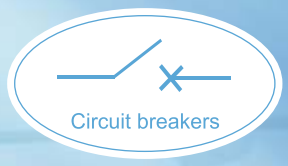
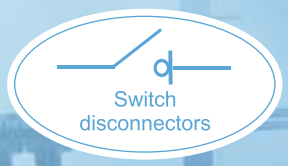
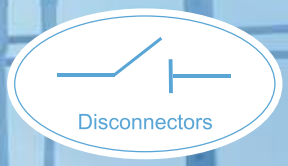
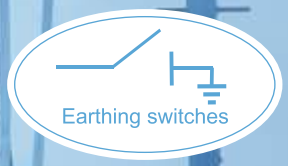
ZAKŁAD WYTWÓRCZY APARATÓW ELEKTRYCZNYCH SP. Z O.O.

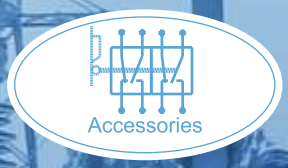
ZWAE











PRODUCT CATALOGUE

EDITION 2

CONTENTS

ABOUT THE COMPANY

Zakład Wytwórczy Aparatów Elektrycznych sp. z o.o. was established in 2000 and it is a company with only Polish capital. ZWAE provides HV and MV switchgear and tries to continue tradition of Polish apparatus production in Lębork – most of our personnel are former employees of already closed company ZWAR, a domestic producer of distributing apparatus.

Our offer is aimed both at power engineering and industrial plants using power equipment. Among our customers there are virtually all divisions of power concerns in Poland, such as PSE S.A., TAURON Dystrybucja S.A., ENEA S.A., Group ENERGA, PGE S.A. and many industrial plants. Our apparatus is also sold to companies from Scandinavia, Egypt, Lithuania, Latvia, Ukraine and Russia.

In order to provide our customers with the best service, we work on the basis of ISO 9001 Quality Management System which was proved by the certificate we received in 2003. The implemented Quality Management System is not only confirmation of level of services we offer, but it also encourages us to improve our qualifications, respond immediately to all comments and suggestions and influences the scope of our offer.

The company has been developing its back-up facilities since the beginning of its activity. In 2013 we gave to use new buildings for office and production. We hope that the change of our location will positively influence the progress production.

The advantage of our company is experienced and highly qualified personnel who are able to meet the challenges of modern power engineering. Our products have owned all of the most important certificates. Besides, our apparatus have gained recognition among many electrical power engineering companies, both polish and foreign.

Our goal is to become an important partner for power engineering and industry in the domestic market. We aim to meet expectations of customers, sustaining high quality of offered solutions and prompt completion of works. While designing switchgear, we strive for keeping it compatible in terms of assembly with currently used devices in order to make their exchanging as simple as it is possible.

Over the last years, we have been intensively working on increasing export of apparatus. We want to be a regular apparatus supplier in such countries as Ukraine, Norway and Finland and maintain our strong position in Russia, Belarus and Latvia. Recently, our offer has been expanded by disconnectors for 420 kV and pantograph disconnector.

We hope that so far we have presented ourselves as an efficient and trustworthy partner. You are welcome to visit our website where you can find detailed information concerning our company and offered products.

ZWAE

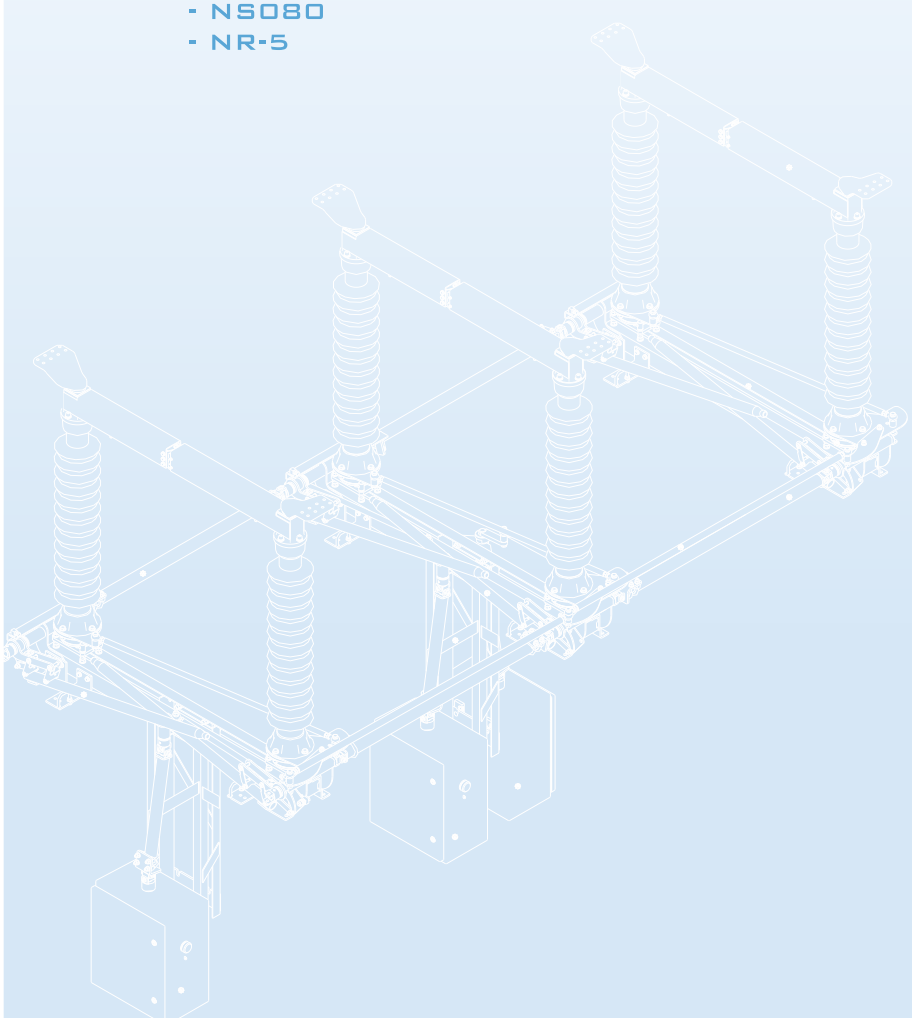
Zakład Wytwórczy Aparatów Elektrycznych Sp. z o.o.

HV SWITCHGEAR

OUTDOOR HV DISCONNECTORS
- MARK40
- TFP
- ONIII

OUTDOOR HV EARTHING SWITCHES
- UNIII

HV SWITCHGEAR OPERATING MECHANISMS
- NS080
- NR-5



HV

MARK40

123, 245 and 420 kV blade - contact disconnector

1. INTENDED USE.

MARK40 is a switch type disconnector with vertical blade contacts movement, compatible with 123, 245 kV and 420 kV outdoor substations. The disconnectors are intended for closing and opening electric circuits, where interrupted or disconnected current value is negligible, or there is no voltage change between the connectors of all poles.

MARK40 type disconnectors are used as single pole switches with individual NSO80 type electric operating mechanisms for each pole.

G60 type earthing switches are compatible with 123 kV, 245 kV and 420 kV outdoor substations and provide a single and double sided earthing of a potential-free circuit section. Single pole switches are compatible with individual NSO80 type electric operating mechanisms installed on each pole. They are also compatible with MARK40 disconnectors.

2. FEATURES.

- excellent performance and technical characteristics;
- easy installation and adjustment;
- excellent corrosion protection (hot galvanized steel components, standardized machine elements, ball and socket joints and standardized elements in current circuit made of stainless steel);
- high durability and reliability (2000 switching cycles);
- three - pole disconnector compatible with motor operating mechanisms including a main operating mechanism (with control elements) and two secondary operating mechanisms.

3. DESIGN.

MARK40 type disconnector is an outdoor type switch with blade contacts moving in vertical direction. Available in a single pole version with individual motor operating mechanism. Three pole version is fitted with three motor operating mechanisms, where one is a main operating mechanism with the operation mode switch and control elements. The switch features a steel beam with stand-off insulators and operating mechanism insulator and one or two earthing switches.

Circuit current features contact heads with flat outlets and floating blade made of aluminium tube. The blade ends are fitted with silver plated contact strips in contact with flexible silver plated head bars. In the final switching phase (closing), the blade rotates on its axis. The rotation causes the contact system to lock, and improves the short circuit performance of a current circuit. Both heads and free end of the blade are fitted with anti-corona screens.

G60 type earthing switches are available in a single pole version with individual motor operating mechanism. The earthing switch current circuit features a fixed socket contact installed on the head and aluminium tube blade. The blade is combined with flexible earthing line and operating mechanism bracket with a base. Moving operating mechanism elements and operating mechanism are separated from the current circuit, and as a result are not exposed to short-circuit current flow. When closing, the earthing switch blade with ball contact slides from the bottom into the socket contact at the connection head. The sections of the socket contact are flexible and the current flow results in a significant increase in contact pressure due to electrodynamic forces. The operating mechanism of an earthing switch exceeds dead centres of limit positions, preventing accidental opening or closing of the blade due to the external forces.

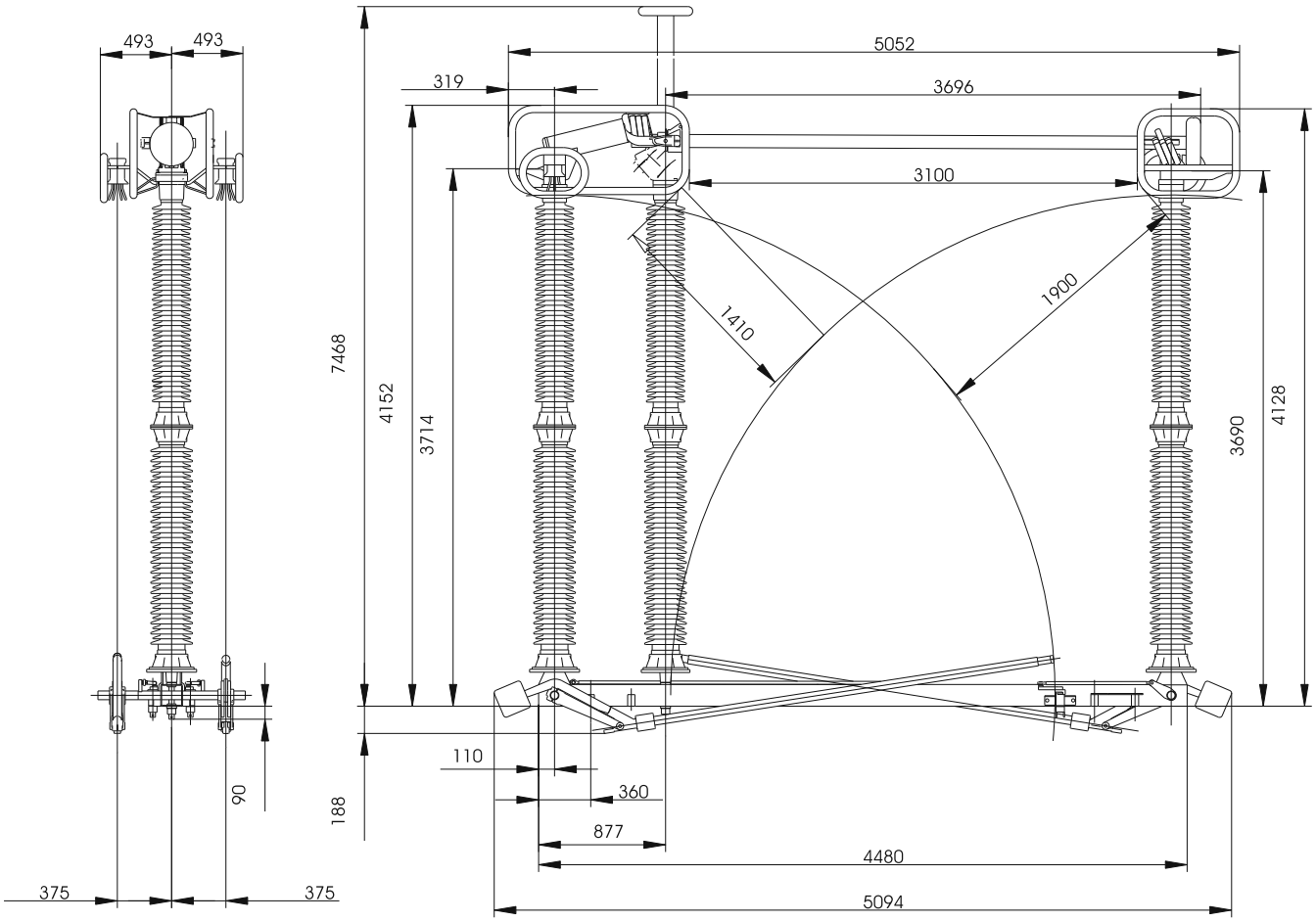
A terminal head of the disconnector is ended with a flat outlet, to enable connection of both stranded and rigid conductors. It is fitted with screens to reduce the power interferences to the standard level.

4. SPECIFICATION.

Item	Parameter	Value		
1.	Rated operating voltage	123 [kV]	245 [kV]	420 [kV]
2.	Rated continuous current	2500 [A] 3150 [A] 4000 [A]	2500 [A] 3150 [A] 4000 [A]	2500 [A] 3150 [A] 4000 [A]
3.	Peak current	125 [kA]	125 [kA]	125 [kA]
4.	Short-circuit current, 1 sec.	50 [kA]	50 [kA]	50 [kA]
5.	Test voltage (50 Hz): - earth and pole to pole insulation, - contact to contact insulation.	 230 [kV] 265 [kV]	 460 [kV] 530 [kV]	 520 [kV] 610 [kV]
6.	Surge test voltage: - earth and pole to pole insulation, - contact to contact insulation.	 550 [kV] 630 [kV]	 1050 [kV] 1200 [kV]	 1425 [kV] 1425 (+240)* [kV]
7.	Operational rated surge test voltage: - earth insulation, - contact to contact insulation.	 - -	 - -	 1050 [kV] 900 (+345)* [kV]
8.	Radio interference voltage	<2500 [uV]	<2500 [uV]	<2500 [uV]
9.	Mechanical strength	2000 cycles	2000 cycles	2000 cycles
10.	Motor operating mechanism	NSO80	NSO80	NSO80

* Peak values of alternating voltage at the opposite terminal are shown in parentheses.

5. DISCONNECTOR DIAGRAM.



NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

TFP 123-550kV
Pantograph disconnector

We would like to inform that today we have introduced the full scope of sale for switch disconnectors. Our sale offer has been expanded by pantograph type TFP, which is sold with a set of the motor operating mechanism type NSO80. That is the result of cooperation with Swiss company ALPHA ELEKTROTECHNIK AG, which has been a producer of pantograph type TFP for over than thirty years.
We hope that this offer will be pleasing for you. You are welcome to see the full offer.

1. INTENDED USE.

Disconnectors type TFP are installed in high voltage outdoor substations. Provide visible and safe isolating clearance in open state and closed disconnectors provide failure free conduction of operational and short-circuit currents.

The disconnector pole is equipped with two insulators: driving and supporting.

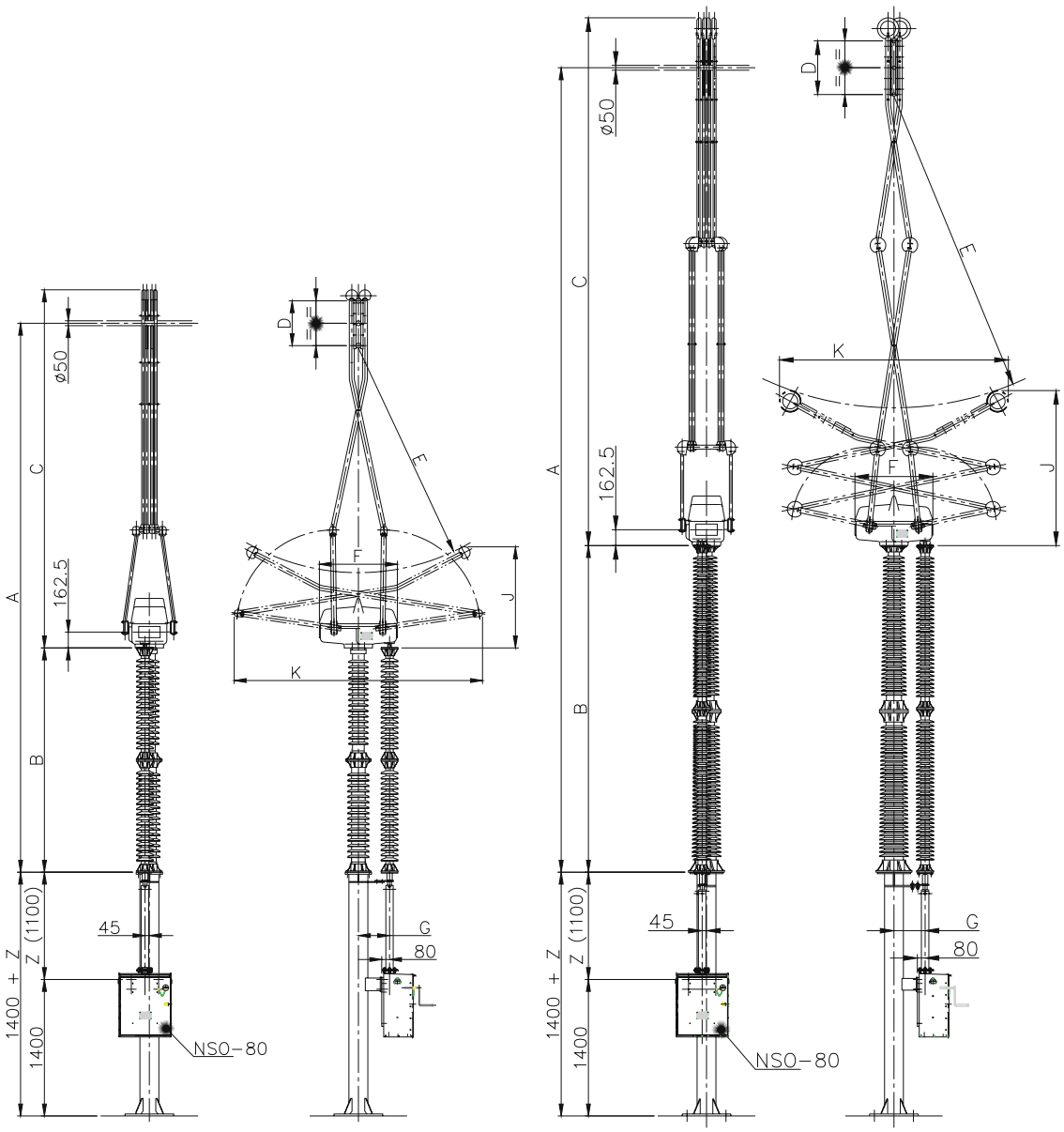
2. SPECIFICATION.

Item	Parameter	Value				
1.	Rated voltage	123 [kV]	170 [kV]	245 [kV]	420 [kV]	550 [kV]
2.	Rated current	1600 [A] 2500 [A]	2500 [A] 3150 [A] 4000 [A]	2500 [A] 3150 [A] 4000 [A]	2500 [A] 3150 [A] 4000 [A]	2500 [A] 3150 [A] 4000 [A]
3.	Rated peak withstand current	100 [kA]	100/160 [kA]	160 [kA]	160 [kA]	160 [kA]
4.	Rated short-time withstand current	40 [kA]	40/63 [kA]	63 [kA] t=3s	63 [kA] t=3s	63 [kA] t=3s
5.	Rated power-frequency withstand voltage - to earth - across open disconnector	 230 [kV] 265 [kV]	 325 [kV] 375 [kV]	 460 [kV] 530 [kV]	 520 [kV] 610 [kV]	 620 [kV] 760 [kV]
6.	Rated lighting impulse withstand voltage - to earth - across open disconnector	 550 [kV] 630 [kV]	 750 [kV] 860 [kV]	 1050 [kV] 1200 [kV]	 1425 [kV] 1665 [kV]	 1550 [kV] 1850 [kV]
7.	Rated switching impulse withstand voltage - to earth - across open disconnector	 - -	 - -	 - -	 1050 [kV] 1245 [kV]	 1175 [kV] 1330 [kV]

3. DIAGRAMS.

Figs. 2

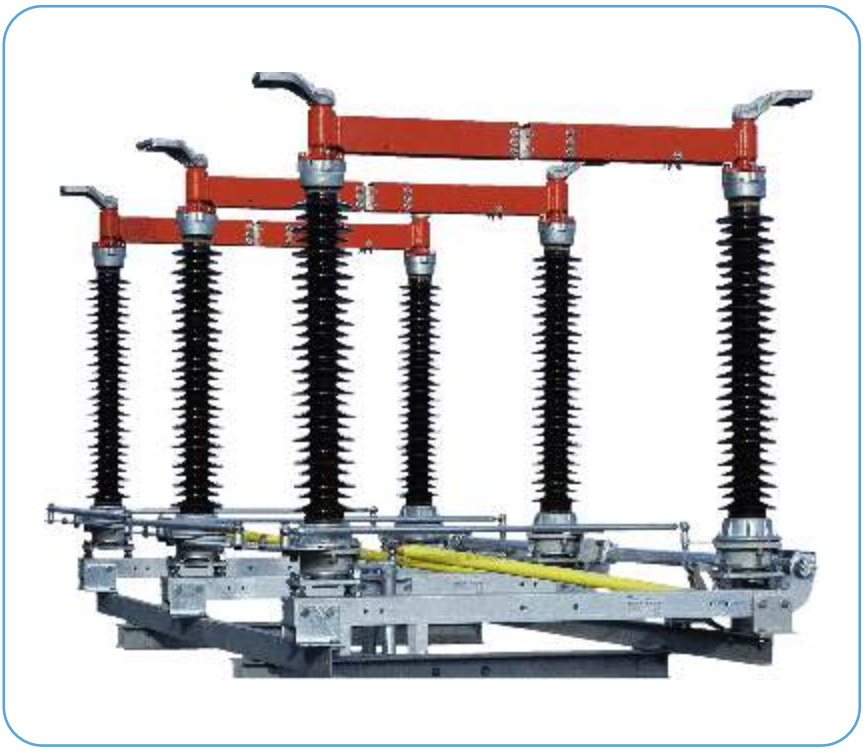
Fig. 1



TYPE	RATED VOLTAGE	FIG.	DIMENSIONS								
			A	B	C	D	E	F	G	J	K
TFPK	123 kV	1	3030	1220	2050	300	1130	600	260	682	1460
TFPK	145 kV	1	3590	1500	2949	300	1350	600	260	642	1670
TFPK	170 kV	1	3982	1700	3672	300	1570	600	260	628	1810
TFP	170 kV	1	4390	1700	4308	300	1630	800	320	968	2145
TFPA	245 kV	1	5630	2300	5412	460	2280	800	320	1044	2540
TFP	245 kV	2	6250	2300	6230	460	2350	800	320	1478	1740
TFP	420 kV	2	8250	3350	2404	550	3150	800	320	1590	2349
TFP	550 kV	2	9400	4000	2576	550	4050	800	320	1840	2760

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

ONIII
Outdoor disconnector



1. INTENDED USE.

ONIII type outdoor disconnectors are installed in high voltage outdoor substations. The disconnectors are intended for closing and opening electric circuits, where interrupted current value is negligible, or there is no voltage change between the connectors of all poles. Open disconnectors provide a visible isolating clearance, and closed disconnectors provide failure free conduction of operational and short-circuit currents. The disconnectors with earthing blades can be used to earth the section of the circuit in a potential free state. The disconnector pole can be fitted with one or two earthing blades.

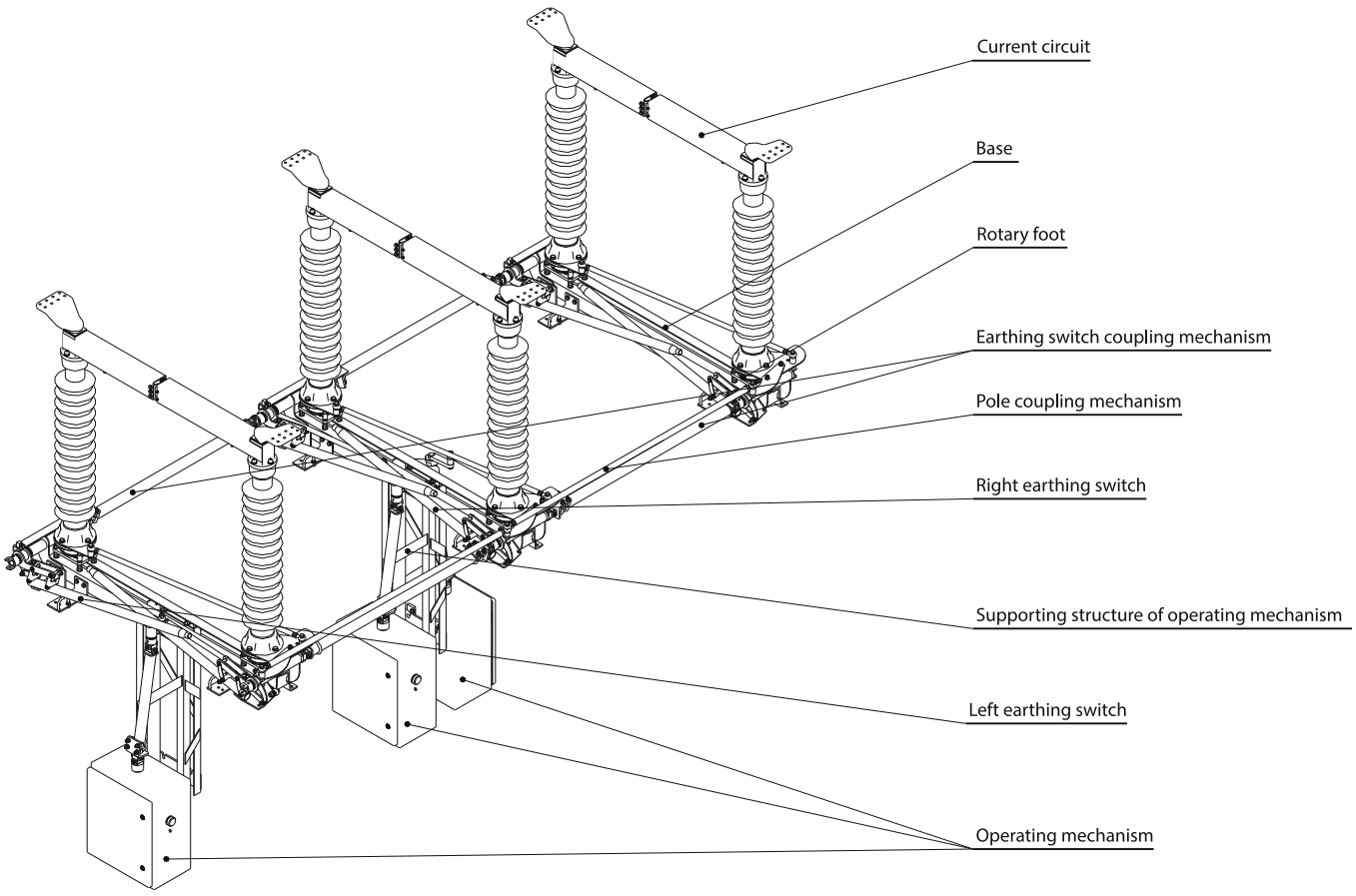
2. FEATURES.

- excellent performance and technical characteristics;
- easy installation and adjustment;
- excellent corrosion protection (hot galvanized steel components, standardized machine elements, ball and socket joints and standardized elements in current circuit made of stainless steel);
- connecting operating mechanisms to any pole;
- high durability and reliability (2000 switching cycles);
- compensation of isolator displacement (terminal tension);
- mounting hole spacing in accordance with ONIII110 standard (ZWAR Lębork);
- two types of current terminals: blade and pin type;
- locking disconnector position and earthing blade position in closed and open state by the movement of crank gear dead centre;
- parallel, series and diagonal configuration;
- disconnectors with earthing blades are fitted with mechanical lock ensuring correct switching cycle;
- the disconnectors are resistant to irregularities of supporting structure surface (coupling with ball and socket joints and Cardan joints).
- **available insulators for 123 kV disconnectors: porcelain or silicone.**

3. SPECIFICATION.

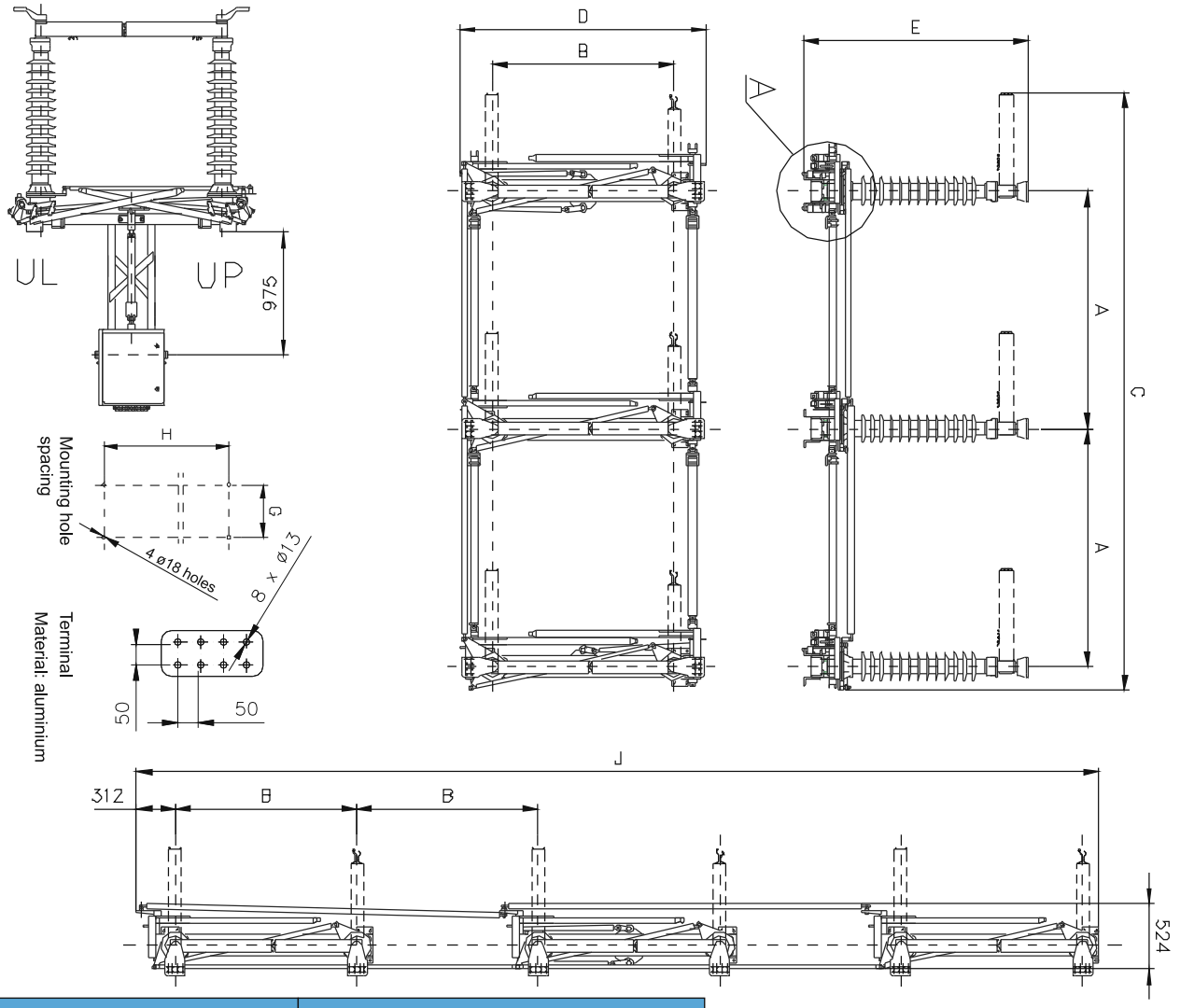
Item	Parameter	Value		
1.	Rated operating voltage	72,5 [kV]	123 [kV]	245 [kV]
2.	Rated continuous current	1600 [A] 2500 [A]	1600 [A] 2500 [A]	1600 [A] 2500 [A]
3.	Peak current	125 [kA]	125 [kA]	125 [kA]
4.	Short-circuit current, 1 sec.	50 [kA]	50 [kA]	50 [kA]
5.	Test voltage (50 Hz): - earth and pole to pole insulation, - contact to contact insulation.	 140 [kV] 160 [kV]	 230[kV] 265 [kV]	 460 [kV] 530 [kV]
6.	Surge test voltage: - earth and pole to pole insulation, - contact to contact insulation.	 325 [kV] 375 [kV]	 550 [kV] 630 [kV]	 1050 [kV] 1200 [kV]
7.	Radio interference voltage	<1000 [μV]	<1000 [μV]	<100 [μV]
8.	Mechanical strength	2000 cycles	2000 cycles	2000 cycles
9.	Operating mechanisms: - motor, - manual.	 NSO80 NR-5	 NSO80 NR-5	 NSO80 NR-5

4. DISCONNECTOR IN PARALLEL CONFIGURATION WITH TWO EARTHING SWITCHES.

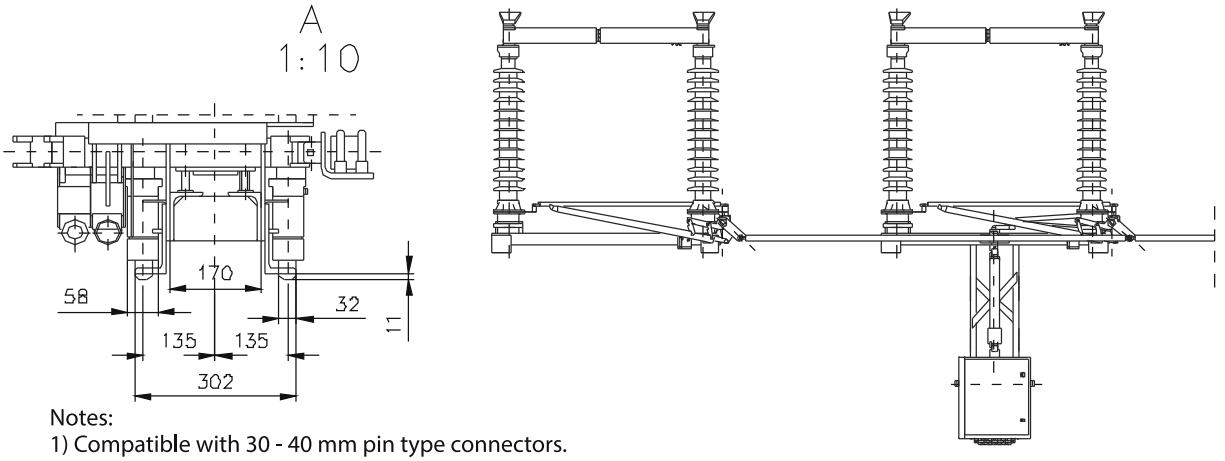


NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

5. ONIII-72 and ONIII-123 DISCONNECTOR DIAGRAM.



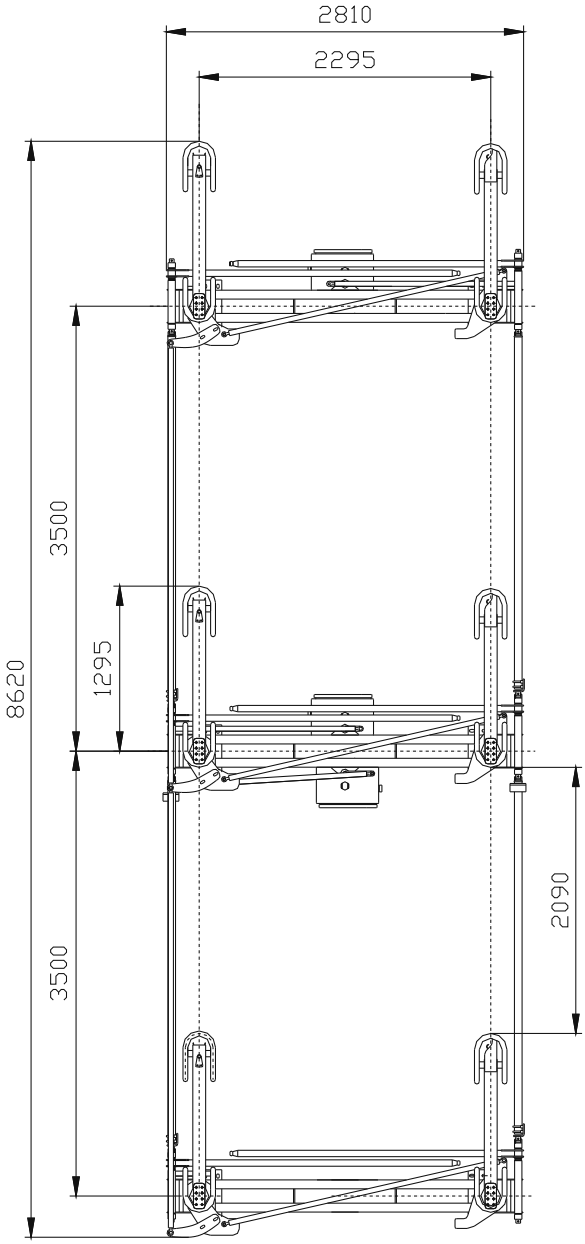
Disconnector type	Dimensions [mm]							
	A	B	C	D	E	G	H	J
ONIII - 72	1300	900	3170	1425	1334	240	1100	4950
ONIII - 123	1900	1450	4770	1964	1794	240	1650	7700

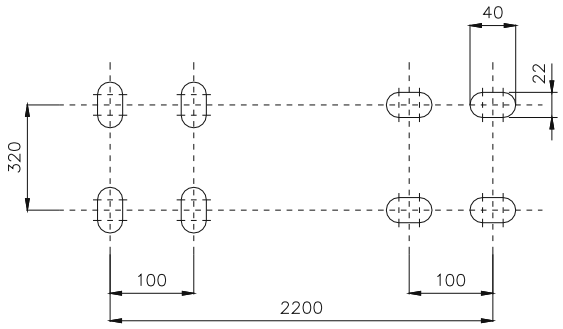


Notes:
1) Compatible with 30 - 40 mm pin type connectors.
2) Other drawings are drawn up for specific projects based on the supporting structure, pole to pole spacing, and the type of current terminals.

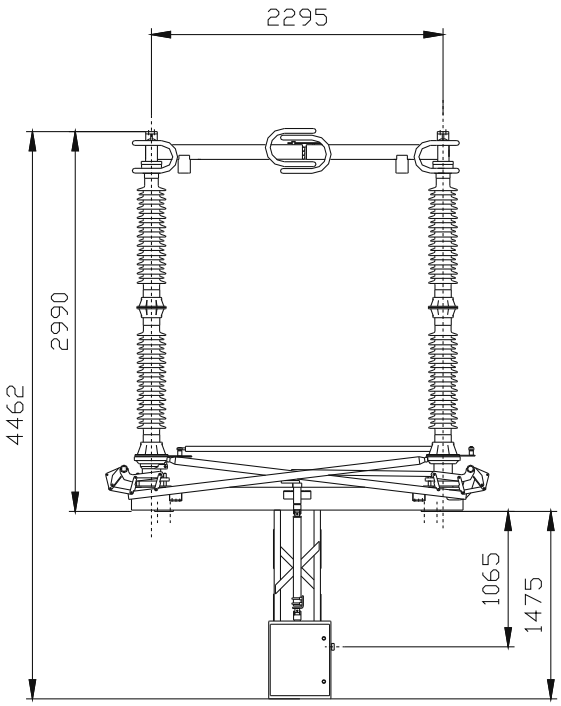
NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

6. ONIII-245 DISCONNECTOR DIAGRAM.





Hole spacing



Notes:
1) Compatible with 30 - 40 mm pin type connectors.
2) Other drawings are drawn up for specific projects based on the supporting structure, pole to pole spacing, and the type of current terminals.

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

UNIII
Outdoor earthing switch

1. INTENDED USE.

UNIII type outdoor earthing switches are installed in outdoor substations. For earthing and short circuit of electric circuits disconnected from the voltage. The earthing switches can be used as single pole switches with individual operating mechanism for each pole (e.g. neutral transformer earthing) or in three pole unit with a common operating mechanism installed for any pole.

2. FEATURES.

- excellent performance and technical characteristics;
- easy installation and adjustment;
- excellent corrosion protection (hot galvanized steel components or stainless steel);
- connecting operating mechanisms to any pole;
- high durability and reliability (2000 switching cycles);
- supporting structures available;
- compatible with Polish power engineering requirements.

3. DESIGN.

Earthing switch base is a rigid welded frame made of steel sections. Earthing blade is fixed to the lever for cutting - plane motion.

When closing, the blade rotates to a vertical position in the first phase and slides in the fixed contact in the top section of a stand-off insulator. Copper flexible connector joins the bottom end of an earthing blade with a steel base. The earthing switch is driven by the rod connected to the intersecting axis gear.

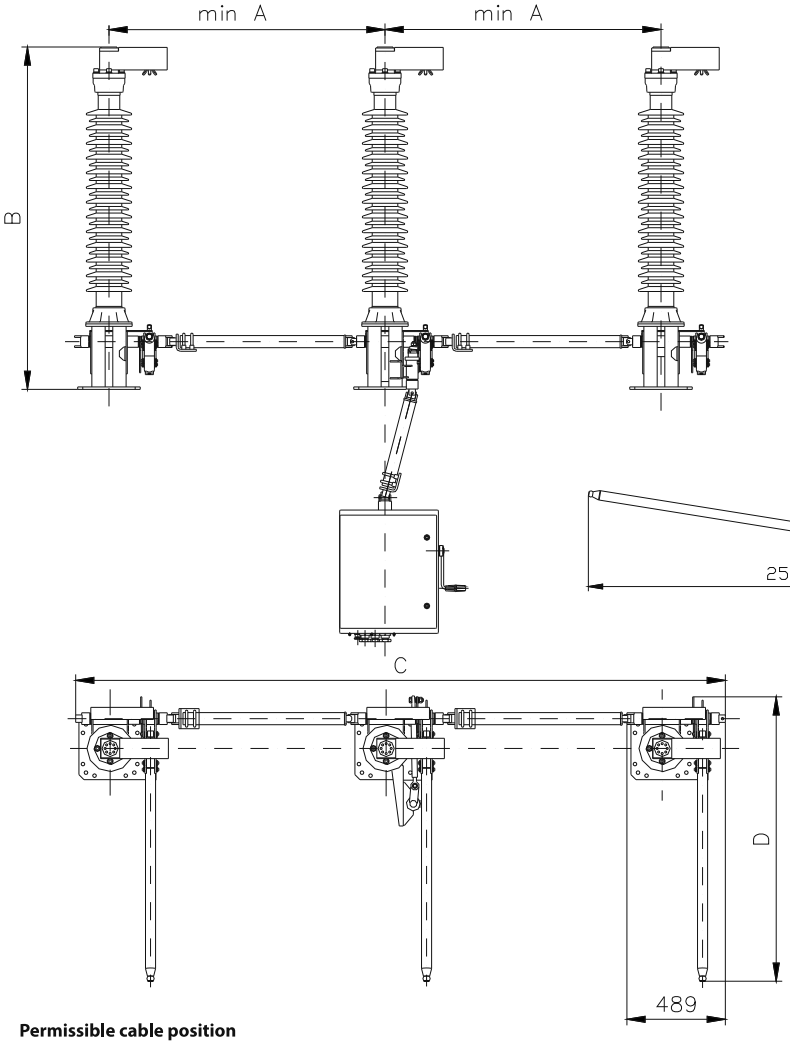
Intersecting axis gear at the crank shaft exceeds dead centres in limit positions. It prevents accidental opening or closing of the earthing switch due to external or electrodynamic forces (short-circuit currents).

4. SPECIFICATION.

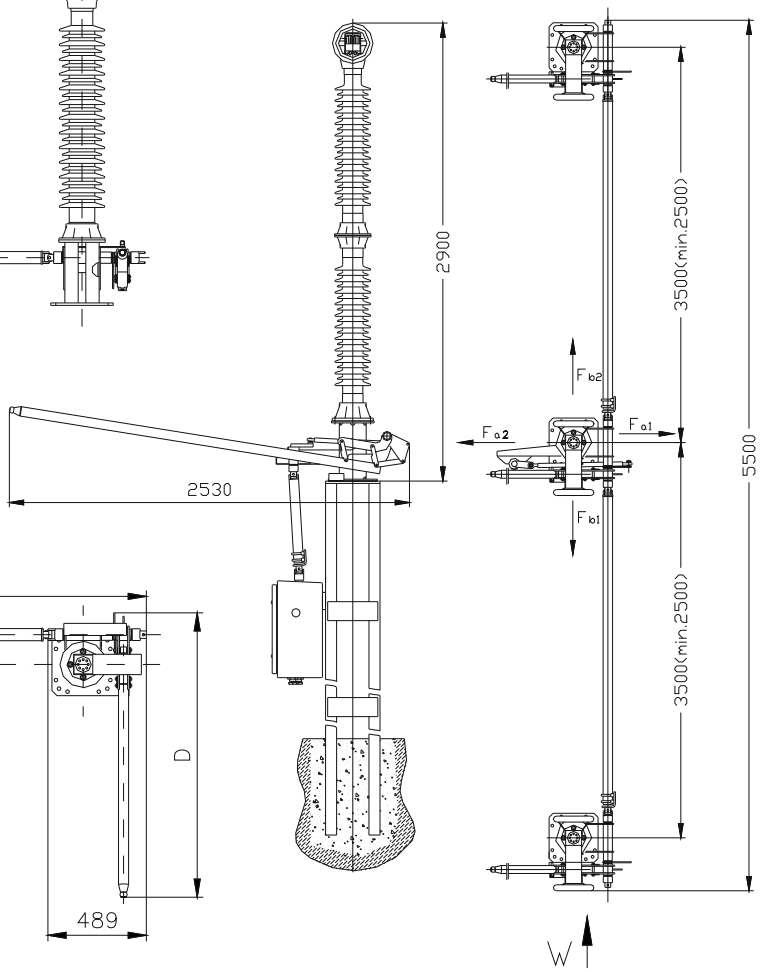
Item	Parameter	Value		
1.	Rated operating voltage	72,5 kV	123 kV	245 kV
2.	Peak current	125 kA	125kA	125kA
3.	Short-circuit current, 1 sec.	50 kA	50 kA	50 kA
4.	Test voltage (50 Hz) for insulation	140 kV	230 kV	530 kV
5.	Surge test voltage for insulation	325 kV	550 kV	1050 kV
6.	Radio interference voltage	<1000 µV	<1000 µV	<100 µV
7.	Mechanical strength	2000 cycles	2000 cycles	2000 cycles
8.	Operating mechanisms: -motor, -manual.	NSO80 NR-5	NSO80 NR-5	NSO80 NR-5

5. DIAGRAMS.

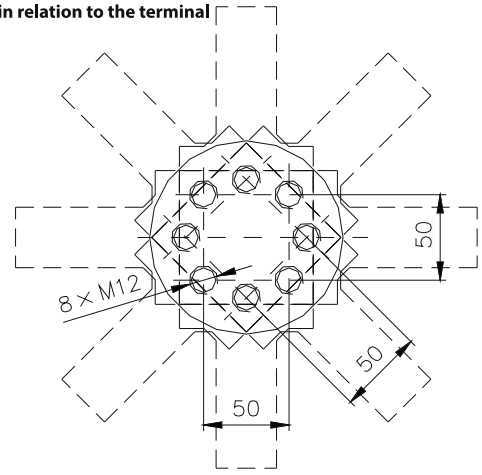
72,5 - 123 kV



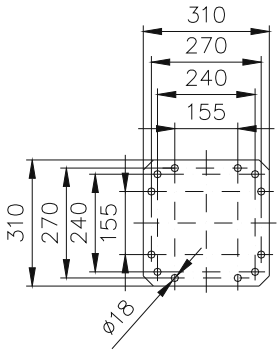
245 kV



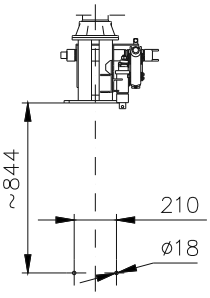
Permissible cable position in relation to the terminal



Terminal – aluminium



Mounting hole spacing



Mounting hole spacing for NR-5 manual operating mechanism

Earthing switch type	Dimensions [mm]			
	A	B	C	D
UNIII - 72	1200	1255	2879	953
UNIII - 123	1370	1700	3225	1412

Notes:
1) Compatible with 30 - 40 mm pin type connectors.
2) Other drawings are drawn up for specific projects based on the supporting structure, pole to pole spacing, and the type of current terminals.

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

NSO80
Motor operating mechanism

1. INTENDED USE.

NSO80 type motor operating mechanisms are intended for HV outdoor disconnectors and earthing switches made by ZWAE Sp. z o. o. Lębork. The operating mechanisms are also compatible with the switchgear, with up to 192° angular displacement, and anti-torque at closing and opening up to 800 Nm. The operating mechanisms are compatible with disconnectors and earthing switches by ZWAR operating at 110, 220 and 400 kV voltage, (e.g. ONIII110..., ONI220, ONS..., UNIII110...). They replace manual or pneumatic operating mechanisms as an upgrade of existing HV disconnectors.

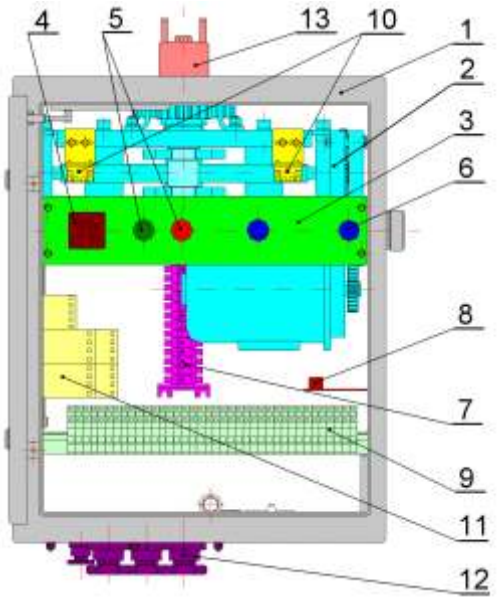
2. FEATURES.

- simple design with reliable mechanisms;
- high torque (800 Nm) for easy operation of single-pole and three-pole switches in extreme conditions (heavy icing);
- different versions of supply and steering voltage (110VDC, 220VDC, 3-phase 230/400VAC);
- comprehensive electric equipment with auxiliary and steering devices (including 5-circuit auxiliary connector);
- the possibility to realise remote control, electric interlock of the main circuit and earthing blades as well as differential protection of buses;
- enclosure corrosion protection of aluminium sheet and coating;
- reliable operation;
- non-handling operation.

3. OPERATING MECHANISM DESIGN.

The motor operating mechanism include:

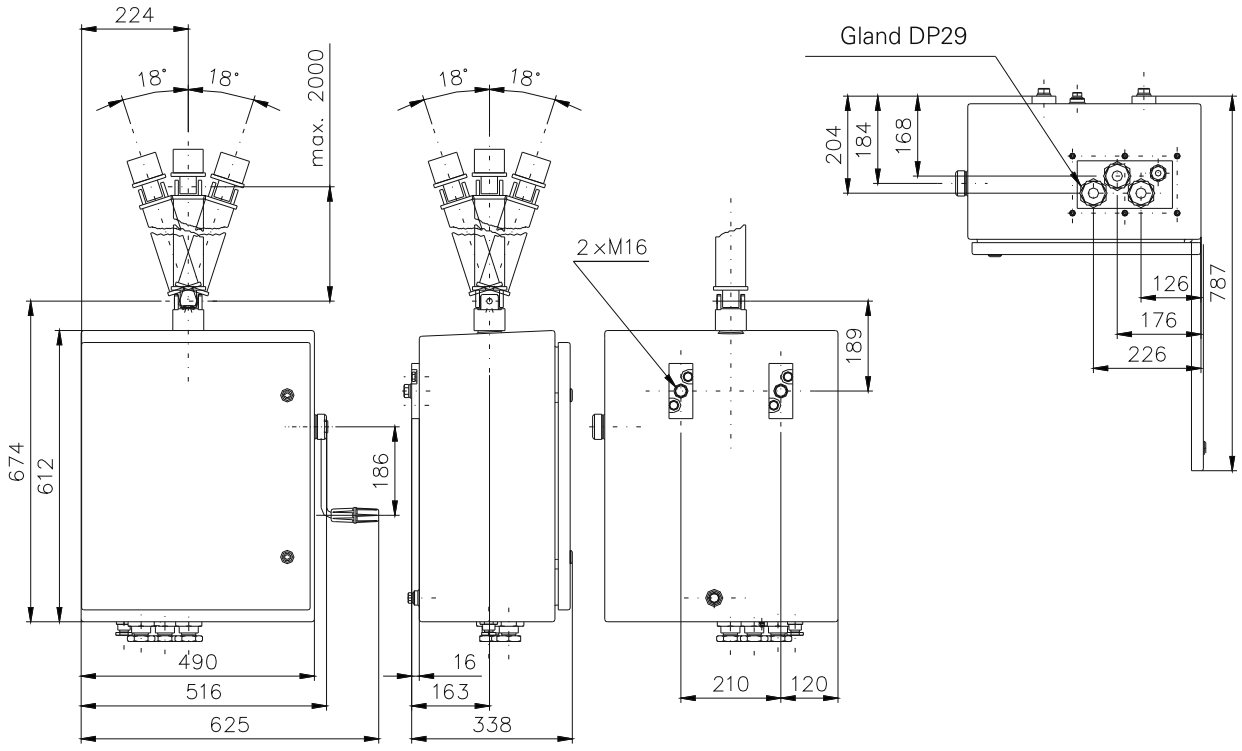
[1] Enclosure;
[2] Mechanism with multi-stage crossed helical gear, driven by an electric motor;
[3] Control panel;
[4] Operation mode switch;
[5] Control buttons;
[6] Electromagnetic lock unit;
[7] Secondary circuit switch (7 closing contacts, 8 opening contacts, 1 r + 1z for differential protection of buses);
[8] Heater to evaporate water condensate from the interior;
[9] Terminal strip for connecting control and power circuits;
[10] Limit switches disconnecting motor power supply at specific angular displacement of the main shaft;
[11] Motor supply control system;
[12] Cable gland unit;
[13] Drive shaft.



4. SPECIFICATION.

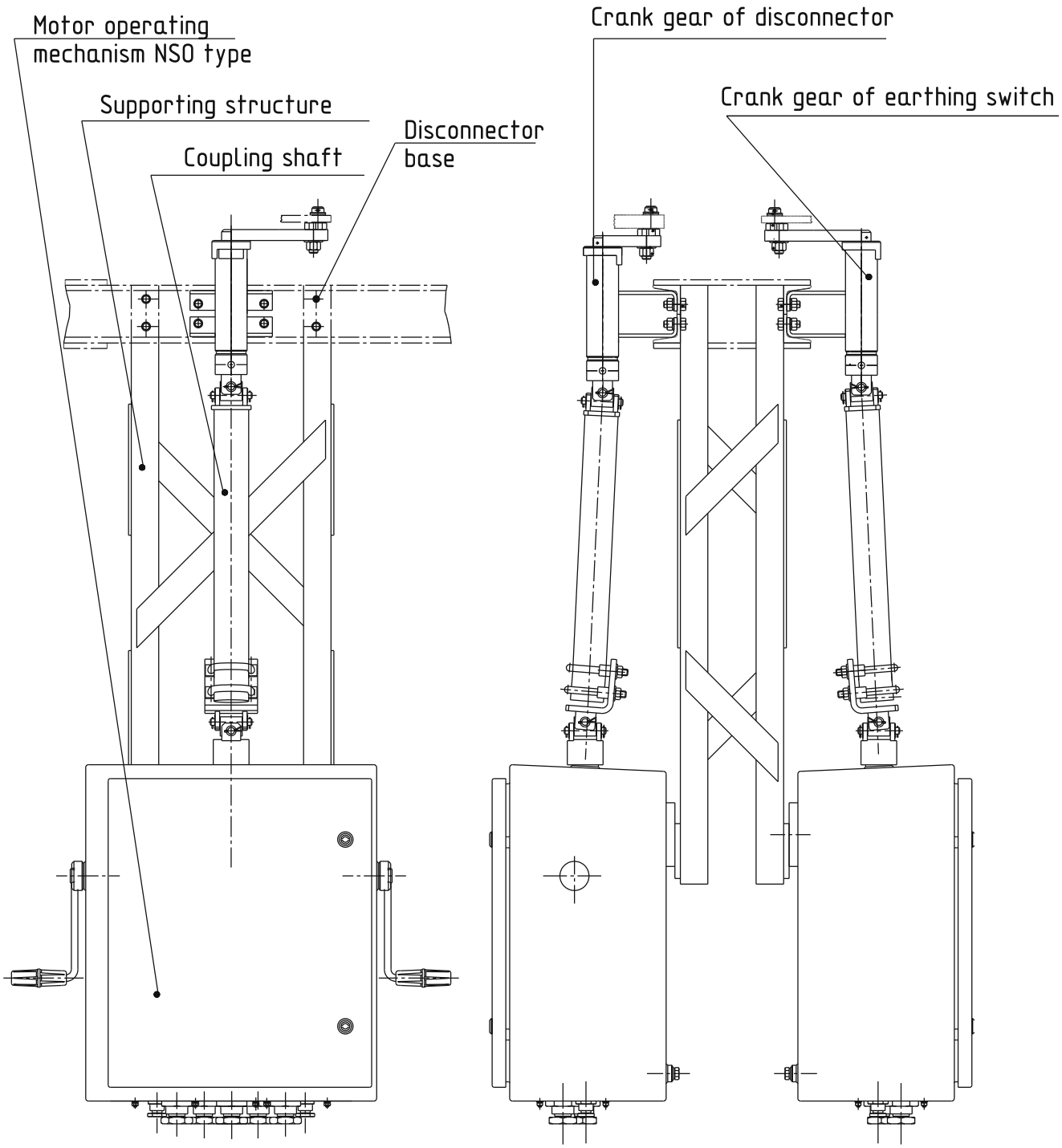
Item	Parameter	Value
1.	Rated voltage / rated current - squirrel cage motor - series motor	3x400 VAC / 4,5 A 220 VDC / 4 A 110 VDC / 10 A
	- contactor coil of motor supply voltage control (depending on motor rated voltage)	400 VAC 220 VDC 110 VDC
	- contactor coil	220 VDC 220 VAC 110 VDC 110 VAC
	- heater	230 VAC 220 VDC
	- electromagnetic lock	220 VDC 110 VDC
2.	Rated power: - squirrel cage motor - series motor - contactor coil - heater - electromagnetic lock coil	 750 W 500 W 7 W 25 W 7 W
3.	Shaft torque - rated - maximum	 300/500/1000 Nm 500/800/1600 Nm
4.	HV switching time	6s; 11s; 15s
5.	Crank handle speed	ok. 100
6.	Main shaft angular displacement	90°; 125°; 192°
7.	Rated switching capability of control switch	AC-15; 230 V; 2,5 A DC-13; 220 V; 0,25 A
8.	Maximum conductor cross section	4 mm^2
9.	Enclosure protection rating	IP 54
10.	Rated mechanical strength	2000 cycles

5. DIAGRAMS.



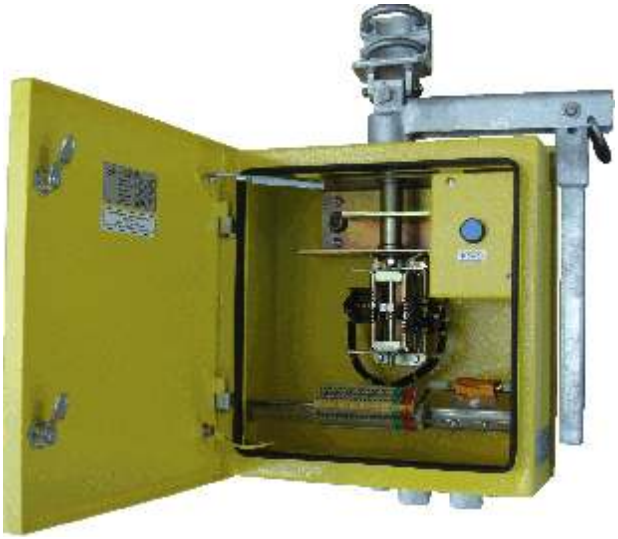
NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

6. REPLACEMENT OF PNEUMATIC OPERATING MECHANISMS WITH NSO80 TYPE.



NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

NR-5
Manual operating mechanism



1. INTENDED USE.

NR-5 manual operating mechanism is compatible with outdoor disconnectors and earthing switches in a distribution network with angular motion of a drive shaft. NR-5 type operating mechanism is dedicated for single pole earthing switches of the neutral point of a transformer, e.g. UNI-72.5. The operating mechanism enables manual operation of installed switch. It is compatible with all switches operated with a shaft (angular displacement up to 192°).

2. FEATURES.

- reduced emergency trip duration;
- reliable operation (2000 switching cycles);
- maintenance-free;
- electromagnetic lock providing proper switching sequence;
- control switch for control and signalling circuits;
- additional Cardan joint for angle operation;
- compatible with Polish power engineering requirements;
- aluminium enclosure, powder coated, hot galvanized steel components.

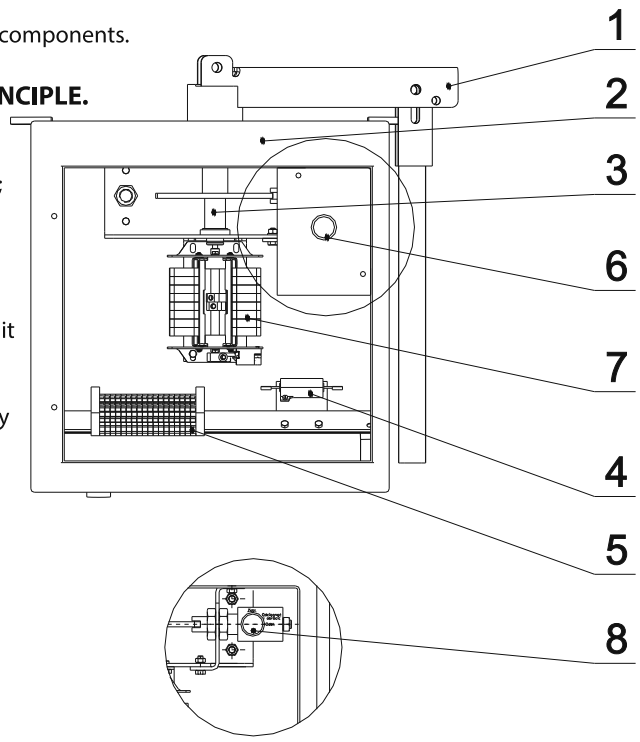
3. OPERATING MECHANISM DESIGN AND WORKING PRINCIPLE.

The manual operating mechanism includes:

- Operating mechanism;
- Terminal strip for connecting control and signalling circuits;
- Electromagnetic lock or mechanical interlock;
- Control switch.

Working principle:

The operating mechanism is operated with a lever, locked in limit positions with a padlock. In the operation phase, a shaft motion is transmitted to the control switch causing the normally open contacts to open and at limit position of the main shaft, the normally open contacts are closed.

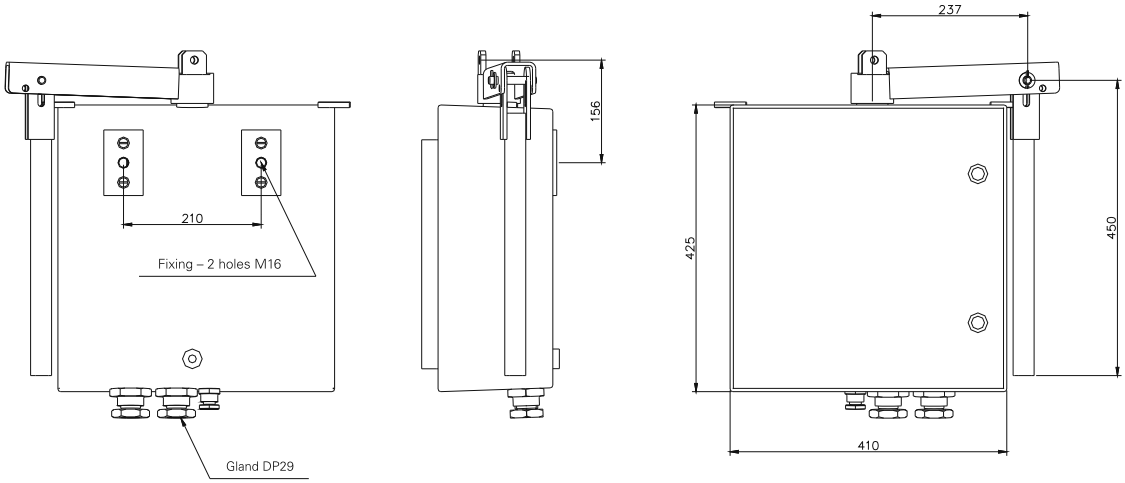


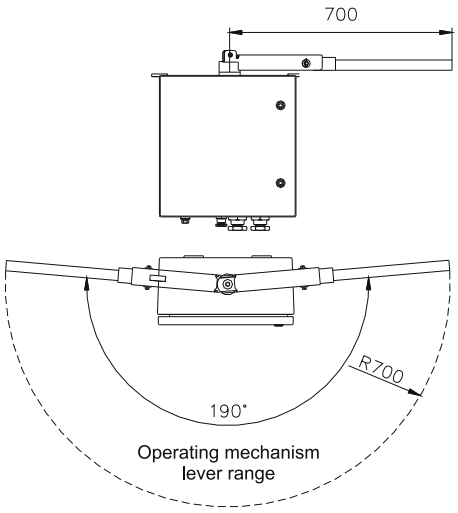
[1] Drive shaft with manual operation lever
[2] Enclosure
[3] Operating mechanism
[4] Heater
[5] Terminal strip
[6] Electromagnetic lock release button (standard equipment)
[7] Control switch
[8] Mechanical lock release lever (option - a replacement of electromagnetic lock).

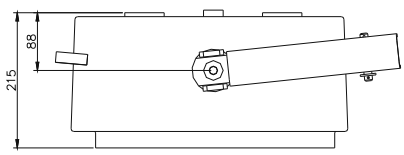
4. SPECIFICATION.

Item	Parameter	Value
1.	Rated torque:	300 Nm
2.	Rated voltage: - electromagnetic lock	 220 VDC 230 VAC 110 VDC
	- heater	230 VAC 220 VDC
3.	Rated power: -electromagnet coil - DC / AC start -electromagnet coil - DC / AC operation - heater	 220 W / 700 W 1,5 W / 1,5 W 25 W
4.	Main shaft angular displacement	192°
5.	Rated switching capability of control switch	AC-15; 230 V; 2,5 A DC-13; 220 V; 0,25 A
6.	Maximum conductor cross section	4 mm^2
7.	Enclosure protection rating	IP 54
8.	Rated mechanical strength	2000 cycles

5. DIAGRAM.







NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

The area described by the lever must be allowed for in the design.

ZWAE

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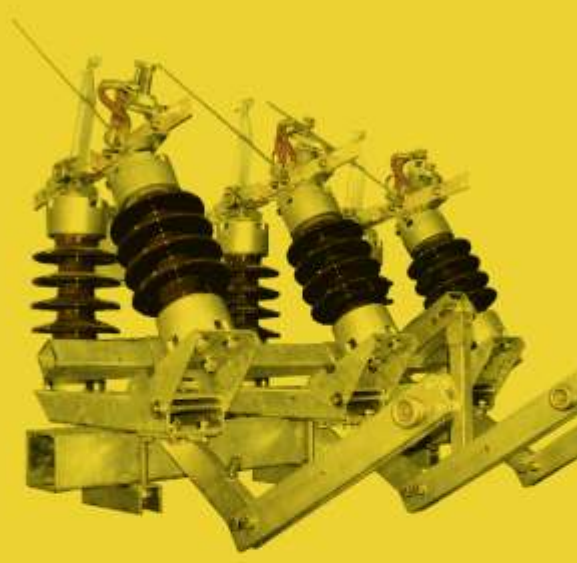
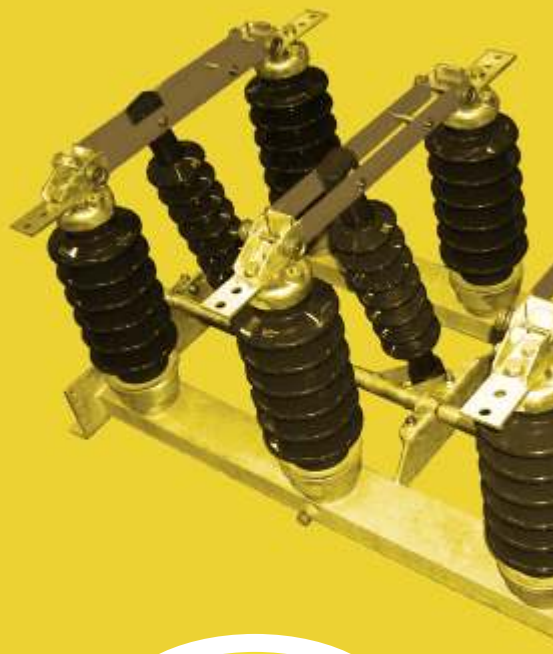




MV OUTDOOR SWITCHGEAR

MV OUTDOOR SWITCH DISCONNECTORS
- RS

MV OUTDOOR DISCONNECTORS
- ONIIIS

MV OUTDOOR SWITCHGEAR OPERATING MECHANISMS
- NSL60
- NS030
- NR-5S

MV
Outdoor

RS
Outdoor switch disconnector

1. INTENDED USE.

RS-24 type three - pole disconnectors (switch disconnectors) compatible with 15 kV and 24 kV outdoor substations. Intended for closing and opening electrical circuits and earthing disconnected circuit sections. The operating mechanism enables installation of switchgear with vertical and horizontal arcing contacts, and version with expulsion chambers with horizontal contacts. Modular switch contact design enables extension to a required switch type, as well as modification of field spacing.

2. FEATURES.

- excellent performance and technical characteristics;
- compatible with NSL60, NSO30 motor operating mechanisms, with radio remote control;
- flexible coupling protecting against breakage of line cables;
- easy installation and adjustment;
- excellent corrosion protection (hot galvanized steel components or stainless steel);
- high durability and reliability;
- easy and safe maintenance;
- all switchgear with isolating switching device features.

3. DESIGN.

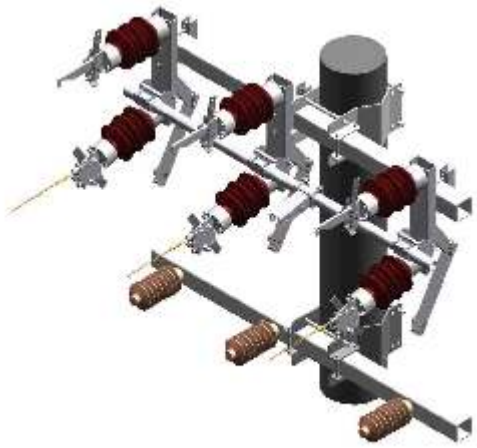
The switches feature three independent poles. The distance between poles and segments is adjustable in a wide range (min. 350 mm). All poles are mounted on a common shaft. The unit is installed on a hot galvanized supporting structure. The earthing switch function can be utilized by installing an auxiliary module on the disconnector poles.

The switches are fitted with porcelain or silicone insulators with a holder with main contact unit. The contacts are made of silver plated flat copper bars. The other end of the main contacts is fitted with terminals (two 3 mm holes, 30 mm spacing). The contact design provides high adhesion surface and contact force, and self alignment. Switch disconnector poles are fitted with arc suppression units: arcing contacts or expulsion chambers. The frame, supporting structures and operating mechanism are made of corrosion protected steel components (hot galvanized).

4. SPECIFICATION.

Item	Parameter	Value	
		with arcing contact	with expulsion chamber
1.	Rated voltage	24 kV	
2.	Rated continuous current	630 A	
3.	Rated frequency	50 Hz	
4.	Lightning surge test voltage:		
	- earth and pole to pole insulation	125 kV	
	- contact to contact insulation	145 kV	
5.	Rated alternating test voltage:		
	- earth and pole to pole insulation	50 kV	
	- contact to contact insulation	60 kV	
6.	Rated current:		
	- low inductive reactance circuit	20 A	25 A
	- in ring network circuits	10 A	630 A
	- in cable and overhead lines, idle state	20 A	630 A
7.	Rated peak current	40 kA	
8.	Rated short-circuit current, 1 sec.	16 kA	
9.	Mechanical strength	1000 cycles	

5. DISCONNECTOR MOUNTING.



Switch disconnector configuration with arcing contacts.

Switch disconnector mounted on ŻN pole with expulsion chamber.

6. MANUAL OUTDOOR OPERATING MECHANISMS.

6.1. INTENDED USE.

Manual NNO and NNP type operating mechanisms are used to operate rotary MV outdoor disconnectors and switch disconnectors.

6.2. FEATURES.

- simple design;
- easy installation and coupling with other switchgear;
- excellent corrosion protection (hot galvanized steel components or stainless steel);
- high durability and reliability;
- easy and safe maintenance;
- three-position (open - close - earth);
- padlock locked.

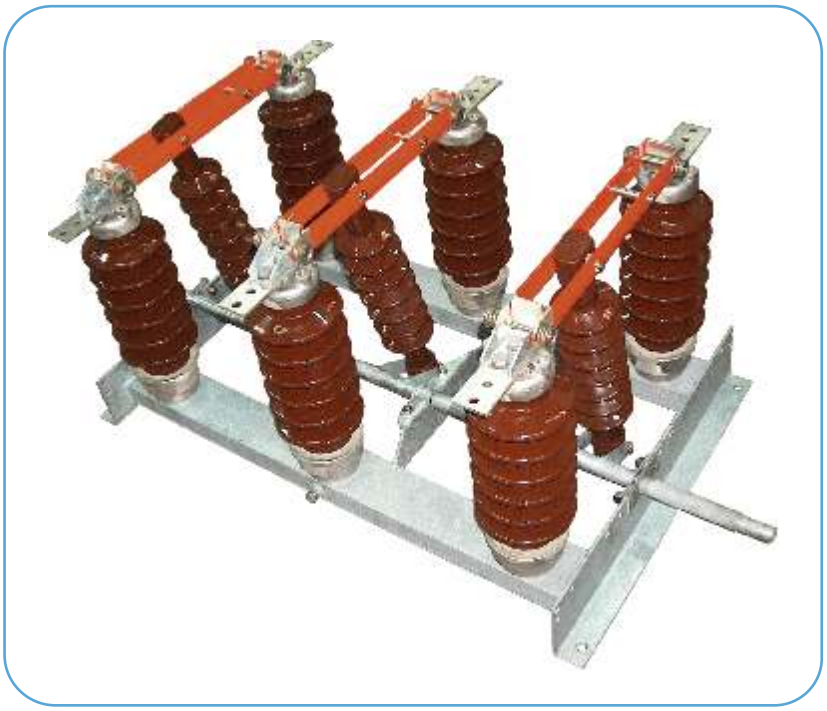
NNO - Version for spun concrete pole

NNO - Version for ŻN/BSW pole

NNP - Version for spun concrete pole

NNP - Version for ŻN/BSW pole

ONIIIS
MV Outdoor disconnector



1. INTENDED USE.

ONIIIS type outdoor disconnectors are installed in medium voltage outdoor substations. The disconnectors are intended for closing and opening electric circuits, where interrupted current value is negligible, or there is no voltage change between the connectors of all poles. Open disconnectors provide a visible isolating clearance, and closed disconnectors provide failure free conduction of operational and short-circuit currents. The disconnectors with earthing blades can be used to earth the section of the circuit in a potential free state. The disconnector pole can be fitted with one or two earthing blades.

2. FEATURES.

- excellent performance and technical characteristics;
- easy installation and adjustment;
- excellent corrosion protection (steel components, standardized machine elements hot galvanized and standardized elements made of stainless steel);
- compatible with manual NNP type operating mechanism and motor NSL60-2 type operating mechanisms;
- high durability and reliability (2000 switching cycles);
- mounting hole spacing in accordance with ONIII 20...-2 and ONIII 30...-2 standard (ZWAR Lębork);
- vertical and horizontal disconnector operation;
- disconnectors with earthing blades are fitted with mechanical lock ensuring correct switching cycle.

3. DESIGN.

ONIIIS type MV outdoor disconnectors feature blade contact design. The disconnector base is a steel frame with drive shaft mounted on bearings with operating lever. The lever can be adjusted by 10° within the full range. The based is fitted with stand-off insulators with fixed and moving contacts. A linear contact between fixed and moving contacts, and the clamping force is provided by the springs. Moving contacts are connected with drive shaft via porcelain pull insulators. Angular shaft displacement is transferred by pull insulators to the moving contacts, setting it in motion in a plane perpendicular to the base.

ONIIIS disconnector design enables use of built-in earthing switches, installed on the side of a fixed non-separable contact (bottom earthing switch) or fixed separable contact (top earthing switch). A mechanical interlock is installed between the disconnector drive shaft and earthing switch drive shaft to ensure a correct switching sequence.

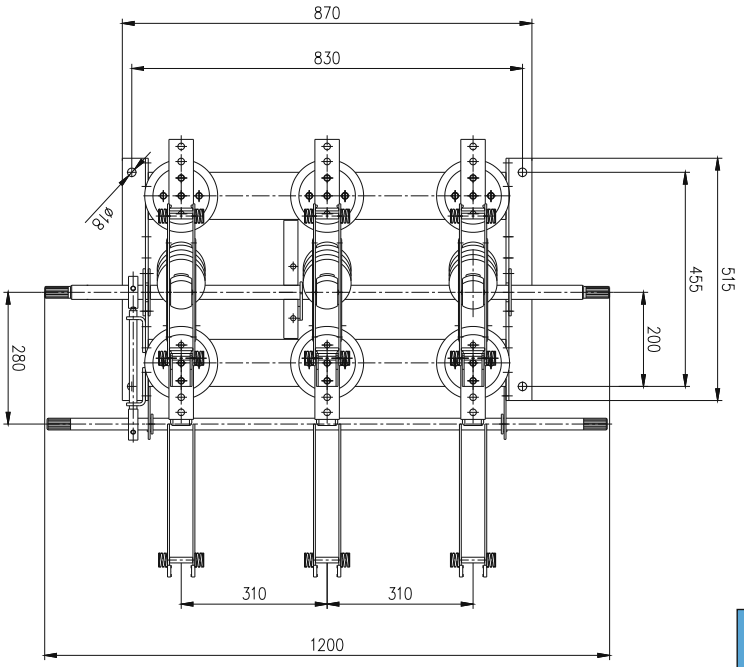
The disconnectors are adapted for vertical and horizontal operation with terminals compatible with flat buses installed parallel to the base.

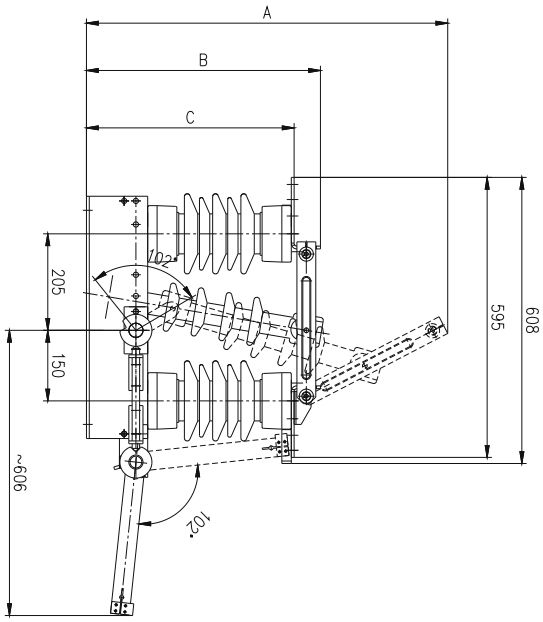
The disconnectors are activated by a NNP type manual operating mechanisms or NSL60, NR-5S type motor operating mechanism with intersecting axis gear with rotary operating mechanisms: NR-5 type manual and NS030 type motor mechanism. The operating mechanisms are coupled with a disconnector via a tube rod.

4. SPECIFICATION.

Item	Parameter	Value	
1.	Disconnector type	ONIIIS-24	ONIIIS-36
2.	Rated continuous disconnector current	800 A 1600 A	800 A 1600A
3.	Rated peak disconnector current	50 kA	50 kA
4.	Short-circuit disconnector current, 1 sec.	20 kA	20 kA
5.	Test voltage (50 Hz): - earth and pole to pole insulation - contact to contact insulation	 55 kV 75 kV	 75 kV 100 kV
6.	Surge test voltage: - earth and pole to pole insulation - contact to contact insulation	 125 kV 145 kV	 170 kV 195 kV
7.	Earth insulation creepage distance - rated - increased	 420 mm 460 mm - -	 610 mm 770 mm 900 mm 1116 mm
8.	Earthing switch peak rated current	40 kA	40 kA
9.	Earthing switch short-circuit current, 1 sec.	16 kA	16 kA
10.	Rated mechanical strength	2000 cycles	2000 cycles
11.	Operating mechanism: - motor, - manual.	 NSL60 NNP	 NSL60 NNP

5. DIMENSIONS – ONIIIS-24/8/UD (ONIIIS-24/16/UD).





Disconnector type	Creepage distance 460 mm		
	A	B	C
ONIIIS-24/8/UD	768	497	441
ONIIIS-24/16/UD	780	521	443

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

NSL60
Motor operating mechanism

1. INTENDED USE.

NSL60 type motor operating mechanisms are compatible with MV disconnectors and pole mounted switch disconnectors with plane rod motion. The operating mechanism enables remote or local control of a MV switch. It is compatible with each coupler operated with a rod along the pole with 100-190 mm pitch, where switching force does not exceed 6500 N.

2. FEATURES.

- simple design with reliable mechanisms (2000 switching cycles);
- high maximum axial force up to 6.5 kN;
- reliable operation;
- reduced emergency trip duration;
- manual operation at power failure;
- compact dimensions;
- compatible with Polish power engineering requirements;
- mechanical interlock (optional);
- control switch to position mapping (optional);
- enclosure for installation of remote control units (optional).

3. SPECIFICATION.

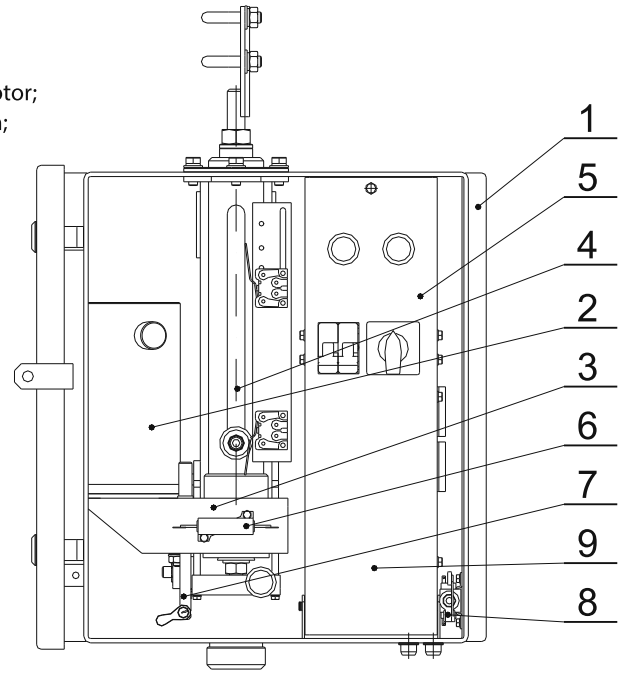
Item	Parameter	Value		
1.	Motor rated voltage	24 VDC	110 VDC	220 VDC 230 VAC
2.	Rated power	300W		
3.	Motor rated current	19 A	4 A	2,2 A
4.	Maximum axial force	6,5kN		
5.	Switching time	ok. 4 sec.		
6.	Max. conductor cross-section for connection of terminal strip	2,5 mm^2		
7.	Rated mechanical strength	2000 cycles		

4. OPERATING MECHANISM DESIGN.

The motor operating mechanism include:

- mechanism with multi-stage gear, driven by an electric DC motor;
- limit switches disconnecting motor supply at specific position;
- terminal strip for connecting power circuits;
- electrical interlock microswitch disconnecting motor power supply during manual operation;
- mechanical interlock of the operating mechanism;
- contactor unit;
- heater with thermostat.

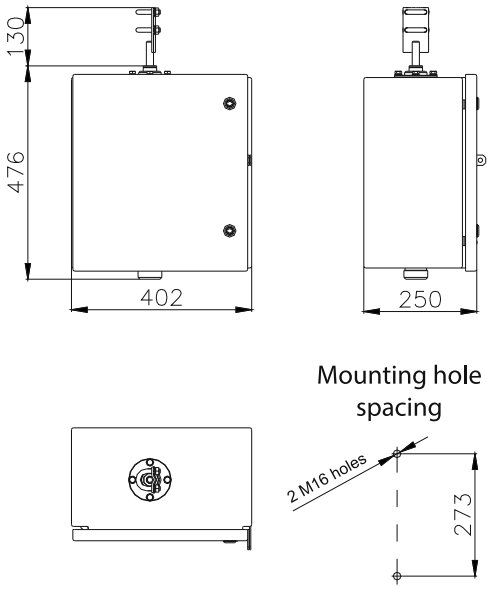
[1] Enclosure
[2] Motor
[3] Gear
[4] Rod
[5] Control panel
[6] Heater
[7] Mechanical lock
[8] Door microswitch
[9] Terminal strip (accessible after opening the control panel).



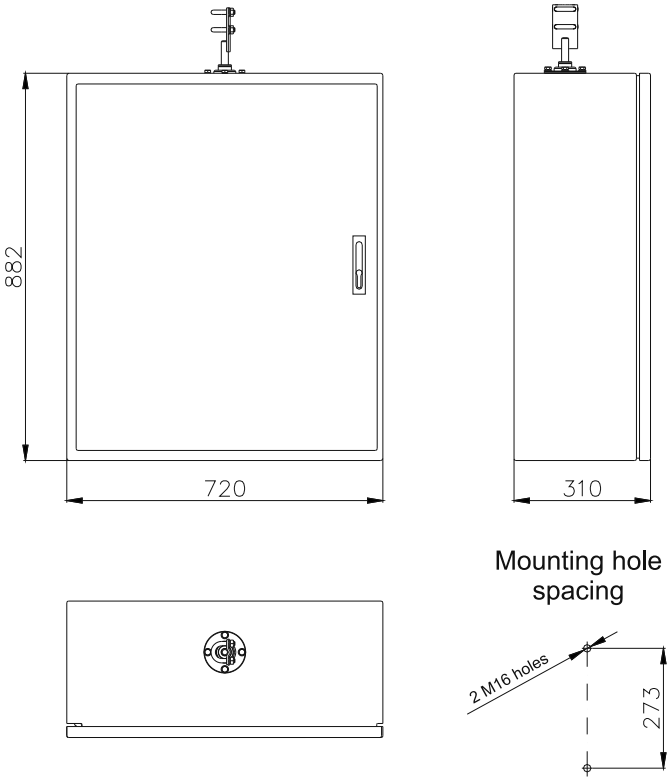
PA4 type aluminium enclosure, epoxy powder coated. Door sealed with silicone gasket. Enclosure with IP54 protection rating.

5. OPERATING MECHANISM DIAGRAM.

VERSION 1



VERSION 2



NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

NSO30
Motor operating mechanism

1. INTENDED USE.

NSO30 type motor operating mechanisms are compatible with MV disconnectors and pole mounted switch disconnectors with rotary rod motion. The operating mechanism enables remote or local control of a pole mounted switch. It is compatible with all switches operated with a rod along the post with angular displacement of 240°, and torque up to 300 Nm.

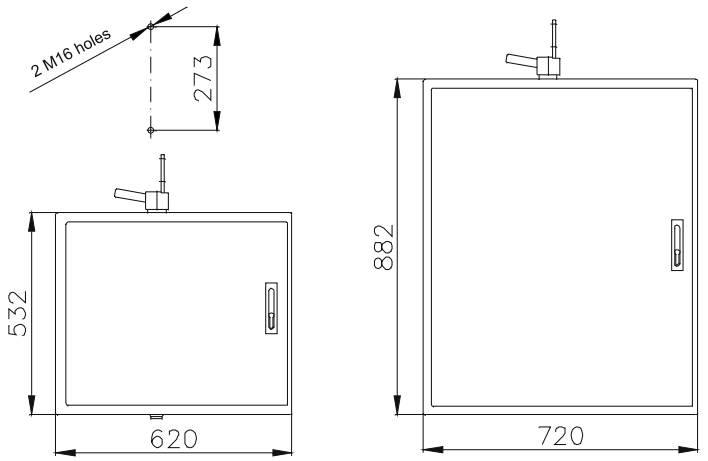
2. FEATURES.

- reduced emergency trip duration;
- reliable operation (2000 switching cycles);
- high angular displacement to compensate the rod torsional deflection;
- maintenance-free;
- manual switching in emergency;
- compatible with Polish power engineering requirements;
- control switch to position mapping (optional);
- enclosure for installation of remote control units.

3. SPECIFICATION.

Item	Parameter	Value		
1.	Motor rated voltage	24 VDC	220 VDC 230 VAC	110 VDC
2.	Rated power	300W		
3.	Motor rated current	19 A	2,2 A	4 A
4.	Torque	300 Nm		
5.	Switching time	4 sec.	3 sec.	3 sec.
6.	Max. possible conductor cross-section for connection of terminal strip	4 mm^2		
7.	Rated mechanical strength	2000 cycles		

4. DIAGRAMS.



NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

NR-5S
Manual operating mechnism

1. INTENDED USE.

Manual operating mechanism type NR-5S are compatible with switches and earthing switches of MV outdoor distribution network with plane rod motion. The operating mechanism type NR-5S enables local control of all MV switches with sliding motion with 104, 142 and 186mm stroke.

2. FEATURES.

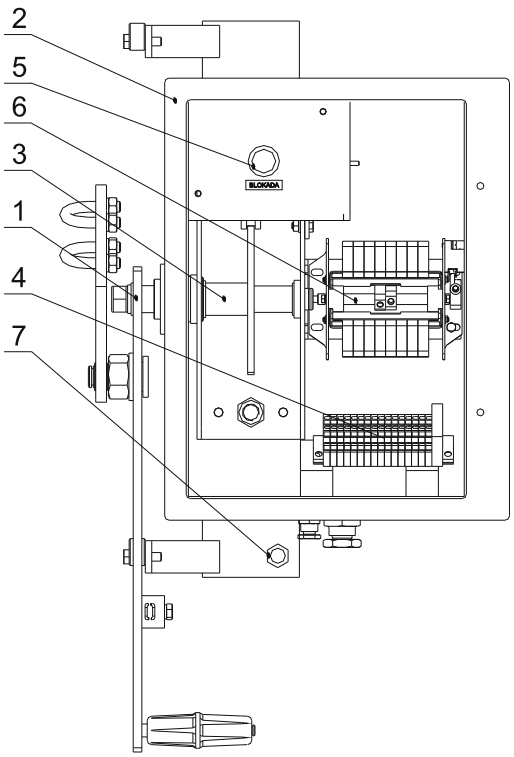
- simple design with reliable mechanisms (2000 switching cycles);
- maintance-free;
- electromagnetic lock and mechanical interlock;
- extreme position lock with padlock;
- the auxiliary contacts for control circuits and signaling;
- available version with heater;
- compatible with Polish power engineering requirements.

3. WORKING PRINCIPLE.

The operating mechanism is operated with lever, locked in limit position with padlock. In the operation phase, a shaft motion is transmitted to the control switch causing the normally open contacts to open and at limit position of the main shaft, the normally open contacts are closed.

The manual operating mechanism include

- driving mechanism;
- terminal strip;
- electromagnetic lock or mechanical interlock;
- the auxiliary contacts.



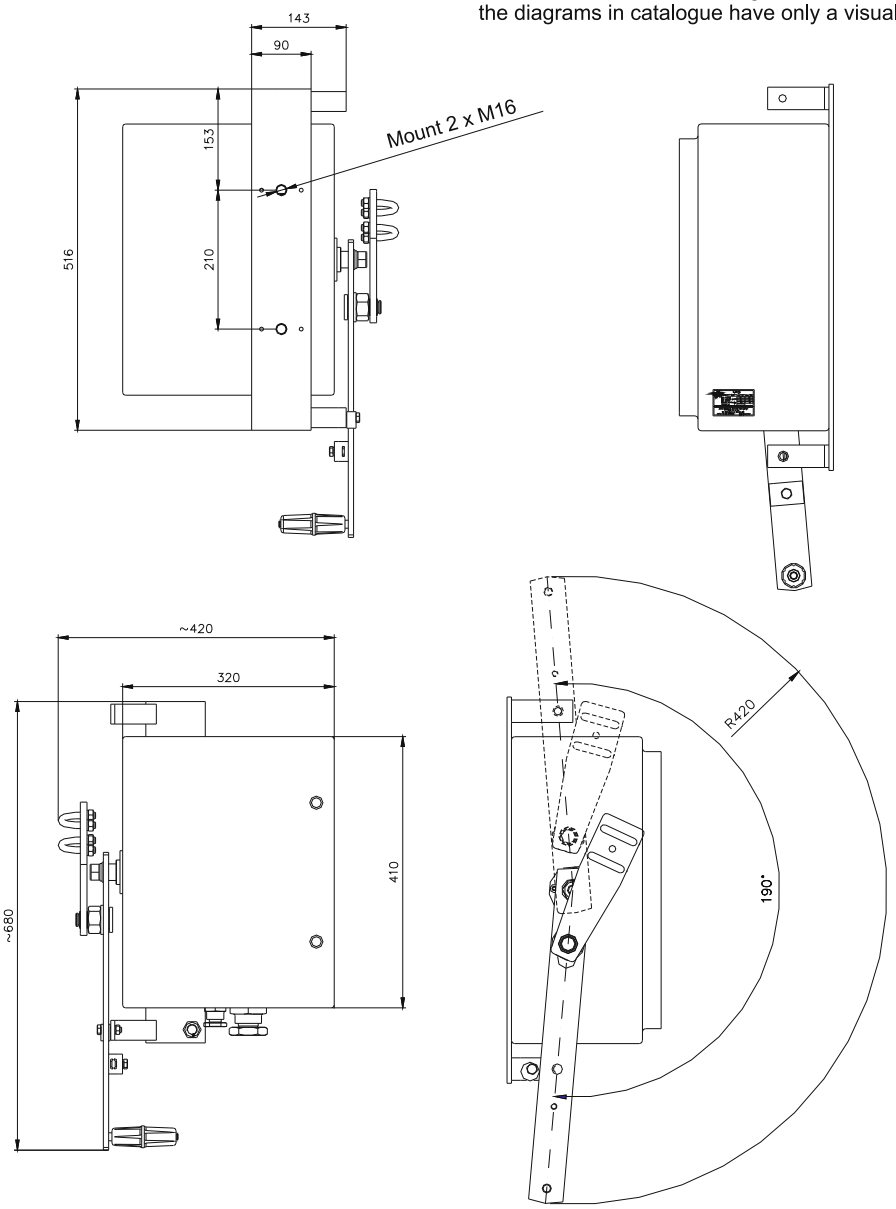
[1] Drive shaft with manual operation lever
[2] Enclosure
[3] Operating mechanism
[4] Terminal strip
[5] Elektromagnetic lock release button (standard equipment)
[6] Control switch
[7] Grounding screw M12

4. SPECIFICATION.

Lp.	Parametr	Value
1.	Rated torque	300 N
2.	Rated voltage : - electromagnetic lock	 220 VDC 230 VAC 110 VDC
3.	Rated power: - elektromagnet coil - DC / AC start - elektromagnet coil - DC / AC operation	 220 W / 700 W 1,5 W / 1,5 W
4.	Main shaft angular displacement	192°
5.	Rated switching capability of control switch	AC-15; 230 V; 2,5 A DC-13; 220 V; 0,25 A DC-13; 110 V; 1 A
6.	Maximum conductor cross section	4 mm^2
7.	Enclosure protection rating	IP 54
8.	Rated mechanical strength	2000 cycles

5. OPERATING MECHANISM DIAGRAM.

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.



ZWAE

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MV INDOOR SWITCHGEAR

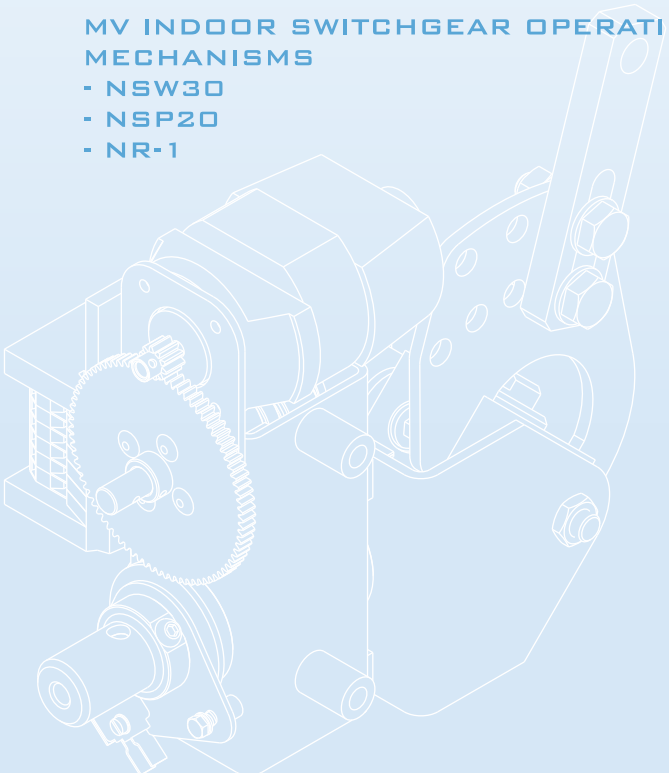
MV VACUUM CIRCUIT BREAKER
- 3AH5

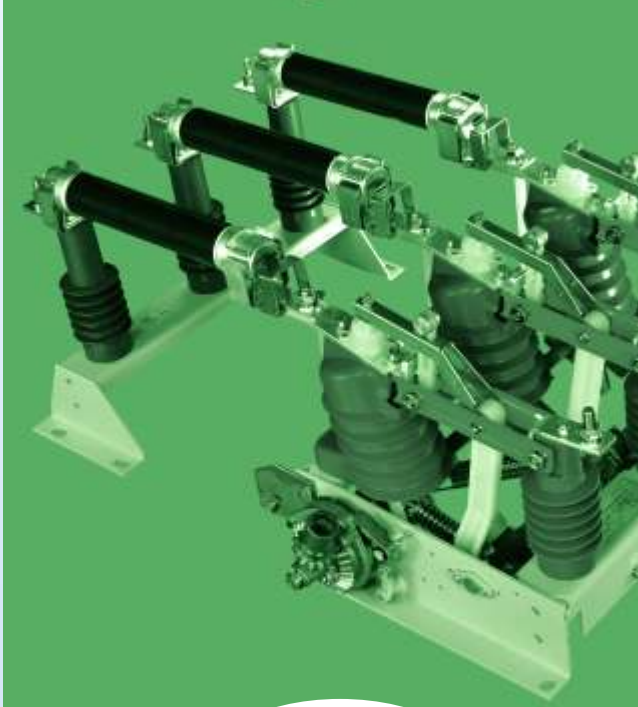
MV INDOOR SWITCH DISCONNECTORS
- OM/OMB

MV INDOOR SWITCHES
- OW
- OW HIGH CURRENT
- OWS HIGH CURRENT
- OW-I-25

MV INDOOR EARTHING SWITCHES
- UW
- UWS

MV INDOOR SWITCHGEAR OPERATING MECHANISMS
- NSW30
- NSP20
- NR-1





MV
Indoor

3AH5
Vacuum circuit breaker

1. FEATURES.

Today's circuit breakers must meet various requirements for switching resistive circuits with capacity or induced currents. The circuit breakers provide durability and application in circuits which require frequent switching. Low short-circuit powers in distribution networks are opposite the large short-circuit powers in the industry. The new 3AH5 is a general purpose circuit breaker. Its compact design is compatible with any switchgear. The wide range of technical specification meets all the requirements.

Extinguishing medium (vacuum) offers the most cost effective solution for medium voltage switchgear. The optimized vacuum switching method is superior to other methods, e.g. it provides constant dielectric properties, resistance and high current.

The features specific to 3AH5 circuit breakers:

- high reliability;
- high reliability due to extensive experience;
- maintenance free;
- electrical and mechanical durability up to 10000 cycles;
- compact dimensions;
- user friendly control panel.

3AH5 circuit breaker has the following properties:

- uniform installation method of stand-off insulators;
- rated voltage 12 to 36 kV;
- rated breaking current 13.1 to 31.5 kA;
- rated work current 800 to 2,500 A;
- pole pitch 160 to 350 mm.

2. ACCESORY LIST.

Main accessories	Optional accessories	Remarks
- Step manual operating mechanism - Thermal relay manual operating mechanism - Thermal relay motor operating mechanism		Manual operating mechanism with a crank handle With starting electromagnet and prevention function
- Starting electromagnet 3AY15 10 - Primary breaking release	- Secondary breaking release - Transformer release 0.5 A - Low energy transformer release 0,1 Ws - Undervoltage release	"Spring under tension" signalling Max. 2 switch off releases available Available configurations and order number, see table
- Control switch 6R + 6Z non-wired[1] - Terminal strip	- Control switch 12R + 12Z non-wired[2] - Plug	Available from the user side Plug instead of terminal strip
- Automatic actuation signalling - Circuit breaker operating mechanism actuation signalling - Switching operation counter - Varistor module (DC > 60 V)		- - - Secondary circuits
	- Halogen free and fire retardant cables - Heater to prevent condensation (AC 230 V)	- -
- Crank handle		For manual tension of activating spring of the motor operating

Different configurations of releases available				
Accessories basic	Auxiliary releases (additional charge)			
Primary release 3AY15 10	Second release 3AX11 01	Transformer release 0,5 A 3AX11 02	0,1 Ws 3AX11 04	Undervoltage release 3AX11 03
1 1	1			
		1	1	
1		1		1
1 1			1	1

1) Maximum number of free contacts on the user side: 5R+4Z
2) Maximum number of free contacts on the user side: 11R+10Z

3. SPECIFICATION AND TYPES.

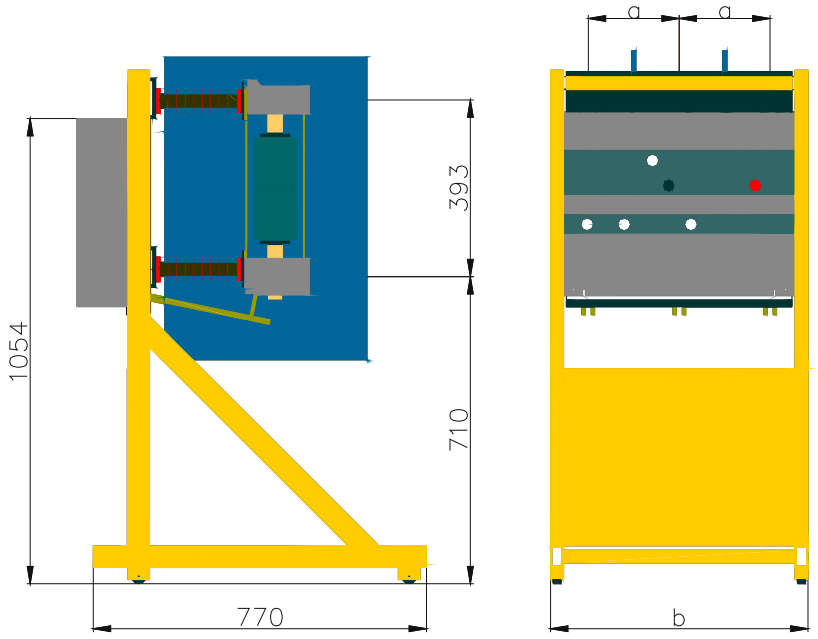
Item	U_r kV	I_{sc} kA	I_{ma} kA	PMB* mm	Type	I_r *(complements order number)* 800 A — 1250 A — 2000 A — 2500 A
1	**12** U_p = 75 kV U_d = 28 kV	13,1	32,8	160 210	**3AH5 121-□** **3AH5 131-□**	← **1** ← **1**
		16	40	160 210	**3AH5 122-□** **3AH5 132-□**	← **1** — **2** ← **1** — **2**
		20	50	160 210	**3AH5 123-□** **3AH5 133-□**	← **1** — **2** ← **1** — **2**
		25	63	160 210	**3AH5 124-□** **3AH5 134-□**	← **1** — **2** ← **1** — **2**
		31,5	80	210	**3AH5 135-□**	← **2** — **6**
2	**17,5** U_p = 95 kV U_d = 38 kV	25	63	160 210	**3AH5 204-□** **3AH5 214-□**	← **1** — **2** ← **1** — **2** — **6**
		31,5	80	210	**3AH5 215-□**	← **2** — **6**
3	**24** U_p = 125 kV U_d = 50 kV	16	40	210 275	**3AH5 272-□** **3AH5 282-□**	← **1** — **2** ← **1** — **2**
		20	50	210 275	**3AH5 273-□** **3AH5 283-□**	← **2** — **6** ← **2** — **6**
		25	63	210 275	**3AH5 274-□** **3AH5 284-□**	← **2** — **6** ← **2** — **6**
4	**36** U_p = 170 kV U_d = 70 kV	16	40	350	**3AH5 312-□**	← **2**
		25	63	350	**3AH5 314-□**	← **2** — **4**

* Pole pitch

I_r Rated work current
I_{sc} Rated short-circuit breaking current
I_{ma} Rated short-circuit making current

U_r Insulation rated voltage
U_d Rated test voltage at mains frequency
U_p Rated surge test voltage

4. RETROFIT:
TROLLEY WITH 3AH5 CIRCUIT BREAKER AS A REPLACEMENT OF SCI-4 CIRCUIT BREAKER - EXAMPLE.



NOTE:
As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

a	b
210	598
275	714

5. INDICATOR AND OPERATING MECHANISM CONTROLS.

[1] Data plate

[2] Crank handle socket

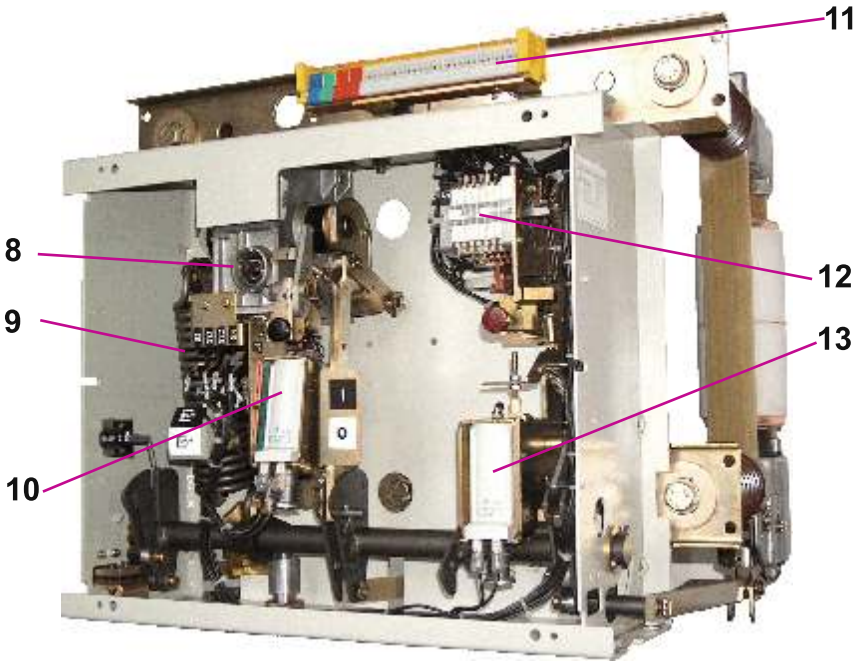
[3] Indicator - "Spring under tension"

[4] Switching operation counter

[5] ON-OFF indicator

[6] ON switch

[7] OFF switch



[8] Gearmotor

[9] Activating spring

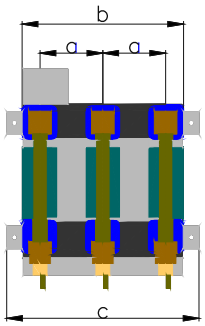
[10] Starting electromagnet

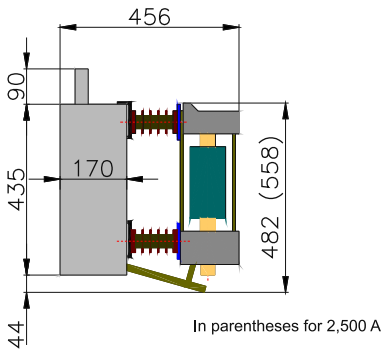
[11] LV circuit terminal strip (or connector)

[12] Control switch S1

[13] Work current primary release

6. DIMENSIONS AND WEIGHT.

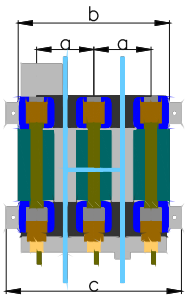


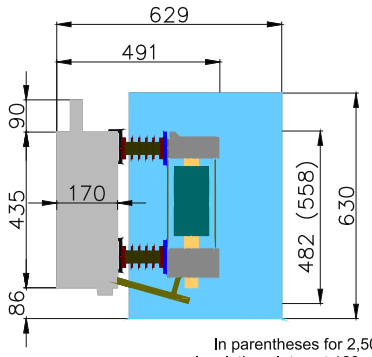


In parentheses for 2,500 A

12 kV

I_{sc} kA	I_r A	PMB* 160 mm a mm	b mm	c mm	Weight kg	PMB* 210 mm a mm	b mm	c mm	Weight kg
13,1 - 16	to 1250	160	390	490	35 - 45	210	490	592	40 - 50
20 - 25	to 1250	160	405	490	40 - 45	210	505	592	45 - 50
31,5	1250	-	-	-	-	210	505	592	50
31,5	2500	-	-	-	-	210	539	592	70

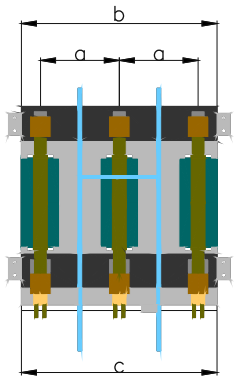


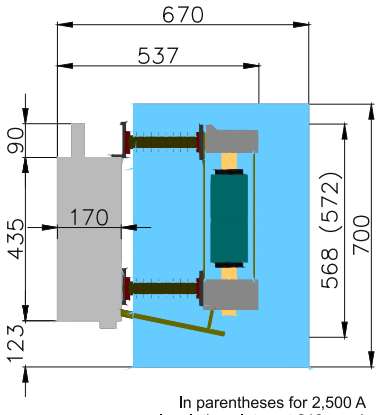


In parentheses for 2,500 A
Insulation plates at 160 mm *

17,5 kV

I_{sc} kA	I_r A	PMB* 160 mm a mm	b mm	c mm	Weight kg	PMB* 210 mm a mm	b mm	c mm	Weight kg
25	to 1250	160	422	490	40 - 45	210	522	592	45 - 50
31,5	to 1250	-	-	-	-	210	522	592	45 - 50
25 - 31,5	2500	-	-	-	-	210	539	592	65

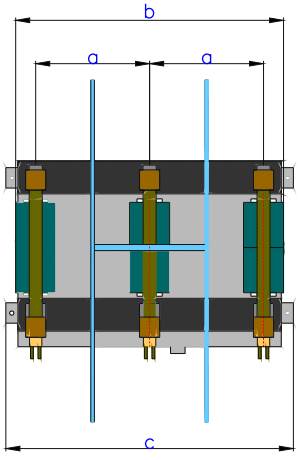


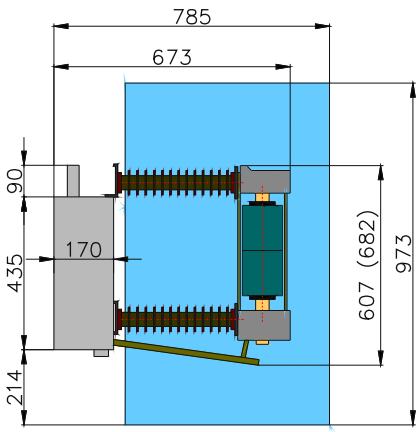


In parentheses for 2,500 A
Insulation plates at 210 mm *

24 kV

I_{sc} kA	I_r A	PMB* 210 mm a mm	b mm	c mm	Weight kg	PMB* 275 mm a mm	b mm	c mm	Weight kg
16 - 25	to 1250	210	516	592	55 - 70	275	646	708	55 - 70
20 - 25	2500	210	539	592	70 - 85	275	669	708	70 - 85





In parentheses for 2000 A

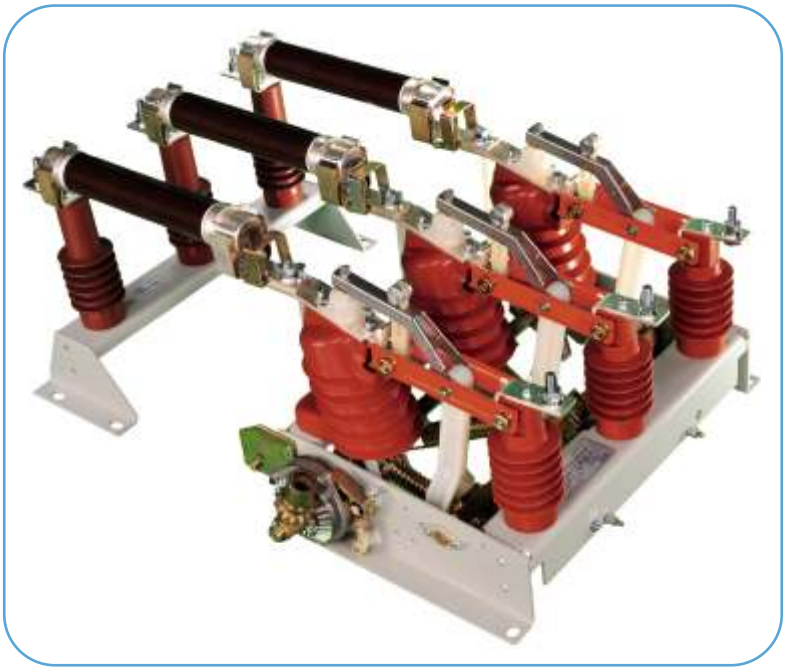
36 kV

I_{sc} kA	I_r A	PMB* 350 mm a mm	b mm	c mm	Weight kg
16 - 25	to 1250	350	819	868	85 - 95
25	2000	350	819	868	100 - 110

* Pole pitch

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

OM/OMB
Indoor switch disconnector



1. INTENDED USE.

OM type indoor switch disconnectors and switch disconnector sets with OMB type fuses compatible with indoor 7.2 to 24 kV switchgear. For switching currents not exceeding rated continuous current. Switch disconnectors with OMB fuse are compatible with fuse cartridges and are capable of breaking and limiting short-circuit currents.

In the open state, the switch disconnectors provide safety isolating clearance and meet the requirements for disconnectors.

2. FEATURES.

- modular design (easy configuration);
- compatible with operating mechanisms with plane motion or rotary motion of a rod;
- left or right side installation;
- compatible with NSW30-3 type motor operating mechanism;
- protection of transformer to 100 A insert at 24 kV;
- reliable operation;
- compact dimensions;
- high technical-operational parameters;
- adjusting to operational needs of professional power engineering;
- easy maintenance;
- accessories:
  - reactance insulator for 12; 17,5; 24 kV voltage;
  - electromagnetic release 24; 48; 110; 220 V DC/AC;
  - control switches indicating the switchgear position.

3. DESIGN AND WORKING PRINCIPLE.

OM type switch disconnectors are a three-pole switches characterized by a cutting movement of current circuit blade and a modular design. Installation of top and bottom earthing switch. Fixed contacts made of silver plated flat copper bar. High switching parameters due to a main circuit coupled with arcing contact. Arcing contacts opening and closing delayed in relation to main contacts. When switching, the arc is suppressed at the arcing contact. Arc suppression is the result of an automatic blow-out of compressed air during opening combined with the method of fast arc extending. Switch disconnector opening and closing speed is independent of staff operation speed.

It provides step mechanism for closing and thermal relay - spring mechanism for opening. Mechanisms are activated by motor or manual operating mechanism, where both mechanisms are simultaneously actuated at closing.

OM type switch disconnectors can be operated by: NSW30 type motor operating mechanism or NR-1 manual operating mechanism. Mounting hole spacing in a front cell wall is identical in both cases. The length of a coupling shaft joining the switchgear with operating mechanism is 1,100 mm.

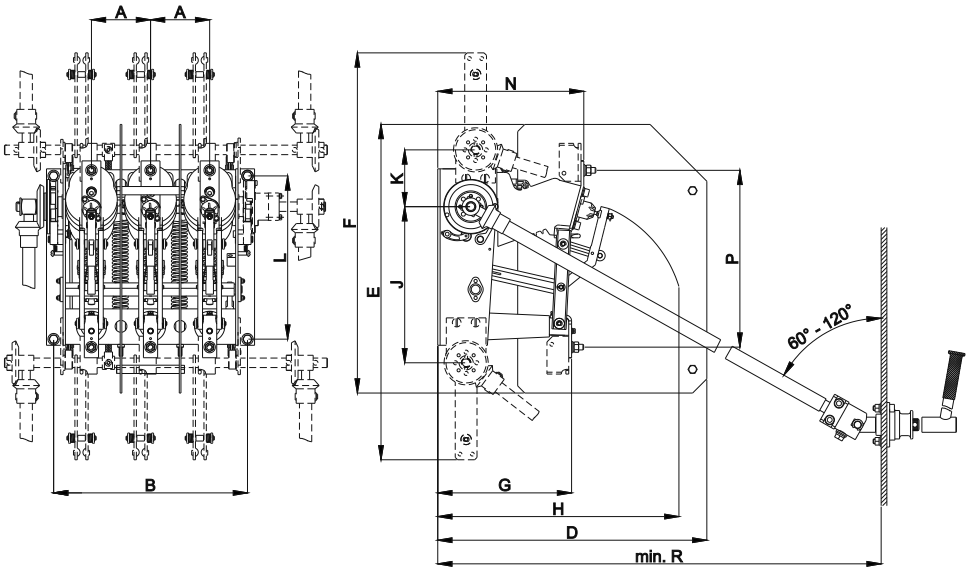
4. SPECIFICATION.

Item	Parameter	Value	
		OM/OMB-12	OM/OMB-24
1.	Rated operating voltage	12 [kV]	24 [kV]
2.	Rated frequency	50 [Hz]	50 [Hz]
3.	Rated continuous current	630 [A]	630 [A]
4.	Rated transitive current	1150 [A]	1150 [A]
5.	Work switching capabilities: - low inductance circuit - ring network circuits - cable and overhead line loading - unloaded transformers up to:	 630 [A] 630 [A] 50 [A] 1250 [kVA]	 630 [A] 630 [A] 25 [A] 1250 [kVA]
6.	Maximum fuse cartridge size	100 [A][1]	100 [A]
7.	Rated short-circuit making current	50 [kA]	40 [kA]
8.	Peak with stand current	50 [kA]	40 [kA]
9.	Short-circuit withstand current, 1sec.	20 [kA]	16 [kA]
10.	Current circuit resistance	60 [μΩ]	65 [μΩ]
11.	Test voltage (50Hz): - earth and pole to pole insulation - terminal to terminal insulation	 28 [kV] 32 [kV]	 50 [kV] 60 [kV]
12.	Surge test voltage: - earth and pole to pole insulation - terminal to terminal insulation	 75 [kV] 85 [kV]	 125 [kV] 145 [kV]
13.	Mechanical strength	2000 cycles	2000 cycles

Note:
1) Compatible with HH type 120 A fuse cartridge by SIBA.

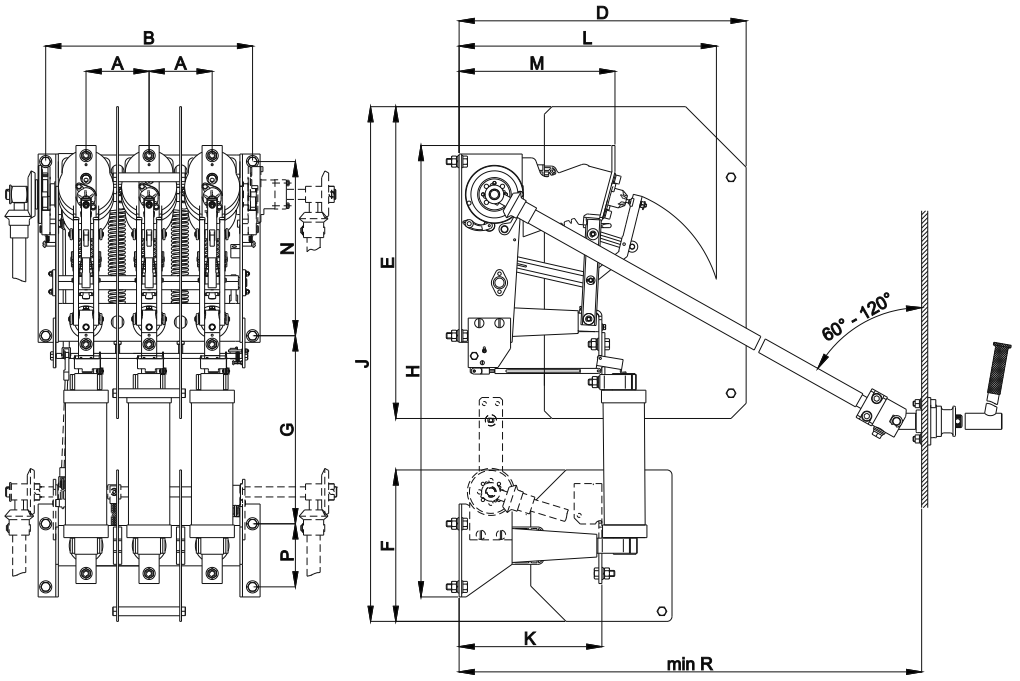
5. OM / OMB TYPICAL INDOOR SWITCH DISCONNECTOR DIAGRAMS.

OM-12 and OM-24 type indoor switch disconnector with top or bottom earthing switch



Typ rozłącznika	Wymiary [mm]												
	A	B	D	E	F	G	H	J	K	L	N	P	R
OM-12/UD/UG P=185	185	530	-	-	-	283	510	330	120	345	309	375	800
OM-12/UD/UG P=125	125	410	570	709	718	283	510	330	120	345	309	375	800
OM-24/UD/UG P=275	275	710	-	-	-	365	665	390	145	395	380	452	1000
OM-24/UD/UG P=160	160	480	770	924	922	365	665	390	145	395	380	452	1000

Switch disconnector set with OMB-12/BD and OMB-24/BD type fuses

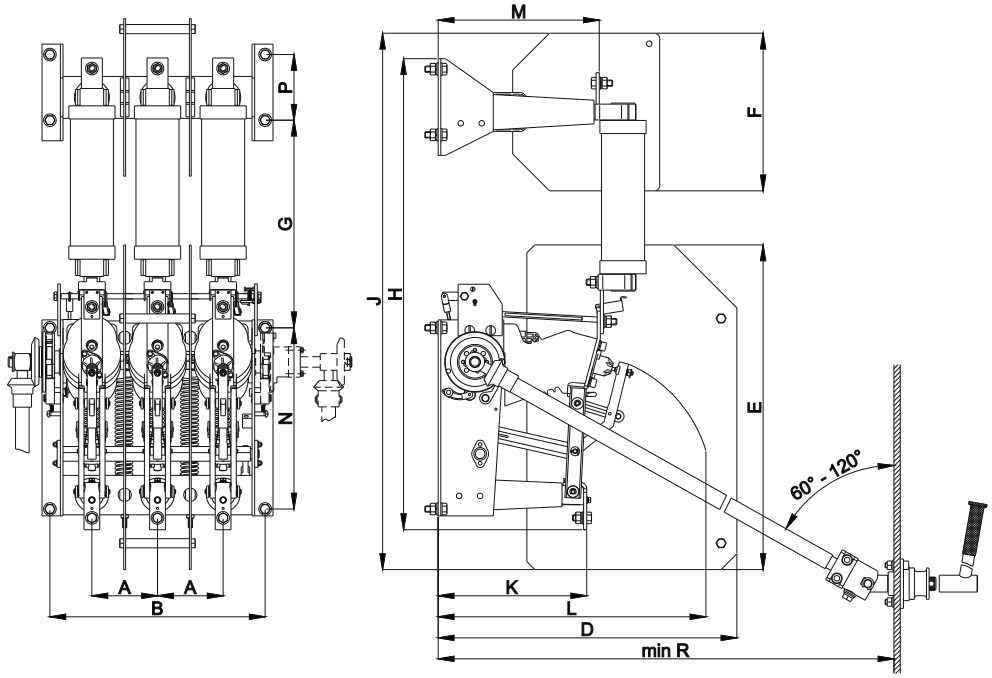


Switch disconnector type	Dimensions [mm]													
	A	B	D	E	F	G	H	J	K	L	M	N	P	R
OMB-12/BD/UD P=185, e*=537	185	530	-	-	-	617,5	1139	1265	283	510	309	345	125	800
OMB-12/BD/UD P=185, e*=292	185	530	-	-	-	372,5	894	1020	283	510	309	345	125	800
OMB-12/BD/UD P=125, e*=537	125	410	570	618	300	617,5	1139	1265	283	510	309	345	125	800
OMB-12/BD/UD P=125, e*=292	125	410	570	618	300	372,5	894	1020	283	510	309	345	125	800
OMB-24/BD/UD P=275, e*=537	275	710	-	-	-	612,5	1217	1448	371	665	386	395	135	1000
OMB-24/BD/UD P=275, e*=442	275	710	-	-	-	517,5	1122	1353	371	665	386	395	135	1000
OMB-24/BD/UD P=160, e*=537	160	480	770	780	405	612,5	1217	1448	371	665	386	395	135	1000
OMB-24/BD/UD P=160, e*=442	160	480	770	780	405	517,5	1122	1353	371	665	386	395	135	1000

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

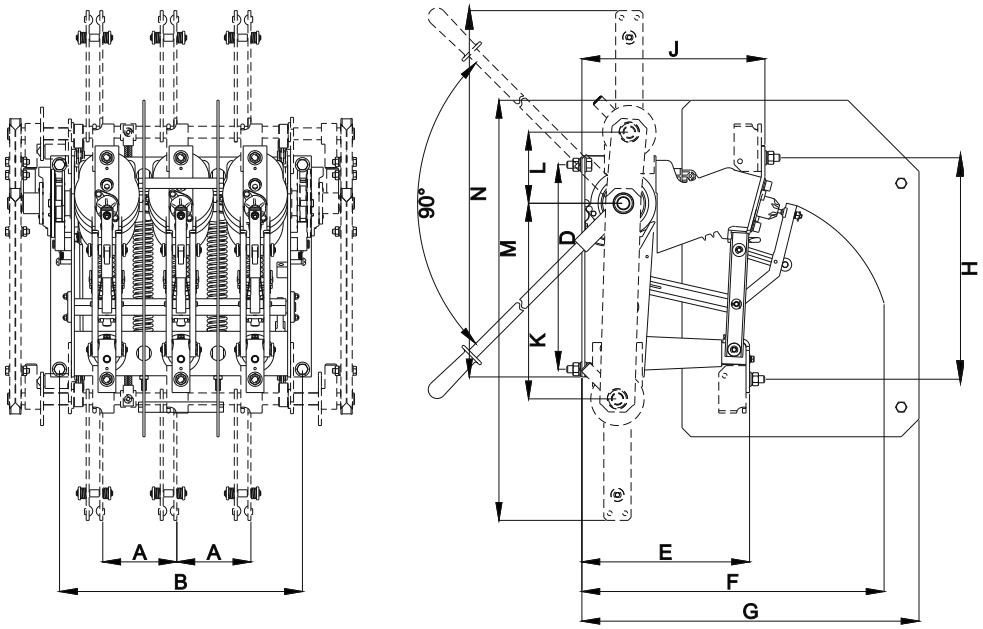
MV INDOOR SWITCH DISCONNECTORS

Indoor switch disconnector set with OMB-12/BG and OMB-24/BG type fuses



Switch disconnector type	Dimensions [mm]													
	A	B	D	E	F	G	H	J	K	L	M	N	P	R
OMB-12/BG P=185, e*=537	185	530	-	-	-	667,5	1142	1266	283	510	309	345	125	800
OMB-12/BG P=185, e*=292	185	530	-	-	-	422,5	897	1021	283	510	309	345	125	800
OMB-12/BG P=125, e*=537	125	410	570	618	300	667,5	1142	1266	283	510	309	345	125	800
OMB-12/BG P=125, e*=292	125	410	570	618	300	422,5	897	1021	283	510	309	345	125	800
OMB-24/BG P=275, e*=537	275	710	-	-	-	616	1198	1448	371	665	386	395	135	1000
OMB-24/BG P=275, e*=442	275	710	-	-	-	521	1103	1353	371	665	386	395	135	1000
OMB-24/BG P=160, e*=537	160	480	770	780	405	616	1198	1448	371	665	386	395	135	1000
OMB-24/BG P=160, e*=442	160	480	770	780	405	521	1103	1353	371	665	386	395	135	1000

OM-12/T and OM-24/T type switch disconnector with top and bottom earthing switch

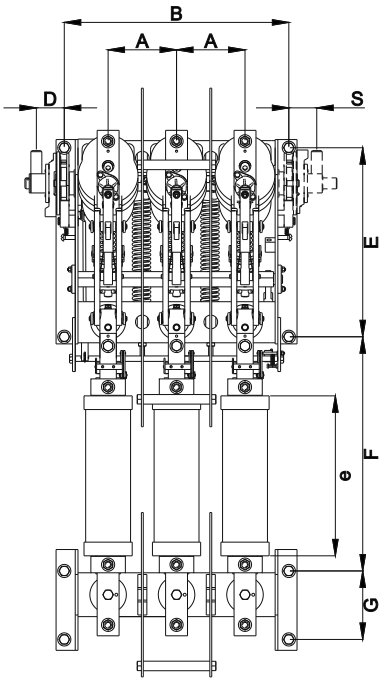


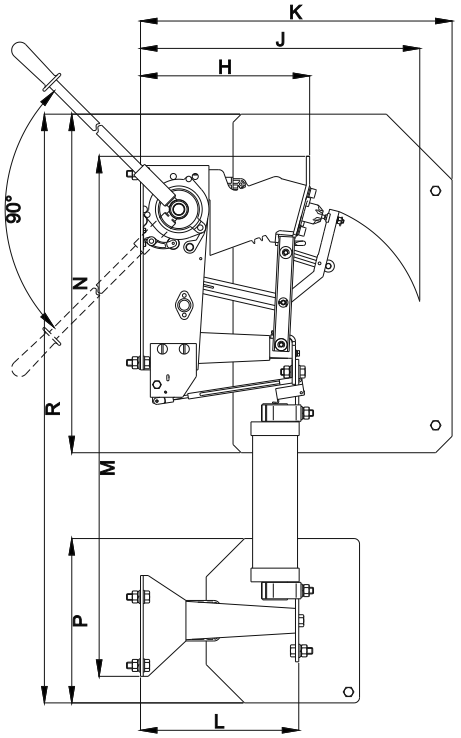
Switch disconnector type	Dimensions [mm]											
	A	B	D	E	F	G	H	K	J	L	M	N
OM-12/T/UD/UG P=125	125	410	345	283	510	570	375	309	330	120	709	618
OM-24/T/UD/UG P=160	160	480	395	365	665	770	452	380	390	145	924	922

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

MV INDOOR SWITCH DISCONNECTORS

Switch disconnector set with OMB-12/T/BDT and OMB-24/T/BDT type fuses

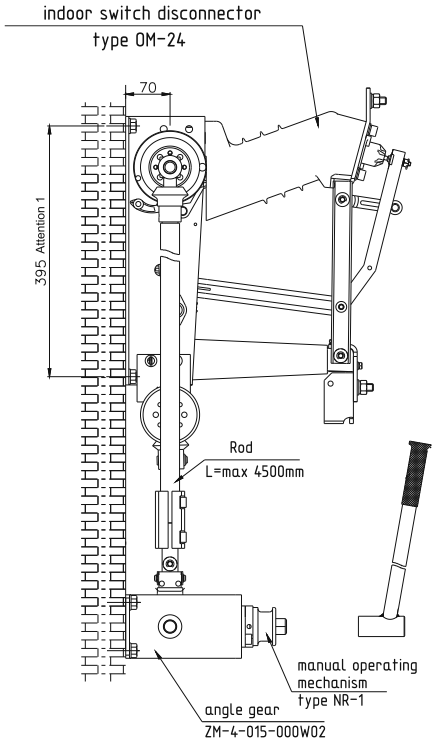


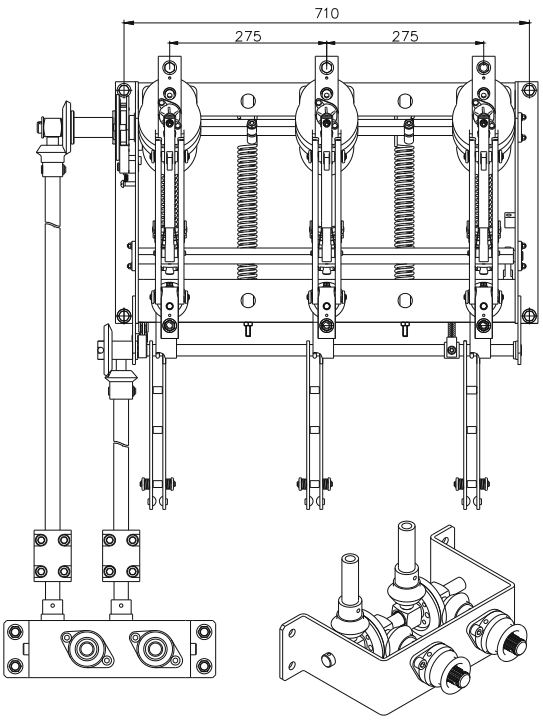


Switch disconnector type	Dimensions [mm]														
	A	B	D	E	F	G	H	J	K	L	M	N	P	R	S
OM-12/T/BDT/UD P=125, e*=292	125	410	51	345	427,5	125	309	510	570	289	950	618	300	1075	40
OM-24/T/BDT/UD P=160, e*=442	160	480	51	395	540	135	386	665	770	371	1158	780	405	1408	40

6. TOWER SUBSTATION SOLUTIONS.

OM-24/UD/275 type indoor switch disconnector in tower substation: version with manual operating mechanism NR-1 /O1 (switch disconnector) and NR-1/02 (earthing blade) installed inside the substation.





Note:
1) Possible right side installation of the operating mechanism.

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

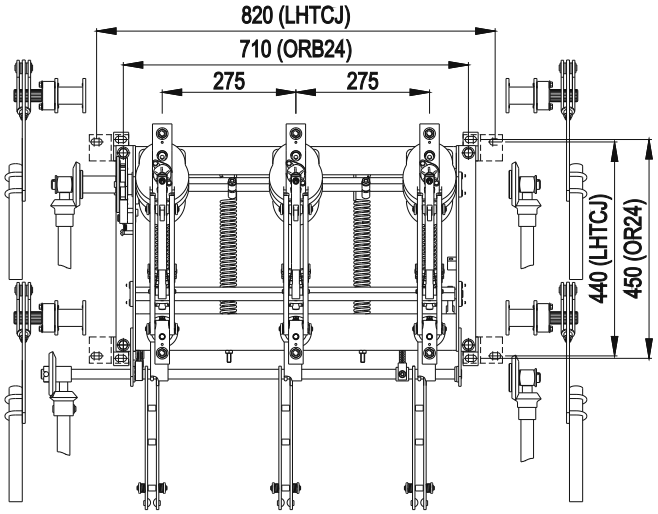
7. REPLACEMENT FOR LHTCJ / OR24-300 / ORB24 TYPE SWITCH DISCONNECTORS.

As a company carrying on the many years traditions in production of medium and high voltage switchgear in Lębork we would like to present an example of OM / OMB type indoor switch disconnector as a replacement for the existing LHTCJ / OR24-300 type switch disconnectors. This solution is a result of meetings and discussions with operational staff of medium voltage networks and substations of power plants in Poland.

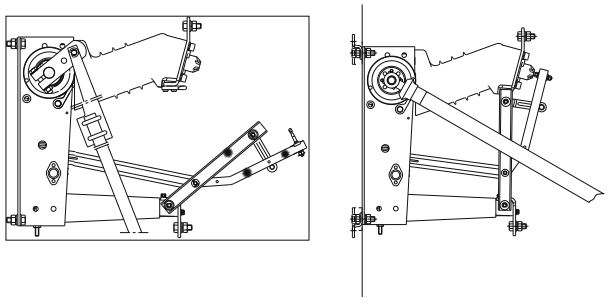
FEATURES:

- easy and simple replacement of existing switchgear with use of existing operating mechanisms;
- cost saving due to fast switchgear replacement (reduced downtime);
- various mounting hole spacing in the base available;
- various current terminals available;
- various operating mechanism installation sides available (left/right);
- various operating mechanism types available (plane or angular rod movement).

View of the OM-24/UD/275 type switch disconnector - available configurations:

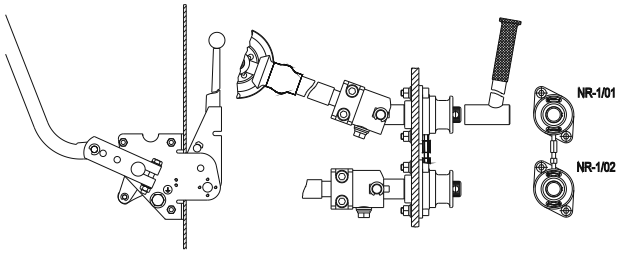


View of the OM-24/275... type indoor switch disconnector coupled with an operating mechanism with:
plane (NRW04; NR3-B) angular (NR-1; NSW30) rod movement



NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

View of the manual operating mechanism with
plane (NRW04; NR3-B) angular (NR-1; NSW30) rod movement



OW
Indoor disconnector

1. INTENDED USE.

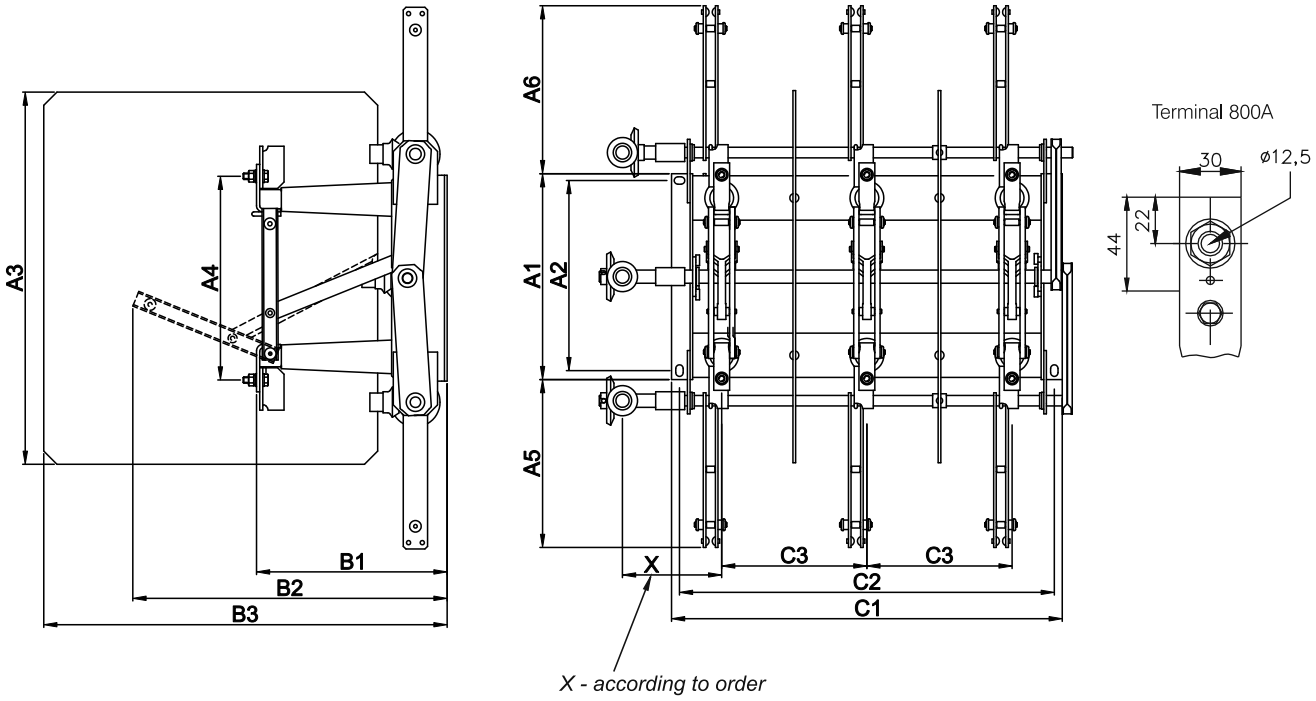
Indoor three-pole disconnectors intended for closing and opening current free electrical circuits. Provide visible and safe isolating clearance in open state. Built-in earthing switches are intended for short-circuit and earthing networks disconnected from the voltage. Compatible with indoor HV AC switching devices.

2. SPECIFICATION.

Item	Parameter		Value				
1.	Rated operating voltage		12 [kV]	12 [kV]	24 [kV]	24 [kV]	36 [kV]
2.	Rated continuous current		800 [A]	1600 [A]	800 [A]	1600 [A]	1600 [A]
3.	Peak current		80 [kA]	80 [kA]	40 [kA]	80 [kA]	80 [kA]
4.	Short-circuit current	**1-sec.**	-	31,5 [kA]	16 [kA]	31,5 [kA]	31,5 [kA]
		3-sec.	31,5[kA]	25 [kA]	-	-	-
5.	Test voltage (50Hz): - earth and pole to pole insulation - terminal to terminal insulation		 28 [kV] 32 [kV]	 28 [kV] 32 [kV]	 50 [kV] 60 [kV]	 50 [kV] 60 [kV]	 95 [kV] 120 [kV]
6.	Surge test voltage: - earth and pole to pole insulation - terminal to terminal insulation		 75 [kV] 85 [kV]	 75 [kV] 85 [kV]	 125 [kV] 145 [kV]	 125 [kV] 145 [kV]	 190 [kV] 220 [kV]
7.	Pole pitch: - air insulation - air insulation with additional insulating barrier		 200 [mm] 125 [mm]	 180 [mm] - [mm]	 275 [mm] 160 [mm]	 275 [mm] - [mm]	 390 [mm] - [mm]

Attention: Built-in earthing swiches with short-circuit parameters 40/16kA or 50/20 kA

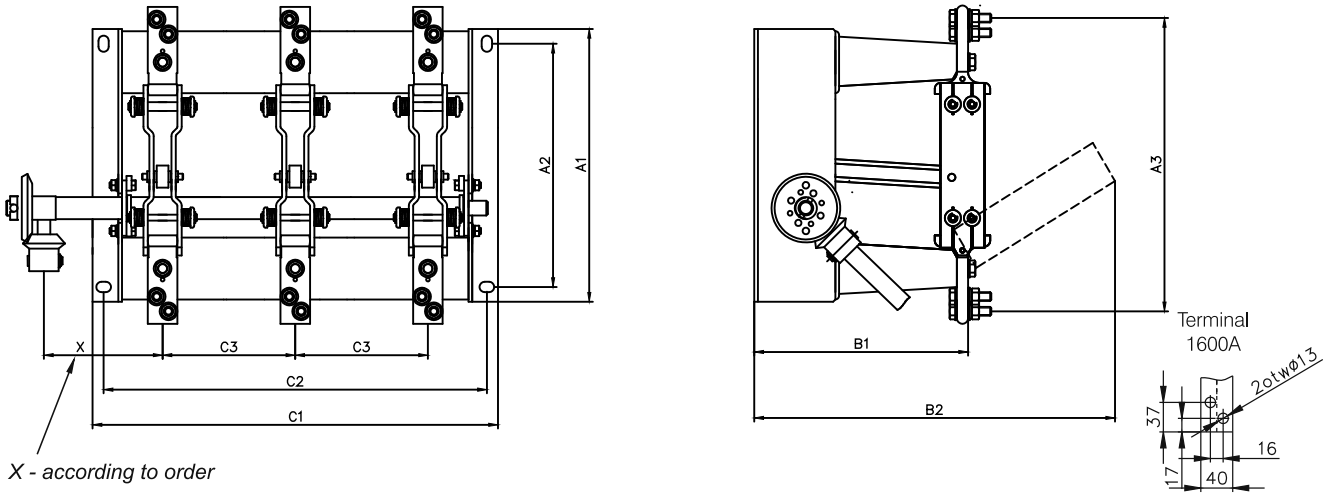
3. OW TYPE INDOOR DISCONNECTOR FOR 12/24 kV AND 800 A RATED CURRENT.



Disconnector type	Dimensions [mm]											
	A1	A2	A3	A4	A5	A6	B1	B2	B3	C1	C2	C3
OW-12/8/Z/125 (with insulating barriers)	300		485	298	230	230	292	438	500	440	410	125
OW-12/8/Z/UG/125 (with insulating barriers)	300	260	485	298	230	230	292	438	500	440	410	125
OW-12/8/Z/UD/125 (with insulating barriers)	300	260	485	298	230	230	292	438	500	440	410	125
OW-12/8/Z/200	300		-	298	230	230	292	438	-	590	560	200
OW-12/8/Z/UG/200	300	260	-	298	230	230	292	438	-	590	560	200
OW-12/8/Z/UD/200	300	260	-	298	230	230	292	438	-	590	560	200
OW-24/8/Z/160 (with insulating barriers)	390		705	386	318	318	360	595	764	510	480	160
OW-24/8/Z/UG/160 (with insulating barriers)	390	360	705	386	318	318	360	595	764	510	480	160
OW-24/8/Z/UD/160 (with insulating barriers)	390	360	705	386	318	318	360	595	764	510	480	160
OW-24/8/Z/275	390		-	386	318	318	360	595	-	740	710	275
OW-24/8/Z/UG/275	390	360	-	386	318	318	360	595	-	740	710	275
OW-24/8/Z/UD/160	390	360	-	386	318	318	360	595	-	740	710	275

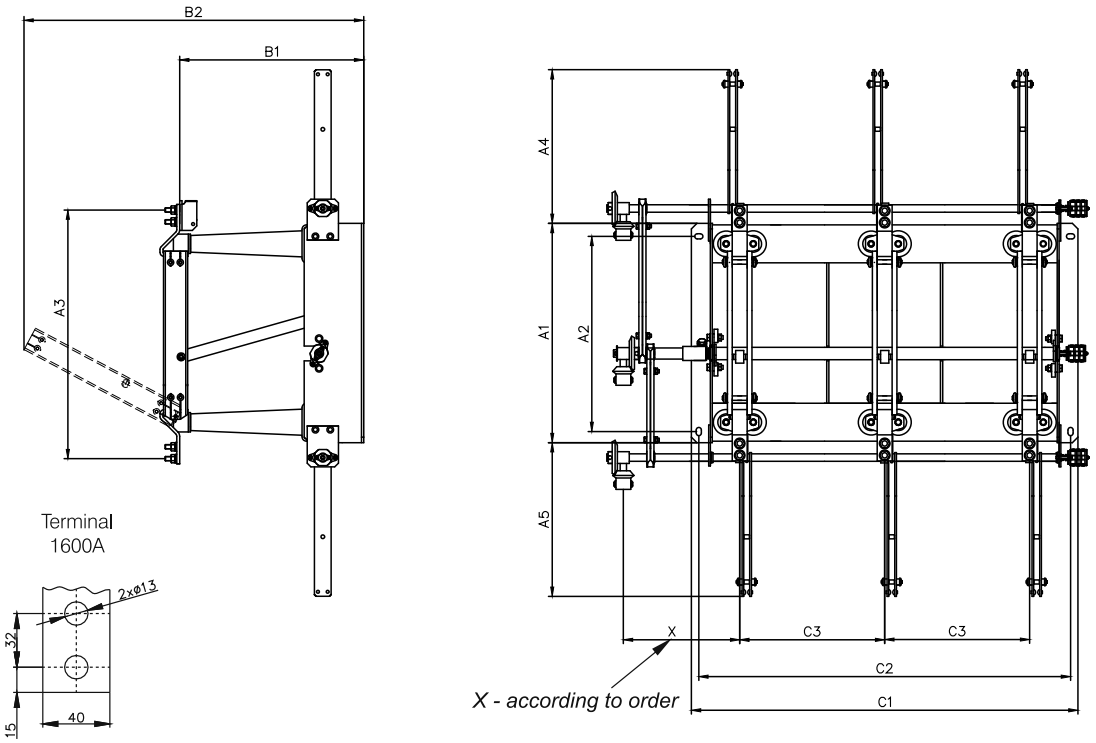
NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

4. OW TYPE INDOOR DISCONNECTOR FOR 12/24 kV AND 1600 A RATED CURRENT.



Disconnector type	Dimensions [mm]							
	A1	A2	A3	B1	B2	C1	C2	C3
OW-12/16/Z/180	370	330	398	290	490	550	520	180
OW-24/16/Z/275	435	395	463	360	590	740	710	275

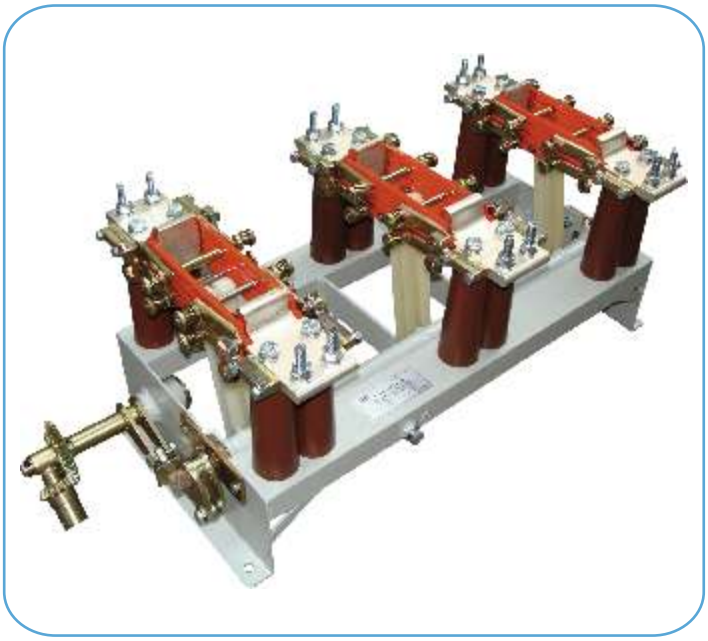
5. OW TYPE INDOOR DISCONNECTOR FOR 36 kV AND 1600 A RATED CURRENT.



Disconnector type	Dimensions [mm]									
	A1	A2	A3	A4	A5	B1	B2	C1	C2	C3
OW-36/16/Z/390	590	525	605	-	-	503	913	1040	1000	390
OW-36/16/Z/390/UD	590	525	605	413	-	503	913	1040	1000	390
OW-36/16/Z/390/UG	590	525	605	-	413	503	913	1040	1000	390

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

OW
High current indoor disconnector



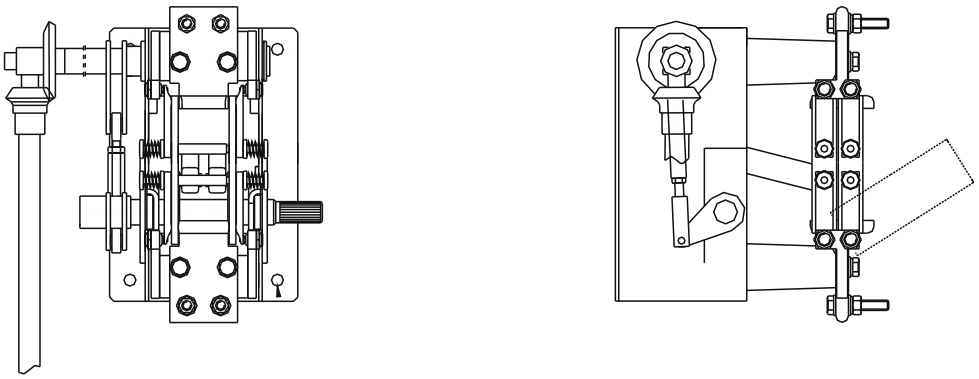
1. INTENDED USE.

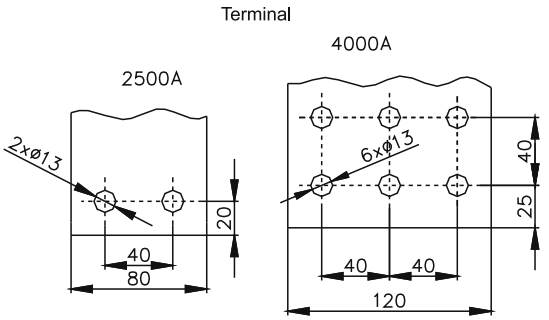
Indoor three-pole disconnectors intended for closing and opening current free electrical circuits. Provide visible and safe isolating clearance in open state. Built-in earthing switches are intended for short-circuit and earthing networks disconnected from the voltage. Compatible with indoor HV AC switching devices.

2. SPECIFICATION.

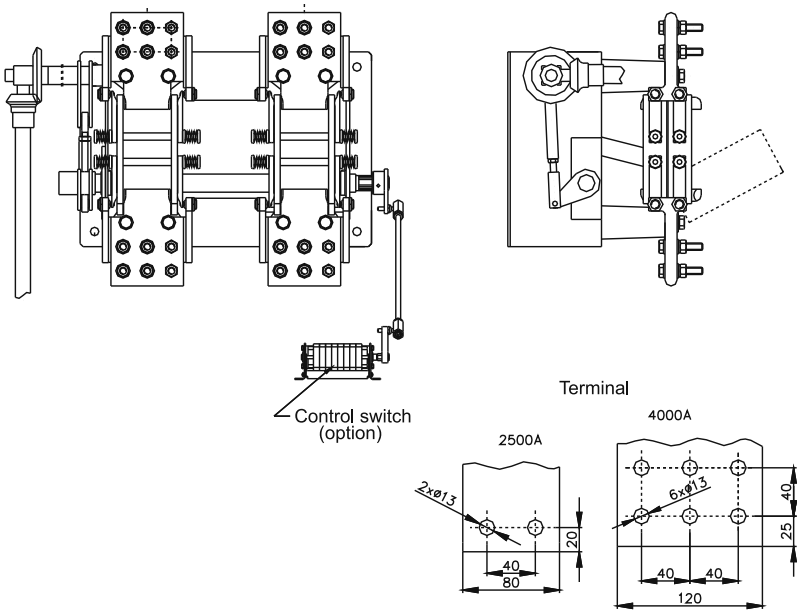
Item	Parameter	Value						
1.	Rated operating voltage	3,6 [kV]	3,6 [kV]	12 [kV]	12 [kV]	24 [kV]	36 [kV]	36 [kV]
2.	Rated continuous current	2500 [A]	4000 [A]	2500 [A]	4000 [A]	2500 [A]	2500 [A]	3150 [A]
3.	Peak current	150 [kA]	150 [kA]	160 [kA]	160 [kA]	150 [kA]	125 [kA]	150 [kA]
4.	Short-circuit current,1sec.	60 [kA]	60 [kA]	64 [kA]	63 [kA] (3sec.)	60 [kA]	50 [kA]	60 [kA]
5.	Test voltage (50Hz): - earth and pole to pole insulation - terminal to terminal insulation	10 [kV] 12 [kV]	10 [kV] 12 [kV]	28 [kV] 32 [kV]	28 [kV] 32 [kV]	50 [kV] 60 [kV]	70 [kV] 80 [kV]	70 [kV] 80 [kV]
6.	Surge test voltage: - earth and pole to pole insulation - terminal to terminal insulation	40 [kV] 46 [kV]	40 [kV] 46 [kV]	75 [kV] 85 [kV]	75 [kV] 85 [kV]	125 [kV] 145 [kV]	170 [kV] 195 [kV]	170 [kV] 195 [kV]
7.	Pole pitch: - air insulation	260 [mm]	260 [mm]	300 [mm]	300 [mm]	350 [mm]	360 [mm]	520 [mm]

3. OW TYPE SINGLE POLE INDOOR DISCONNECTOR FOR 3.6 kV AND 2500 A / 4000 A RATED CURRENT.



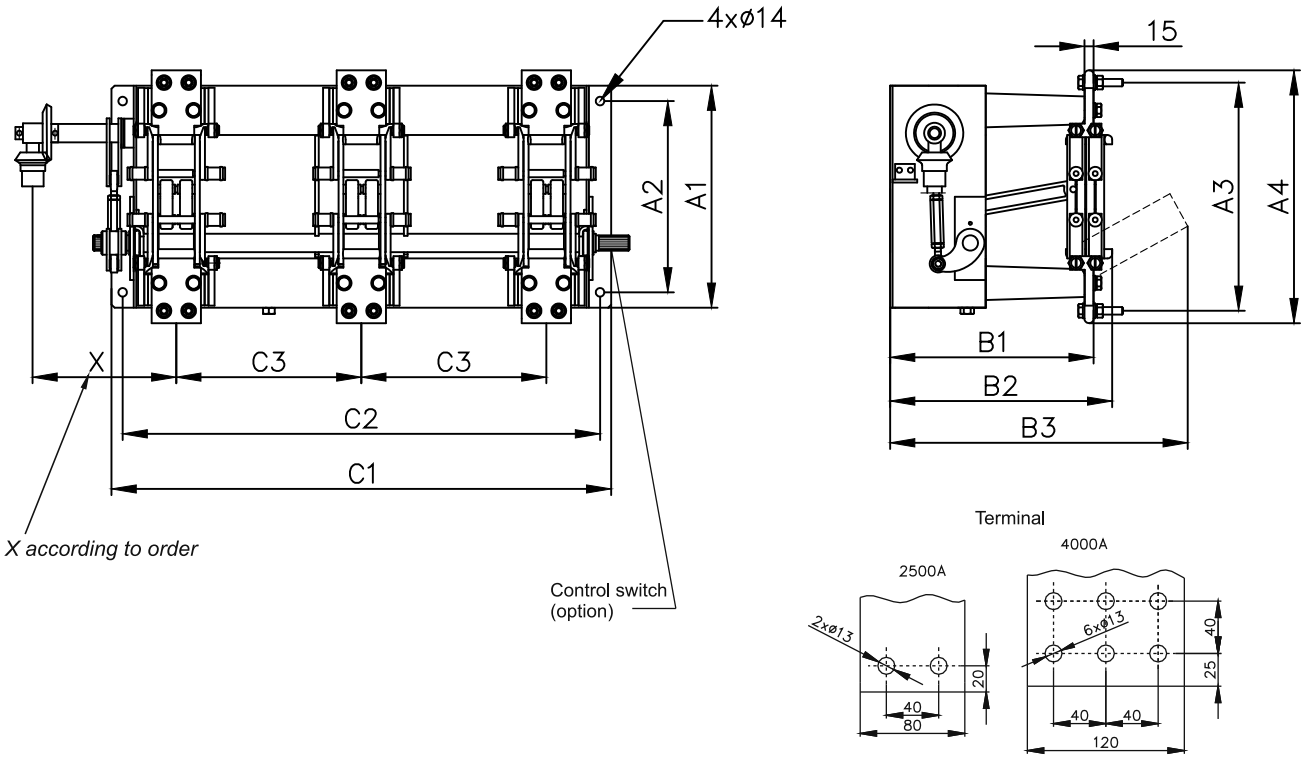


4. OW TYPE TWO-POLE INDOOR DISCONNECTOR FOR 3.6 kV AND 2500 A / 4000 A RATED CURRENT.



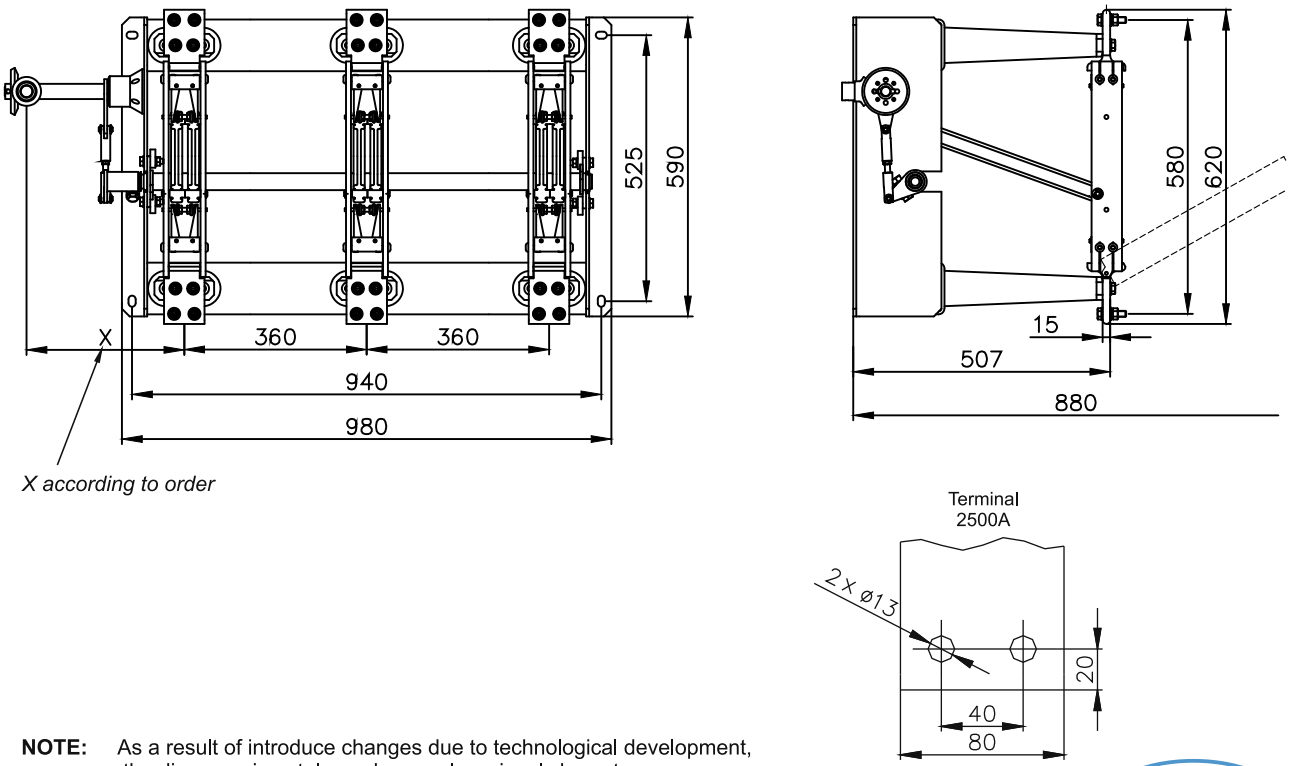
NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

5. OW TYPE INDOOR DISCONNECTOR FOR 12 kV AND 2500/4000 A RATED CURRENT.



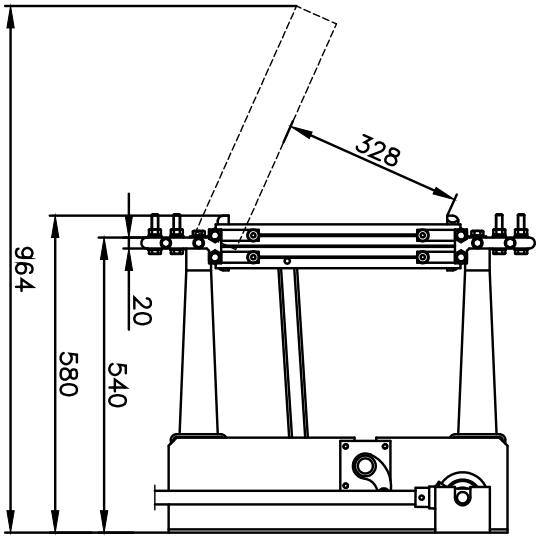
Disconnector type	Dimensions [mm]									
	A1	A2	A3	A4	B1	B2	B3	C1	C2	C3
OW-12/25/Z/300	360	310	370	410	330	360	540	810	774	300
OW-12/40/Z/300	360	310	440	490	335	375	565	810	774	300

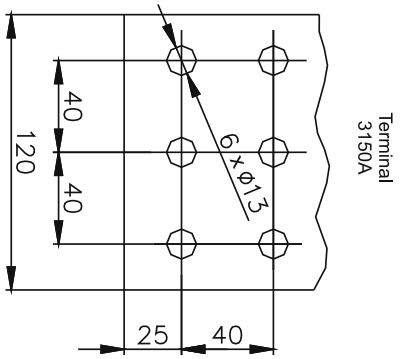
6. OW-36/25/Z/360 TYPE INDOOR DISCONNECTOR: (36 kV, 2500 A).

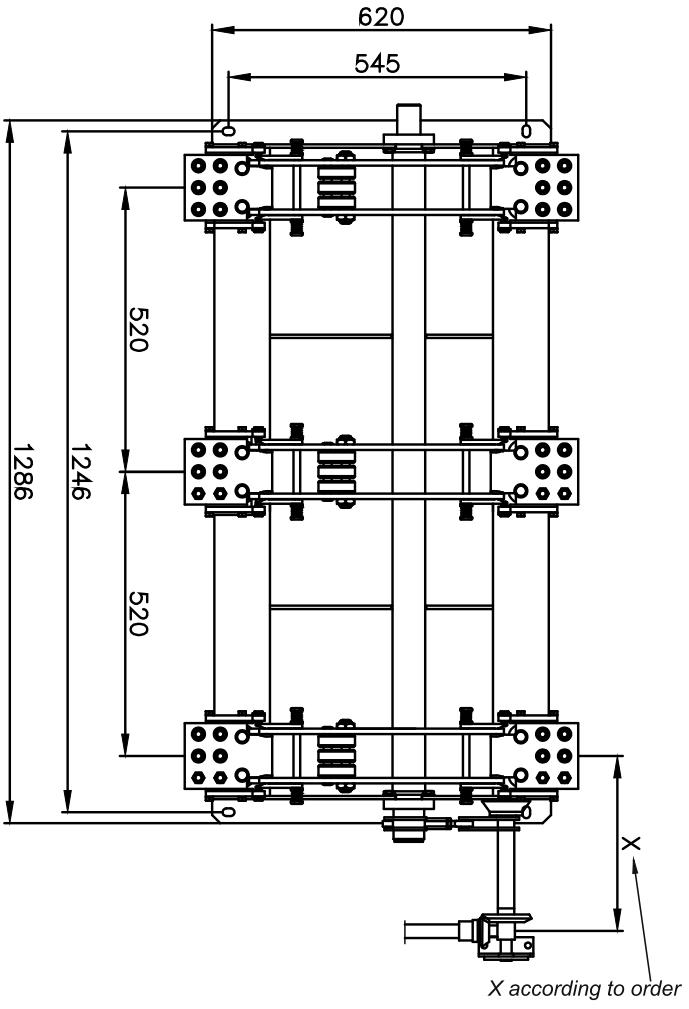


NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

7. OW-36/31.5/Z/520 TYPE INDOOR DISCONNECTOR (36kV, 3150 A).

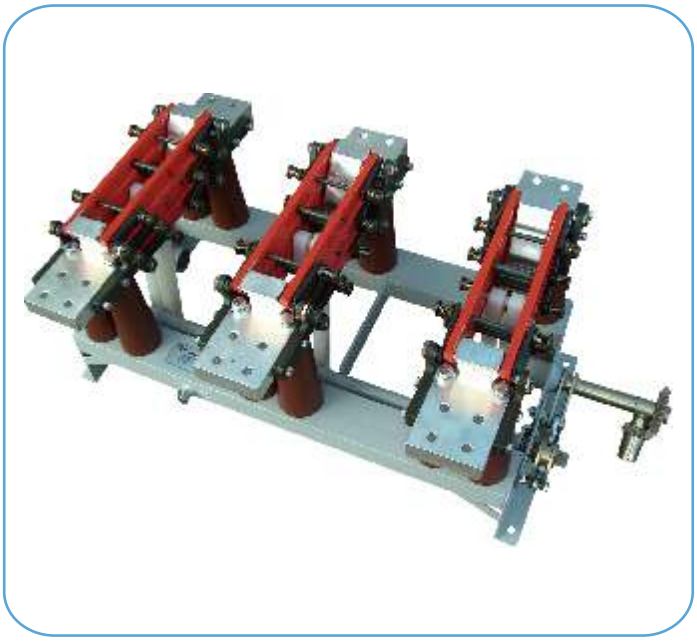






NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

OWS
High current indoor disconnector



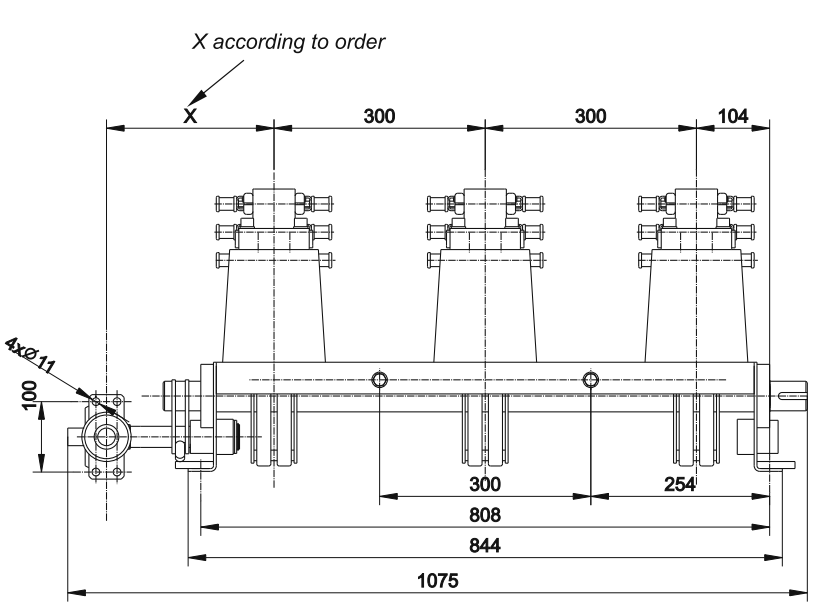
1. INTENDED USE.

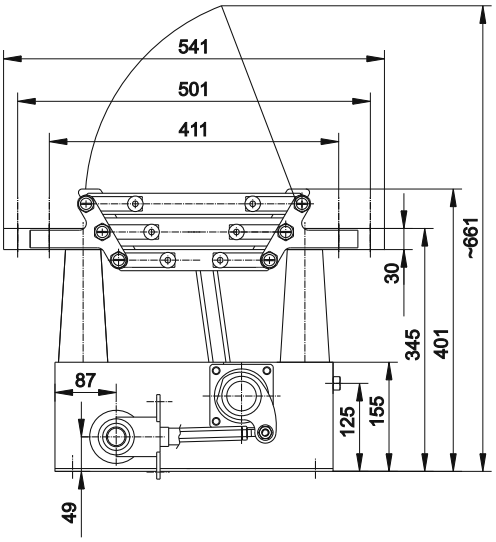
Indoor three-pole disconnectors intended for closing and opening current free electrical circuits. Provide visible and safe isolating clearance in open state. Built-in earthing switches are intended for short-circuit and earthing networks disconnected from the voltage. Compatible with indoor HV AC switching devices.

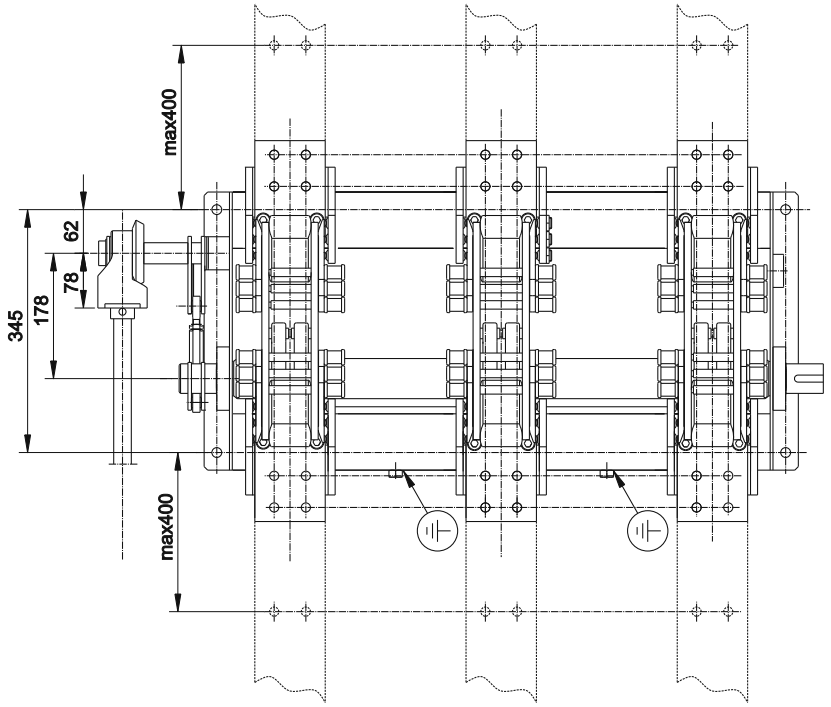
2. SPECIFICATION.

Item	Parameter	Value
1.	Rated operating voltage	12 [kV]
2.	Rated continuous current	4000 [A]
3.	Peak current	190 [kA] 225 [kA]
4.	Short-circuit current,1sec.	76 [kA] 90 [kA]
5.	Test voltage (50Hz): - earth and pole to pole insulation - terminal to terminal insulation	28 [kV] 32 [kV]
6.	Surge test voltage: - earth and pole to pole insulation - terminal to terminal insulation	75 [kV] 85 [kV]
7.	Pole pitch: - air insulation	300 [mm]

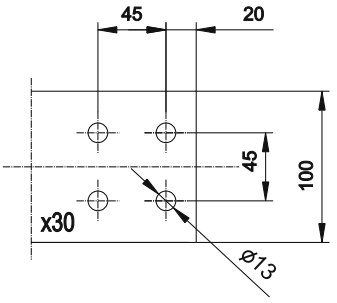
3. DIAGRAM.



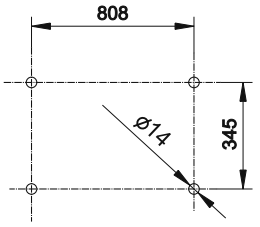




Terminal material:cooper



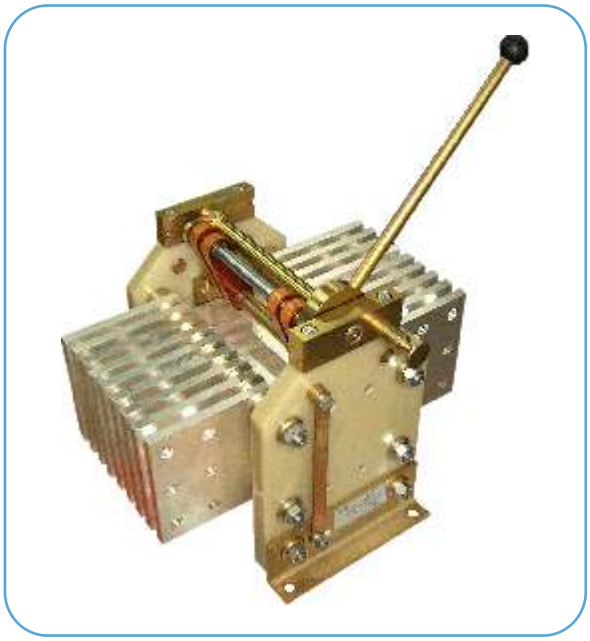
Mounting hole spacing



NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

OW-I-25

Indoor disconnector 660 V 25,000 A



1. INTENDED USE.

OW-I-25 type single - pole indoor disconnectors compatible with 660 V indoor switchgear. Intended for closing and opening dead electrical circuits. The disconnectors in open state provide safe isolating clearance.

2. FEATURES.

- compatible with NSW30 type motor operating mechanism;
- excellent performance and technical characteristics;
- compatible with Polish power engineering requirements.

3. SPECIFICATION.

HIGH CURRENT OW-I-25 TYPE INDOOR DISCONNECTORS		
Item	**Parameter**	**Value**
1.	Rated operating voltage	660 [V]
2.	Rated continuous current	25000 [A]
3.	Rated short - time with stand current (1s)	80 [kA]
4.	Rated peak with stand current	200 [kA]
5.	Test voltage (50Hz) for insulation	3500 [V]
6.	Operational category	AC20, DC20
7.	Control switch rated voltage	250 [V]
8.	Control switch rated continuous current	10 [A]

4. DISCONNECTOR OPERATION.

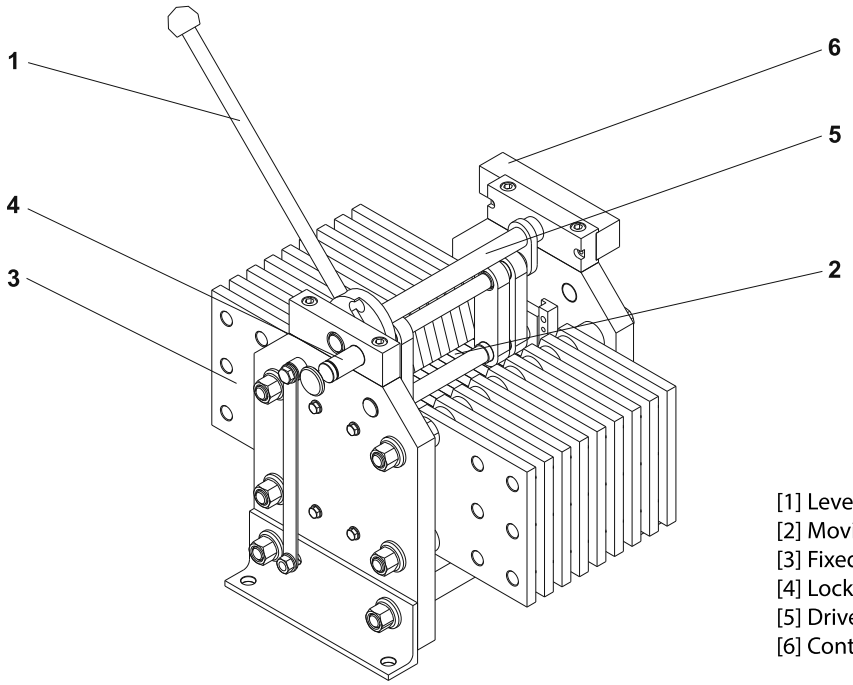
In closed state, the contact moving element is pushed to the fixed contacts and the lever (item 1) is located as shown in Fig. 1. In this state, the moving contacts (item 2) provides contact with fixed contacts (item 3). Moving contact element is immobilized with the bolt (item 4) and the cut-out at the drive shaft stop (item 5). In this state, the pusher of one of the control switches (item 6) is supported in the hollow ring mounted on the drive shaft.

The switch indicates the disconnector closed state. Disconnector opening:

- retracting interlock bolt with left hand (item 4)
- rotating the lever by 90° with right hand (item 1).

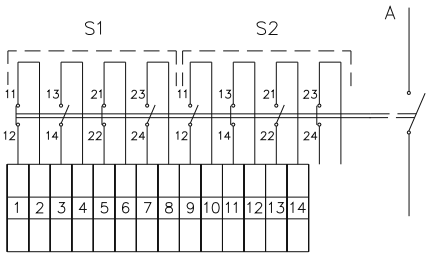
CAUTION! Do not release the lever during operation!

With disconnector open, the moving contact element is locked by the interlock bolt (item 4). In the open state, the moving contact is in the maximum distance from the fixed contact. The distance between fixed contacts (item 3) and moving contacts (item 2) is 11 mm. Control switch indicates the disconnector open state.

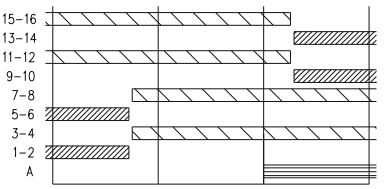


[1] Lever
[2] Moving contact
[3] Fixed contact
[4] Lock
[5] Drive shaft
[6] Control switch cover

5. THE STATE OF CONTROL SWITCHES CORRESPONDS TO THE OPEN STATE OF MAIN DISCONNECTOR SWITCHES.

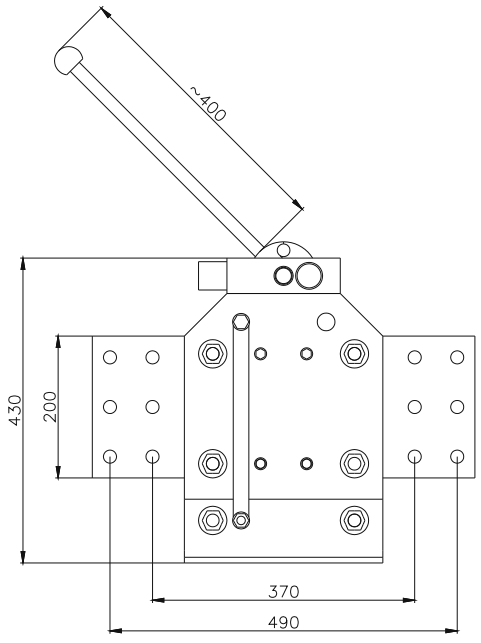


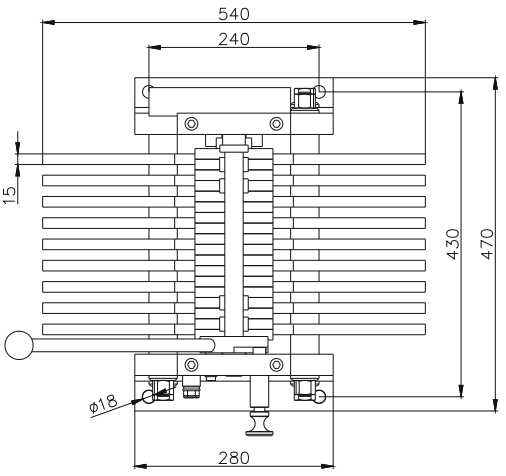
S1 – Control switch (open state)
S2 – Control switch (close state)
A – OW-I-25 disconnector – main contacts



Operation of main contacts with auxiliary contacts – diagram

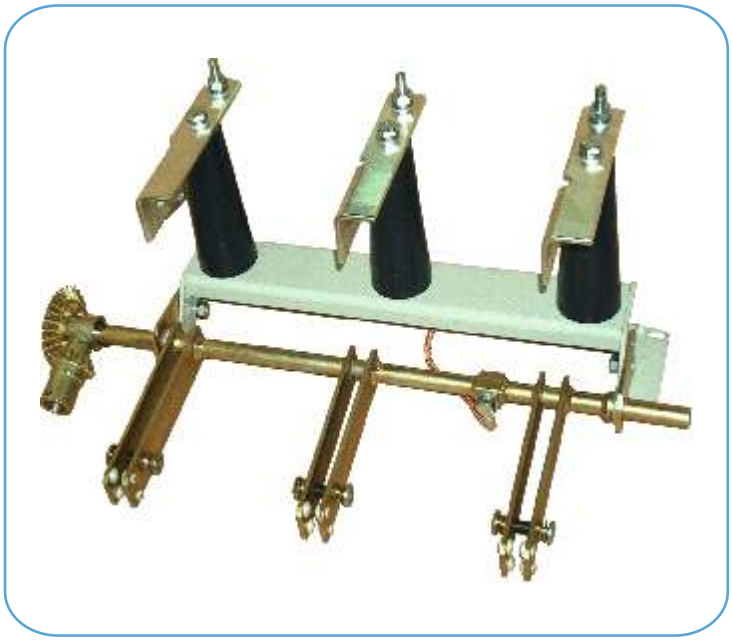
6. DIAGRAMS.





NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

UW
Indoor earthing switch



1. INTENDED USE.

UW type earthing switches for earthing and short circuit of electric circuits disconnected from the voltage. Compatible with indoor HV AC switchgear.

2. FEATURES.

- simple design;
- compatible with NSW30 type motor operating mechanism or NR-1 type manual operating mechanism;
- available with porcelain or resinous insulators,
- reliable operation;
- excellent performance and technical characteristics;
- compact dimensions;
- easy maintenace.

3. DESIGN.

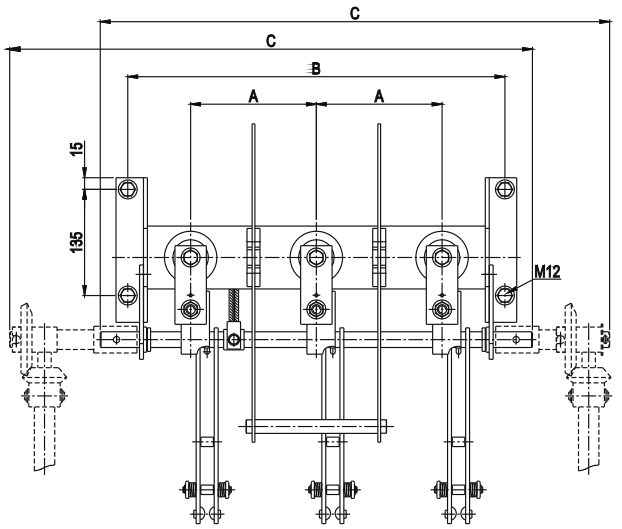
The earthing switches with blade contact design. The steel base with insulators with copper and silver plated earthing contacts (connectors). The drive shaft with welded moving contacts and copper and silver plated contact tips. The base with earth terminal with M12x30 screw. Pole to pole insulation is an isolating clearance; the isolating clearance is improved with additional insulating plates for earthing switches with reduced pole pitch.

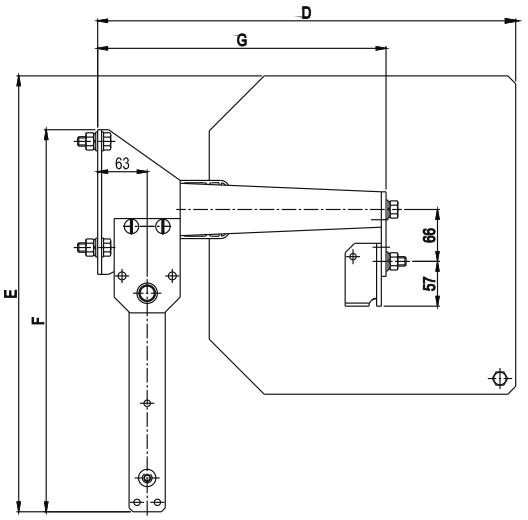
UW type earthing switches can be operated with: NSW30 type motor operating mechanism or NR-1 / NRK type manual operating mechanism. Mounting hole spacing in a front cell wall is identical in both cases. The length of a coupling shaft joining the switchgear with operating mechanism is 1,100 mm.

4. SPECIFICATION.

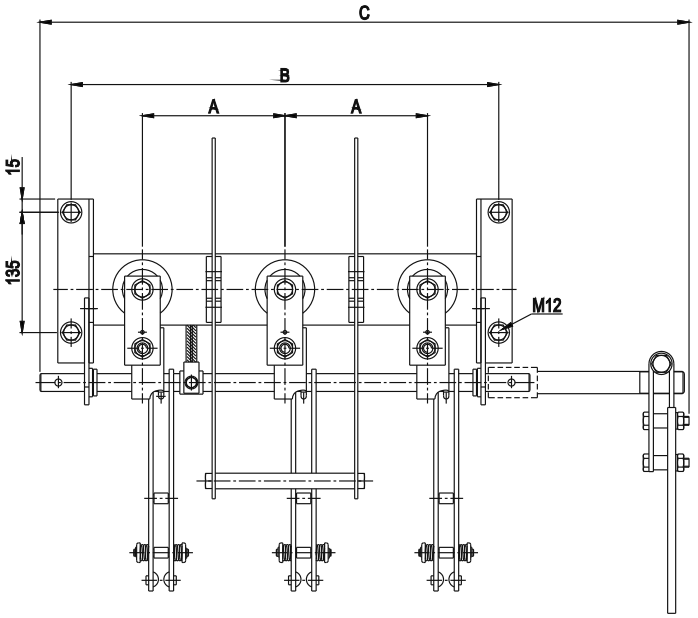
Item.	Parameter	Value	
		UW-12	UW-24
1.	Rated operating voltage	12 kV	24 kV
2.	Rated frequency	50 Hz	50 Hz
3.	Peak withstand current	50 kA	40 kA
4.	Rated short-time withstand current	20 kA	16 kA
5.	Test voltage (50Hz) for earth and pole to pole insulation	28 kV	50 kV
6.	Surge test voltage for earth and pole to pole insulation	75 kV	125 kV

5. DIAGRAMS.





Earthing switch type	Dimensions [mm]						
	A	B	C	D	E	F	G
12kV / 185mm	185	530	651	-	-	385	273
12kV / 160mm	160	480	601	-	-	385	273
12kV / 125mm	125	410	531	422	430,5	385	273
24kV / 275mm	275	710	860	-	-	486	366
24kV / 160mm	160	480	630	532	554,5	486	366

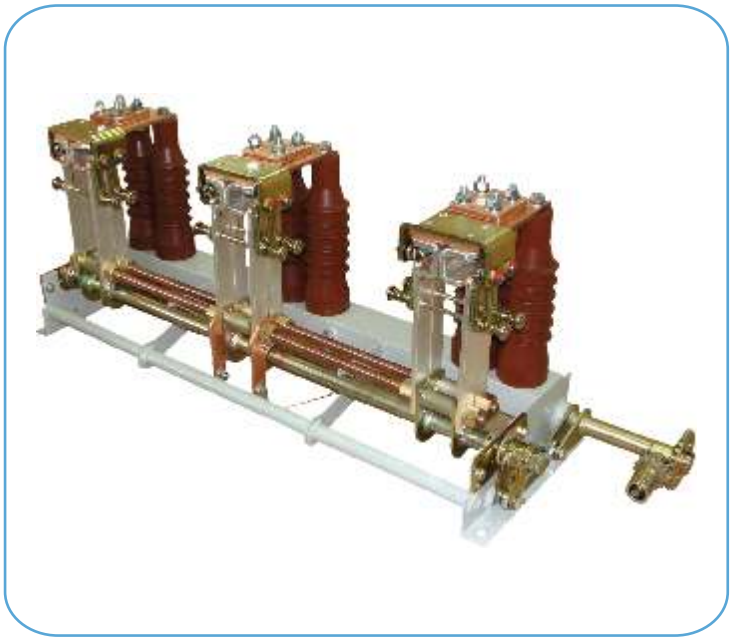


Earthing switch type	Dimensions [mm]		
	A	B	C
12kV / 185mm	185	530	697
12kV / 160mm	160	480	647
12kV / 125mm	125	410	577
24kV / 275mm	275	710	964
24kV / 160mm	160	480	734

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

UWS

High current indoor earthing switch



1. INTENDED USE.

UWS type earthing switches for earthing and short circuit of electric circuits disconnected from the voltage. Compatible with indoor HV AC switchgear.

2. FEATURES.

- simple design;
- compatible with NSW30 type motor operating mechanism or NR-1 type manual operating mechanism;
- available with porcelain or resinous insulators,
- reliable operation;
- excellent performance and technical characteristics;
- compact dimensions;
- easy maintenace.

3. DESIGN.

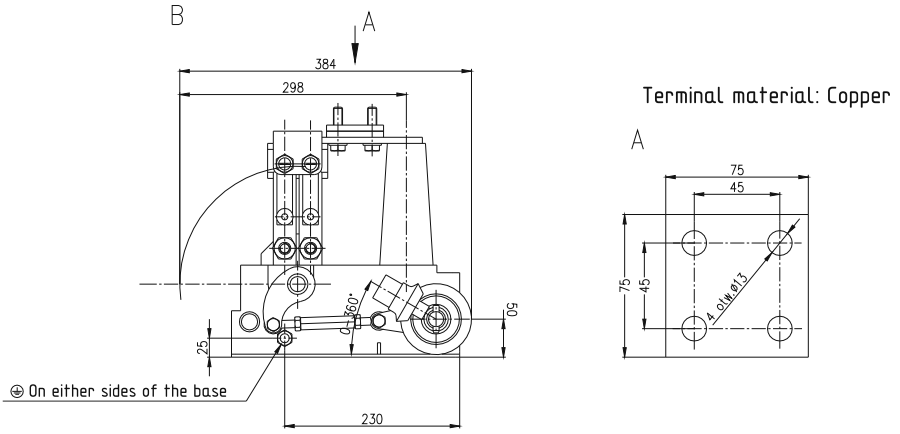
The earthing switches with blade contact design. The steel base with insulators with copper and silver plated earthing contacts (connectors). The drive shaft with welded moving contacts and copper and silver plated contact tips. The base with earth terminal with M12x30 screw. Pole to pole insulation is an isolating clearance; the isolating clearance is improved with additional insulating plates for earthing switches with reduced pole pitch.

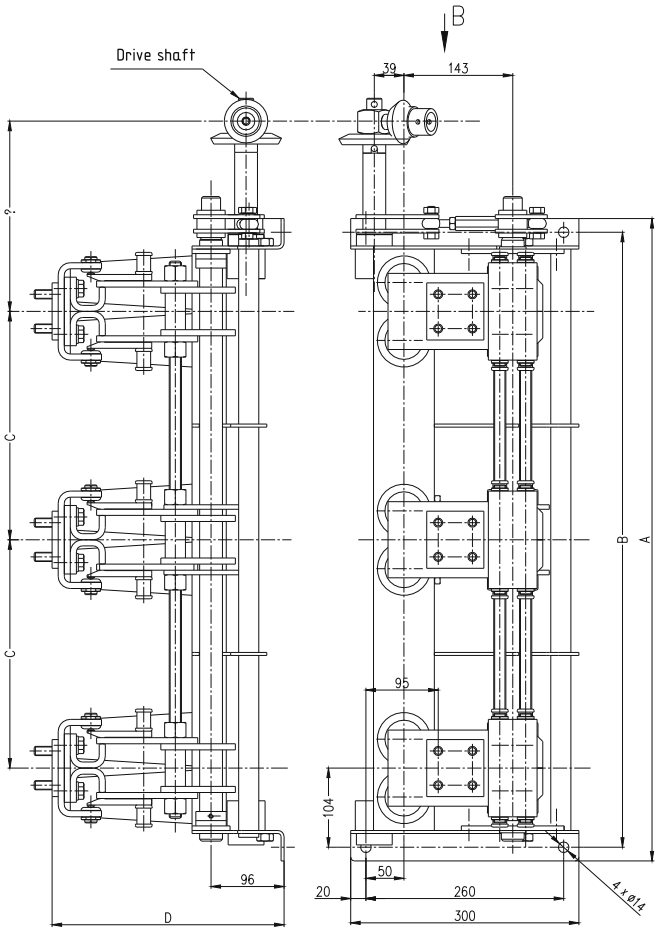
UWS type earthing switches can be operated with: NSW30 type motor operating mechanism or NR-1 / NRK type manual operating mechanism. Mounting hole spacing in a front cell wall is identical in both cases. The length of a coupling shaft joining the switchgear with operating mechanism is 1,400 mm.

4. SPECIFICATION.

Item	Parameter	Value	
		UWS-12	UWS-24
1.	Rated operating voltage	12kV	24kV
2.	Rated frequency	50/60 Hz	50/60Hz
3.	Peak withstand current	160/190kA	125kA
4.	Rated short-time withstand current	65/76kA	50kA
5.	Test voltage (50Hz) for earth and pole to pole insulation	28/32 kV	50/60kV
6.	Surge test voltage for earth and pole to pole insulation	75/85kV	125/145kV

5. DIAGRAMS.





Ur	A	B	C	D	E	F	G
12kV	844	808	300	305	160	298	384
24kV	964	928	360	401	256	402	488

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

NSW30
Motor operating mechanism

1. INTENDED USE.

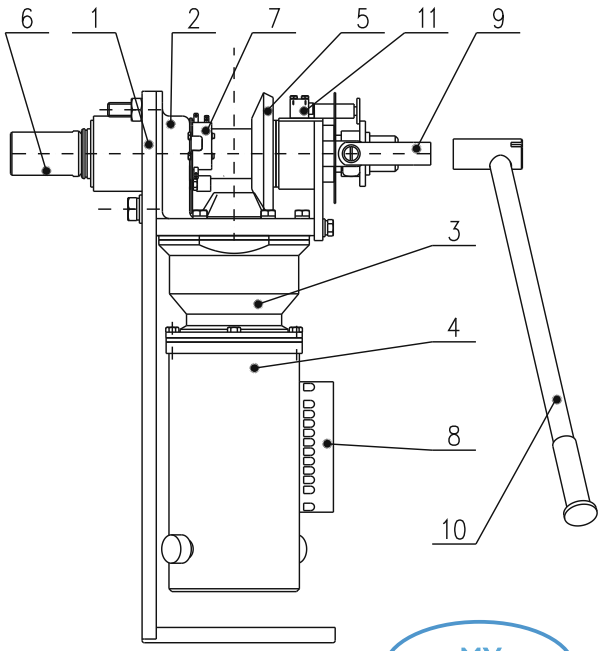
NSW30 type motor drives are compatible with MV indoor disconnectors and earthing switches. The operating mechanism enables remote or local control of a switch installed in a switchgear chamber. The existing manual operating mechanisms can be easily replaced to provide new operation and safety standards (available remote, local or manual control).

2. FEATURES.

- easy replacement of pneumatic operating mechanisms in existing switchgear with NSW30 motor operating mechanisms;
- two types of motor operating mechanisms: the motor with permanent magnets (NSW30-3) and series motor (NSW30-4);
- easy replacement of NRK type manual operating mechanism with NSW30 without changes to existing switching substation (identical mounting hole spacing and output shaft dimensions);
- easy installation and adjustment;
- reliable operation (2000 switching cycles, high torque max. 300 Nm);
- wide range of application for the whole range of medium voltage indoor switchgear (steady setting of angular displacement of the output shaft);
- high angular displacement of the output shaft ~220° (installation of limit switches directly to the stops of controlled switchgear - 100% reliability of limit positions);
- compact dimensions;
- maintenance-free;
- **accessories: elektromagnetic interlock BE-2 type.**

3. OPERATING MECHANISM DESIGN.

- the motor operating mechanism include:
- mechanism with multi-stage gear, driven by a DC motor;
- coupling for manual and motor control;
- limit switches disconnecting motor power supply at specific angular displacement of the main shaft;
- terminal strip for control and power circuits;
- external control cabinet available.



Operating mechanism design:

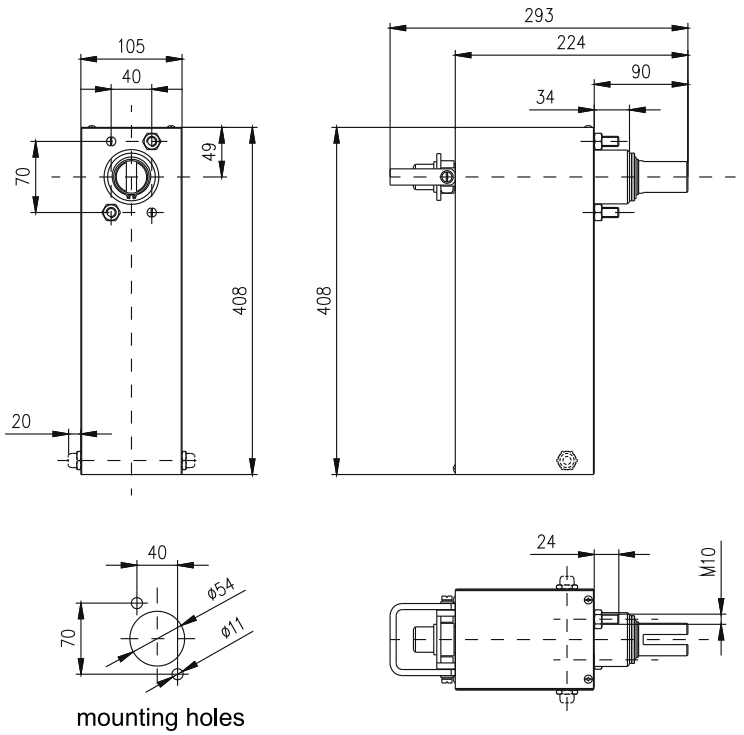
[1] Enclosure
[2] Body
[3] Gear
[4] Motor
[5] Intersecting axis gear
[6] Output shaft
[7] Limit microswitch
[8] Terminal strip
[9] Coupling / interlock fixture
[10] Manual lever
[11] Mechanical interlock microswitch

4. SPECIFICATION.

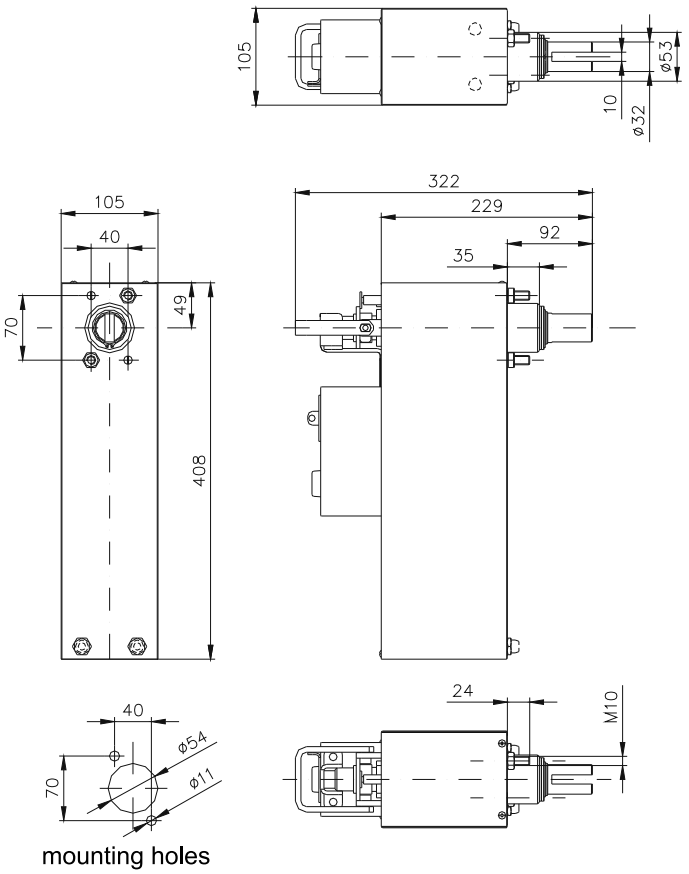
Item	Parameter	Value	
1.	Operating mechanism type	NSW30-3	NSW30-4
2.	Applied motor type	with permanent magnets	series
3.	Motor rated voltage	220 VDC 230 VAC 110 VDC 110 VAC 24 VDC 24 VAC	220 VDC 230 VAC
4.	Rated power	300 W	300 W
5.	Motor rated current	2,2 A/220 V 4 A/110 V 19 A/24 V	4,9 A/220 V
6.	Shaft torque: - rated - maximal	 150 Nm 300 Nm	 150 Nm 300 Nm
7.	Switching time	ca. 5s.	ca. 5s.
8.	Maximum conductor cross section	4 mm^2	4 mm^2
9.	Rated mechanical strength	2000 cycles	2000 cycles

5. DIAGRAMS.

NSW30 TYPE WITHOUT INTERLOCK BE-2 TYPE

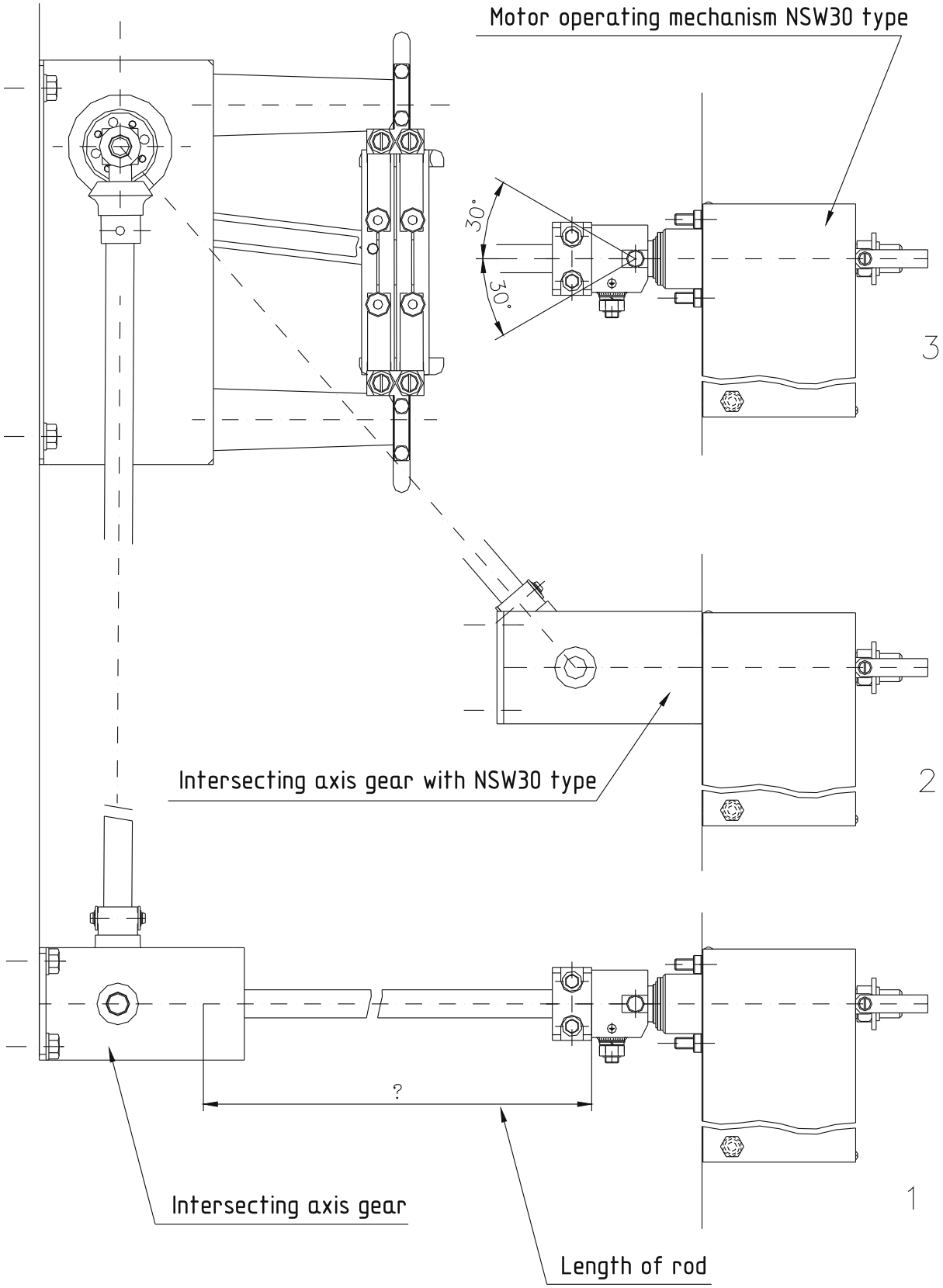


NSW30 TYPE WITH INTERLOCK BE-2 TYPE

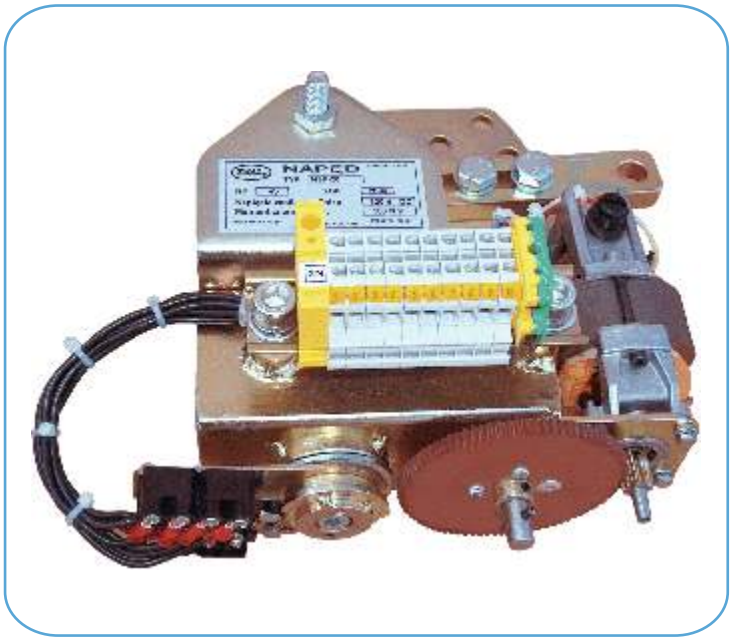


NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

6. COUPLING METHODS OF THE OPERATING MECHANISM NSW30 TYPE WITH MV INDOOR SWITCHGEAR.



NSP20
Motor operating mechanism



1. INTENDED USE.

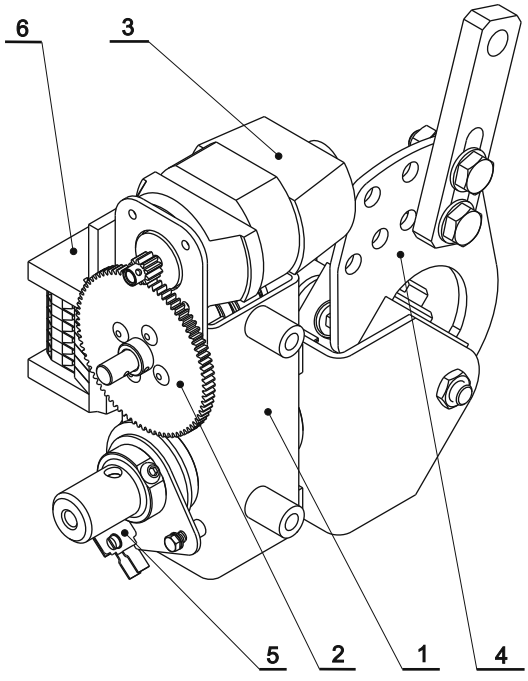
NSP20 type motor drives are compatible with MV indoor disconnectors, earthing switches and switch disconnectors. The operating mechanism enables remote or local control of a switch installed in a switchgear chamber. The existing manual operating mechanisms can be easily replaced to provide new operation and safety standards (available remote, local or manual control).

2. FEATURES.

- easy replacement of pneumatic operating mechanisms in existing switchgear with NSP20 motor operating mechanisms;
- method of operation similar to NRW04 manual operating mechanism;
- easy installation and adjustment;
- reliable operation (2000 switching cycles, high torque max. 300 Nm);
- wide range of application for the whole range of medium voltage indoor switchgear.

3. DESIGN.

- the motor operating mechanism includes: gear mechanism with a DC series motor;
- the gear changing the shaft rotation plane;
- limit switch;
- terminal strip for control and power circuits;
- external control cabinet available.



OPERATING MECHANISM DESIGN:
[1] Body
[2] Gear
[3] Motor
[4] Intersecting axis gear
[5] Limit switch
[6] Terminal strip

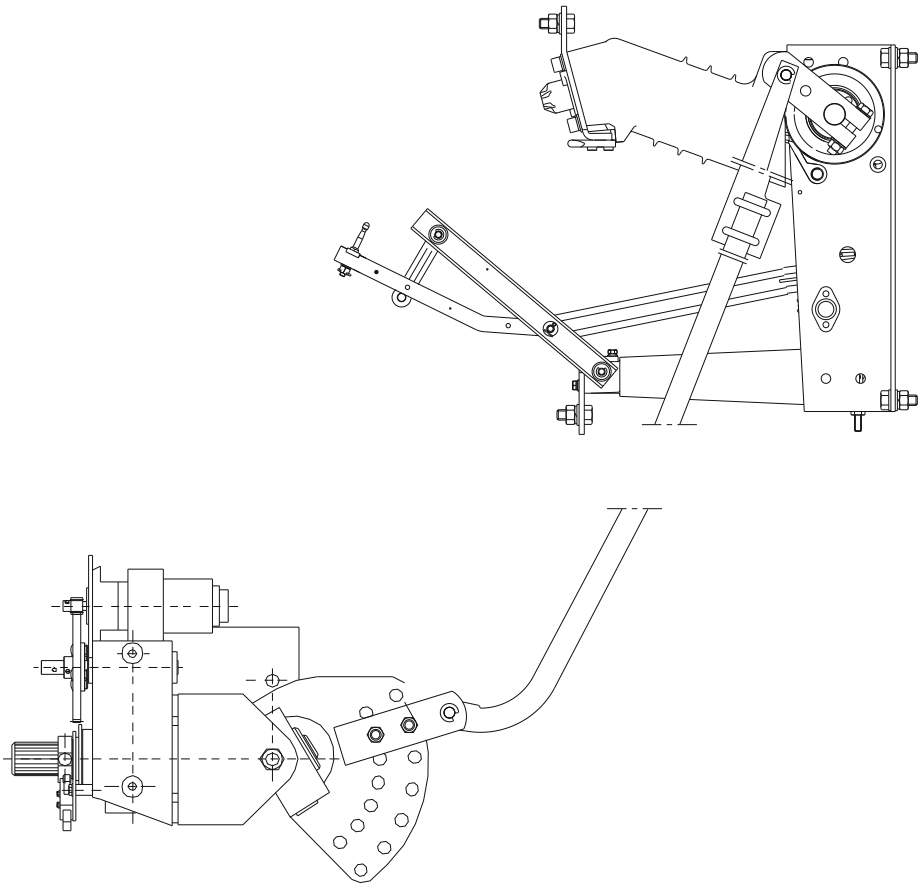
4. SPECIFICATION.

Item	Parameter	Value
1.	Motor rated voltage	220 VDC 230 VAC 110 VDC 110 VAC
2.	Rated power	65 W
3.	Motor rated current	0,44 A / 220 V 0,96 A / 110 V
4.	Shaft torque	max. 200 Nm
5.	Switching time	ca. 3s
6.	Maximum conductor cross section	4 mm^2
7.	Rated mechanical strength	2000 cycles

5. COUPLING METHOD OF THE OPERATING MECHANISM.

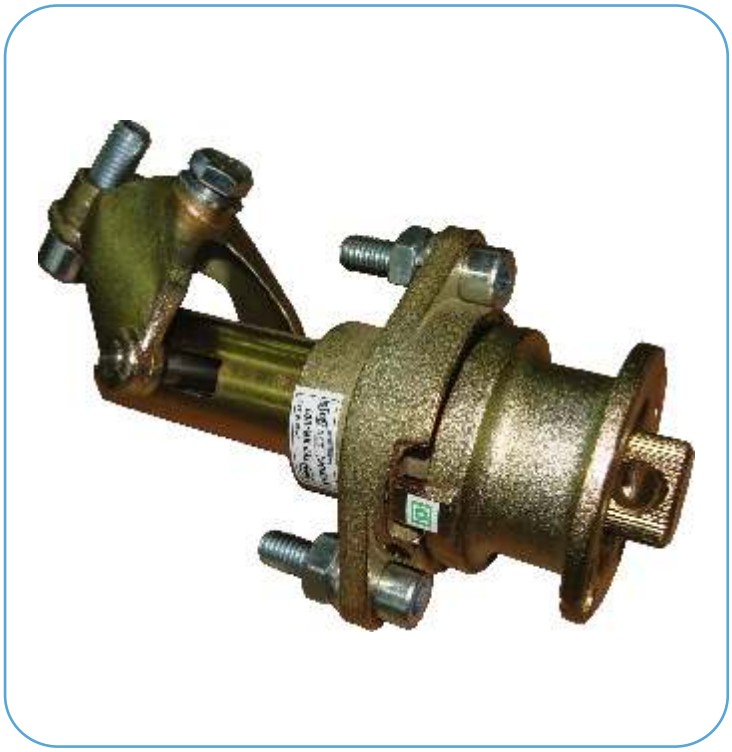
Due to the method of operation similar to the old NRW04, NR1 and NR3 manual operating mechanisms, the replacement from manual to electric operating mechanisms is easy.

The following diagram shows a coupling with indoor switch disconnector.



The mechanical coupling can be adapted to individual Client requirements.

NR-1
Manual operating mechanism



1. INTENDED USE.

NR-1 type manual operating mechanism is used for closing and opening indoor disconnectors, switch disconnectors and earthing switches at 36 kV rated voltage.

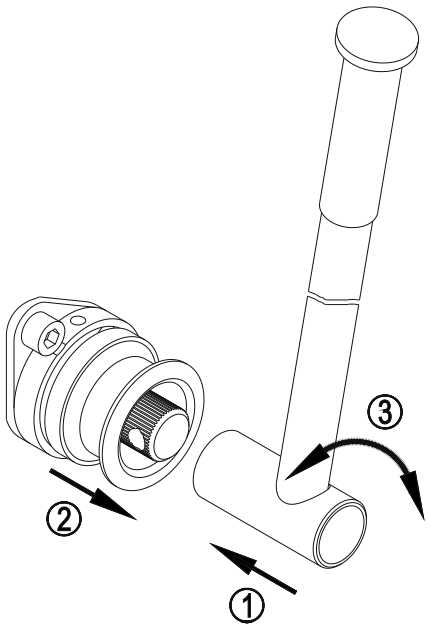
2. FEATURES.

- simple design;
- easy installation and coupling with other switchgear;
- mechanical lock between earthing switch and switch disconnector (disconnector) operating mechanisms;
- high durability and operation reliability;
- compact dimensions;
- compatible with Polish power engineering requirements;
- possible replacement of NR-1 type manual operating mechanism with NSW30 type motor operating mechanism without changes to existing switching substation (identical mounting hole spacing and output shaft dimensions);
- **accessories: elektromagnetic interlock BE-2 type.**

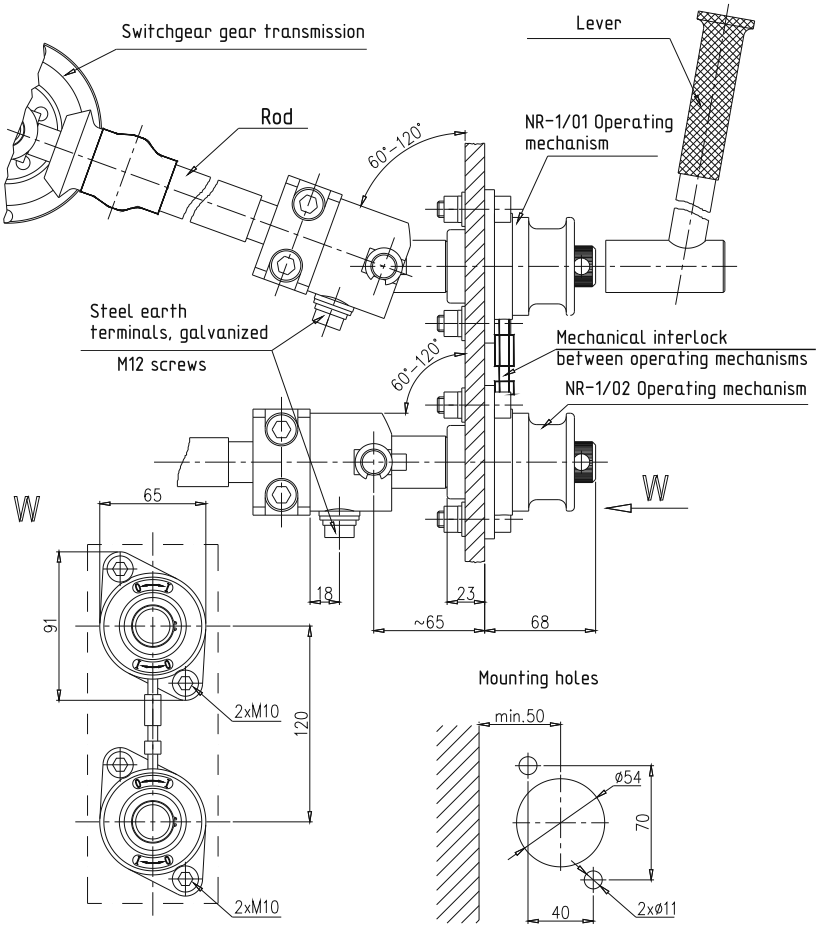
3. WORKING PRINCIPLE.

1. Mount the lever on the drive shaft;
2. Retract the sleeve;
3. Close (right) or open (left) the switchgear irrespective of the current position of a switchgear.

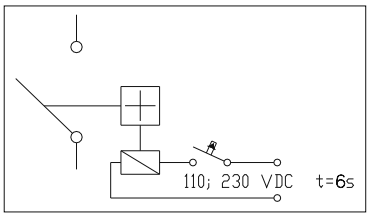
The sleeve enters the hollow in a drive shaft body of the MV switchgear in the preset position.

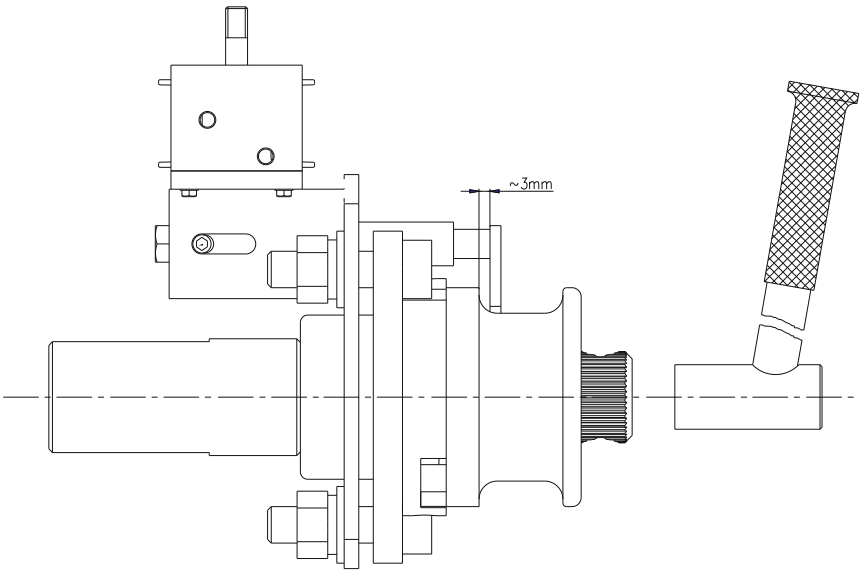


4. INSTALLATION.



5. MODEL OF COOPERATION OF NR-1 TYPE WITH ELECTROMAGNETIC INTERLOCK BE-2 TYPE.





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ZWAE

Zakład Wytwórczy Aparatów Elektrycznych Sp. z o.o.

ACCESSORIES

- WN/WNS
- LP-1
- PB

ACCESSORIES

WN-1 / WNS-1

Voltage detector
Voltage detector with switching interlock

1. WN-1 VOLTAGE DETECTOR.

1.1. INTENDED USE.

Voltage detectors are used as visual indicators of voltage in MV circuits, e.g. busbars in switching substations. Voltage detectors are compatible with MV switchgear (switch disconnectors and disconnectors) made by ZWAE Sp. z o.o. with reactance insulators, and switchgear by other manufacturers fitted with similar voltage dividers.

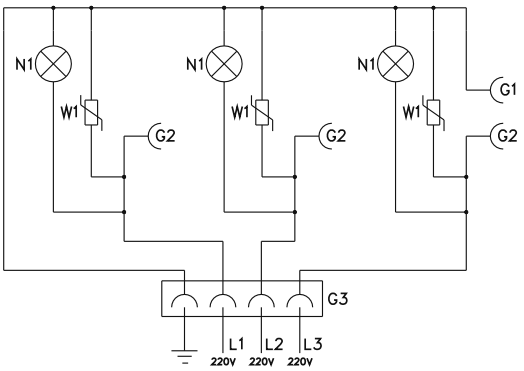
1.2. DESIGN.

Voltage detectors consists of the enclosure with electronic components. The front panel features three control lights indicating voltage for each phase and three banana sockets for phase voltage and one neutral conductor socket. The detectors enable additional voltage control in MV circuits. The rear part of the enclosure features the plug to connect stand-off insulator cables. Screw terminals for easy installation.

1.3. RATING.

Limiting (minimum) detection current:	$I_{min} = 60\,\mu A$
Rated detection current:	$I_n = 270\,\mu A$
Substitutive impedance of a single detector phase:	$Z_n = 220\,k\Omega$

1.4. CIRCUIT DIAGRAM.



N1 – neon discharge tube 220V
W1 – Varistor 275 VAC
G1 – Banana socket 4 mm, black.
G2 – Banana socket 4 mm, red.
G3 – Power outlet 4-way.

Fig. 1. WN-1 detector circuit diagram.

WN-1 voltage detectors are connected directly to the terminals of reactance insulators (terminals L1, L2, L3). The terminal marked with earth symbol must be connected with the earthing system. The control light functioning can be verified with an additional tester.

NOTE: As a result of introduce changes due to technological development, the diagrams in catalogue have only a visual character.

2. WNS-1 VOLTAGE DETECTOR.

2.1. INTENDED USE.

Voltage detectors with interlock are used as visual voltage indicators in MV circuits, e.g. busbars in switching substations. The detectors are compatible with switchgear systems and enable or disable operation of a specific switchgear. The detector is an additional safety device.

Voltage detectors are compatible with MV switchgear (switch disconnectors and disconnectors) made by ZWAE Sp. z o.o. with reactance insulators, and switchgear by other manufacturers fitted with similar voltage dividers.

2.2. DESIGN.

Voltage detectors consists of the enclosure with electronic components. The front panel features three control lights indicating voltage for each phase and three banana sockets for phase voltage and one neutral conductor socket. The detectors enable additional voltage control in MV circuits. The detector features two LEDs indicating enabled or disabled MV switchgear operation.

The rear part of the enclosure features two plugs. Top (4-field) section is used to connect cables of MV switchgear stand-off insulators. Bottom (8-field) section is used to connect auxiliary power supply or as a terminal for two auxiliary relay contacts. The contact state reflects the voltage presence at the busbars. Screw terminals for easy installation. Voltage detectors with interlock are fitted with overvoltage and short-circuit protection.

2.3. RATING.

Limiting (minimum) detection current:	$I_{min} = 60\,\mu A$
Rated detection current:	$I_n = 270\,\mu A$
Substitutive impedance of a single detector phase:	$Z_n = 220\,k\Omega$
Auxiliary contacts - two pairs:	2P
Auxiliary contact rated load:	8A/230VAC
Input power:	<2VA
Auxiliary power supply:	230VAC
	220VDC
	110VDC

Other voltage versions available.

2.4. DIAGRAM.

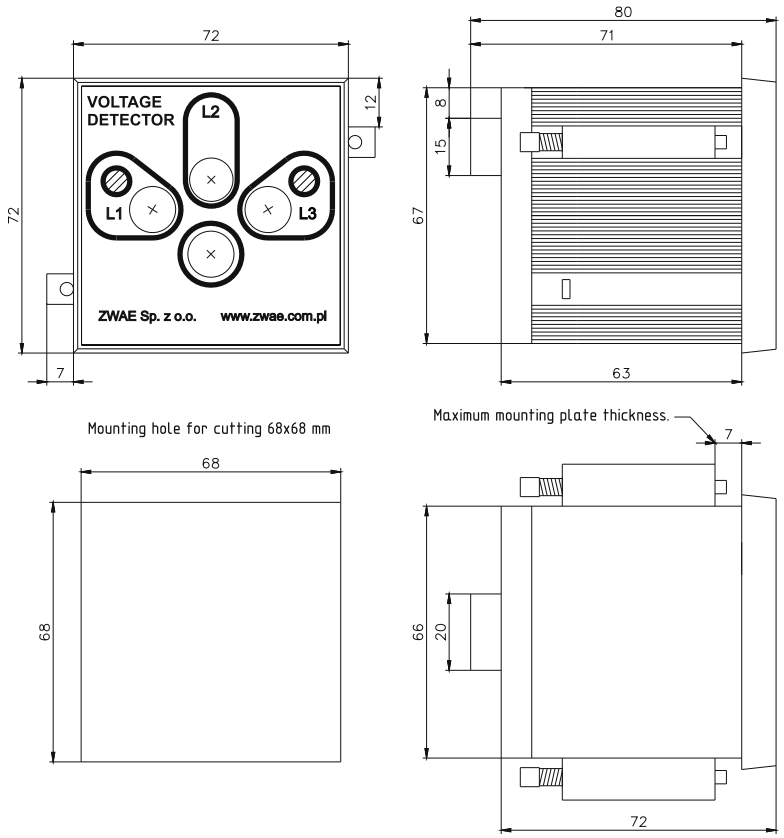


Fig. 2. WN-1 and WNS-1 voltage detector - dimensions.

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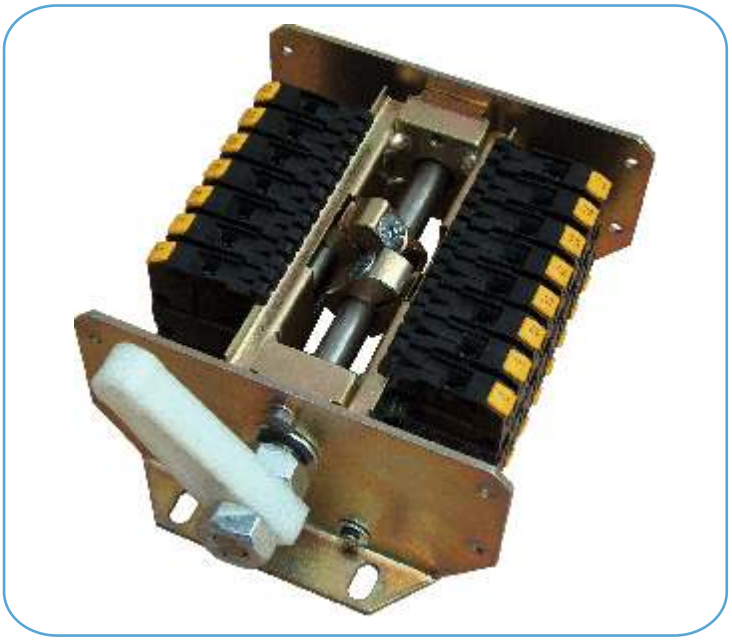
LP-1
Secondary circuit switch



1. INTENDED USE.

Secondary circuit switch indicates switchgear state by mechanical coupling of final control elements and switch contacts. The switch contact state indicates correct switchgear position.

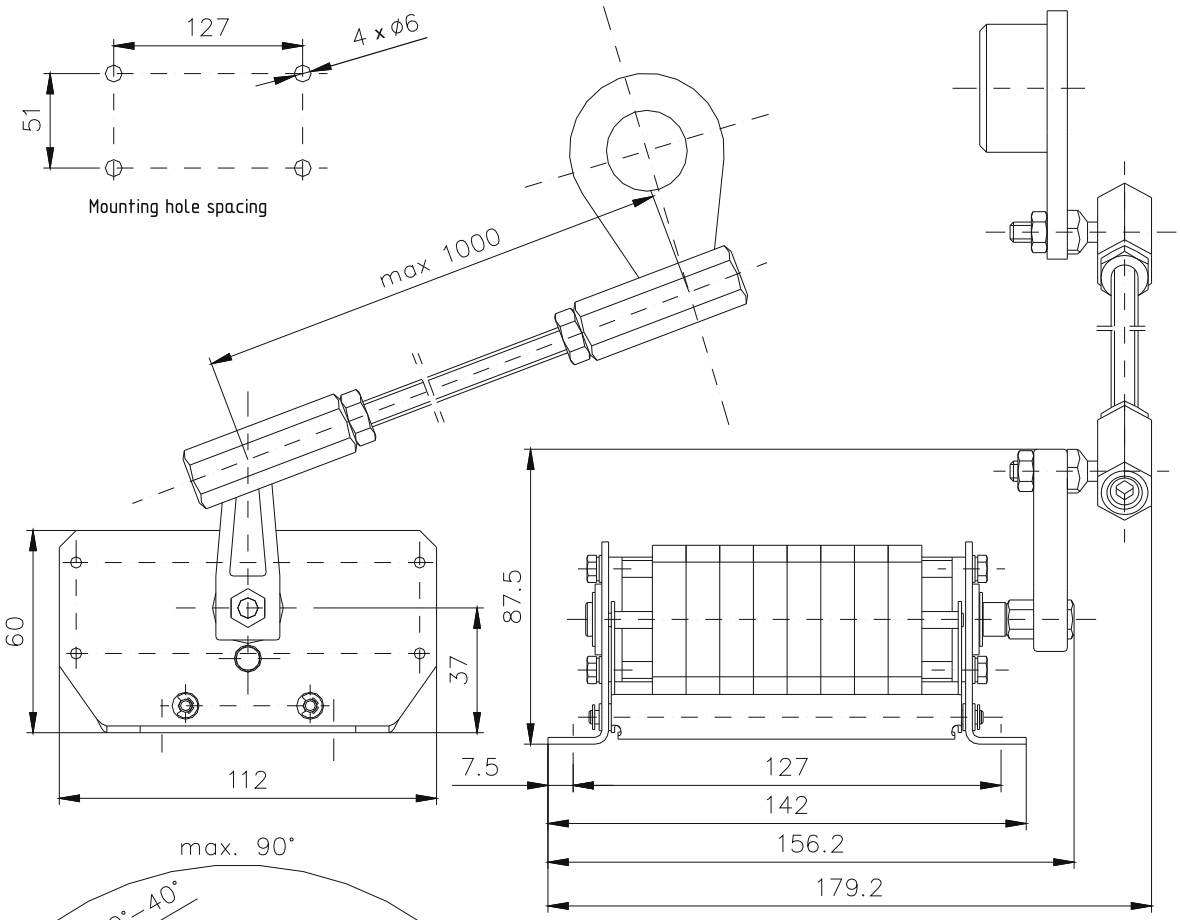
2. FEATURES.

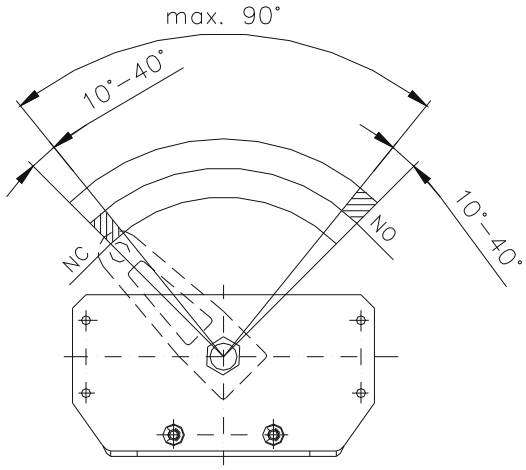
- simple design;
- standardized contacts;
- compact dimensions;
- adjustable actuation angle;
- various configurations of contact switching available.

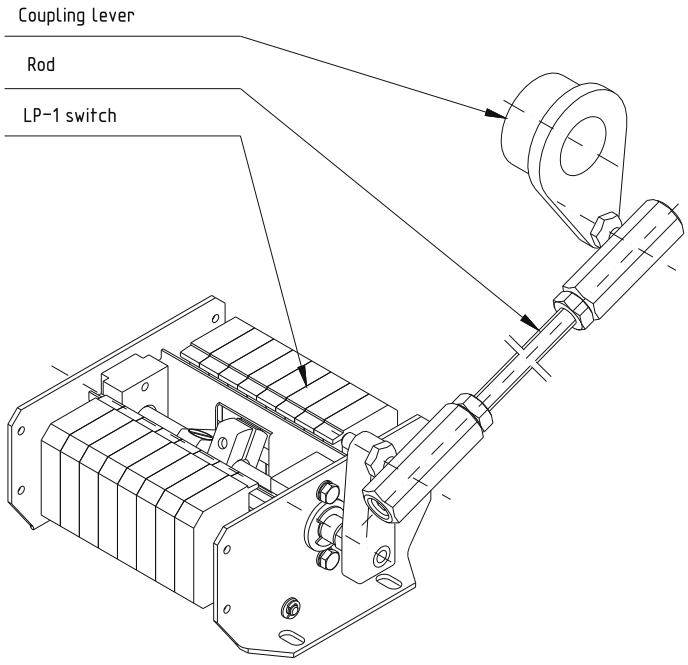
3. SPECIFICATION.

Item	Parameter	Value	
1.	Insulation rated voltage	500V	
2.	Rated continuous current I_u=I_{th}	10 A	
3.	Rated switching currents	AC-15	DC-13
		220V - 2,6A	24V - 4A
		380V - 1,6A	110V - 1A
		500V - 1,6A	220V - 0.25A
4.	Switching reliability		
	- at rated voltage and rated operational currents,	0.2 million cycles	
	- switching AC electromagnets,	1 million cycles to 80 VA	
	- switching DC electromagnets	1 million cycles to 10 W	
5.	Operating temperature	-5<>+50°C	
6.	Connection cable cross-section:		
	- rigid	2 x 1<>1,25 mm^2	
	- stranded	2 x 0.75<>1,5 mm^2	
7.	Operating position	any	

4. DIAGRAM.







Contact configuration at the left hand lever position

1 2	5 6	9 10	13 14	17 18	21 22	25 26	29 30
NO	NO	NO	NO	NO	NO	NO	NO
3 4	7 8	11 12	15 16	19 20	23 24	27 28	31 32
NC	NC	NC	NC	NC	NC	NC	NC

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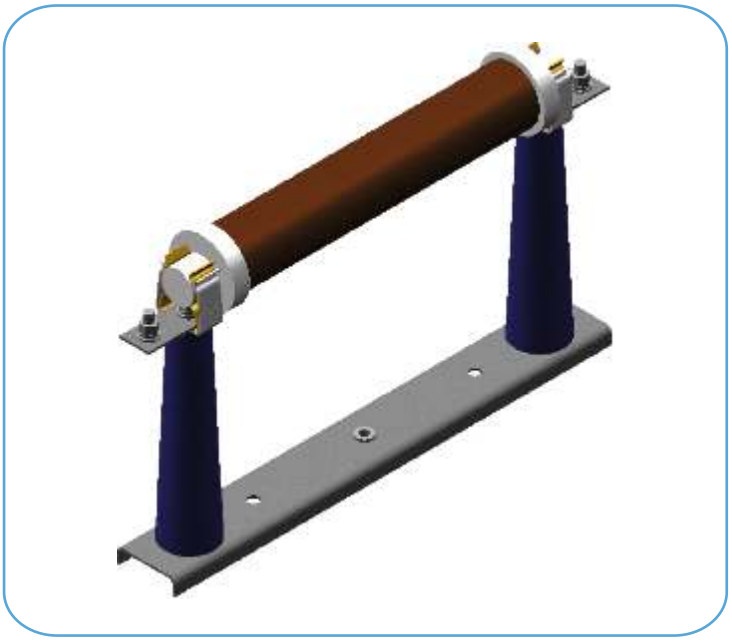
PB
Fuse base



1. INTENDED USE.

Fuse bases with fuse cartridge for protection against transformer, capacitor bank, cable and overhead line branches short-circuit. It protects the switchgear against dynamic and thermal effect of high short-circuit currents by limiting the peak value and interrupting the current within several milliseconds.

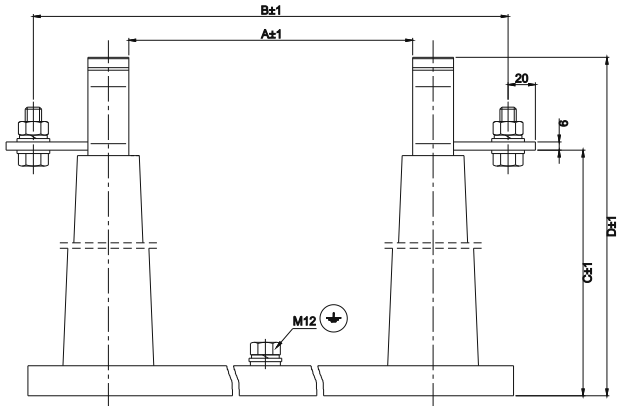
2. FEATURES.

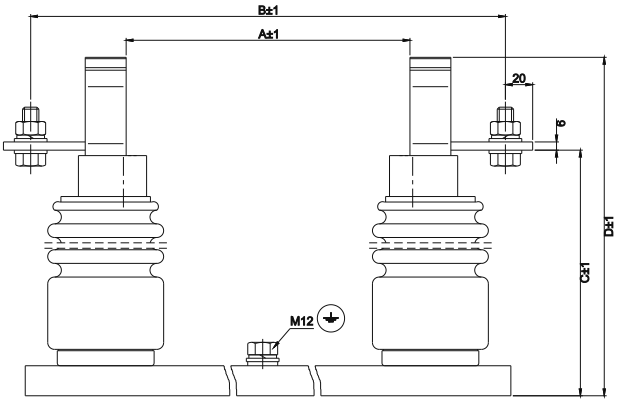
- simple design;
- easy installation;
- possible standardized available cartridges;
- possible reactance insulators for voltage indicators (signalling burn trough of fuse cartridge)

3. DESIGN.

Fuse base include steel beam with earth terminal. The beam features two indoor stand-off insulators. The insulator caps feature contact clips for installation of fuse cartridges. The contact clips have three parts: contact spring, clamping spring and terminals.

4. DIAGRAMS.





Fuse cartridge type	Dimensions [mm]				
	A	B	C	D	E
12kV / 537mm	540	680	200	268	380
12kV / 292mm	295	435	200	268	180
24kV / 537mm	540	680	282	350	380
24kV / 442mm	445	585	282	350	300
36kV / 537mm	540	680	380	448	380

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Detailed product information can be found on CD

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