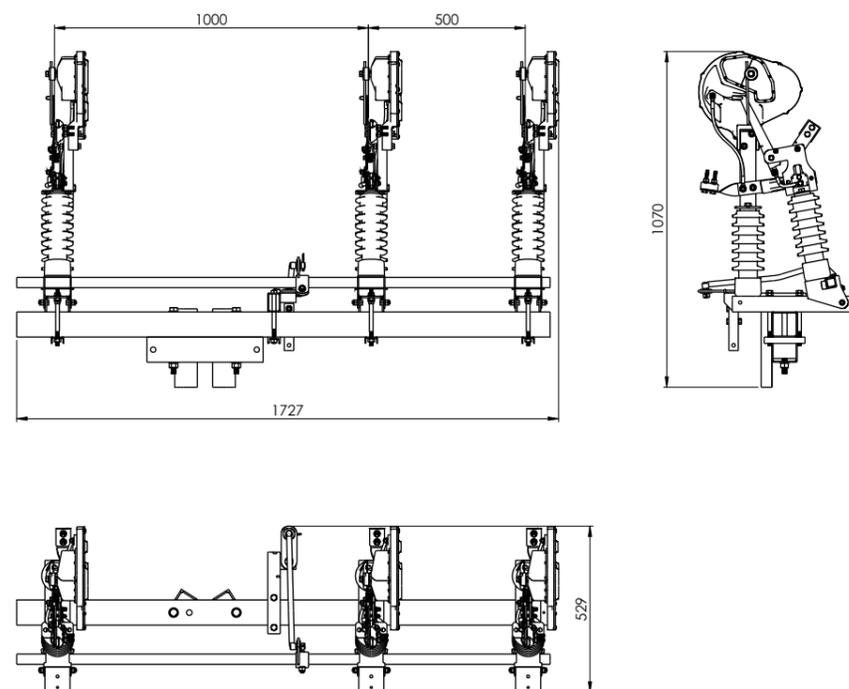


◇ Cut-off earthing switch RUNM III SA 24/4/100

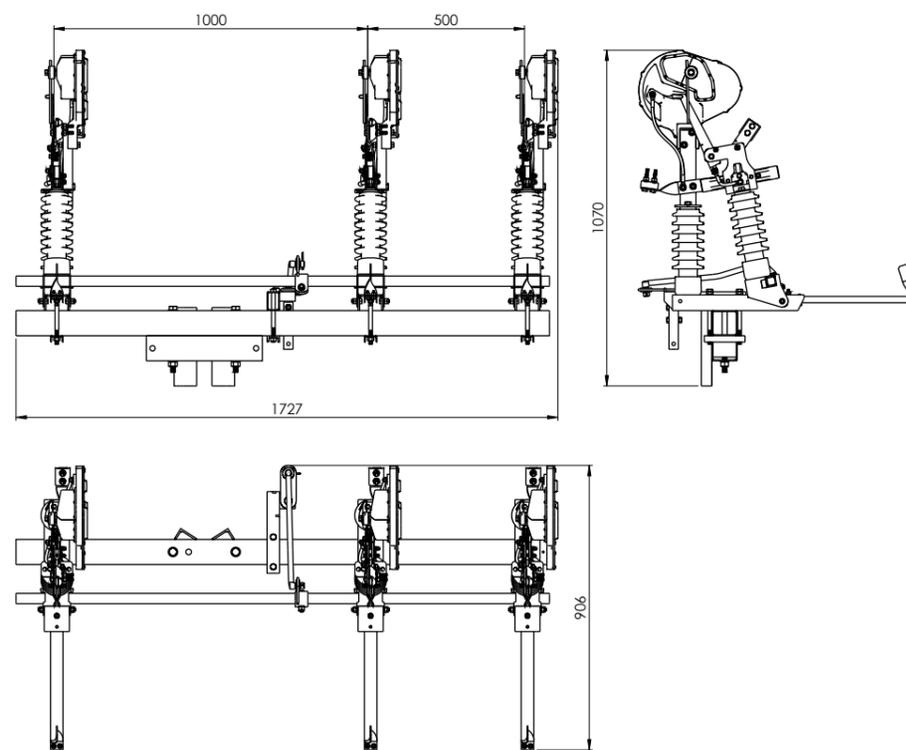


Basic dimensions

◇ Cut-off switch RNM III SA 24/4/100



◇ Cut-off earthing switch RUNM III SA 24/4/100



3.4. Module cut-off switches - vertical installation on a pole.

Overhead cut-off switches RNMp (RUNMp) III SA 24/4/100 have the triple pole structure with a support frame and a drive shared by all poles. Each pole of a switch consists of two stand-off insulators. One insulator is fixed to the fixed base, the other to the moving bearing frame. This ensures simultaneous connection and disconnection of all poles. The module structure cut-off switches RNMp (RUNMp) III SA 24/4/100 allows to set the pole position in relation to one another independently while maintaining the minimal safe distance. The switches can only be installed on the pole post (over pole wires) in a vertical position. In the case of ordering, enter the spun pole top diameter.

The module cut-off switches normally include porcelain insulators. They can be additionally equipped with insulators:

- RNmp (RUNMp) III SA 24/4/100K – composite insulators
- RNmp (RUNMp) III SA 24/4/100S – silicone insulators

The current circuit of each pole consists of main contacts and an extinguishing chamber. They are mounted on specifically profiled support frames placed directly on the stand-off insulators.

The main current circuit consists of a flat fixed contact and two coiled together profiled contacts.

Moving contacts of the current circuit were profiled in a shape ensuring the reliable self-direction and large contact surface. In addition, mounting of the moving contacts has technical clearance due to which the contact surface between moving contacts and the fixed contact (or earthing contact) is optimal.

Standard main contacts are made of a copper flat bar and protected against corrosion by tinning or silver plating. Each moving pole of a switch is by design equipped with an articulated joint with a 16-120 mm² feeder

clamp. The articulated joint is designed to prevent breaking of a cord or a power supply cable. All connecting elements (screws, caps) of the main and auxiliary circuit are made of stainless steel.

The extinguishing chamber is made of a special material resistant to electric arc and UV radiation. Inside and outside the chamber there is a special mechanism allowing to disconnect and connect auxiliary contacts, which are intended for extinguishing electric arc during disconnecting a line under load.

To ensure the optimal current path, the connection clamps are connected to the main and auxiliary contacts via copper flexible connectors. Connection clamps enable connection of a wire or a cable of cross-section up to 120 mm². The main frame and support elements of the switches were made of closed steel sections and cold-formed steel sections. Each moving element of the frame is equipped with a slide bearing made of precious metals or abrasion resistant and UV-resistant material. This solution ensures many years of failure-free operation of the switch. The product is protected against corrosion by a hot dip zinc layer, in accordance with the following standard: ISO standard 1461:2009 - Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.

The switch is controlled using hand operated drive NRA or motor drive NEA. The cut-off earthing switch can only be controlled using hand operated drive NRA(u).

The drives are coupled with the switch driving mechanism using 2 screws M10.

The module switches can be controlled with drive NRMA(u) of reciprocal motion. Installation and operation details are presented in chapter 4, Hand operated drives NRMA, NRMAu.

Basic solutions

◇ Cut-off switch RNMp III SA 24/4/100

◇ Cut-off earthing switch RUNMp III SA 24/4/100

03-719
RNmp III SA 24/4/100

03-720
RUNMp III SA 24/4/100

03-723
RNmp III SA 24/4/100K

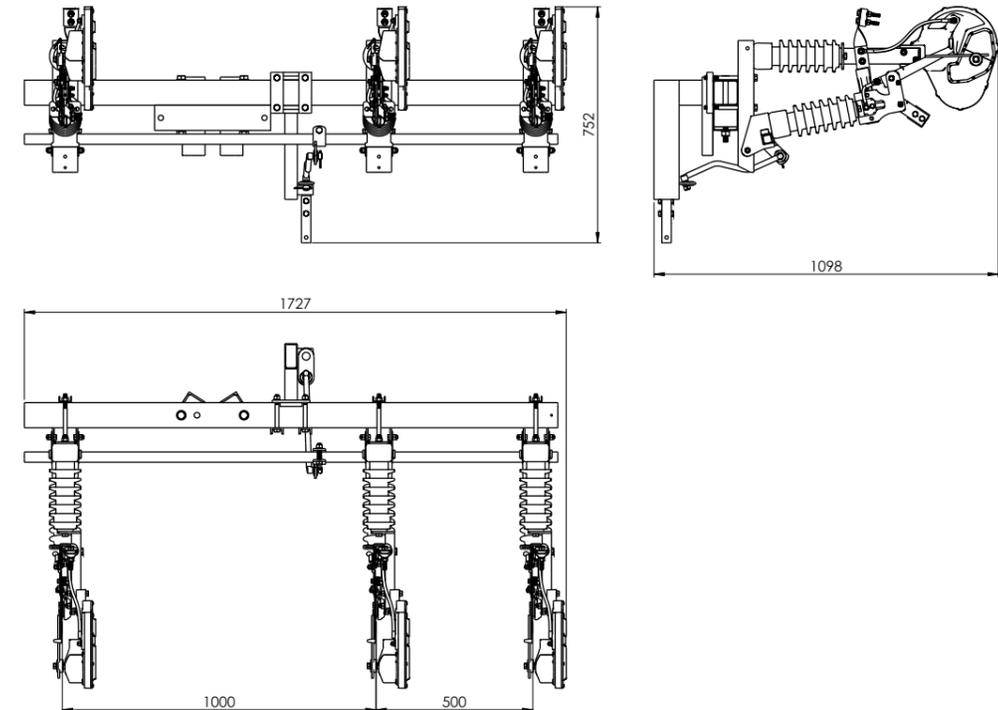
03-724
RUNMp III SA 24/4/100K

03-727
RNmp III SA 24/4/100S

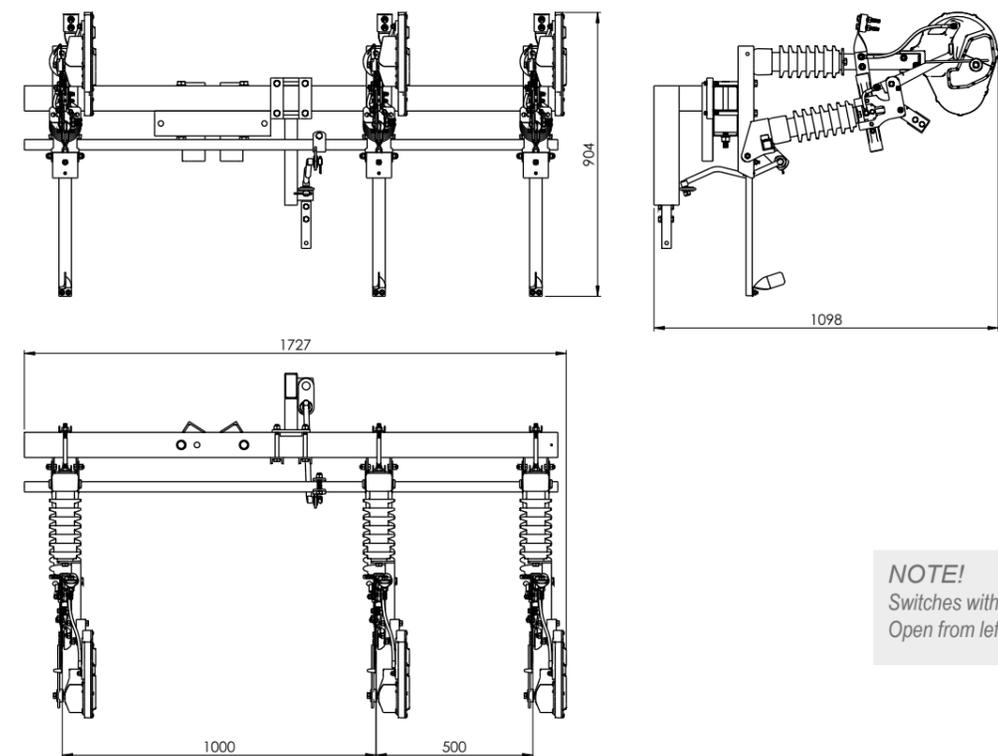
03-728
RUNMp III SA 24/4/100S

Basic dimensions

◇ Cut-off switch RNMp III SA 24/4/100



◇ Cut-off earthing switch RUNMp III SA 24/4/100



NOTE!
Switches with left side movement.
Open from left to right.

4. EXPLOITATION OF CUT-OFF SWITCHES

NOTE!

Do not touch the circuit elements, extinguishing chamber, or switch stand-off insulators under any circumstances.

The switches are delivered to the recipient completely assembled and tuned - always in the disconnected position. After unpacking check if the device suffered no mechanical damage in transport and if all data on the rated plate is correct. Pay extra attention to the extinguishing chamber and its auxiliary contacts - the device should be in an undisturbed condition (do not conduct any repairs without involvement of manufacturer's service under any circumstances) and have no mechanical damage from transport, unloading, and assembly. During installation of the switch on a pole and coupling it with hand operated drive NRA(u) or NRMA(u) or motor drive NEA, the device should be in the disconnected position. During the hand operated drive installation, its key should be on the right side in the disconnected switch position.

NOTE!

Does not apply to vertical module cut-off switches. These switches operate with left motion and the drive key should be placed on the left (does not apply to hand operated drives NRMA(u)).

NOTE!

Do not install any drive other than NRA(u), NRMA(u), or NEA under any circumstances.

The cut-off switches are adjusted to connect wires of up to 120mm² cross-section. Before connection, it is recommended to clean connection elements (connection clamps) contact surfaces of possible pollution and cover them with a thin layer of (acid-free) conductive grease. In order to decrease frictional resistance, cover all moving steel elements (bearings, articulated joints, drive key moving elements) with a thin layer of grease (e.g. ŁT-43).

Before switch hand-over to operation, check the device state, correctness of coupling with the drive, and operation correctness. Carry out a visual inspection of the switch, checking insulators state (pollution, cracks, etc) and correctness of screw tightening - this particularly applies to wires, drive connection, and mounting of the device on the support frame. Then perform several connection cycles, paying attention to correct operation of the chamber main and auxiliary contacts (arming at disconnection).

5. INSPECTIONS AND MAINTENANCE

5.1. Inspections

Switch inspection should be carried out once every five years in the case of failure-free operation, and also:

- After every main contacts replacement
- After short-circuit connection of the switch

During inspection, pay extra attention to:

- Insulators state (scratches, cracks, etc)
- Main contacts state (dirt, signs of partial melting)
- Extinguishing chamber state (connection with the support frame, clean chamber outlet)
- Switch screws (wires connections, drive connection, mounting of the device on the support frame)
- Switch drive state
- Protective covers state

5.2. Maintenance

It is recommended to carry out maintenance of the switch after every inspection. Maintenance includes:

- Cleaning insulators
- Cleaning the extinguishing chamber
- Cleaning main contacts
- Covering main with current (acid-free) grease
- Tightening potentially loosened screws
- Filling in damaged protective layers (with cold zinc spray)

CHAPTER 4

HAND OPERATED DRIVES OF THE SWITCHES

NRA
NRAu

HAND OPERATED DRIVES OF THE SWITCHES

NRMA
NRMAu

MOTOR OPERATED DRIVES OF THE SWITCHES

NEA

HAND OPERATED DRIVES NRA, NRAu

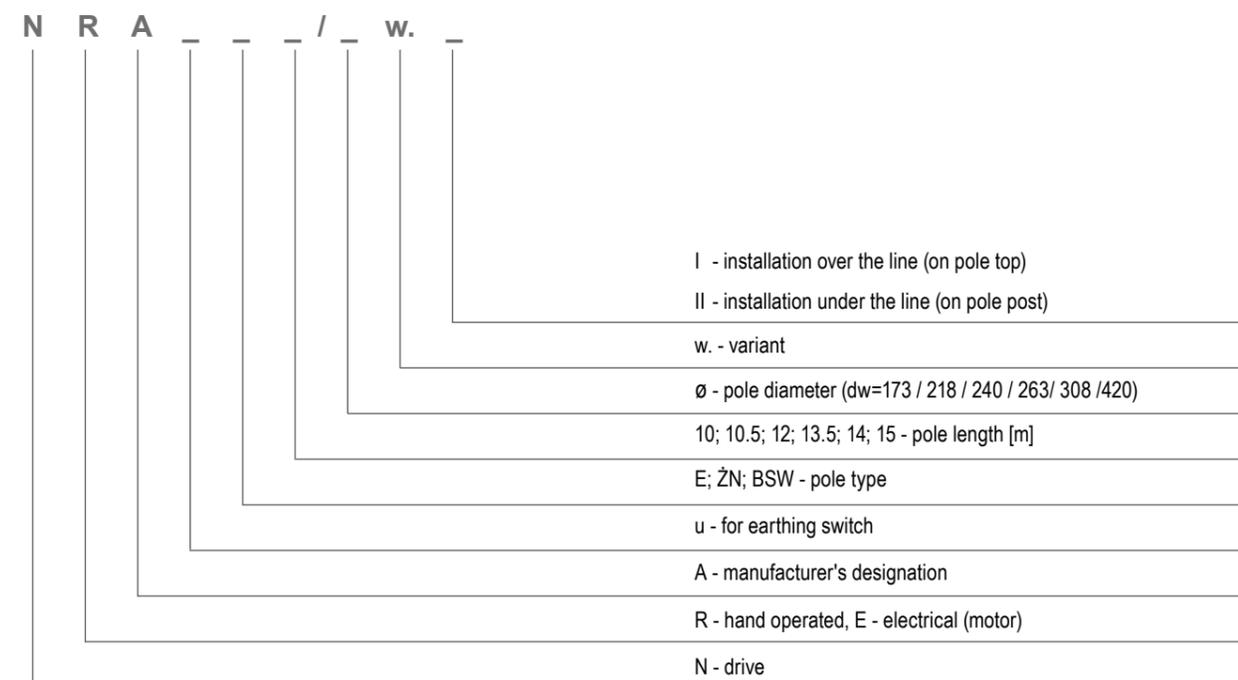
1. CHARACTERISTICS AND INTENDED USE

Drives NRA and NRAu are intended for manual control of operation of overhead switches (NRA) and overhead earthing switches (NRAu) produced by the ALPAR Artur i Piotr Kowalscy Spółka Jawna company.

NRA
NRAu

The key structure is made straight-through for the wrapping connector, which enables adjusting the height of mounting the key to the pole, which in turns allows to install it at the most convenient height. NRA(u) keys enable installation of wrapping connector of both square and round cross-section.

2. METHOD OF ORDERING HAND OPERATED DRIVES



Designation examples:

NRAu E12/263 w.II

– Hand operated drive for an earthing switch installed under the line, on an E-pole of \varnothing 263 top diameter and 12 m length

NRA E13,5 w. I

– Hand operated drive for an earthing switch installed under the line, on E-type pole of 13.5 m length

3. HAND OPERATED DRIVES SUB-ASSEMBLIES LIST

Drive type	Connectors		Wrapping connector articulated joint	Guides		Type			KEY
	ECN-1S L-3000	ECN-3S L-1500		PC-8	PC-U	E	ŻN	BSW	
NRA E-10,5 W.I	2		L-2000	2		OB-10 OB-10			NRA
NRA E-10,5 W.II	1	1	L-2000	2		OB-10 (OB-11)			NRA
NRAu E-10,5 W.I	2		L-2000	2		OB-10 (OB-11)			NRAu
NRAu E-10,5 W.II	1	1	L-2000	2		OB-10 (OB-11)			NRAu
NRA E-12 W.I	2	1	L-2000	3		OB-10 (OB-12)			NRA
NRA E-12 W.II	2		L-2000	3		OB-10 (OB-12)			NRA
NRAu E-12 W.I	2	1	L-2000	3		OB-10 (OB-12)			NRAu
NRAu E-12 W.II	2		L-2000	3		OB-10 (OB-12)			NRAu
NRA E-13,5 W.I	3		L-2000	3		OB-11 (OB-12+)			NRA
NRA E-13,5 W.II	2	1	L-2000	3		OB-11 (OB-12+)			NRA
NRAu E-13,5 W.I	3		L-2000	3		OB-11 (OB-12+)			NRAu
NRAu E-13,5 W.II	2	1	L-2000	3		OB-11 (OB-12+)			NRAu
NRA E-15 W.I	3	1	L-2000	4		OB-12 (OB-15)			NRA
NRA E-15 W.II	3		L-2000	3		OB-12 (OB-15)			NRA
NRAu E-15 W.I	3	1	L-2000	4		OB-12 (OB-15)			NRAu
NRAu E-15 W.II	3		L-2000	3		OB-12 (OB-15)			NRAu
NRA ŻN-12 W.I	2	1	L-2000		3		ED-ŻN		NRA
NRA ŻN-12 W.II	2		L-2000		3		ED-ŻN		NRA
NRAu ŻN-12 W.I	2	1	L-2000		3		ED-ŻN		NRAu
NRAu ŻN-12 W.II	2		L-2000		3		ED-ŻN		NRAu
NRA BSW-12 W.I *	2	1	L-2000 L-1000		3			ED-BSW	NRA
NRA BSW-12 W.II	2		L-2000		3			ED-BSW	NRA
NRAu BSW-12 W.I *	2	1	L-2000 L-1000		3			ED-BSW	NRAu
NRAu BSW-12 W.II	2		L-2000		3			ED-BSW	NRAu
NRA BSW-14 W.I *	3		L-2000 L-1000		3			ED-BSW	NRA
NRA BSW-14 W.II	2	1	L-1000		3			ED-BSW	NRA
NRAu BSW-14 W.I *	3		L-2000 L-1000		3			ED-BSW	NRAu
NRAu BSW-14 W.II	2	1	L-1000		3			ED-BSW	NRAu

Stirrup bolts in the brackets apply to poles of top diameter dw=263

* L-1000 articulated joints are used for BSW-12(14) poles with flat system structures L-2000 articulated joints are used for BSW-12(14) poles with triangular system structures

4. STRUCTURE

Hand operated drives for overhead switches NRA and NRA(u) are made of steel and protected against corrosion by a hot dip zinc layer, in accordance with the following standard: ISO standard 1461:2009. They are drives with rotational motion.

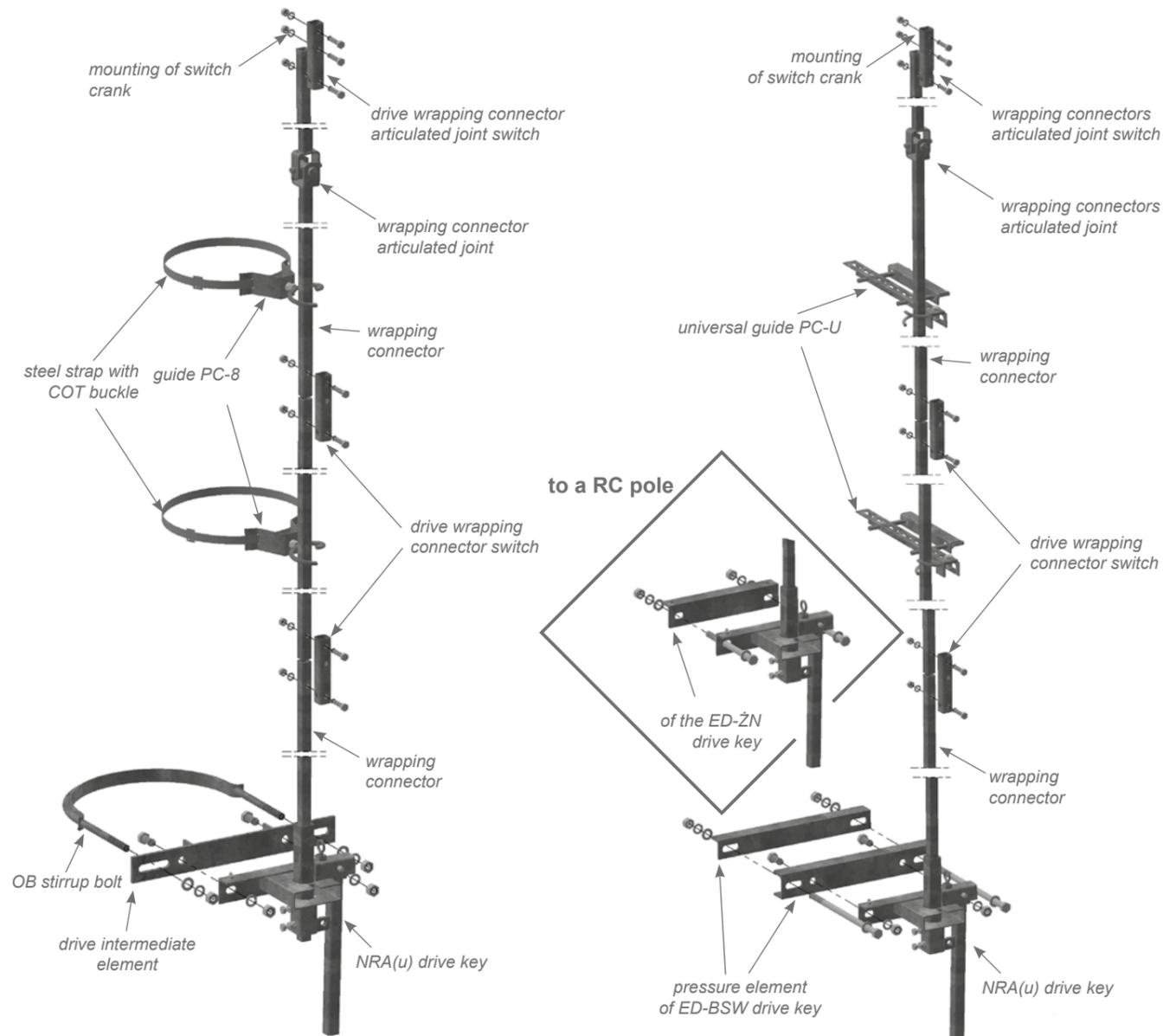
Hand operated drives consist of:

Drive key | Intermediate element with a stirrup bolt | Pole guides with stirrup bolts | Wrapping connectors | Connector articulated joint | Insulating stick (optional).

5. DRIVE ELEMENTS LIST

◇ For E-spun poles

◇ For BSW/RC concrete poles



6. DRIVE OPERATION DESCRIPTION

During installation on a pole, every hand operated drive should be coupled with the switch in the following position: disconnected.

6.1. Drive NRA enables the two-step switch operation, i.e.

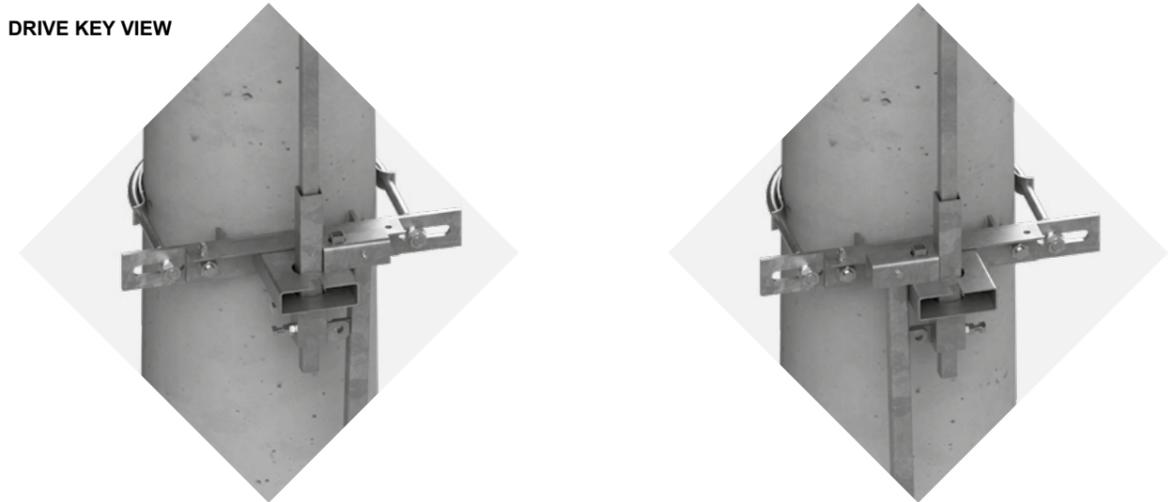
◇ disconnected switch

0° key on the right side
- switch in the disconnected position

◇ connected switch

180° key on the left side
- switch in the connected position

DRIVE KEY VIEW



TOP VIEW



* NRA drive key can be additionally prevented from opening in any operating position using a power lock

NOTE!
This drive type can be used solely for switches without earthing.

Does not apply to vertical module switches.
For this group of switches, drive key handle must be on the left side.

6.2. Drives NRAu enable the three-step switch operation, i.e.

◇ disconnected switch

0° key on the right side
- switch in the disconnected position*

◇ unearthed connected switch

990° key in middle position
- switch in the connected position,
unearthed

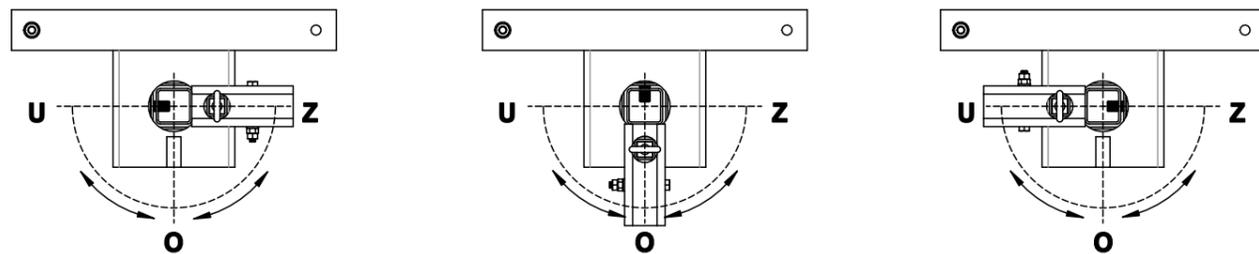
◇ earthed connected switch

180° key on the left side
- switch in the connected position,
earthed

DRIVE VIEW KEY VIEW



TOP VIEW



Due to using special interlocking in the hand operated drive key (applies only to NRA(u)), during connection the interlocking stops the switch in the following position: connected, unearthed. This solution ensures the switch will always be connected in the medium position. To set the switch in the third position, i.e.: connected, earthed; release the hand operated drive interlocking by lifting the trigger.

NRAu drive key can be additionally prevented from opening in any operating position using a power lock.

Does not apply to vertical module switches.
For this group of switches, drive key handle must be on the left side.

HAND OPERATED DRIVES NRMA, NRMAu

1. CHARACTERISTICS AND INTENDED USEVES

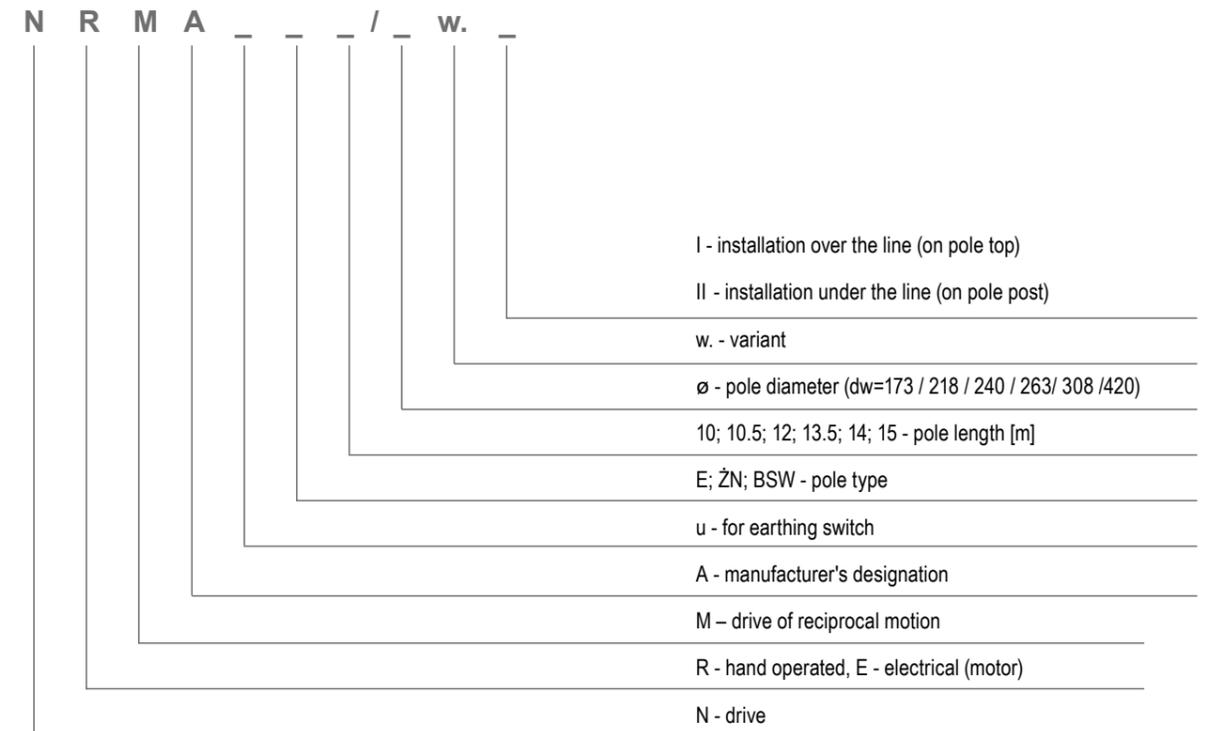
Drives NRMA and NRMAu are intended for manual control of operation of overhead switches (NRMA) and overhead earthing switches (NRMAu) produced by the ALPAR Artur i Piotr Kowalscy Spółka Jawna company.

NRMA
NRMAu

The key structure is straight-through for the wrapping connector, which enables adjusting the height of mounting the key to the pole, which in turn allows to install it at the most convenient height.

NRMA(u) keys enable installation of wrapping connector of both square and round cross-section.

2. METHOD OF ORDERING HAND OPERATED DRIVES



Designation examples:

NRMAu E12/263 w.II

- Hand operated drive for an earthing switch installed under the line, on an E-pole of fi263 top diameter and 12m length

NRMA E13,5 w. I

- Hand operated drive for an earthing switch installed under the line, on E-type pole of 13.5 m length

3. 3. HAND OPERATED DRIVES SUB-ASSEMBLIES LIST

Drive type	Connectors		L-2500 wrapping connector+switch crank handle	Guides			Mounting the key			KEY
	ECN-1S L-3000	ECN-3S L-1500		E	ŻN	BSW	E	ŻN	BSW	
				PC-GD	PC-GD	PC-GD	EP-1/E			
NRMA E-12 w.I	2	1	1	2			OB-11 OB-12			NRMA
NRMA E-12 w.II	2		1	2			OB-11 OB-12			NRMA
NRMAu E-12 w.I	2	1	1	2			OB-11 OB-12			NRMAu
NRMAu E-12 w.II	2		1	2			OB-11 OB-12			NRMAu
NRMA E-13,5 w.I	3		1	2			OB-11 OB-12			NRMA
NRMA E-13,5 w.II	2	1	1	2			OB-11 OB-12			NRMA
NRMAu E-13,5 w.I	3		1	2			OB-11 OB-12			NRMAu
NRMAu E-13,5 w.II	2	1	1	2			OB-11 OB-12			NRMAu
NRMA E-15 w.I	3	1	1	2			OB-11 OB-12+			NRMA
NRMA E-15 w.II	3		1	2			OB-11 OB-12+			NRMA
NRMAu E-15 w.I	3	1	1	2			OB-11 OB-12+			NRMAu
NRMAu E-15 w.II	3		1	2			OB-11 OB-12+			NRMAu
NRMA ŻN-12 w.I	2	1	1		2				1	NRMA
NRMA ŻN-12 w.II	2		1		2				1	NRMA
NRMAu ŻN-12 w.I	2	1	1		2				1	NRMAu
NRMAu ŻN-12 w.II	2		1		2				1	NRMAu
NRMA BSW-12 w.I	2	1	1			2			1	NRMA
NRMA BSW-12 w.II	2		1			2			1	NRMA
NRMAu BSW-12 w.I	2	1	1			2			1	NRMAu
NRMAu BSW-12 w.II	2		1			2			1	NRMAu
NRMA BSW-14 w.I	3	1	1			2			1	NRMA
NRMA BSW-14 w.II	3		1			2			1	NRMA
NRMAu BSW-14 w.I	3	1	1			2			1	NRMAu
NRMAu BSW-14 w.II	3		1			2			1	NRMAu

4. STRUCTURE

Hand operated drives for overhead switches NRMA and NRMA(u) are made of steel and protected against corrosion by a hot dip zinc layer, in accordance with the following standard: ISO standard 1461:2009. These are drives with reciprocal motion.

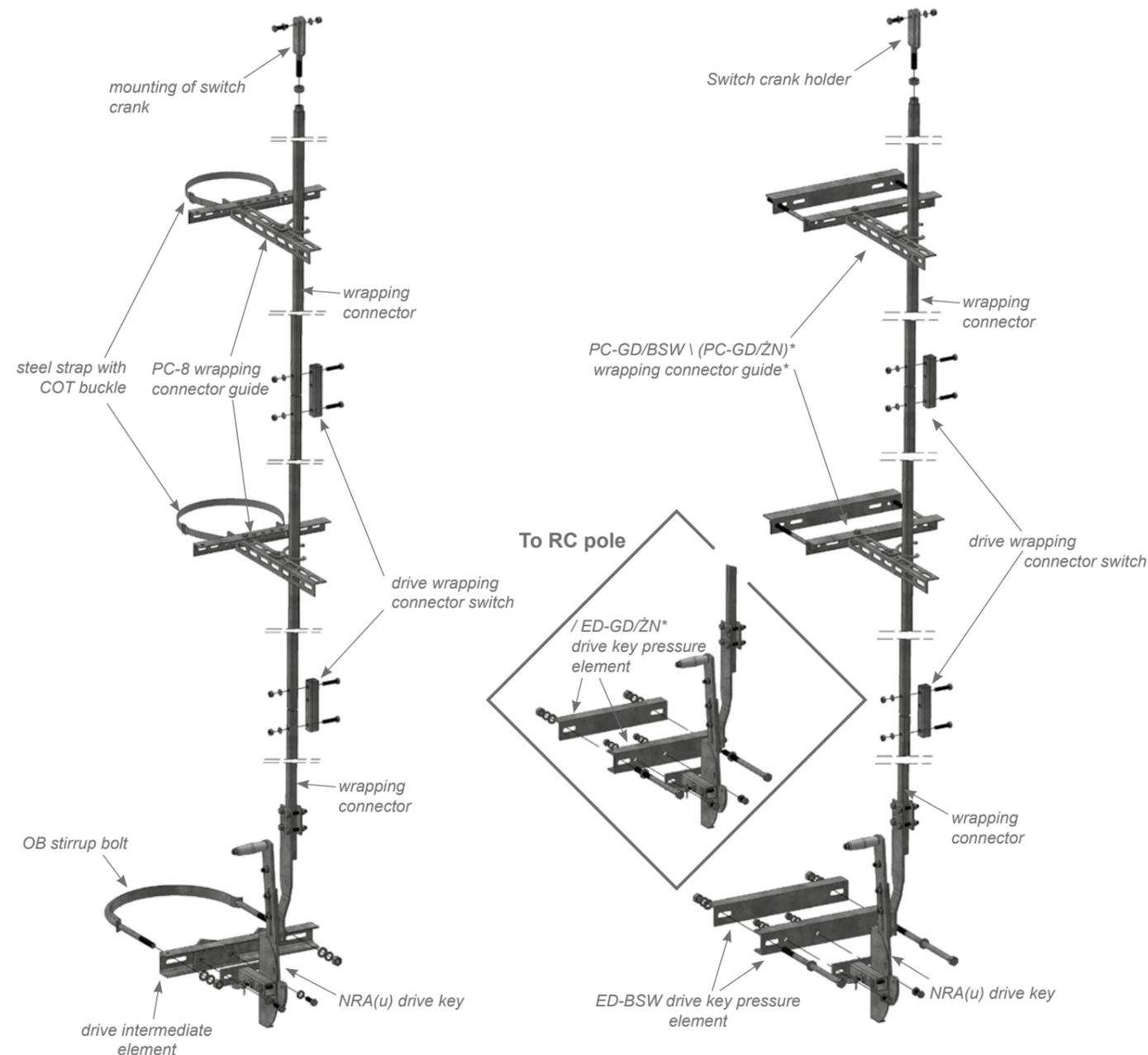
Hand operated drives consist of:

Drive key | Intermediate element with a stirrup bolt | Pole guides with stirrup bolts | Wrapping connectors | Connector articulated joint | Insulating stick (optional).

5. DRIVE ELEMENTS LIST

◇ For spun E-poles

◇ For BSW/RC concrete poles



6. DRIVE OPERATION DESCRIPTION

During the installation on a pole, every hand operated drive should be coupled with the switch in the following position: disconnected.

6.1. Drive NRMA enables the two-step switch operation, i.e.

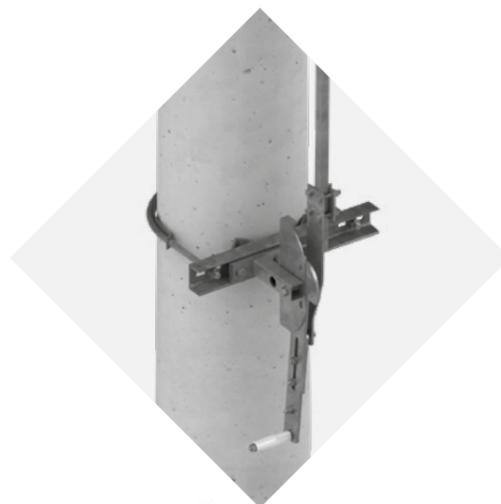
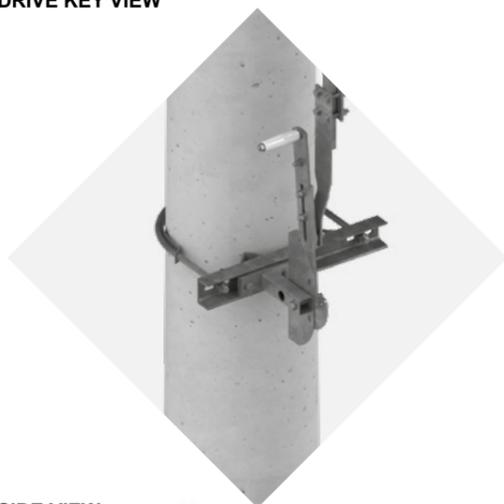
◇ *disconnected switch*

- 0° key in up position
- switch in the disconnected position*

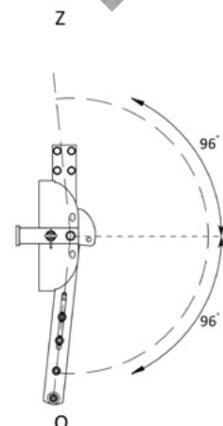
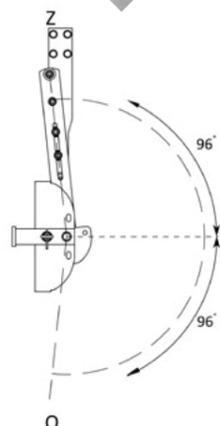
◇ *connected switch*

- 180° key in up position
- switch in connected position

DRIVE KEY VIEW



SIDE VIEW



*NRMA drive key can be additionally prevented from opening in any operating position using a power lock

NOTE!
This drive type can be used solely for switches without earthing.

Does not apply to vertical module switches.
For this group of switches, drive key handle must be on the left side.

6.2. Drive NRMAu enables the three-step switch operation, i.e.

◇ *disconnected switch*

- 0° key in up position
- switch in the disconnected position*

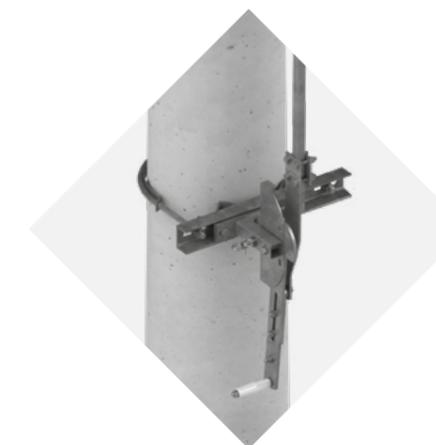
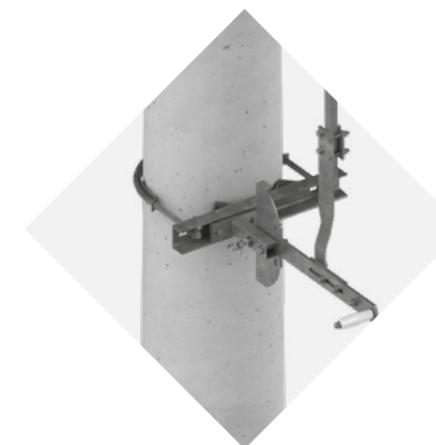
◇ *unearthed connected switch*

- 90° key in middle position
- switch in the connected position, unearthed

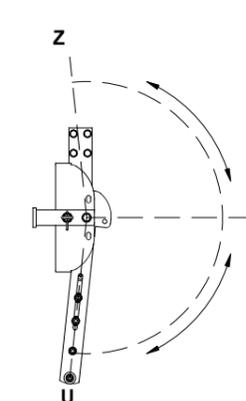
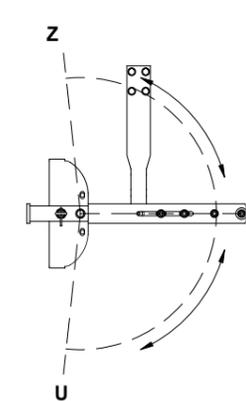
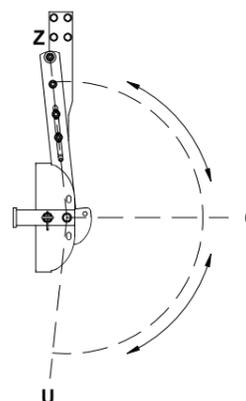
◇ *earthed connected switch*

- 180° key in up position
- switch in the connected position, earthed

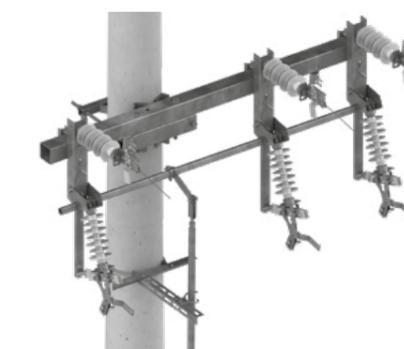
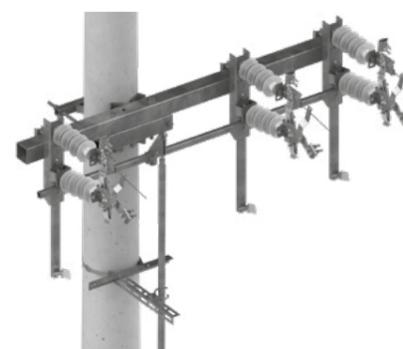
DRIVE KEY VIEW



SIDE VIEW



MOVING FRAME VIEW



Due to using special interlocking in the hand operated drive key (applies only to NRMAu), during connection the interlocking stops the switch in the following position: connected, unearthed. This solution ensures the switch will always be connected in the medium position. To set the switch in the third position, i.e.: connected, earthed; release the hand operated

drive interlocking by lifting the trigger.
NRMAu key can be additionally prevented from opening in any operating position using a power lock.

MOTOR DRIVES NEA

1. CHARACTERISTICS AND INTENDED USE

Drive NEA-02 is intended for cooperation with all overhead devices of MV lines using rotary motion wrapping connector available on the market.

The drive gear and automatics are placed within sealed cabinet of IP54 protection class.

The cabinet is made of powder coated aluminium sheet. There is a heat insulation layer on the inside.

The cabinet can be equipped with any type lock on customer's request. The specifically selected mechanical system cooperates with the high class electronic system. The electronic system turns the motor on and off, offers a PWM soft start option which decreases the start-up current, and enables the cooperation with any electromechanical system. The drive utilizes a permanent magnet motor of high efficiency and 250 W power, which allows to reach very high torque and very short switch connection/disconnection time at the level of 1.5 s. The cap plate includes elements necessary for the drive control (connect/disconnect buttons, mode selection switch, crank) and mechanical and electrical interlocking system with the option of adding a lock.

The display shows the following information: Current device position (ON or OFF), temperature inside the drive cabinet, number of connection cycles performed, current motor circuit power supply voltage (24 V). Voltage measured during the last device connection or disconnection cycle.

2. ADVANTAGES

Motor drive NEA-02 is equipped with an electronic controller responsible for motor control, communication with remote electromechanical controller, thermostat, and display.

Electronic motor control allowed to eliminate all contact elements (contactors, transmitters), and thus there is no issue of tarnished contacts and jammed moving elements. Tarnished contacts decrease drive power, which increases the device connection and disconnection cycle time and, in extreme cases, complete operational failure of the drive.

The electronic controller has many over-voltage and interference protective means, due to which it is well-protected itself and ensures correct operation, as well as lack of possibility of accidental connection.

Another advantage of utilising the electronic controller is smooth connection of the motor, due to which in the initial stage of motor start-up there is no current inrush which significantly shortens the battery lifecycle. The controller allows also for dynamic braking of the motor after achieving set position, which prevents mechanical overload of the device and the wrapping connectors.

Due to thermostat controlling the heater (230 V), the drive maintains the optimal operational conditions inside the cabinet.

The built-in display shows the following information: Current device position (ON or

OFF), temperature inside the drive cabinet, number of connection cycles performed, current motor circuit power supply voltage (24 V). Voltage measured during the last device connection or disconnection cycle (low voltage may signal either bad battery state or an issue with a contact on the power supply cables).

The circuits and the motor are protected against moisture, which significantly influences the drive lifecycle. All metal parts are covered with anti-corrosive protection layers or made of corrosive-resistant materials.

The key-locked cabinet provides good protection against weather as well as from unauthorised access.

There is lighting installed inside the cabinet, which allows installation after dark. Both the lights in the cabinet and the display turn off automatically after closing the door.

The drives have an option of setting operation range of the electronic device within 320°.

Simple mechanical structure using tested mechanisms combined with modern electronics results in a lifecycle of the entire device of up to 5000 connection cycles, a high rated torque 70 Nm (max 300 Nm), operational reliability, and shortened time of emergency shutdowns.

In the case of voltage drop, there is an option of manual connection.

Small size and weight of the mechanism. Adjusted to the needs of Polish Power Engineering.

NEA



3. TECHNICAL DATA

Parameter name	Unit	Value
1. Rated voltage of control circuits and motor power	V	DC 24
2. Control circuits power consumption during standby	A	0,12
3. Control and motor circuits power consumption during connection	A	25
4. Rated voltage of heating system power supply	V	AC 230
5. Heating system power	W	30
6. Total gear system ratio from the motor to the drive	i	97,8:1
7. Gear system ratio from the crank to the drive	l	32:1
8. Operating temperature range	°C	-40 .. +50
9. Temperature range inside the cabinet	°C	+5 .. +85
10. Storage temperature range	°C	-25 .. +50
11. Recommended wrapping connector rotation range	°	140 .. 320
12. Rated torque	Nm	70
13. Connection time	s	< 1,5
14. Disconnection time	s	< 1,5
15. Cabinet protection class	IP	54
16. Weight without batteries	kg	21
17. Height	mm	450
18. Width	mm	450
19. Depth	mm	300

4. STRUCTURE AND METHOD OF OPERATION

The motor drive consists of:

- continuous current motor of 250 W power;
- 10:1 worm gear;
- mechanical interlocking of the entire drive;
- hand operated drive;
- end switches and position sensors;
- power supply circuit connection terminal strip;
- electrical controller with microprocessor;
- control panel lighting;
- heater controlled by an electronic thermostat.

THE CABINET

The cabinet is made of epoxide powder coated aluminium sheet. Its door is sealed with a silicone seal. The cabinet structure ensures interior protection of IP54 class. Next to the door there is a sensor which signals door opening to the remote operator and turns on the lighting inside the cabinet and the control panel display.



MECHANICAL PART

The mechanical system with gear is attached at four points to the cabinet back. The drive utilises sealed worm gear operating in grease, along with an initial gear combined with the motor. Driving mechanism interlocking elements are mounted on the gear.

The motor drives the output shaft connected with the driving thrust and the end switch elements using two gears. As a result of the output shaft rotation, cams mounted on it switch the end switches. The rotation range can be set as needed between 0° and 320° (recommended range is 140°.. 320°).

ELECTRICAL AND ELECTRONIC PART

The driving mechanism is equipped with an electronic automatics system using unipolar power transistor. The PWM soft start system was used to decrease start-up current. Connection and disconnection time are limited by the timing circuit to 3 s. Moreover, in order to precisely position the mechanism during stopping at a terminal position, the system is equipped with dynamic braking.

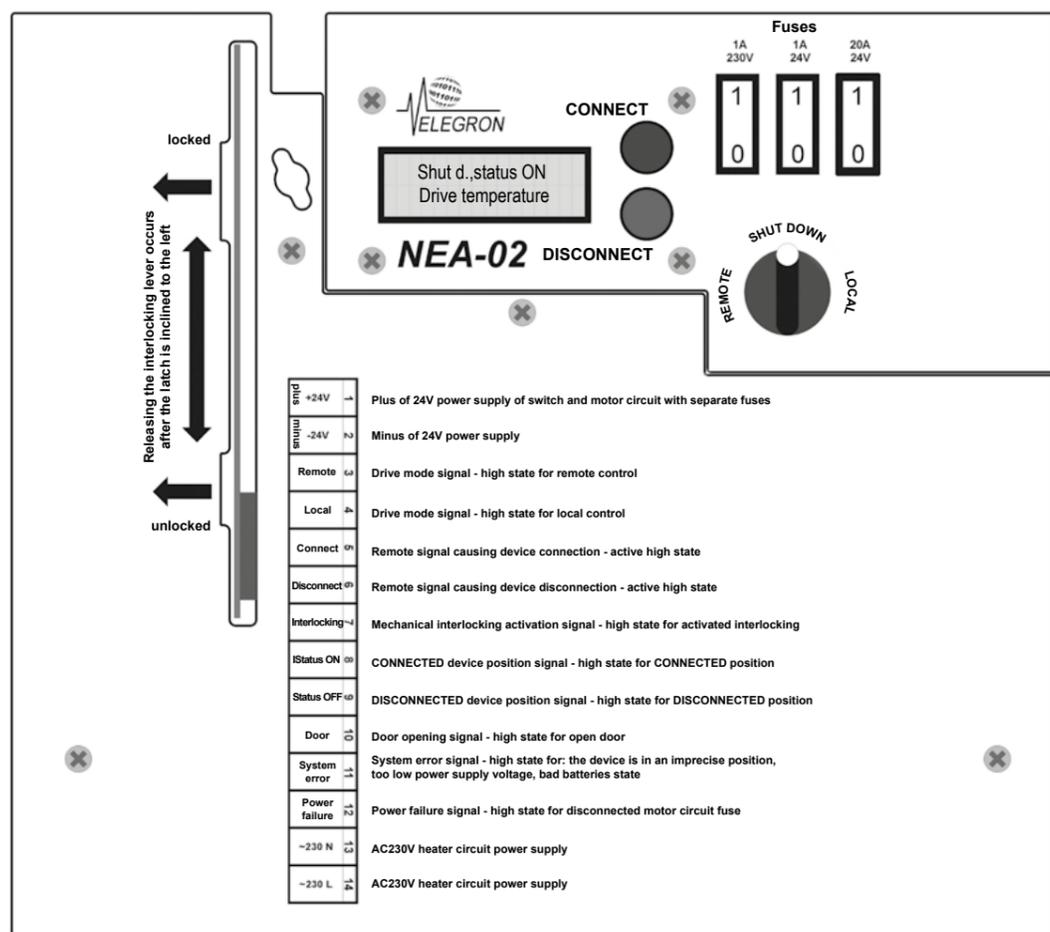
The drive position terminals are located on the lower part of the gear, and position control is enabled by cams mounted on the output shaft connected to the wrapping connector.

All elements used for local manoeuvring of the drive are placed on the cap plate. The system is equipped with a heater of 30 W power, controlled with an electronic thermostat. The electronic system has the following list of controls and signals.

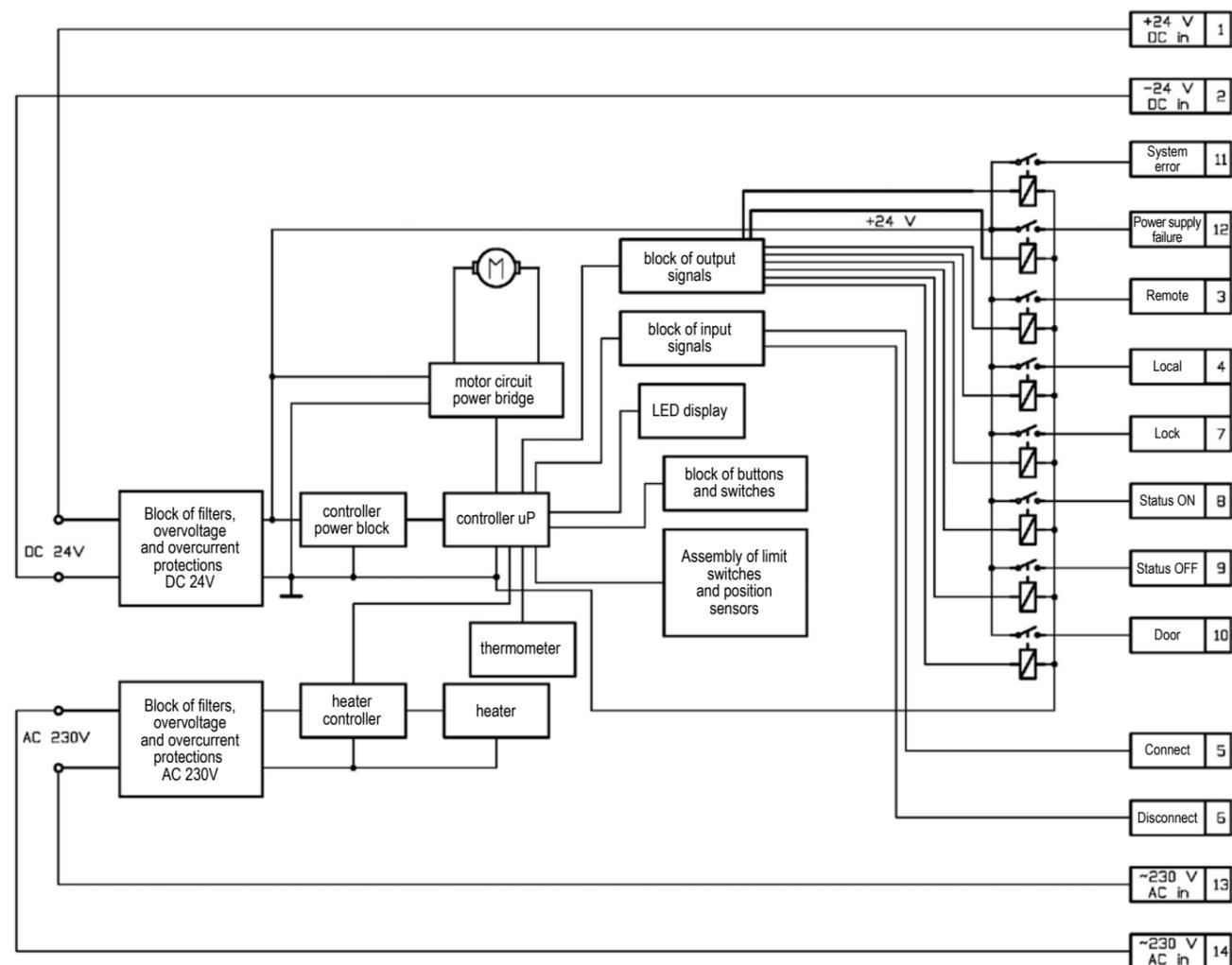
- Remote control - connect
- Remote control - disconnect
- Manual control signal
- Remote control signal
- Mechanical interlocking signal

- Connected position signal
- Disconnected position signal
- Opening door signal
- Bad state of batteries signal

The drive can be blocked both electrically and mechanically. The drive can be blocked by setting mode selection switched placed on the mechanism front panel - when the switch is in the middle position, electrical manoeuvring of the mechanism is impossible. Putting the crank into the hole causes automatic locking of electric control, both remote and local, regardless of the operation mode selection switch position. Mechanical interlocking which blocks the drive operation by moving interlocking lever while simultaneously allowing to place a lock. This is when employees work on the line and preventing accidental disconnection of the switch is crucial for their safety. Manual manipulation of the switch is then impossible. Opening the door causes automatic interlocking of remote control until they're closed.



BLOCK DIAGRAM



5. OPERATION, PERIODIC INSPECTIONS AND REPAIRS

The drive structure ensures failure-free operation of the device for the period of 10 years. All steel elements of the drive are galvanised. Ongoing controls and inspections are not required.

Once a year it is recommended to:

- check the drive power supply reliability,
- check correctness of operation and installation of end switches, and in the case of loosening correct the position and the mounting
- check correctness switch of operation when the crank is in the hand operated drive socket

- inspect worm gear state, and possibly clean and grease it,
- inspect wires glands state,
- inspect the drive transmission system screws state,
- inspect heating system,
- check door opening sensor operation.

Repairs of the mechanism should be conducted with brand spare parts.

6. COMMISSIONING

Appropriate product test procedures were carried out by the manufacturer. The user is obliged to check the completeness of the equipment during commissioning.

7. WARRANTY CONDITIONS

The manufacturer gives warranty for the product for a period of 24 months from the installation date, however, for no longer than 36 months from the purchase date, provided that installation and operation of the drive are compliant with the user manual.

8. TRANSPORT AND STORAGE

During transport, unloading and storage, the drive should remain in the position marked on its packaging and should not be subjected to mechanical damage. The drive can be transported by any means of transport in a covered state.

CHAPTER 5

OVERHEAD FUSE BASES

PBNVA-20/4

PBNVA-30/4

PBNWMA-24/50

PBNWMA-30/50

OVERHEAD FUSE BASES PBNVA 20/4 PBNVA 30/4

1. CHARACTERISTICS AND INTENDED USE

Fuse bases PBNVA 20/4, PBNVA 30/4 are intended for mounting fuse-carriers WBGnp and OWBG. They are used in pole transformer stations as circuit protection

Fuse bases PBNVA can be equipped with MV surge arrester with valid certificate.

2. TYPES

PBNVA 20/4



PBNVA 20/4K



PBNVA 20/4S



PBNVA 30/4



PBNVA 30/4K

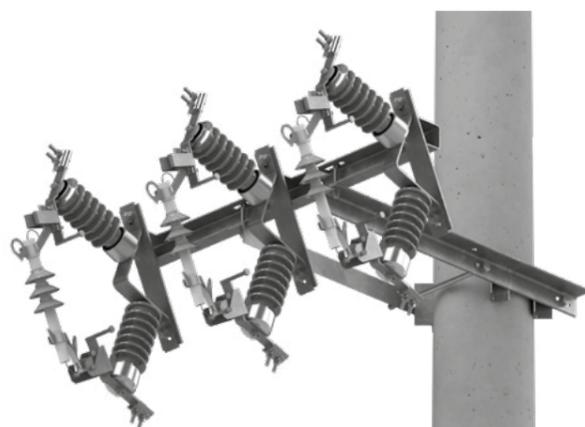


PBNVA 30/4S



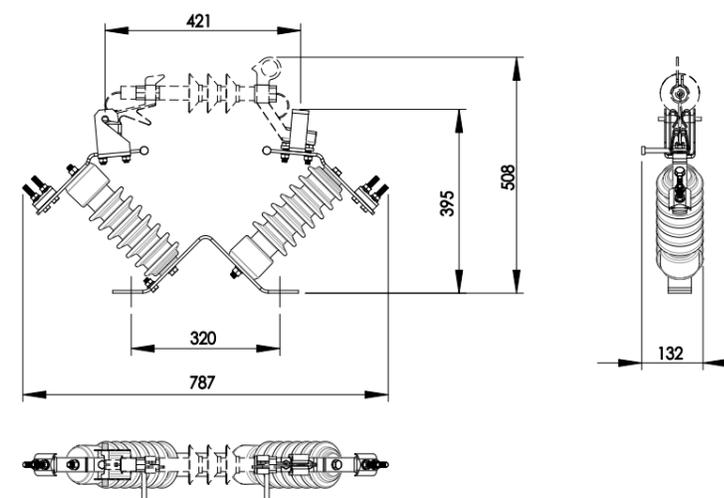
3. APPLICATION

Bases PBNVA are used in transformer stations as transformer protection.

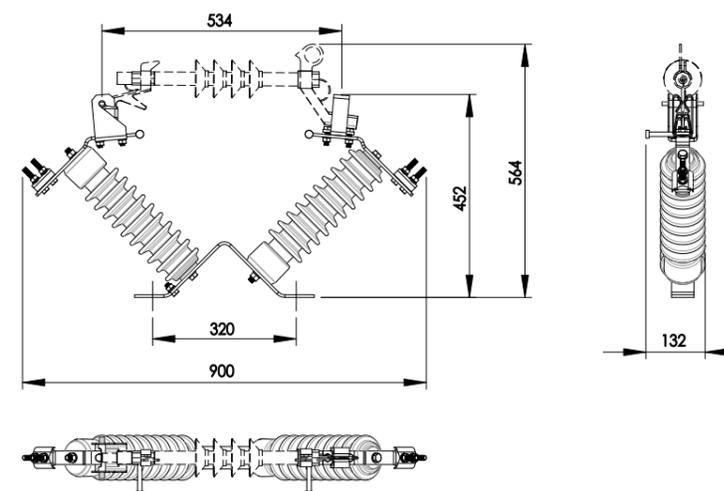


Basic dimensions

Overhead fuse base PBNVA 20/4



Overhead fuse base PBNVA 30/4



4. TECHNICAL DATA

1. Rated voltage	24 kV	36 kV
2. Rated frequency /number of phases	50 Hz/3	50 Hz/3
3. Rated continuous current of the base	25 A	10 A
4. System lightning impulse test voltage:		
– inter-pole	125 kV	170 kV
– inter-clamp	145 kV	190 kV
5. Rated alternating test voltage:		
– inter-pole	50 kV	70 kV
– inter-clamp	60 kV	80 kV

OVERHEAD FUSE BASES PBNWMA 24/50 PBNWMA 30/50

1. CHARACTERISTICS AND INTENDED USE

Fuse bases PBNWMA 24/50 and PBNWMA 30/50 are intended for mounting high voltage fuse-carriers, e.g. HH prod. SIBA. They are used in pole transformer stations as circuit protection.

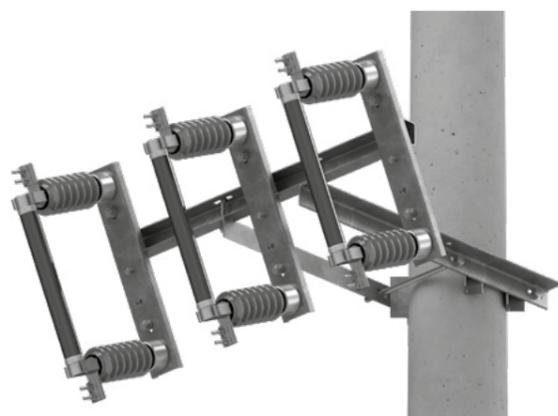
Fuse bases PBNWMA can be equipped with MV surge arrester with valid certificate.

2. TYPES



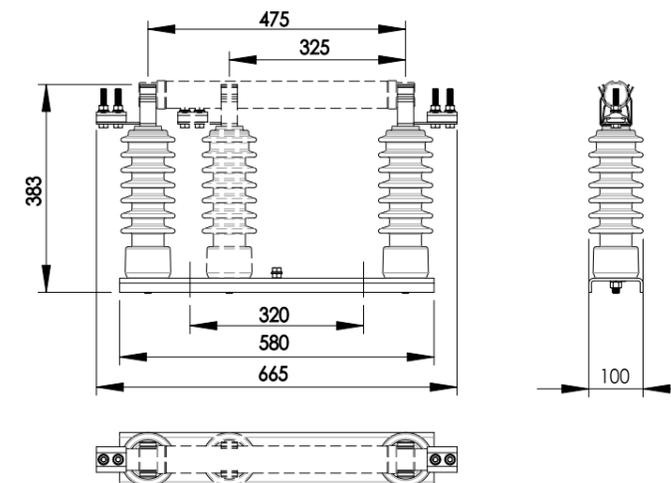
3. APPLICATION

Bases PBNVA are used in transformer stations as MV transformers and measuring transformers protection.

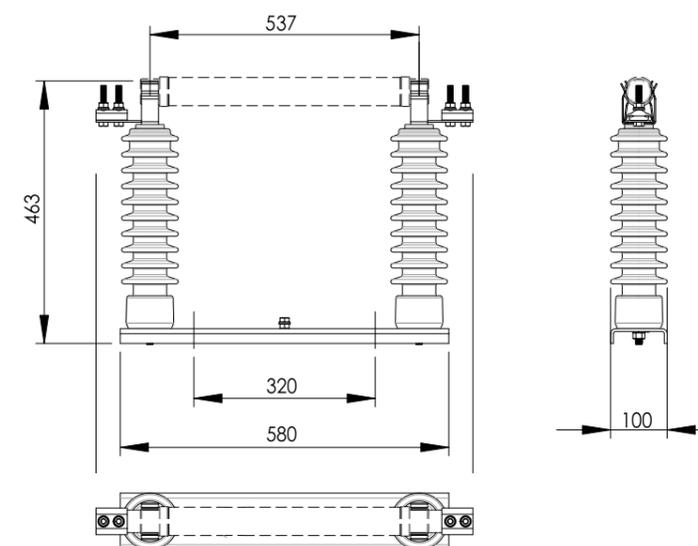


Basic dimensions

Overhead fuse base PBNWMA 24/50



Overhead fuse base PBNWMA 30/50



NOTE!
 Base PBNWMA-24/50 enabled the installation of fuse-carrier of L=292 mm. In order to install, unscrew the left stand-off insulator and screw it into the base internal hole using the same screw elements.

4. TECHNICAL DATA

1. Rated voltage	24 kV	36 kV
2. Rated frequency /number of phases	50 Hz/3	50 Hz/3
3. Rated continuous current of the base	50 A	50 A
4. System lightning impulse test voltage:		
– inter-pole	125 kV	170 kV
– inter-clamp	145 kV	190 kV
5. Rated alternating test voltage:		
– inter-pole	50 kV	70 kV
– inter-clamp	60 kV	80 kV

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