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MINEL

RASTAVLJAČI DOO BEOGRAD

SRBIJA

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Ko je Minel sa međunarodnom reputacijom
Who we are the corporation of an international reputation

MINEL RASTAVLJAČI inženjering preduzeće za projektovanje, proizvodnju opreme, montažu i izgradnju energetskih i industrijskih objekata jedno je od vodećih preduzeća. Osnovano je pre 40 godina. MINEL RASTAVLJAČI je brzo postao visokospcijalizovano preduzeće u oblasti projektovanja, inžinjeringa i izgradnje brojnih industrijskih objekata. Preduzeće radi za elektoenergetiku.

MINEL RASTAVLJAČI prihvata ideje kupaca za izgradnju, bez obzira na vrstu i veličinu objekta i izrađuje studije tržišne opravdanisti. Takođe, obučava osoblje kupca, pušta u pogon i pomaže u održavanju objekta, ukoliko je potrebno.

Ukratko, MINEL RASTAVLJAČI je orjentisan prema kupcoma kako bi ispunio sve njihove zahteve. Zahvaljujući svom iskustvu MINEL RASTAVLJAČI može da pruži konsultanske usluge ili da obavi inžinjering po principu ključ u ruke.

Za više od 40 godina postojanja MINEL RASTAVLJAČI je uspešno izgradio stotine objekata u ?????

MINEL RASTAVLJAČI je preduzeće čija je osnovna delatnost, projektovanje, proizvodnja opreme, montaža i izgradnja energetskih i industrijskih objekata.

MINEL RASTAVLJAČI je neizbežan partner u izgradnji mnogih važnih infrastrukturnih objekata. Prilagođavajući se tržištu uspešno je ostvario brojne projekte od velikog značaja.

— program modernizacije i revilatizacije energetskog sistema
— program modernizacije železnice
— program izgradnje brzih pruga kroz Srbiju
— izgradnja gasovoda kroz Srbiju.

U mnogim zemljama MINEL RASTAVLJAČI je učestvovao u izgradnji velikih elektroenergetskih objekata, stičući ugled među poznatim svetskim kompanijama (ABB, GEC ALSTHOM, WESTINGHOUSE i dr.)

Promenom svoje organizacione forme kroz nove oblike tehnolo{kih celina, MINEL RASTAVLJAČI se za kratko vreme razvio u pouzdan sistem koji, kroz svoj inženjerig, realizuje kompletne projekte po sistemu ključ u ruke.

MINEL RASTAVLJACI joint stock company is primarily an engineering company for the designing, manufacture of the thermo-power and industrialprojects, one of majo companies in Yugoslavia. Established in Minel has quickly become a high-specializet enterprise in the fields of designing, engineering and construction of numerous industrial projects. Its activities are directed to the electric-and thermo power plants, processing and food industry, and it supplies all the necessary equipment both for the technology and inftra-structure of these projects. MINEL RASTAVLJACI also undertakes its Purchasers idea for construction regardless a sort or size of the project concerned, and it elaborates a study for the alsodoes trainig of its Purchasers staff, puts the plants concerned into operation and renders assistance in maintenance of the same, where requests. In brief, MINEL RASTAVLJACI is oriented to its Purchasers so as to meet all their requests. Thanks to its very rich experience MINEL RASTAVLJCI is able to give the consulting services, if requested, or to carry out the engineering on turn keu basis. For more than 40 years of its exsperience MINEL RASTAVLJACI has constructed hundreds of projects in more than 40 countris on ali the five contintes.

MINEL RASTAVLJACI is an inevitable partner in construction of major infra-structure projects in Yugoslavia. Ever adapting itself to the market requiremens, MINEL RASTAVLJACI has successfully realized numerous projects of great importance. Now it has been included in completion of projects in being of lasting importance:

— The Programme for electric power generation, transmission and distribution upadate
— The Programme for railway update
— The Progamme for construction of the fast railroads throughout Serbia.

MINEL RASTAVLJCI has taken part, in many countries, in construction of big electric-power projects, and thus it gained rather well-established reputation among the well known world companies (ABB, GEC ALSTHOM, WESTINGHOUSE, etc.) Changing its organizational forms into new technological entiries, MINEL Rastavlaci has developed, in a very short tine, a reiable system which is able to realize through its engineering the complete projects on the turn key basis. Based on its engineering system, MINEL RASTAVLJACI designes, supplies the equipment, produces, erects and srarts up:

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Sistem inženjerig MINEL RASTAVLJAČI projektuje, isporučuje opremu, proizvodi, montira i pušta u pogon:

— elektroenergetska postrojenje i objekte.

Zahvaljujući dosadašnjem bogatom iskustvu i stečenim referencama cilj MINEL RASTAVLJAČA je brži tehnološki razvoj. Stalna programska i tehnološka nadgradnja, uz inovacije i saradnju sa naučnim institutima i sopstvanim razvojnim centrima, čini da se MINEL RASTAVLJAČI na tržištu pojavljuje kao inženjering sistem za kompletne energetske i industrijske objekte.

MINEL RASTAVLJAČI sprovodi sve etape posla, od ideje, preko projektovanja, do predaje postrojenja po sistemu ključ u ruke, i odavno je prešao granice domaćeg tržišta.

Usluge MINEL RASTAVLJAČA u ovoj oblasti obuhvataju: konsalting, analizu stanja, izradu investicionh programa, idejnih i glavnih projekata i druge investiciono-tehničke dokumentacije za rekonstrukciju postojećih i izgradnju novih objekata za proizvodnju, prenos i distribuciju električne energije.

Brojne su reference kroz sledeće objekte:

- Termoelektrane
- Hidroelektrane
- Postrojenja za prenos i distribuciju električne energije
- Transformatorske stanice
- Železničke elektro-instalacije
- Postrojenja za kompenzaciju reaktivne energije.

MONTAŽA

Jedno od završnih i zato delikatnih aktivnosti u izgradnji industrijskih objekata pripada montaži. Naročito specijalizovana za montažu energetskih objekata, MINEL-ova montaža u potpunosti ispunjava zahteve brze i ekonomične izrade.

REMONT

Posebna vrsta usluge je remont izgrađenih elektroenergetskih i termoenergetskih postrojenja. Kada se tokom vremena ukaže potreba poboljšavanja rada postrojenja ili primene savremenih rešenja, pristupa se remontu koji MINEL uspešno realizuje.

— electro-transmission plants and projects

Owing to its rich experience so far and references gained, MINEL RASTAVLJACI set a goal of its faster tehnological development primary in the fields of utility boilers and power transformers. Sustained improvement of the programme and technology together with the innovation and cooperation with numerous scientific institutes and its own development centers enabled MINEL RASTAVLJACI to appear in the market as an engineering system for complete power and industrial projects. Significant own experience and communication with some international corporations contributed MINEL RASTAVLJACI to become a system capable of carrying out all stages of the work starting from an idea, through designing, up to the turn key delivery of the plant, in which respect MINEL RASTAVLJACI has surpassed the limits of the home market long ago.

MINEL RASTAVLJACI services also include the consulting, condition analysis, elaboration of the investment programme, general and main designs, as well as the other investment-technical documentation for reconstruction of the generation, transmission, distribution and usage of electric power.

Numerous references have been received for the projects, such as:

- thermo-power plants
- hydro-power plants
- el. power transmission and distribution
- installations
- transformer stations
- railway electric system reactive power compensation system

ERECTION WORKS

One of final, and accordingly delicate in construction of the industrial plants belong to erection works.

As an expert Erector of the power (utility) projects, MINEL's erection works fully meet the requirements of a fast and economic construction.

OVERHAUL

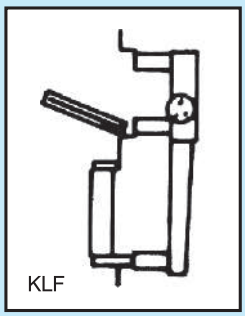
A special sort of MINEL RASTAVLJACI services is an overhaul of the thermo-power plants constructed. If during the exploitation of a plant it may appear necessary to improve the operation, or to introduce some more ap-to-date solution, then an overhaul is to be done and MINEL RASTAVLJACI is the one which carries it out successfully.

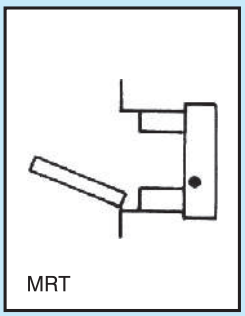
REP AIR WORKS AND MAINTENANCE

Care of the plants that MINEL RASTAVLJACI has delivered during many ueag makes an integral part of its activities. Thanks to its long practical work and the experience gained, MINEL RASTAVLJACI has arranged a repair and maintenance service specialized in fest removal of any defects or damages.

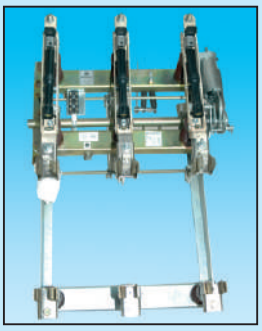
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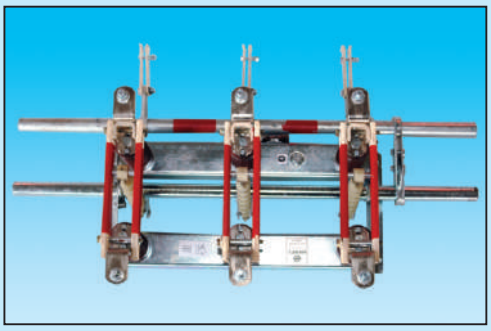
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KLF


MRT

Proizvodni program
Produce program





		Rastavljači Isolating switches					Sklopke-rastavljači Load-break switches					
Nazivni napon Rated voltage	kV	12... 17,5		24		38	12		17,5	24		38
Lista JUS Series acc. VDE		1	2	1	2	2	1	2	2	1	2	2
Nazivna trajna struja Rated current	A	630	630 1250 1600 2500 3150 4000	630	630 1250 1600 2500	630 1250 1600 2500	630	630 1250 1600 2500	630	630	630 1250	630 1250

Nazivna trajna struja
Rated current

Nazivni napon
Rated voltage

RASTAVLJAČ
ISOLATING SWITCH

Nazivna prenosiva temena vrednost struje
Rated impulse current

Razmak ose polova
Pole centre

MRT 12 - 630 / 50 -210-SU-EUK-E$_1$
T 12 - 630 -210-SU-EUK-E$_1$
KLF 12 - 630 -210-SU

SKLOPKA-RASTAVLJAČ
SA PREGIBNOM CEVI

LOAD-BREAK SWITCH
WITH TILTING TUBE

Isključenje akumulisanom energijom
Trip-free release

Uređaj za brzo uključivanje zemljospojnika
Quick ON device of earthing switch

Zemljospojnik »dole«
Earthing switch »below«

Nosač osigurača »dole«
Fuse base »below«

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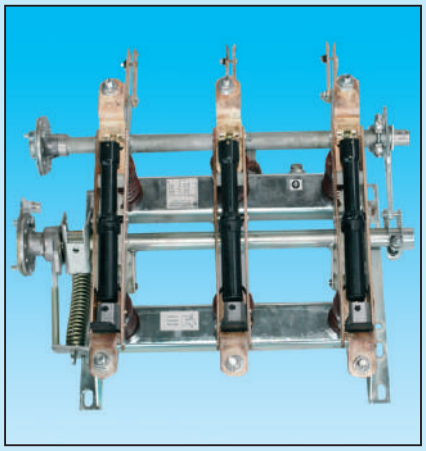
Ispitivanja
Tests

Sva ispitivanja snaga sprovedena su u nezavisnoj laboratoriji KEMA u Arnhajmu, Holandija. Tamo je potvrđeno da sklopka-rastavljač sa pregibnom cevi sadrži rezerve u mogućnostima, iznad vrednosti datih u podacima o mehaničkim i električnim karakteristikama.

Sklopke-rastavljači sa pregibnom cevi koje MINEL proizvodi po licenci F&G izrađene su i ispitane shodno odgovarajućim odredbama za aparate naizmenične struje VDE 0670, odeljak 3, zatim prema publikaciji IEC 265 i normama DIN. Rastavljači i zemljospojnici odgovaraju VDE 0670, odeljak 2 i IEC 129.

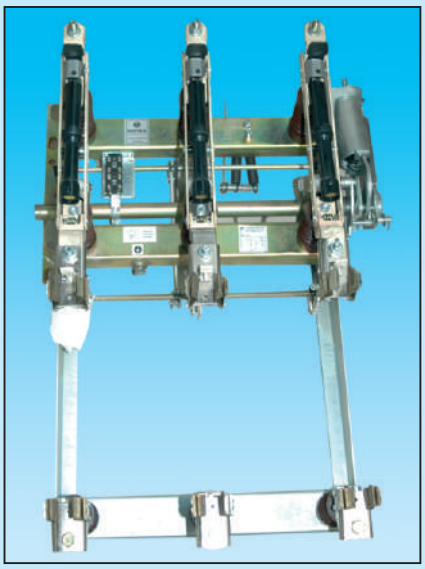
All performance tests were carried out in the independent KEMA test laboratory at Arnhem in the Netherlands. They confirmed that the tilting tube switches possess reserves extending beyond the rated values of electrical and mechanical data.

MINEL's tilting tube load-break switches are construced and tested in accordance with the specifications for AC devices VDE 0670, Part 3, IEC Publications 265 and DIN standards. The isolating switches and earthing switches correspond to VDE 0670, Part 2 and IEC 129.



KLa 12, KLa 17,5, KLa 24, KLa 38 kV
CM 12/24 kV

Kriterijum izbora
Selection criteria



KLFa 12, KLFa 17,5, KLFa 24, KLFa 38
CM 12 kV, 24 kV

Nazivni naponi i nazivne trajne struje

Moguće su sledeće kombinacije:

Voltage and current ratings

The Following arrangements are available:

Nazivni napon / Rated voltage	Nazivna trajna struja / Rated current						
	400A	630A	1250A	1600A	2500A	3150A	4000A
12 kV		●○	●○	●○	●○	○	○
17,5 kV	●○	●○					
24 kV		●○	●○	○	○		
38 kV		●○	●○	○	○		

● za sklopke-rastavljače / for load-break switches
○ za rastavljače / for isolation switches

Obrtni momenti na sklopkama-rastavljačima

Radi pokretanja sklopki-rastavljača sa pregibnom cevi moraju biti korišćeni sledeći obrtni momenti, zavisno od tipa aparata:

Actuating moments on load-break switches

The following torques which differ according to type must be applied for the switching of tilting tube load-break switches:

Tip / Type series	Obrtni moment / Torque
KL 12, KL 17,5, KL 24, KL 38, CM 12/24	50–80 Nm
KLF 12, KLF 17,5, KLF 24, KLF 38, CM 12/24	140 Nm
LTKE 12/1250–1600	130 Nm
LTKE 12/2500	160 Nm
LTKE 24/1250	130 Nm
LTKE 38/1250	110 Nm

Razmaci polova

Zavisno od potrebe može korisnik da bira razne razmake ose polova, pri čemu treba obratiti pažnju na date tehničke podatke.

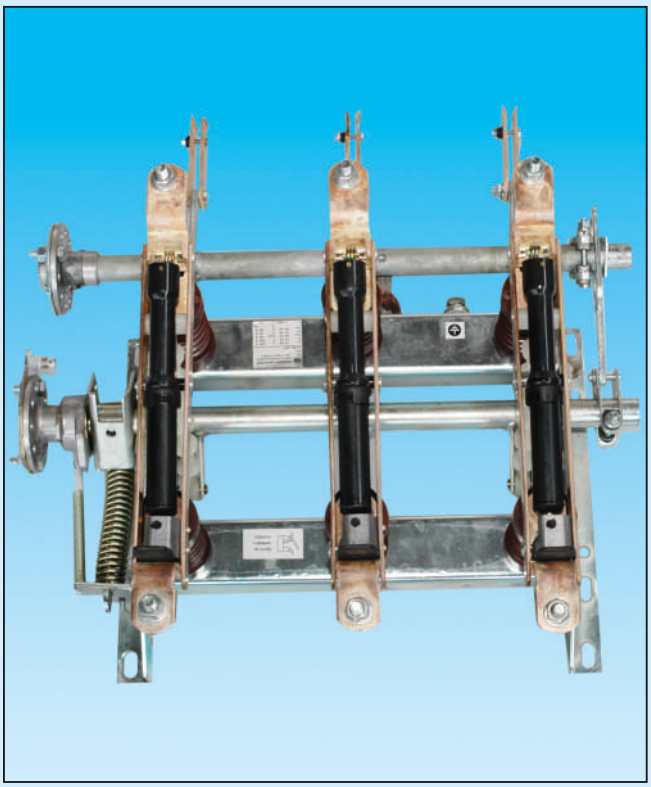
Pole centres

Depending on the application, the user can chose between various pole spacings, the technical data assigned must be observed.

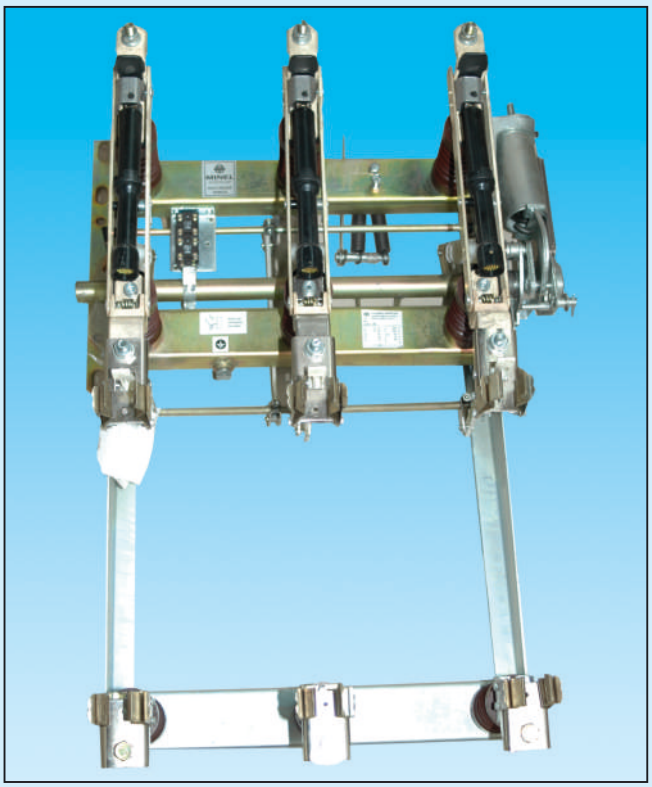
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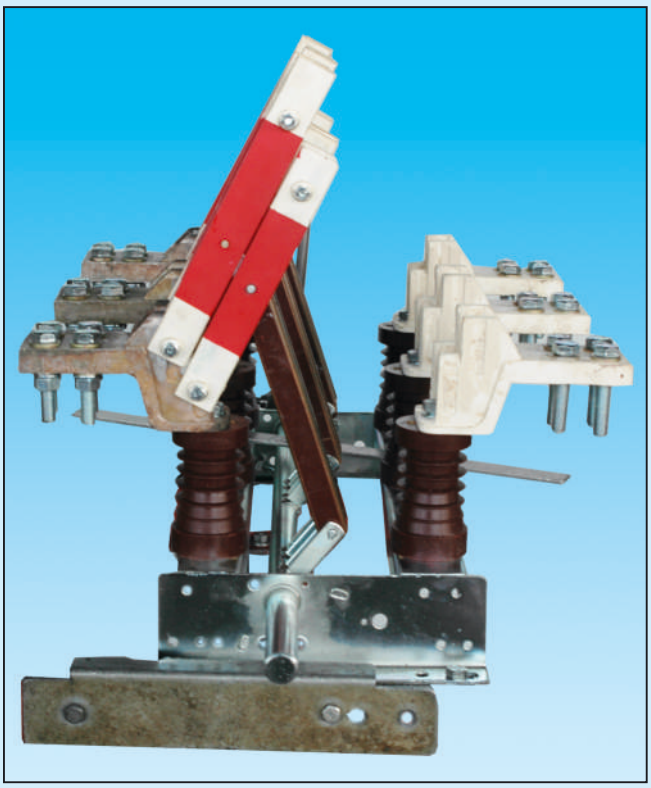
Pregled tipova
Overview of types



KLa 12; KLa 17,5; KLa 24; KLa 38



KLFa 12; KLFa 17,5; KLFa 24; KLFa 38



MRT-EUK-EOK 12; 17,5; 24; 38 kV/(630–4000 A)



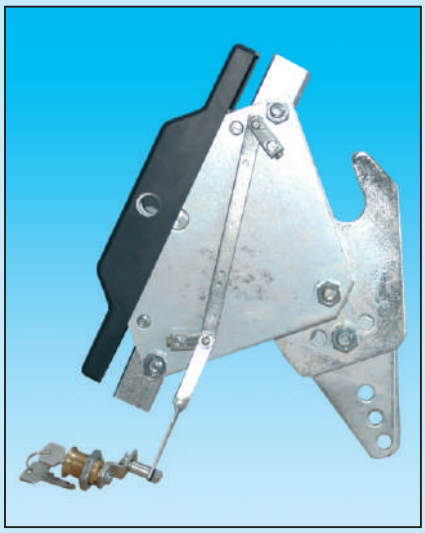
CMF 12/24-630-(150-180-210-250)

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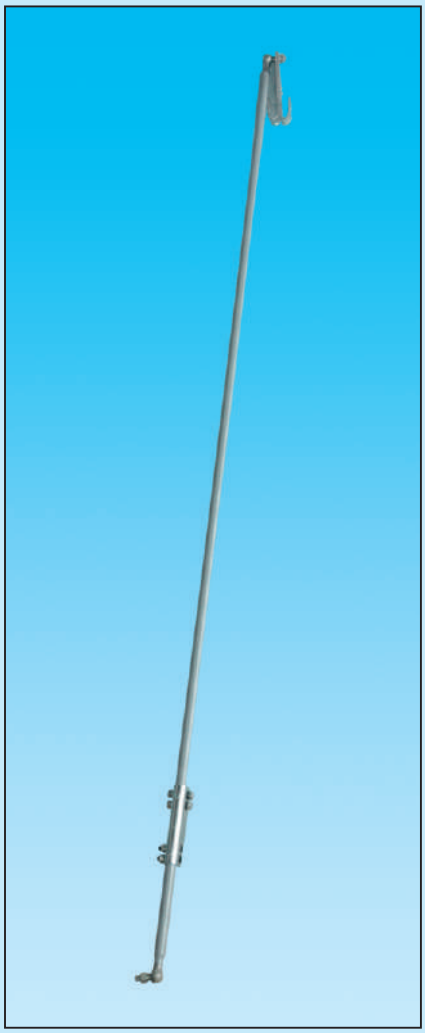
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Ručni pogon sa polužjem
Insertion – Lever actuator with Linkage

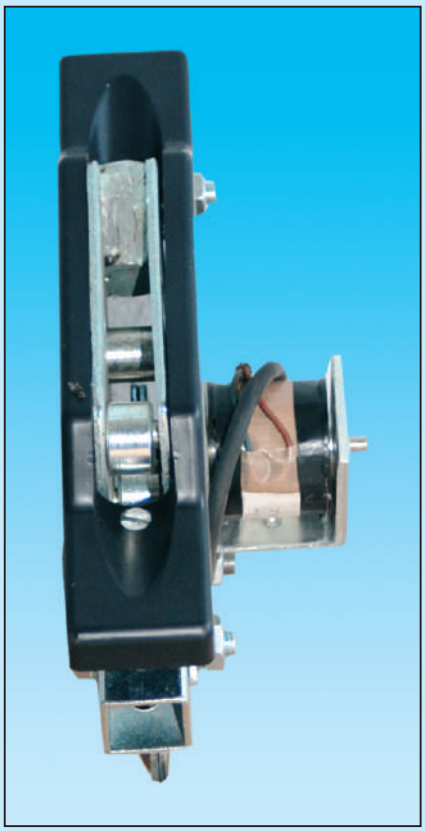
Tip RP 7
Type RP 7



RP 7.1,2 sa KO 10



Polužje PS-2; PR 2



RP 7.1,2 sa EMB

Polužni pogon omogućava pokretanje rasklopnih aparata pri zatvorenim vratima električnog postrojenja.
Za prenošenje sile služi polužje, koje se isporučuje u dužinama od 1500 mm i 2000 mm i može skraćivati sa jedne strane.
Pogonom se rukuje pomoću ručice sa kuglastom glavom koja se uvlači u odgovarajuće ležište u pogonu.
Posebna pogodnost ovog pogona je u tome, što on može da bude postavljen u ravni čeonih vrata postrojenja. Na mestu ležaja pogona mogu se postaviti brave kao i čeoni poklopci za zatvaranje izreza sa magnetnim držanjem. Više pogona mogu se postaviti jedan pored drugoga na najmanjem razmaku.

The insertion-lever actuator permits acruation on the switch from the front of the installation, with the doors glosed. Transmission is by means of a linkage rod (available in lengths of 1.500 and 2.000 mm), which can be shortened at one end. Actuation is by means of a lever which can be inserted fitted with a ball-head. The particular advantage of this system is that the front can be kept even. At the mounting point of the actuator a front plate with magnetic mounting can be fitted converting the slit, as well as an interiock laton. Several actuators can be arranged side by side in a very small space.

Tip Type	Tip rasklopnog aparata Switch type	b_1, b_2 [mm] 17,5 kV	24 kV	38 kV	
RP 7–T 1,5	EOK, EUK	90*	170*	230	b_1
RP 7–T 2	MRT, T, MRZ, RUK	130*	170*	230	b_2
RP 7–K 1,5 RP 7–K 2	EOK/E-1, EUK/E-1 KL, LTKE, KLF MRZ-E-1	116*	171*	271	b_2
S 50	Uklopna poluga Insertion lever				
KO–10	Cilindrična brava Cylindrical Lock				
MR–(24, 60, 110, 220 Vjss/DC) MWR–(110, 220, V ~/AC 50 Hz)	Elektromehanička blokada Electro-mechanical interlock				

* 42 mm manje kod aparata sa smanjenim podnosivim udarnim naponom.
* 42 mm less on equioment with reduced impulse level.

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Motorni pogon
Motorized actuator

Tip MN
Type MN

Sklopke-rastavljači mogu biti opremljeni sa motornim pogonom tipa MN, radi daljinskog rukovanja. Pogoni omogućuju i ručno pokretanje. Isporučuju se za razne pogonske napone koji su uobičajeni kao pomoćni naponi u razvodnim postrojenjima.

Pri narudžbini molimo da date tip i vrstu rasklopnog aparata na koji treba da se dogradi motorni pogon.

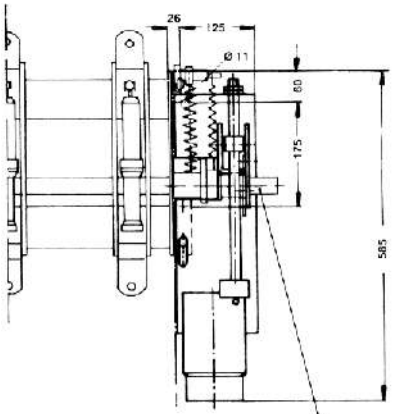
Load-break switches and isolating switches can be equipped with motirized actuators, type MN, for remote actuation. The actuators allow operation in an emergency. All common auxillary voltages are available as operating voltage.

When ordering, please specify the type of switchgear to which the actuator is to ve fitted.

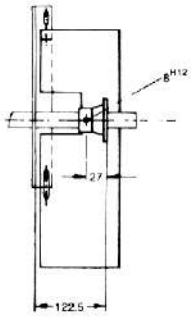
Tehnički podaci / Technical Data

Nazivni napon Voltage rating	Nazivna trajna struja Current rating	Nazivni obrtni momenat Nominal torque	Nazivna struja topljivih osigurača Recommended fuse current rating
24 V =	7,5 A	150 Nm	16 A
60 V =	3,0 A	150 Nm	6 A
110 V ≅	2,0 A	150 Nm	4 A
220 V ≅	1,1 A	150 Nm	2 A

Rasklopni aparati do 17,5 kV
Switch up to 17.5 kV



Dogradnja na rastavljač
Fitting to isolating switch



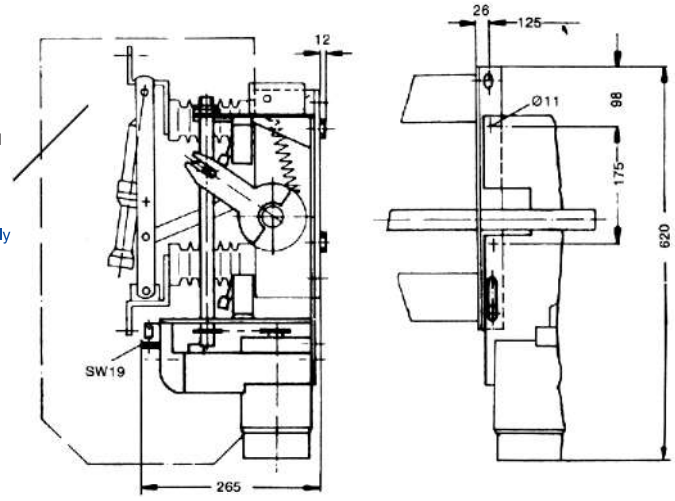
Kod rasklopnih aparata sa razmakom osa polova od 115, 135 i 175 mm, vratilo se sklapa sa baznom pločom.

At switches with 115, 135 and 175 mm pole-centre distances, the shift terminates at the baseplate.

Rasklopni aparati do 38 kV
Switch up to 38 kV

Pregrada između rasklopnog aparata i motornog pogona postavlja se samo kod 20/ 630-230 i 20/1250-320

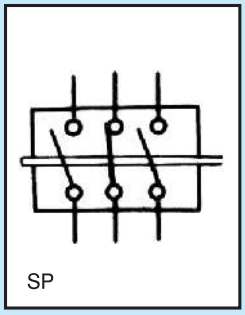
Insulating barriers between switch and motorized actuator only necessaty at type 20/ 630-230 and 20/1250-320



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Pomoćne signalne sklopke
Auxiliary switches

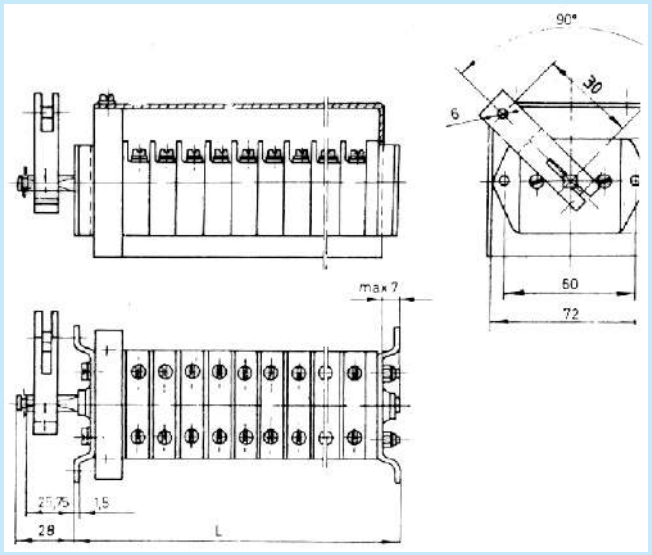


SP

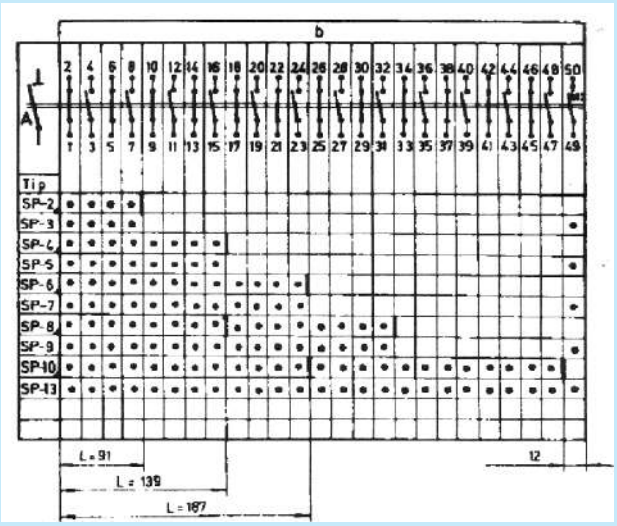


Pomoćne signalne sklopke
dograđene uz ručne pogone.

Auxiliary switches
fitted near by actuators.



Tehnički podaci Technical data	
Nazivni napon do Rated voltage up to	≅ 220 V
Trajna operativnost Longtrem loading	≅ 10 A
Rasklopna moć Switching power	= 2 A, ~ 10 A
Sa vremenskom konstantom With time constant	T ≤ 20 ms

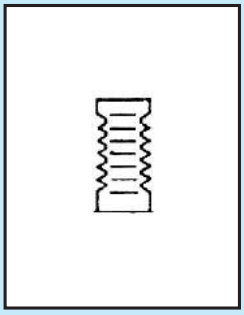


Pomoćne signalne sklopke dograđene direktno na postolja rastavljača	Auxiliary switches fitted directly on the base of isolating switches
Pomoćne signalne sklopke za sklopke-rastavljače, rastavljače	Auxiliary switches for load-break switches, isolating switches

Broj kontakata Number of contacts	Tipovi sklopki-rastavljača i rastavljača / Type for load-break switches and isolating switches					
	12 kV	12...17,5 kV	12 Kv	24 kV	24 kV	38 kV
	Nazivni napon / Rated voltage					
	630 A	630 A	1250...2500 A	630 A	1250 A	630... 1250 A
	sa rastojanjem ose polova (mm) / with pole centre (mm)					
	115,135	210,175	175,250	175,230,275	320	400
2	KH 12/1	KH 12/2	LH 12	KH 22	LH 22	LH 32
4	KH 14/1	KH 14/2	LH 14	KH 24	LH 24	LH 34
6	KH 16/1	KH 16/2	LH 16	KH 26	LH 26	LH 36
8	KH 18/1	KH 18/2	LH 18	KH 28	LH 28	LH 38
10	–	–	–	KH 210	LH 210	LH 310
12	–	–	–	KH 212	LH 212	–

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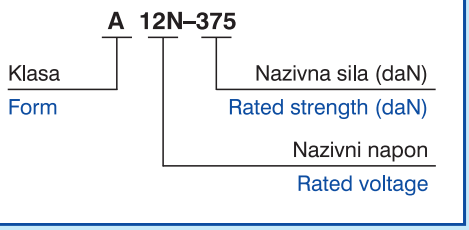


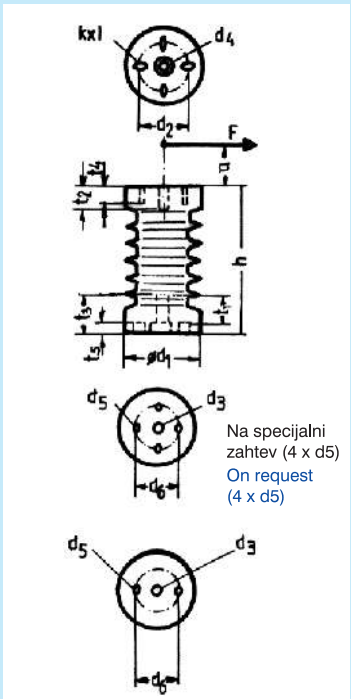
Izolacione potpore
Supporting insulators

12...38 kV

$$Fx = F\frac{2a}{a+x} \qquad \text{za } x \geq a \quad \text{for}$$

$$Fx = F\frac{h+a}{h+x} \qquad \text{za } x \leq a \quad \text{for}$$





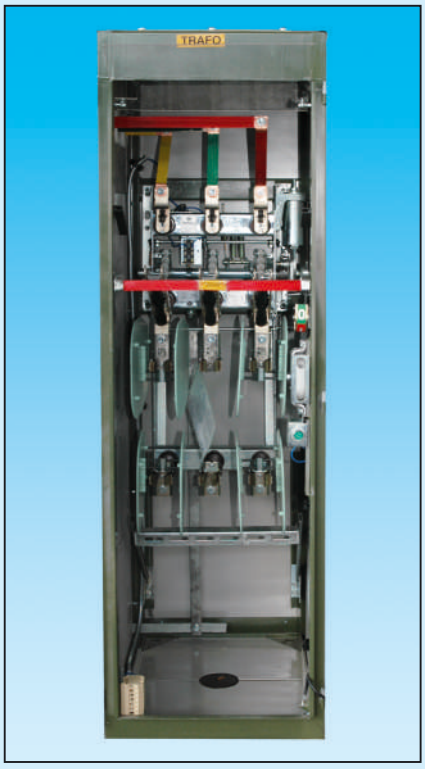
Nazivni napon Rated voltage kV	Tip Type DIN 48 136	Naz. podn. atm. udatni napon Basic impulse level kV	Nazivna sila Rated strength F N	h	a	ød1	d2	d3	d4	d5	d6	t1	t2	t3	t4	t5	k x l	Broj rebara Nimber of ribs	Oznaka Mark
12	A 12N-375	85	3750	130	30	56	38	M10	M16	M6	36	26	15	30	9	8	6,5 x 8	5	EMA 12
	A 12N-500		5000			61													SAG 12
	B 12N-750		7500		40	82	45	M16	M20	M10	46		25	44	12				EMB 12
	B 12N-1000		10000			77													SBG 12
	C 12N-1250		12500		50	100	55				66			49					EMC 12
	C 12N-1600		16000			91													SCG 12
24	A 24N-375	125	3750	210	30	65	45	M10	M16	M6	36	26	15	44	9	8	6,5 x 8	8	EMA 24
	A 24N-500		5000			75													SAG 24
	B 24N-750		7500		40	80	50	M16	M20	M10	46		25	49	12				EMB 24
	B 24N-1000		10000			86													SBG 24
	C 24N-1250		12500		50	105	60		M24		66	35		58			8,4 x 10		EMC 24
	C 24N-1600		16000			100													SCG 24
38	A 38N-375	170	3750	300	30	79	45	M10	M16	M6	36	27	15	45	9	8	6,5 x 8	11	EMA 38
	A 38N-500		5000			82													SAG 38
	B 38N-750		7500		40	93	60	M16	M24	M10	46	35	25	53	12		8,4 x 10		EMB 38
	B 38N-1000		10000			98													SBG 38
	C 38N-1250		12500		50	105	70		M30		66	41		59					EMC 38
	C 38N-1600		16000			115													SCG 38

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Razvodno polje
Cubicle





Trafo polje KLFa



Trafo polje CMF

Polja su »Tipski ispitana« prema propisima VDE 0670 deo 6 odnosno IEC 298. Izvođenje uzemljenja odgovara VDE 0141.

Konstrukcija polja

Razvodno polje sastoji se iz jedne samonoseće, čvrste, varene konstrukcije iz profila, koja ostvaruje transportnu sigurnost i dobru električnu vezu. Postolje sadrži noseće profile za ugradnju sklopki-rastavljača i zemljospojnika.

Za priključak uzemljenja unutrašnjeg prostora predviđen je odgovarajući priključni vijak.

Rasterećenje pritiska

Sastoji se iz poklopca od pocinkovanog čeličnog lima koji odozgo zatvara polje, tako da pri normalnom pogonu reducira ulaz iz prašine. U slučaju pojave električnog luka usled kvara otvara se poklopac kao membrana.

Vrata polja

Za zatvaranje prednje strane služe vrata od čeličnog lima, sa prozorom za kontrolu stanja uključenja pokazivača kratkog spoja. Radi obuzdavanje udara od pritiska, nastalog u slučaju pojave električnog luka pri kvaru, vrata polja su opremljena posebnom bravom otpornom na pritisak. Ona drži vrata čvesto zatvorena ne samo delimično nego po celoj visini, kako na strani šarki tako i na strani zatvaranja.

The cubicles are type-tested in accordance with VDE 0670, part 6 and IEC 298. The earthing system is designed as per VDE-specifications 0141.

Konstrukcija polja

The cubicles is provided in a self supporting distortion-free sheet steel enclosed design made of angular irons in weldwd construction, which guarantees transport safety and best electrical contact.

The cubicle contains holding-profiles for the mounting of the loadbreak and earthing switches. For connection of the indoor-earthing a suitable bolt is provided.

Konstrukcija polja

The top cover in form of a preddure-relief flap can provided on request. It is made of galvanized sheet steel and prevents entry of dust and similar particles under normal service conditions. In case of an arc inside of the cubicle the flap will open.

Cubicle door

The sheet steel front door is provided with a viewing glass to observe the position of the switch and the shortcircuit indicators. A pressure proof doo-locking-system as shown aside ensures protection even under internal arcing conditions.

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Podaci o razvodnim poljima
Data of the cubicles

Tip polja Cubicle type	Sklopka-rastavljač Load break switch	Zemljospojnik Cubicle type	Težina oko Weight about kg	Širina Width mm	Dubina Depth mm	Visina priključka Height of connection bolts mm
Podaci o razvodnim poljima 12 kV Data of the switchboards for 12 kV	Lista 2 BIL 75 kV	Visina 1800 mm Cubicle height 1800 mm	Polja za nepristupačne prostorije Cubicles for non-accessible rooms			
Izvodno polje Incoming/outgoing cubicle HGKN 12 kV	KLa 12/630-135-EUK CM 12/630-150 EUK			550	735	
Transformatorsko polje Transformer protection cubicle HGKN 12 kV	KLFa 12/630-135-SU CMF 12/630-150 SU			550	735	
Podaci o razvodnim poljima 12 kV Data of the switchboards for 12 kV	Lista 2 BIL 75 kV	Visina 1800 mm Cubicle height 1800 mm	Polja za pristupačne prostorije Cubicles for accessible rooms			
Izvodno polje Incoming/outgoing cubicle HGKN 12 kV	KLa 12/630-175-EUK CM 12/630-180 EUK			700	735	
Transformatorsko polje Transformer protection cubicle HGKN 12 kV	KLFa 12/630-175-SU CMF 12/630-180 SU			700	735	
Spojno polje Bus tie cubicle HGKN 12 kV	KLa 12/630-175-EUK			700	735	
Podaci o razvodnim poljima 24 kV Data of the switchboards for 24 kV	Lista 2 BIL 75 kV	Visina 2000 mm Cubicle height 2000 mm	Polja za pristupačne prostorije Cubicles for accessible rooms			
Izvodno polje Incoming/outgoing cubicle HGKN 24 kV	KLa 24/630-230-EUK CM 12/630-210-250 EUK			900 (800) 750	1025 735	
Transformatorsko polje Transformer protection cubicle HGKN 24 kV	KLFa 24/630-230-SU CMF 12/630-210-250 SU			900 (800) 750	1025 735	
Spojno polje Bus tie cubicle HGKN 24 kV	KLa 24/630-230-EUK			900 (800)	1025	

ZNAČENJE OZNAKA:

- Z Standardno polje za dovod i odvod
- T Transformatorsko polje
- G Spojno polje (uzdužno rastavljanje sabirnica)
- M1 Merno polje u kombinaciji sa spojnim poljem
- M2 Merno polje u sabirnicama

SYMBOLS USED IN TYPES:

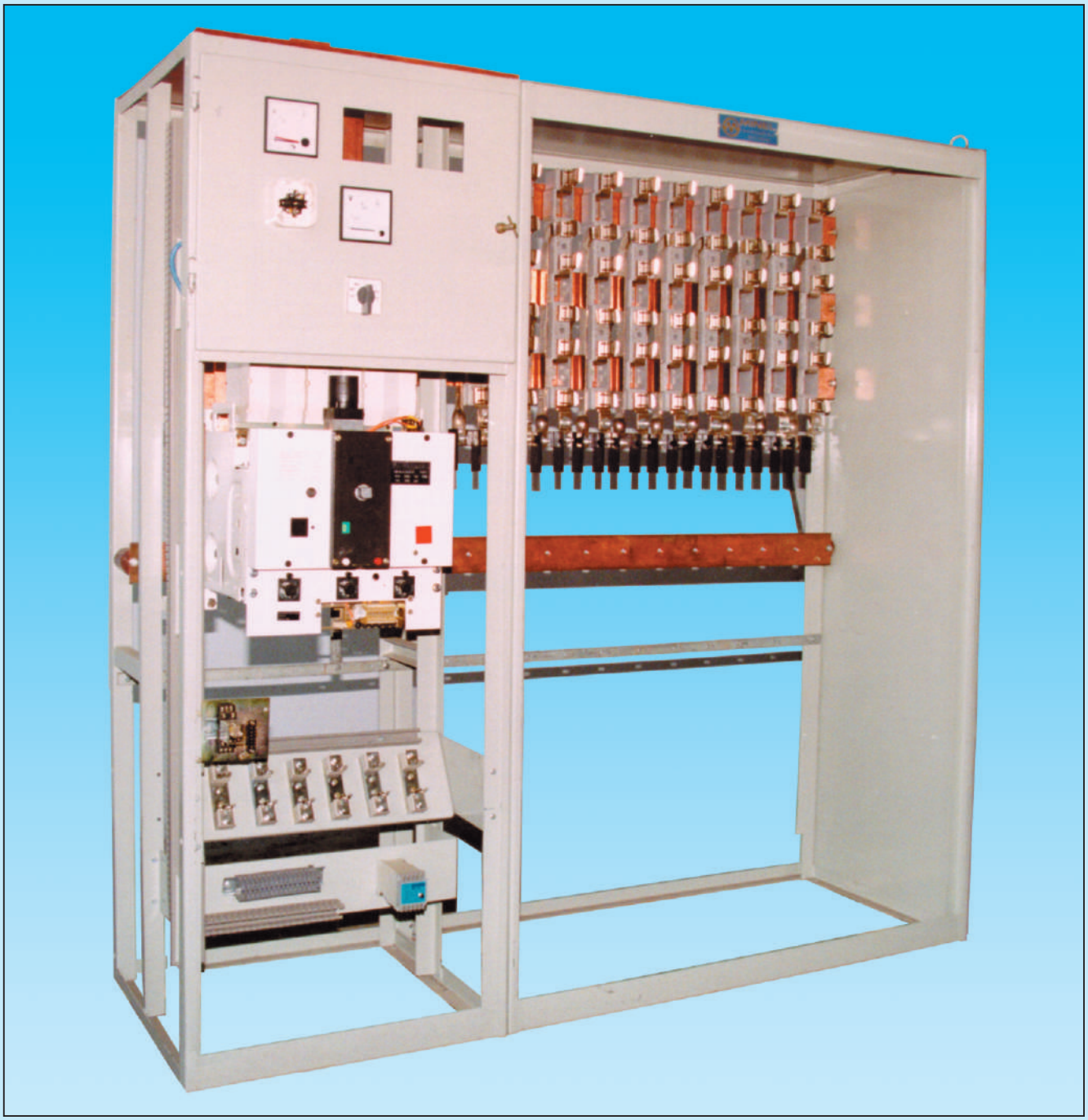
- Z Standard cubicle for incoming/outgoing feeder
- T Transformer protection cubicle
- G Bus-Tie cubicle
- M1 Metering cubicle in combination with G above
- M2 Metering on the same busbars

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NISKONAPONSKA RAZVODNA POSTROJENJA

za TS 10/0,4 kV



Opšte

Niskonaponske razvodne table predstavljaju veoma značajan element u rešavanju razvoda el. energije u distributivnim i industrijskim TS reda 24/10/0,4 kV. Izrađuju se za struje dovoda do 3000 A sa i bez kompenzacije i javne rasvete. Ramovi su varene konstrukcije i zaštićeni farbom RAL 7032 kao i vrata i stranice.

Niskonaponske razvodne table moraju se odlikovati:

– pogonskom sigurnošću i funkcionalnošću

– jednostavnim priključkom dovoda i odvoda

– što manjim dimenzijama

– što kraćim vremenom izrade

– lakim transportom i brzom montažom na terenu.

Niskonaponske razvodne table se montiraju od ramova za trafo (dovodno polje, izvodno (razvodno) polje, polja javne (spoljašnje) rasvete, spojnog polja i polja kompenzacije. Table mogu biti otvorene, poluotvorene i zatvorene čime se postiže stepen zaštite po IEC 144 i IEC 529 od IP 00 do max. IP 41.

Oznake karakterističnih polja

T – trafo (dovod)

I – izvodno (odvodno)

S – spoljna (javna) rasveta

Sp – spojno polje

K – kompenzaciono



TI sa MST – 1000 A tip EDB

Niskonaponska razvodna tabla – TI 10/0,4 kV

T – trafo polje sa MST–1000 A

dimenzije 520 x 500 x 1800 mm

I – izvodno polje sa osiguračkim letvama

dimenzija 880 x 500 x 1800 mm

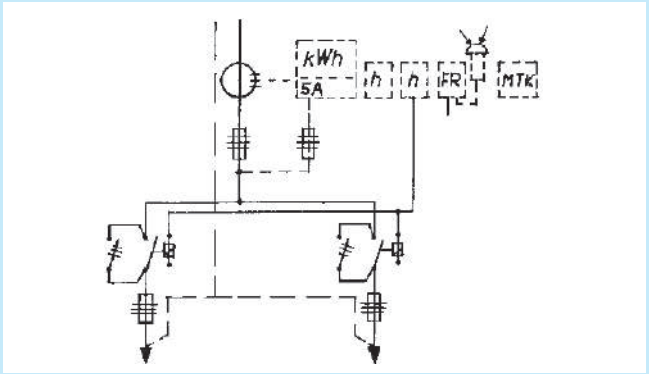
Koriste se za distributivni razvod 12/24/0,4 kV sa maksimalnim presekom sabirnica ECU 100 x 10 mm. NN table mogu biti delimično otvorene, samo sa prednje strane i potpuno zatvorene.

Nazivni napon 660 V, nazivna struja do 1000 A.

Po želji izvodno i trafo polje mogu se montirati (izvodno levo ili desno od trafo polja).



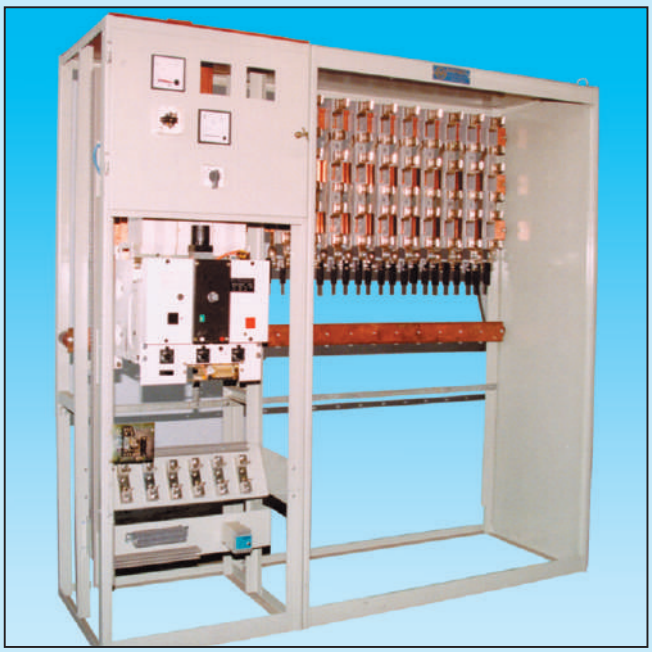
TIS sa MST – 1000 A



Jednopolna šema javne rasvete

Kombinacijom ovih polja može se montirati i NN razvodna tabla TISpITS ili STISpIT gde je

Sp – spojno polje čije su dimenzije kao i trafo polje
520 x 500 x 1800 mm



LH-1600 A

Niskonaponska razvodna tabla – TIS 10/0,4 kV

T – trafo polje sa MST–1000 A
dimenzije 520 x 500 x 1800 mm

I – izvodno polje sa osiguračkim letvama
dimenzija 880 x 500 x 1800 mm

S – spoljna (javna) rasveta koja može biti:
– sa merenjem i bez nerenja
– polunoćna i celunoćna
– 1 x 63 A; 2 x 63 A i 3 x 630 A
– 1 x 100 A; 2 x 100 A i 3 x 100 A
dimenzije 520 x 500 x 1800 mm

Kombinacija T, I i S polja s leva na desno montira se prema želji.

Niskonaponska razvodna tabla – TI 10/0,4 kV

T – trafo polje sa LH–1600 A
dimenzija 620 x 600 x 1800 mm

I – izvodno polje sa osiguračkim letvama

10 i 12 kom. dimenzija 1180; 1380 x 600 x 1800 mm

Može se dodati polje za javnu rasvetu ili kompenzaciono polje adekvatnih dimenzija trafo i izvodnom polju.

Nazivni napon 660 V; nazivna struja 1600 A

Zaštita IP41

Redosled polja po izboru s leva na desno.

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U trafo polju DU-1250 A i DV-1250 A ili DV-1600 A

Niskonaponska razvodna tabla – T_{DU} I_{OSL}10/0,4 kV

T_{DU1250} – Trafo polje sa DU(DV)-1250 A
dimenzija 570 x 535 x 1950 mm

I_{OSL} – Izvodno polje sa OSL-400 A letvama
dimenzija 880 x 535 x 1950 mm

$T_{DU\ 1250/1600}$ – Trafo polje sa DV-1250/1600 A
dimenzija 630 x 600 x 1950 mm

I_{OSL} – Izvodno polje sa osiguračkim letvama od 400 A
dimenzija 880 x 535 x 1950 mm

- Nazivni napon 660 V; nazivna struja do 1600 A
- Zaštita IP41
- Može se dodati levo ili desno polje javne rasvete i kompenzaciono polje
- Maksimalni presek sabirnica 100 x 10 mm za struje do 1600 A

Napomena: U trafo polju pored MST-1000 A, DU-1250 A, DV-1250 A i DV-1600 A mogu se montirati:

1) NN sklopka za unutrašnju montažu NSR 0,4/630 i NSR 0,4/1250 A proizvodnje »Elektrošumadija« – Mladenovac;
2) NN prekidač Record DG30A i D 800 A proizvodnje »Schrack« – Beč
3) NN kompaktni prekidači A4-1 (800 A); A5 (1000 A) bez ili sa okidačima naponskim, termičkim, magnetnim itd. proizvedeno po licenci SACE – Bergamo u saradnji sa EAZ – Plovdiv.



U trafo polju DV-1250 A ili DV-1250 A
Izvodno polje sa KS-3 (400A)

Niskonaponska razvodna tabla
– $T_{DU(DV)\ 1250A}$ I_{KS-3} – 10/0,4 kV

$T_{DU(DV)}$ – trafo polje sa DV-1250 A
dimenzije 570 x 535 x 1950 mm

$I_{KS-3(400A)}$ – izvodno polje sa kompaktnim prekidačima KS-3 (400A) 4, 6, 8 kom.

Može se montirati NN tabla:

1) T_{DU} I_{KS-3} S_2 x 63 A ili T_{DV} I_{KS-3} S_2 x 100 A
2) $S_{63(100A)}$ T_{DU} I_{KS-3} S_{PDV} I_{KS-3} T_{DV}

S_{PDU} – spojno polje sa DU(DV) – 1250 A
dimenzija 570 x 535 x 1950 mm

$S_{2\ x\ 63(100)A}$ – javna (spoljna) rasveta
dimenzija 420 (520) x 535 x 1950 mm



Kondenzatorsko polje

Kompenzaciono (kondenzatorsko) polje 0,4 kV

Sa dimenzijama rama u zavisnosti od broja kondenzatorskih baterija tj, ukupne reaktivne snage potrebne pogonu.

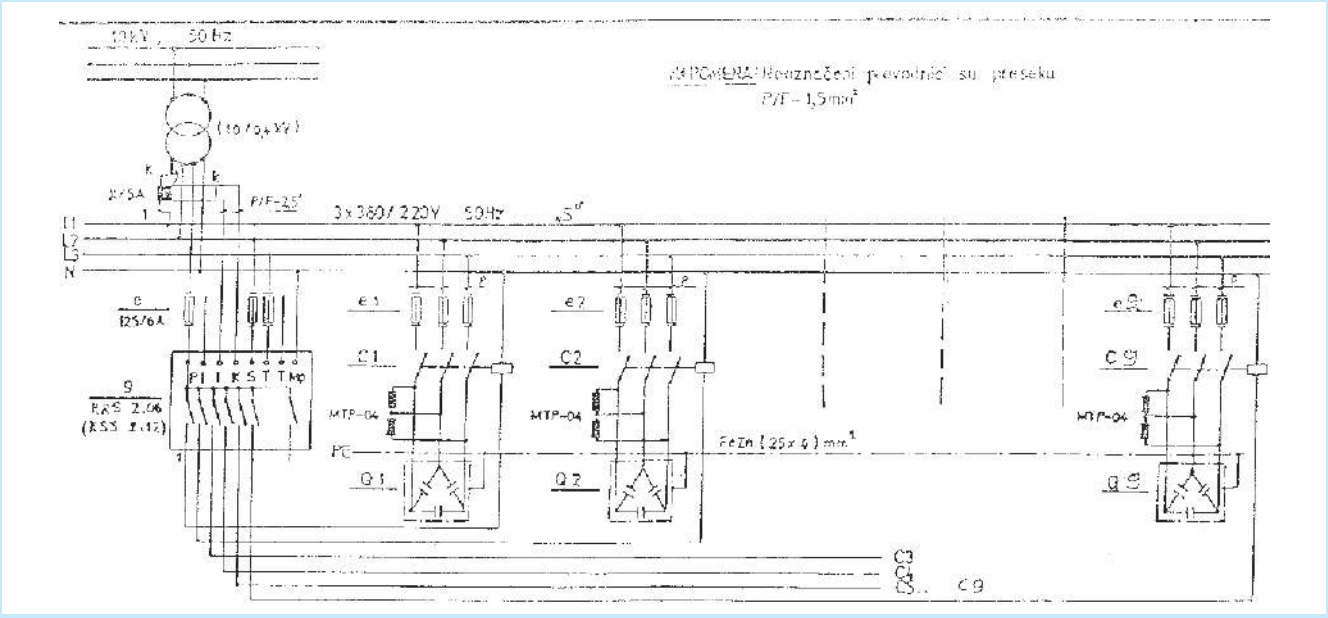
Primer: za 7 x 25 kVAr-a

dimenzije rama su 700 x 535 x 1950 mm

Podaci za naručivanje

Pri naručivanju je potrebno navesti:

- Jednopolnu šemu NN razvoda, definisanim tipom aparata u dovodima i izvodima
- Prenosni odnos strujnih mernih transformatora
- Vrstu pogona aparata (ručni, motorni)
- Merenje
- Vrstu priključka u poljima (šinama, kabovski, odozgo, odozdo)
- Vrsta table (otvorena, poluotvorena, zatvorena)
- Stepen zaštite



Broj i snaga regulacion. stupljeva	Ukupna snaga	Napojni kabl	Q	e	C	S	P	Napomena
Kom. x kVAr	kVAr	mm^2	Tip	A	Tip	mm^2	mm^2	
6 x 10	60	3 x 25 + 10	PTK 10	125/25	DSL 23	20 x 5	P / M 4	
8 x 10	80	3 x 35 + 16	PTK 10	125/25	DSL 23	20 x 5	P / M 4	
12 x 10	120	3 x 70 + 35	PTK	125/25	DSL 23	20 x 5	P / M 4	
6 x 20	120	3 x 25 + 10	PTK 20	125/50	DSL 43	20 x 5	P / M 6	
9 x 20	160	3x120 + 70	PTK 20	125/50	DSL 43	30 x 5	P / M 6	
6 x 30	180	3x150 + 70	PTK 30	125/80	DSL 63	30 x 5	P / M 10	
8 x 30	240	3x240 + 120	PTK 30	125/80	DSL 63	30 x 5	P / M 10	
3 x 40	120	3x70 + 35	PTK 40	125/100	DSL 93	20 x 5	P / M 16	
4 x 40	160	3x120 + 70	PTK 40	125/100	DSL 93	30 x 5	P / M 16	
3 x 50	150	3x120 + 70	PTK 50	125/125	DSL 113	30 x 5	P / M 25	
4 x 50	200	3x185 + 95	PTK 50	125/125	DSL 113	30 x 5	P / M 25	

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Limeni priključni i razvodni ormari

Limeni priključni i razvodni ormari svojom izradom odgovaraju svim zahtevima u pogledu zaštite razvodnih uređaja, instrumenata, aparata i opreme od vlage i isparavanja raznih tečnosti, prašine i mehaničkih oštećenja.

Osobine limenih ormana su:

– sigurnost pogona

– lako rukovanje

– jednostavnost montaže

– preglednost i brzo otklanjanje kvarova

– niska cena.

Limeni ormani prave se od dva puta dekapiranog lima debljina 1–2 mm i farbaju se tipskom bojom RAL 7032.

Ormani kućnih priključaka su konstruktivno rešeni za montažu u zid, a ako je priključni orman i merni montiraju se pored osigurača i brojila aktivne ili aktivne i reaktivne energije, uklopni sat ili MTK i merna letva zavisno od naručioca i priključne kleme za dovod napojnog kabla.

Oprema koja se ugrađuje, postavlja se na osnovnu ploču koja može biti i od dekapiranog lima debljine 2 mm ili pertinaksa, zavisno od vrste opreme i uređaja koji se ugrađuju. Zajedničko za ormane mernih grupa i ormane kućnog priključka je da se na vratima nalazi sigurnosno staklo koje omogućava dobar pregled brojila.

Ormani mernih grupa prema svojoj nameni dele se na:

– NN – orman mernih grupa

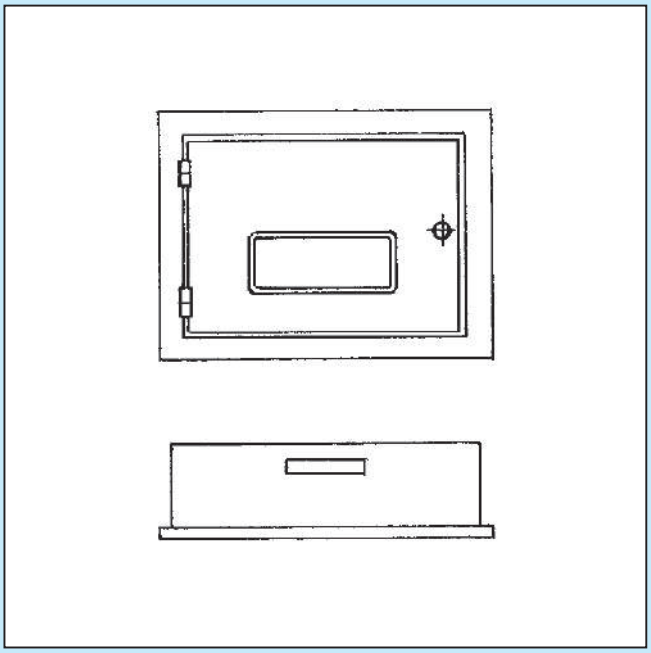
– VN – orman mernih grupa.

Ovi ormani se rade za montažu u zid a dimenzije su date pored slika. Na zahtev kupca ormani se mogu raditi i po drugim dimenzijama.

– stepen zaštite IP44

– Nazivni napon 220/380 V

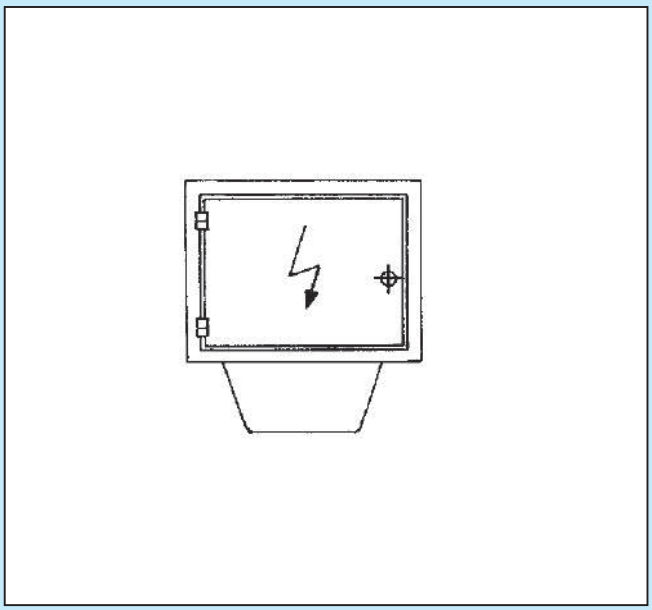
– Nazivna struja do 250 A



1. Kablovski priključni orman Tip KPO-M1

dimenzije 600 x 500 x 200 mm

za struje od 6 ÷ 125 A



2. Kablovski priključni orman

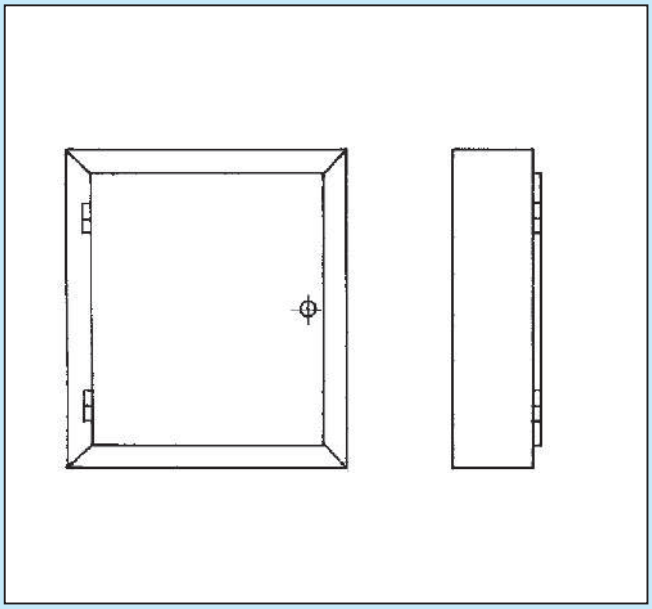
1. Tip KPO M2–1

sa osiguračima od 63 A

dimenzije 300 x 250 x 150 mm

2. Tip KPO M2–2

sa NV osiguračima od 125 A



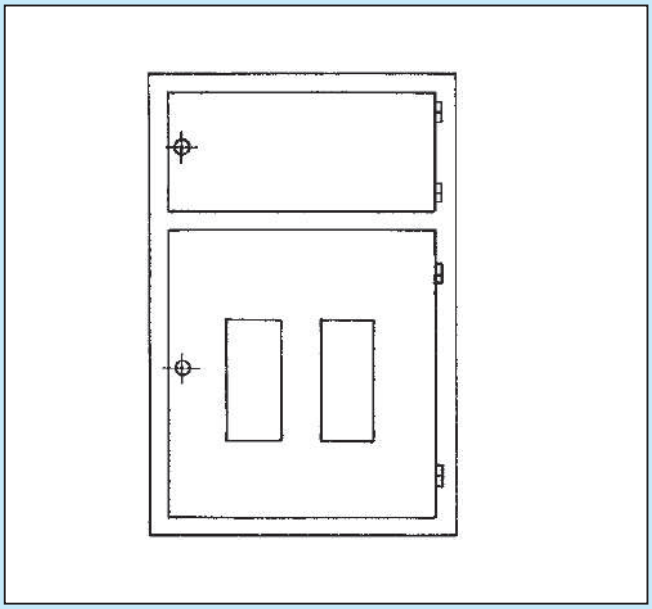
3. Kablovski priključni orman

Tip KPO-M1

dimenzije

1) 300 x 300 x 130 mm

2) 300 x 400 x 130 mm

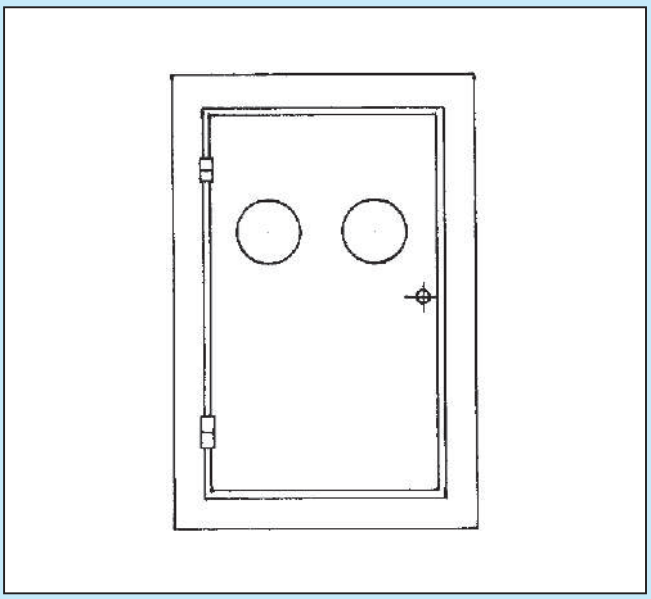


4. Kablovski priključni orman

Tip KPO M4–1 dimenzija 423 x 630 x 200 mm

M5-1 dimenzija 380 x 630 x 200 mm

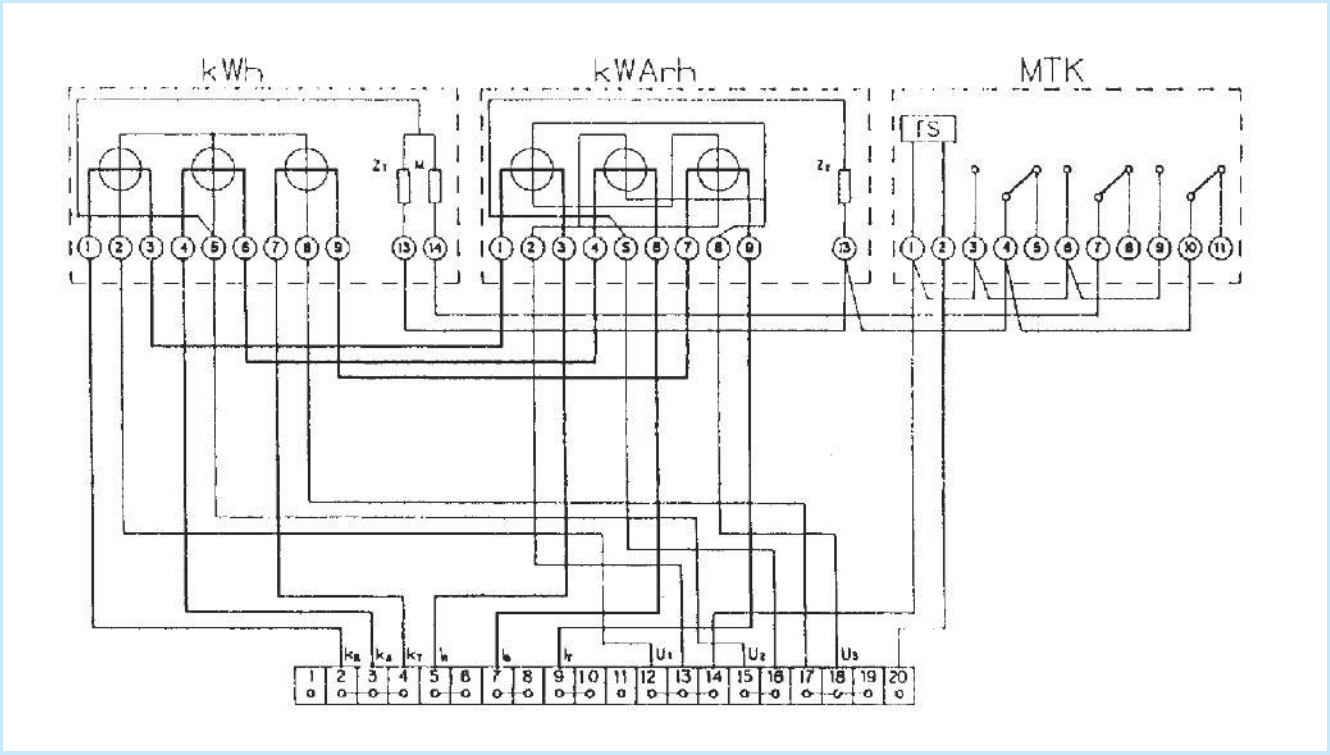
M5–2 dimenzija 565 x 630 x 200 mm



5. Kablovski priključni orman Tip KPO – M6

– KPO – M6–1 dimenzija 400 x 650 x 200 mm sa jednim brojilom i MTK (uklopni sat)

– KPO – M6–2 dimenzija 600 x 650 x 200 mm sa dva brojila i MTK (uklopni sat)



Jedna od šema mernih grupa

Podaci za naručivanje:

Po želji naručioca vršimo projektovanje i izradu ormana a narudžbenica treba da sadrži sledeće podatke:

– napon, struju i frekvenciju

– jednopolnu ili tropolnu šemu

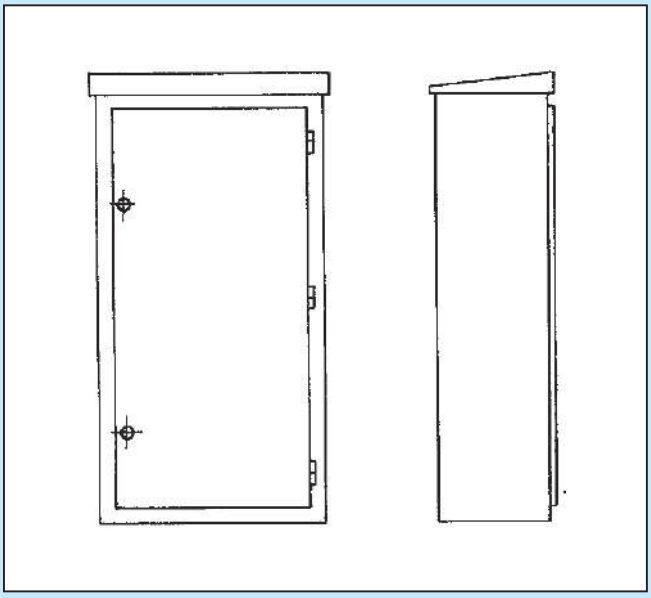
– raspored i vrstu dovoda odnosno odvoda

– podatke o prostoriji gde će se orman montirati

– posebne zahteve ako ih ima

– boja ormana

– rok isporuke



Niskonaponski ormar za STS 10/0,4 kV

– izrađuje se od limova debljine 2 i 3 mm varene konstrukcije, ofarban bojom RAL 7032 nijanse po želji naručioca.

– izrada je u dve veličine i to:

1. za ormar sa MST 1000 A i MST 400 A i 4 izvoda bez merne grupe i javne rasvete dimenzija 900 x 400 x 1140 mm
2. za ormar sa MST 1000 A i MST 400 A i 4 izvoda kao i sa mernom grupom i javnom rasvetom dimenzija 900 x 400 x 1540 mm

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OQS

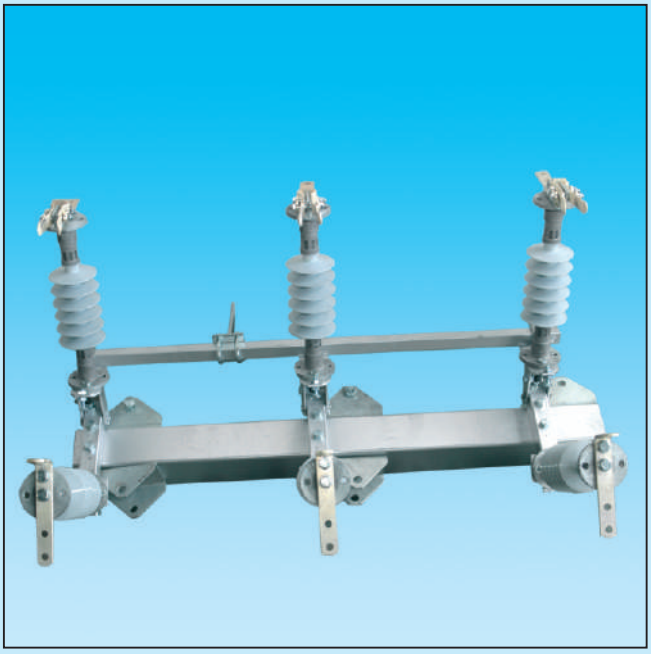
MINEL

RASKLOPNI APARATI DO 38 kV
SWITCHES UP TO 38 kV
APPAREILS DE CONNEXION JUSQU'À 38 kV

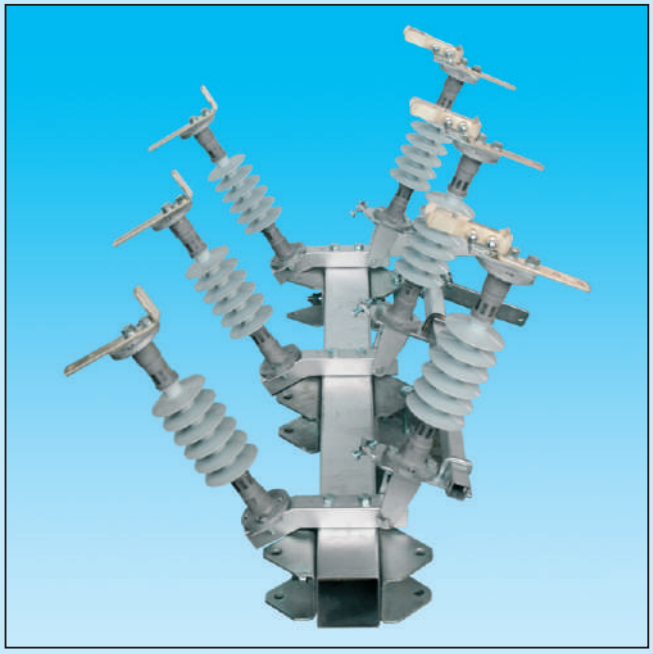
- RASTAVLJAČI
- SKLOPKE RASTAVLJAČI
  12–24 kV; 200–630 A
  Tip RS

- DISCONNECTORS
- SWITCH-DISCONNECTORS
  12 to 24 kV; 200 to 630 A
  Type RS

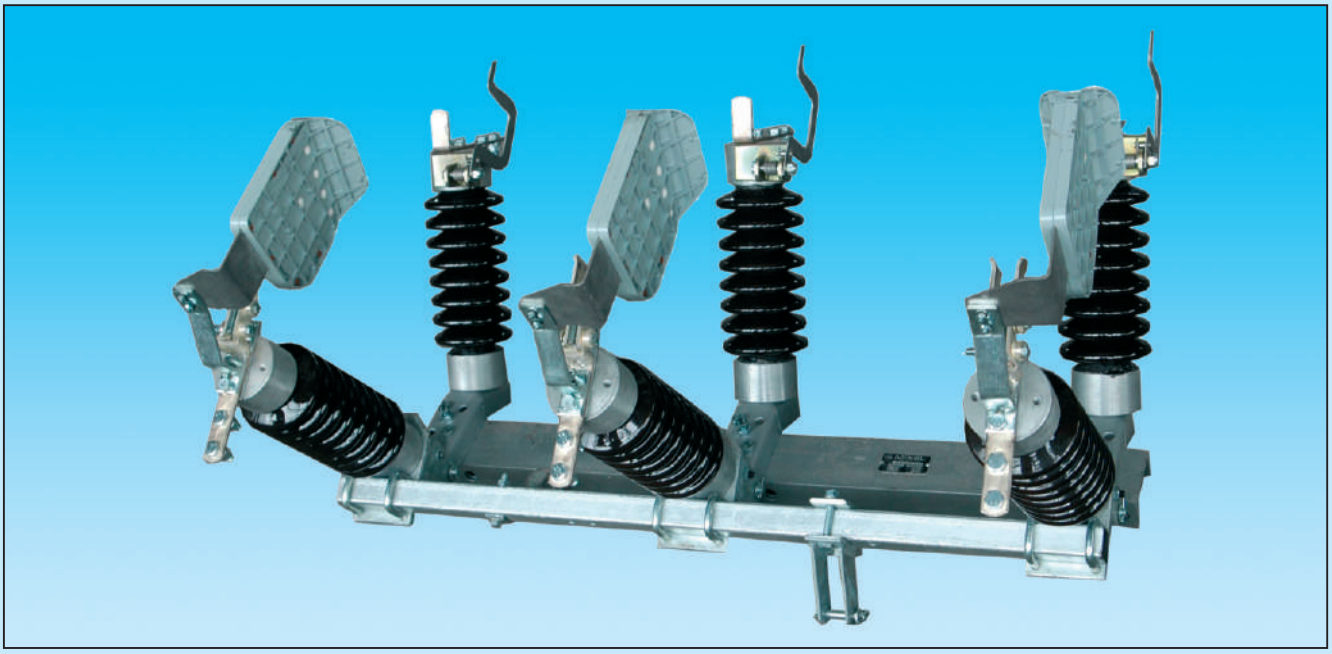
- SECTIONNEURS
- SECTIONNEURS-INTERRUPTEURS
  12–24 kV; 200–630 A
  Type RS



RS-24/(200 A – 630 A)–500



RS-24/(200A – 630 A)–500



RSK2-24/(200 A ÷ 630 A)–500

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OPIS

Tropolni rastavljači serije RS su namenjeni za otvorene prostore.
Koriste se za sekcionisanje i izolovanje pridruženih aparata u mrežama za elektrifikaciju.
Ukoliko je potrebno, mogu se koristiti i za prekidanje opterećenja kada im se ugrade dodatni uredaji.
Izrađeni su i ispitani prema preporukama IEC 129 i 265.

OSNOVNE KARAKTERISTIKE

- Velika pogonska sigurnost
- Velika dinamička i termička čvrstoća
- Kompaktna konstrukcija
- Izbor izolacionih potpora
- Izbor prekidanja opterećenja
- Ručna ili elektromotorna komanda
- Blokiranje krajnjeg položaja
- Pogonska poluga snabdevena izolatorom
- Izbor blokade sa drugom opremom
- Dogradnja zemljospojnika
- Dogradnja nosača VV osigurača
- Horizontalna i vertikalna montaža

KONSTRUKCIJA

Rastavljač serije RS sastoji se od tri pola sa dva izolatora po polu na zajedničkom postolju, platforme za noseći slub, osovinom za tropolno pokretanje i pogona sa polužjem.

• Metalni delovi

Svi metalni delovi rastavljača i pribora za pokretanje i povezivanje izrađeni su od profilisanog čelika vruće pocinkovanog ili od antikorozivnog materijala.

• Strujno provodne komponente

Izrađeni su od tvrdo vučenog visokoprovodnog profilisanog bakra i presvučeni sa srebrom po površini kontakata.

• Izolacione potpore

Izrađene su od tvrdog porcelana, spolja braon glaziran ili silikona.
Odgovaraju propisima u pogledu mehaničkih i dielektričnih karakteristika.
Za normalne atmosferske uslove izrađuju se sa puznom stazom 20 mm/kV. Na poseban zahtev za zagađene uslove 22 mm/kV, za vrlo zagadene 31 mm/kV prema IEC 815.

DESCRIPTION

Three-pole disconnectors series RS for outdoor installation are used for sectioning and isolating of associated devices in power distribution networks.
If required they can be also used for switching loads provided the auxiliary devices are fitted.
They are manufactured and tested according to IEC 129 and 265.

MAIN CHARACTERISTICS

- High service reliability
- High dynamic and thermal strenght
- Compact design
- Choice of insulating supports
- Choice of load switching
- Manual or motor drive
- Locking in end position
- Operating lever with insulator
- Choice of interlocks with other equipment
- Fitting of earthing switch
- Fitting of VV fuse carriers
- Horizontal or vertikal installation

DESIGN

Disconnectors series RS consist of three poles with two insulators per pole on common base, platform for supporting post, three-pole drive shaft and drive mechanism with drive linkage.

• Metal parts

All metal parts of disconnector and drive mechanism are made of hot dip galvanized steel profiles or of non-corrosive material.

• Current-carrying parts

Curent-carrying parts are made of hard-drawn high-conductance copper profiles and silver plated on contact areas.

• Insulating supports

Insulating supports are made of brown glazed hard porcelain and silikon.
Their mechanical and dielectric properties comply with the relevant standards.
For normal atmospheric conditions creepage distance is 20 mm/kV. On special request insulating supports for polluted atmosphere with creepage distance 25 mm/kV or for very high pollution with 31 mm/kV can be supplied, according to IEC 815.

DESCRIPTION

Les sectionneurs tripolaires de série RS sont destinés à l'air extérieur. Ils sont utilisés pour sectionnement et isolement des appareils connectés dans le réseau d'électrification.
S'il est nécessaire, ils peuvent être utilisés pour coupure des charges de ligne en ajoutant les dispositifis complémentaires.
Ils sont construits et essayés selon les recommandations CEI 129 et 265.

CARACTERISTIQUES PRINCIPALES

- Grande securité de commande
- Grande dureté dynamique et thermique
- Construction compacte
- Choix des supports isolants
- Choix de coupure de charge
- Commande manuelle ou à moteur électrique
- Verrouillage de la position extrême
- Levier de commande équipé d'un isolateur
- Choix de verrouillage par autre équipement
- Incorporation de commutateur à terre
- Installation du porte-fusible type VV
- Montage horizontal et vertical

CONSTRUCTION

Le sectionneur de séries RS est composé de trois pôles avec deux isolateurs par pôle sunun châssis commun, d'une plate-forme pour support portant, d'un levier à actionnement tripolaire et de la commande avec tringlerie.

• Pièces métalliques

Toutes les piéces métalliques du sectionneur et d'accessoire pour l'actionnement et la connexion sont fabriquées en acier profilé zingué à chaud ou bien en matièere anticorrosive.

• Composantes conductrices de courant

Elles sont fabriquées en cuivre profilé de haute conductibilité, tiré à dur avec les surfaces de contact argentées.

• Supports isolants

Ils sont fabriqués en porcelaine dur avec glaçure brune à l'extérieur. Ils correspondent aux perscriptions au point de vue caractéristiques mécaniques et diélectriques.
Pour les conditions atmosphériques normales ils sont construits avec ligne de fuile de 20 mm/kV. A la demande particulière pour les conditions polluées la ligne de fuite est de 25 mm/kV et pour les conditions très-polluées 31 mm/kV selon les normes CEI 815.

UGRADNJA

Tropolni rastavljač se formira tako da se prvo sva tri pola postave i pričvrste na zajedničko postolje, dok se pokretne izolacione potpore zajednički povežu sa kvadratnom cevi za tropolno pokretanje.
Na noseći stub se postavi i pričvrsti platforma, zatim postavi prethodno formiran rastavljač, a potom spaja sa prenosnim polužjem i pogonom za pokretanje.
Kod neuzemljenih sistema, tamo gde je sigurnost od primarnog značaja, postavlja se izolator na pogonskom polužju a kod uzemljenih to nije potrebno.

INSTALLATION

Three-pole disconnector is assembled by fitting the three poles onto the common base while linking the moving insulators by square profiled tube for three-pole operation.
The platform is fitted on the post and then preassembled three-pole disconnector is fitted onto it. Finally disconnector is connected with drive linkage to drive mechanism.
In systems with isolated neutral where the safety is of prime importance, an insulator is fitted in drive linkage, while in systems with earthed neutral it is not necessary.

MONTAGE

Le sectionneur tripolaire est formé de trois pôles séparés, préalablement posés et fixés sur un châssis commun, tandis que les supports ilosants mobiles sont connectés par un tuyau carré.
Poser et fixer la plate-forme sur le support portant, et ensuite poser le sectionneur préalablement formé, et connecter à la tringlerie de transmission et à la commande.
Dans les systčmes n'étant pas mis à la terre, où la securité a une importance primordiale, on installe un isolateur sur levier de commande, tandis que dans les systèmes mis à la terre ce n'est pas nécessaires.

MOĆ PREKIDANJA

Osnovni tip RS rastavljača sposoban je da prekida neznatno linijsko opterećenje ili trajno opterećenje u okviru datih vrednosti dograđivanjem pomoćnih uredaja, pa su prema tome i tipizirani:

RS – tropolni linijski rastavljač sa elektrolučnim rogovima za uključenje i prekidanje struje opterećenja vodova i transformatora u praznom hodu pri faktoru snage $\cos\varphi = 0{,}7$ maksimalne prekidne moći 0,5 MVA.

RSP – tropolni linijski sklopka rastavljač sa ugrađenim brzim perima za uključenje i brzo prekidanje struje linijskog opterećenja pri $\cos\varphi = 0{,}7$ sledećih maksimalnih vrednosti:

BREAKING CAPACITY

Basic type of RS disconnector is capable of interrupting very small line currents but for specific loads various auxiliary devices can be fitted and thus several types are distinguished:

RS – Three-pole line disconnector with arcing horns for making and breaking line charging currents and unloaded trasformers at power factor 0.7 and max. breaking capacity 0.5 MVA.

RSP – Three-pole line switch-disconnector with quick-action auxiliary contacts for making and breaking loads at power factor 0.7 with following max. ratings:

POUVOIR DE COUPURE

Le sectionneur de base type RS peut couper une charge de ligne insignifiante ou bien une charge continue dans le cadre des valeurs données en ajoutant des dispositifs auxiliaires. Par consequent, les sectionneurs sont typisés à la manière suivante:

RS – Sectionneur tripolaire de ligne avec cornes pour enclenchement et coupure de courant de lignes et de transformateurs à vide au facteur de puissance $\cos\varphi = 0{,}7$ et pouvoir de coupure max. 0,5 MVA.

RSP – Sectionneur-interrupteur tripolaire à lames rapides jointes pour l'enclenchement et coupure rapide de courant de la ligne à $\cos\varphi = 0{,}7$ à des valeurs maximales suivantes:

Nazivni napon / Rated voltage / Tension nominale	kV	12	17,5	24	38
Nazivna struja prekidanja / Rated breaking current / Courant de coupure nominal	A	40	35	30	25

RSK2 – tropolni linijski sklopka rastavljač sa dograđenim prekidnim komorama za uključenje i prekidanje nazivnih trajnih struja opterećenja do 200 A pri faktoru snage $\varphi = 0{,}7$.

RSK2 – Three-pole line switch-disconnector with built-in arc chutes for making and breaking rated continuous currents up to 200 A at power factor 0.7.

RSK2 – Sectionneur-interrupteur tripolaire de ligne avec des chambres de coupure supplémentaires pour l'enclenchement et coupure des courants continus nominaux jusqu'à 200 A à facteur de puissance $\cos\varphi = 0{,}7$.

Nazivni napon / Rated voltage / Tension nominale	kV	12	17,5	24	38
Nazivna struja prekidanja / Rated breaking current / Courant de coupure nominal	A	200	200	100	50

RSK6 – tropolni linijski sklopka rastavljač sa dograđenim prekidnim komorama za uključenje i prekidanje nazivnih trajnih struja opterećenja do 630 A.

RSK6 – Three-pole line switch-disconnector with built-in arc chutes for making and breaking rated continuous currents up to 630 A.

RSK6 – Sectionneur-interrupteur tripolaire de ligne avec des chambres de coupure supplémentaires pour l'enclenchement et coupure des courants continus nominaux jusqu'à 630 A.

Nazivni napon / Rated voltage / Tension nominale	kV	12	17,5	24	38
Nazivna struja prekidanja / Rated breaking current / Courant de coupure nominal	A	400 630	400 630	400 630	400 630

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STRUJNE KARAKTERISTIKE — RATED CURRENTS — CARACTERISTIQUES DE COURANT

Nazivni napon / Rated voltage / Tension nominale	Nazivna trajna struja / Rated continuous current / Courant nominal continu	Nazivna podnosiva temena vrednost struje / Rated peak withstand current / Valeur de crête de courant nominal admissible	Nazivna kratkotrajna podnosiva struja (1 sec) / Rated short-time current (1s) / Courant de courte durée nominal admissible (1 sec.)
Un kV	In A	Idyn kA	Ith kA
12–17,5–24–38	200 400 630	31,5 40 50	12,5 16 20

DIELEKTRIČNE KARAKTERISTIKE — DIELECTRIC CHARACTERISTICS — CARACTERISTIQUES DIELECTRIQUES

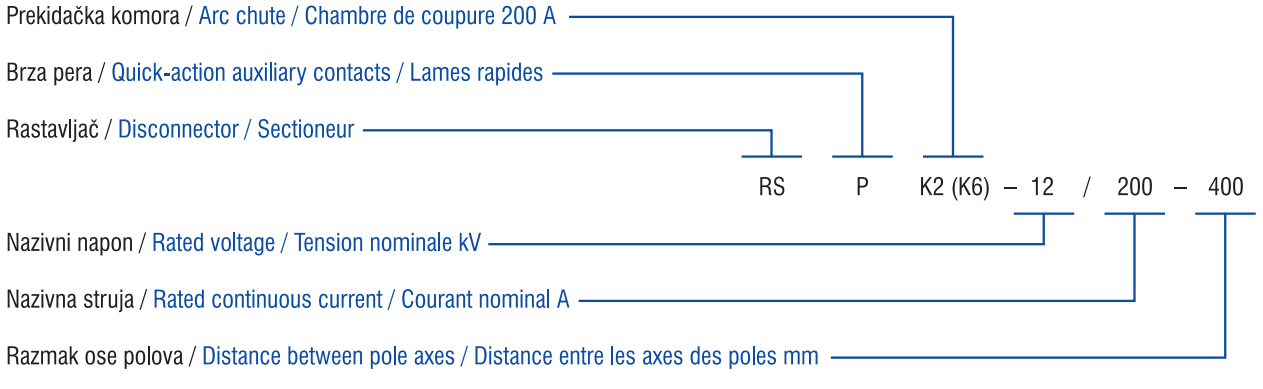
Nazivni napon Rated voltage Tension nominale	Nazivni podnosivi atmosferski udarni napon Rated impulse withstand voltage Tension de tenue nominale aux chocs de foudre		Nazivni podnosivi napon 50 Hz; 1 min. Rated power frequency withstand voltage 1 min 50 Hz Tension de tenue nominale 50 Hz; 1 min.	
Un	Između polova i prema zemlji Between phases and to earth Entre pôles et vers la terre	Na rastavnom razmaku Across isolating distance Sur distance de sectionnement	Između polova i prema zemlji Between phases and to earth Entre pôles et vers la terre	Na rastavnom razmaku Across isolating distance Sur distance de sectionnement
kV	kV	kV	kV	kV
12	75	85	28	32
17,5	95	110	38	45
24	125	145	50	60
38	170	195	70	80

Rastavljači i sklopke rastavljači su izrađeni za normalne klimatske uslove, nadmorske visine do 1000 m za temperature –40 do +50°C, i rad u uslovima relativne vlažnosti od 80%.
Za nadmorske visine preko 1000 m ispitni naponi se uvećavaju za 10% za svakih sledećih 1000 m.

Disconnectors and switch-disconnectors are designed for normal climatic conditions for altitudes up to 1000 m, temperature range –40 to +50°C and relative humidity up to 80%.
For altitudes above 1000 m test voltages are increased by 10% for each 1000 m.

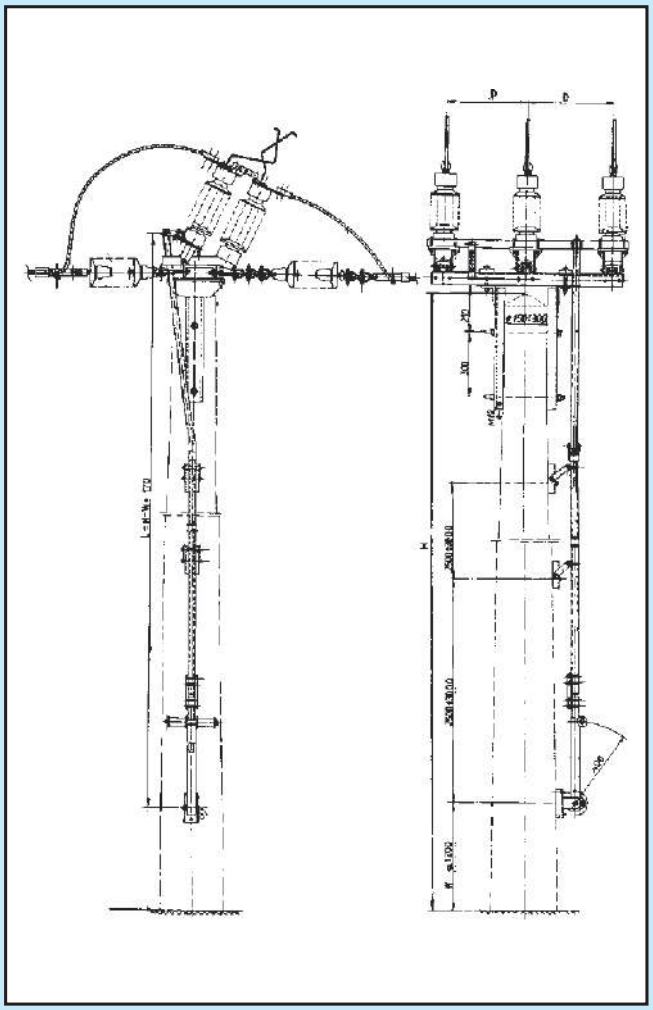
Les sectionneurs et les sectionneurs-interrupteurs sont fabriqués pour les conditions atmosphériques normales, d'altitude à 1000 m, températures de –40° à +50°C, et fonermnement dans les conditions de l'humidité relative de 80%.
Pour les altitudes dépassant 1000 m, les valeurs de tension d'essai sont augmentées pour 10% pour chaques 1000 m suivants.

TIPSKE OZNAKE / TYPE MARKING / MARQUES DE TYPE

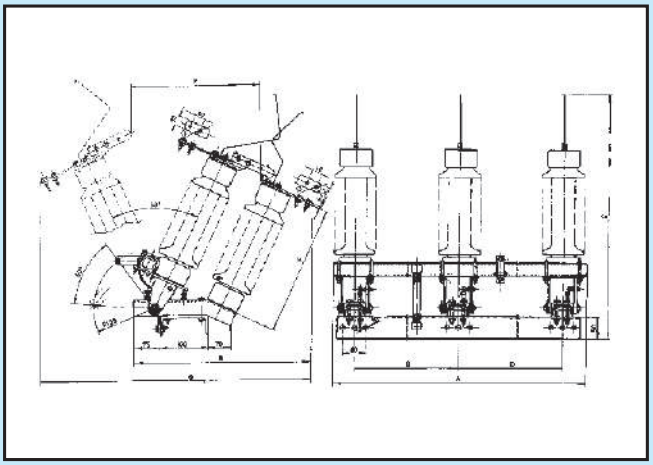


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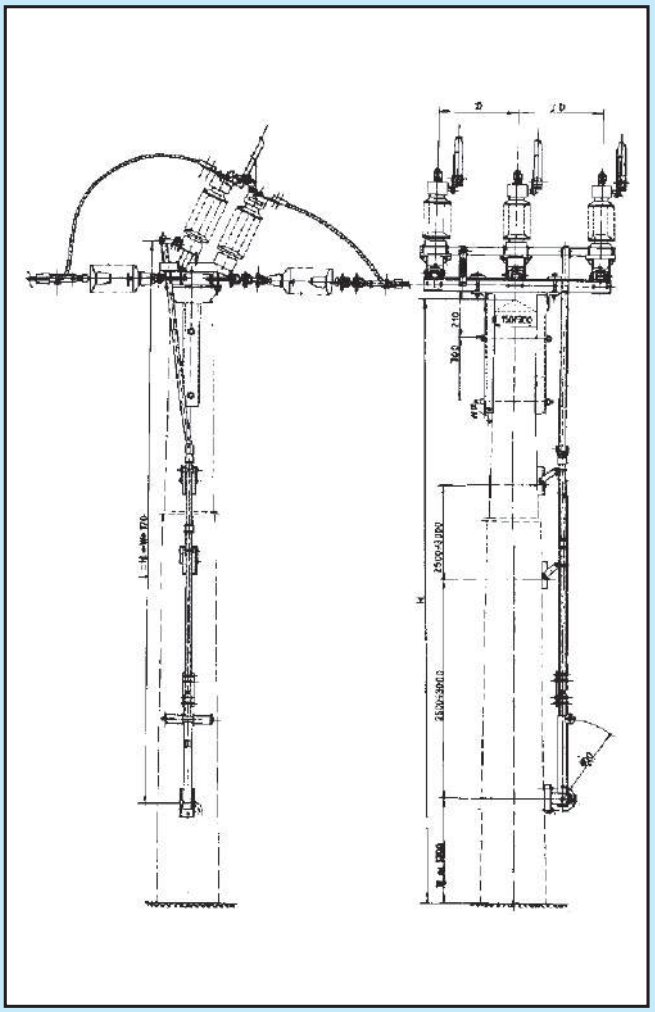
Rastavljač Tip RS
Disconnector Type RS
Sectionneur Type RS



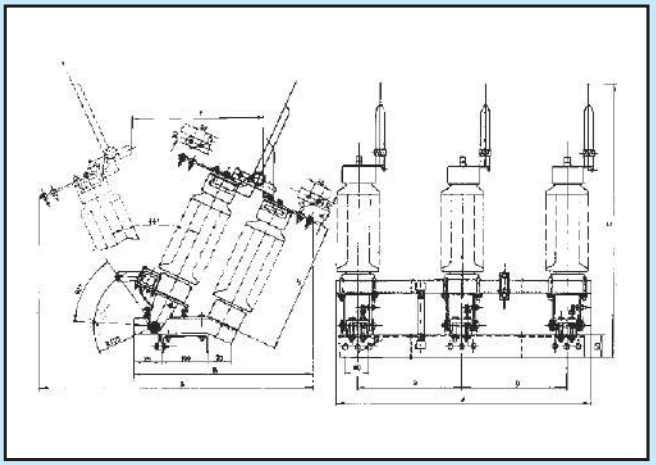
kV	mm						
	A	B	C	Dmin	E	F	G
12	900	480	650	400	380	290	750
17,5	900	480	650	400	380	290	750
24	1100	530	720	500	430	375	820
38	1300	585	830	600	530	490	950



Sklopka rastavljač Tip RSP
Switch-Disconnector Type RSP
Interrupteur-sectionneur Type RSP



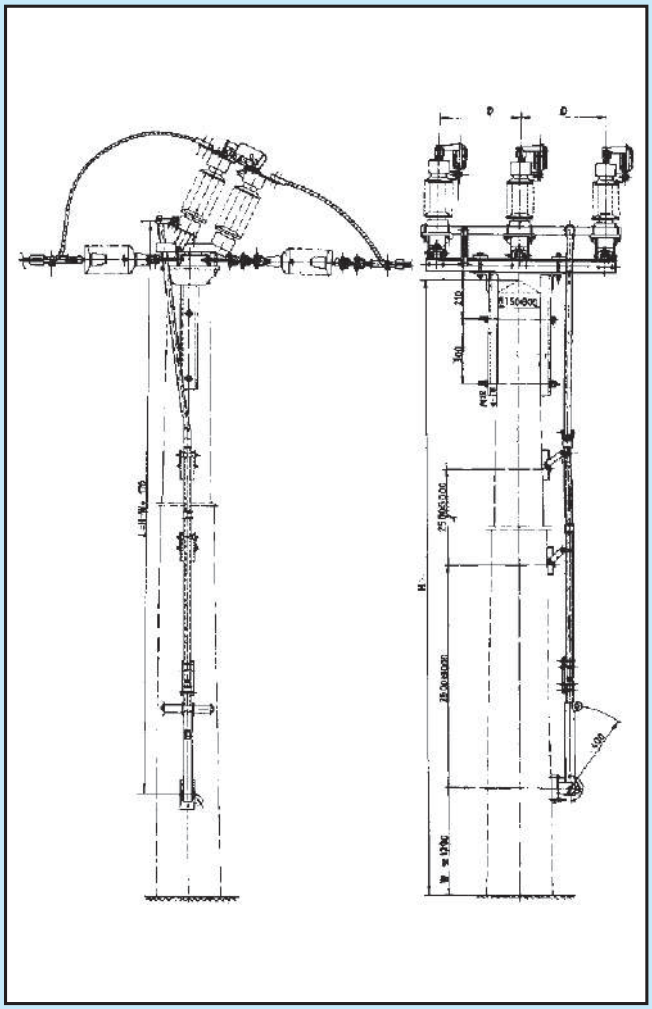
kV	mm						
	A	B	C	Dmin	E	F	G
12	900	480	810	400	380	290	750
17,5	900	480	810	400	380	290	750
24	1100	530	860	500	430	375	820
38	1300	585	960	600	530	490	950



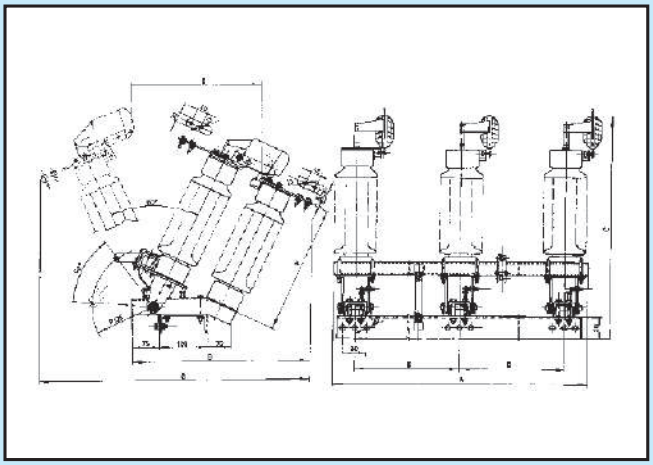
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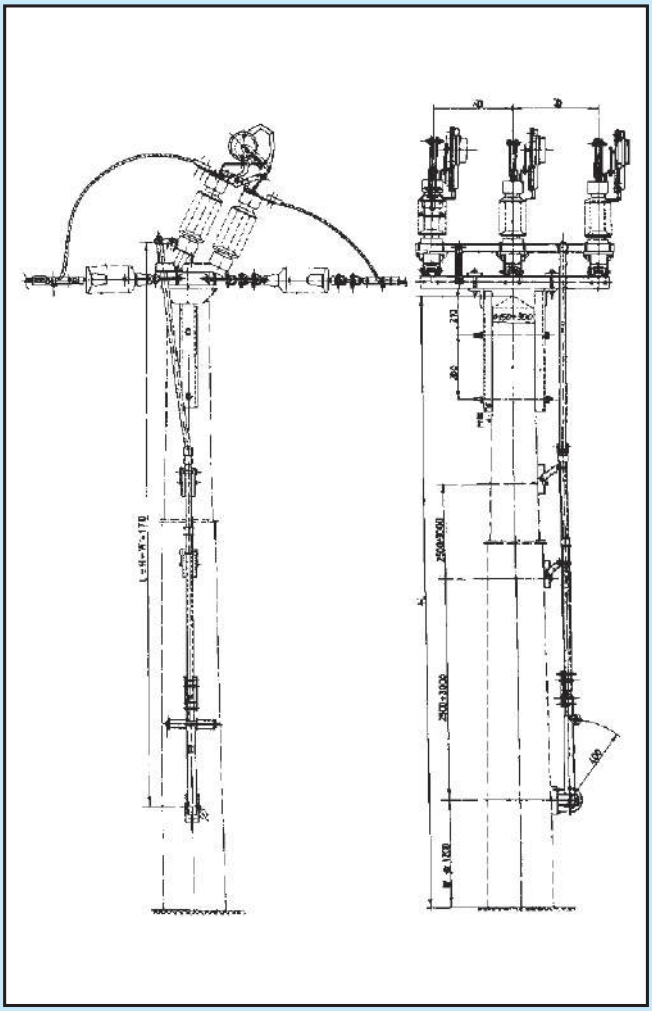
Sklopka rastavljač Tip RSK2
Switch-Disconnector Type RSK2
Interrupteur-sectionneur Type RSK2



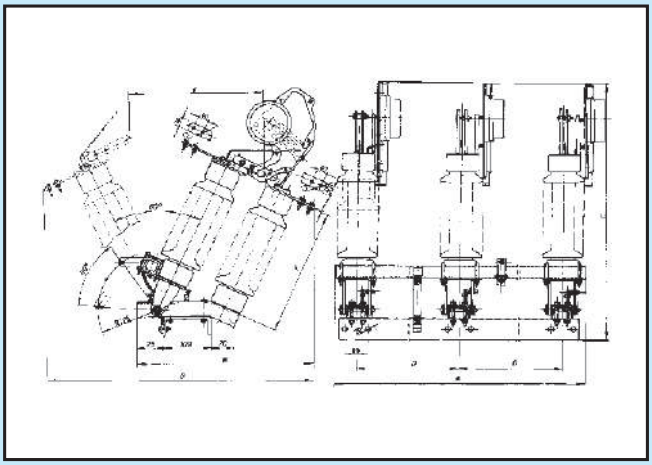
kV	mm						
	A	B	C	Dmin	E	F	G
12	900	480	630	400	380	290	750
17,5	900	480	630	400	380	290	750
24	1100	530	710	500	430	375	820
38	1300	585	840	600	530	490	950



Sklopka rastavljač Tip RSK6
Switch-Disconnector Type RSK6
Interrupteur-sectionneur Type RSK6



kV	mm						
	A	B	C	Dmin	E	F	G
12	900	480	620	400	380	290	750
17,5	900	480	620	400	380	290	750
24	1100	530	660	500	430	375	820
38	1300	585	800	600	530	490	950

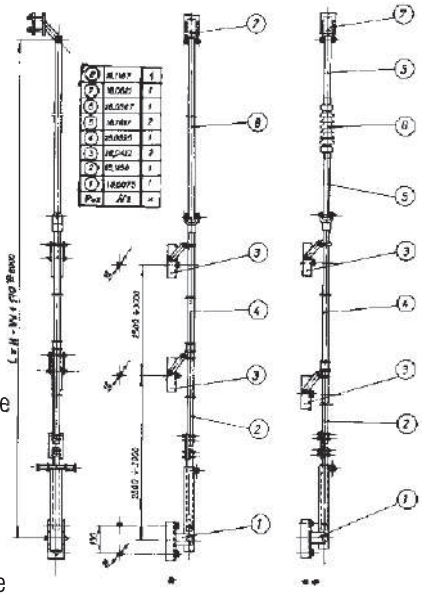


MINEL

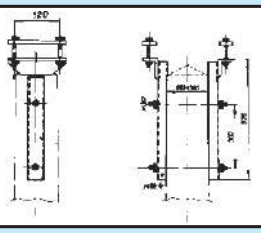
Ručni pogon Tip RP 13.B sa pogonskim polužjem:
* za uzemljeni sistem
** za neuzemljeni sistem

Hand drive Type RP 13.B with drive linkage:
* for earthed system
** for unearthed system

Commande manuelle Type RP 13.B avec trianglerie:
* pour le système mis à la terre
** pour le système non mis à la terre

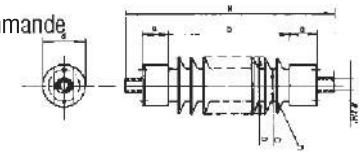


Noseća platforma
Supporating platform
Plate-forme du support

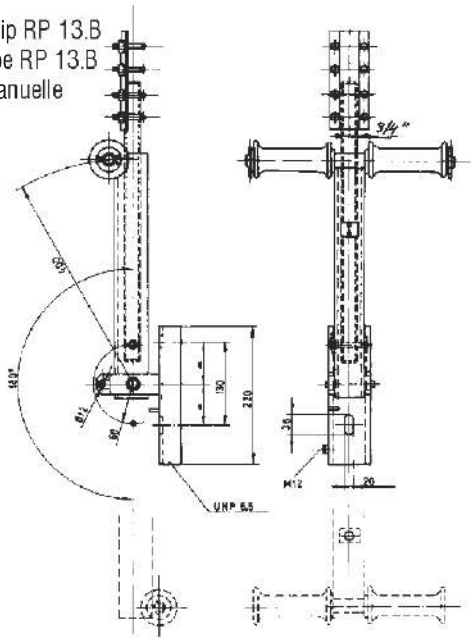


Izolator na polužju
Leverage insulator
Isolateur du levier de commande

poz. ⑥



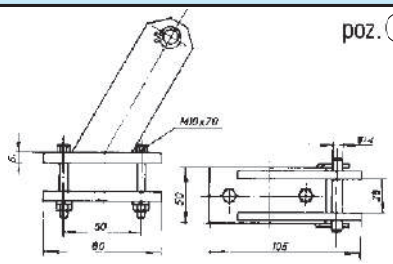
Ručni pogon Tip RP 13.B
Hand drive Type RP 13.B
Commande manuelle Type RP 13.B



poz. ①

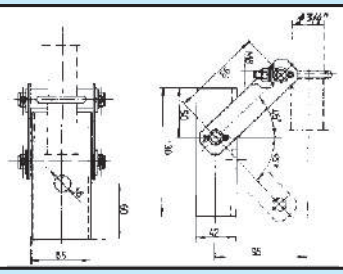
Pogonska poluga
Operating lever
Levier de commande

poz. ⑦

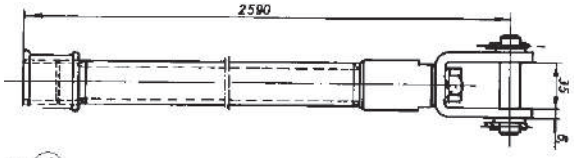


Pogonski zglob
Joint
Articulation

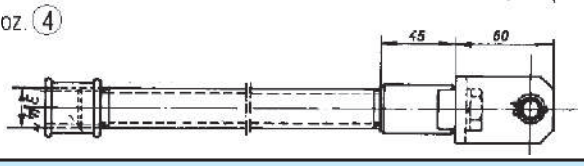
poz. ③



Cev sa zglobom — Jointed pipe — Tuyau articulè

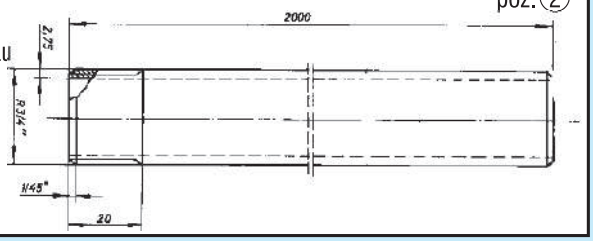


poz. ④

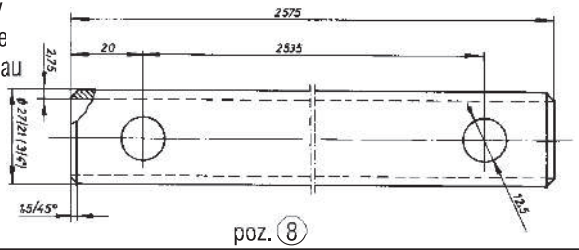


Cev
Pipe
Tuyau

poz. ②

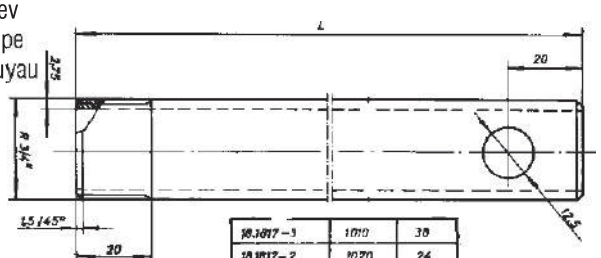


Cev
Pipe
Tuyau



poz. ⑧

Cev
Pipe
Tuyau



18.3617-1	1010	36
18.3617-2	1070	24
18.3617-1	1115	12
A/B	L	kV

poz. ⑤

MINEL

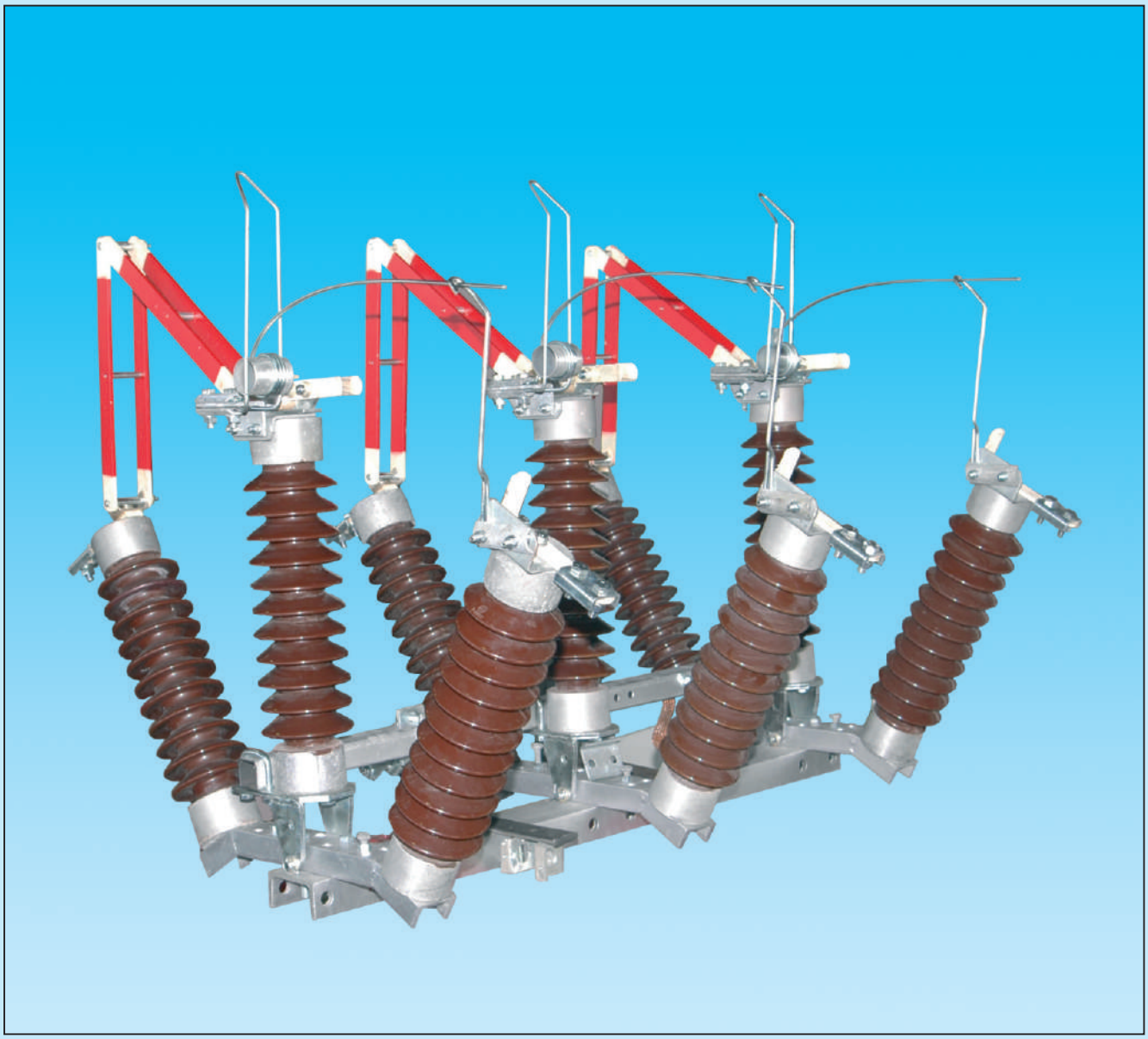
ISO 9001
IQ Net
OQS

RASKLOPNI APARATI DO 38 kV
SWITCHES UP TO 38 kV
APPAREILS DE CONNEXION JUSQU'À 38 kV

- RASTAVLJAČI
- SKLOPKE RASTAVLJAČI
  12–24 kV; 200–630 A
  Tip RSA

- DISCONNECTORS
- SWITCH-DISCONNECTORS
  12 to 24 kV; 200 to 630 A
  Type RSA

- SECTIONNEURS
- SECTIONNEURS-INTERRUPTEURS
  12–24 kV; 200–630 A
  Type RSA



RSAP (12–38 kV/630 A)

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OPIS

Tropolni rastavljači serije RSA su namenjeni za otvorene prostore.
Koriste se za sekcionisanje i izolovanje pridruženih aparata u mrežama za elektrifikaciju.
Ukoliko je potrebno, mogu se koristiti i za prekidanje opterećenja kada im se ugrade dodatni uredaji.
Izrađeni su i ispitani prema preporukama IEC 129 i 265.

OSNOVNE KARAKTERISTIKE

- Velika pogonska sigurnost
- Velika dinamička i termička čvrstoća
- Kompaktna konstrukcija
- Izbor izolacionih potpora
- Izbor prekidanja opterećenja
- Ručna ili elektromotorna komanda
- Blokiranje krajnjeg položaja
- Pogonska poluga snabdevena izolatorom
- Izbor blokade sa drugom opremom
- Dogradnja zemljospojnika
- Dogradnja nosača VV osigurača
- Horizontalna i vertikalna montaža

KONSTRUKCIJA

Rastavljač serije RSA sastoji se od tri pola sa 3 izolatora po polu na zajedničkom postolju, platforme za noseći slub, osovinom za tropolno pokretanje i pogona sa polužjem.

• Metalni delovi

Svi metalni delovi rastavljača i pribora za pokretanje i povezivanje izrađeni su od profilisanog čelika vruće pocinkovanog ili od antikorozivnog materijala.

• Strujno provodne komponente

Izrađeni su od tvrdo vučenog visokoprovodnog profilisanog bakra i presvučeni sa srebrom po površini kontakata.

• Izolacione potpore

Izrađene su od tvrdog porcelana, spolja braon glaziran, ili silikona.
Odgovaraju propisima u pogledu mehaničkih i dielektričnih karakteristika.
Za normalne atmosferske uslove izrađuju se sa puznom stazom 20 mm/kV. Na poseban zahtev za zagađene uslove 22 mm/kV, za vrlo zagadene 31 mm/kV prema IEC 815.

DESCRIPTION

Three-pole disconnectors series RSA for outdoor installation are used for sectioning and isolating of associated devices in power distribution networks.
If required they can be also used for switching loads provided the auxiliary devices are fitted.
They are manufactured and tested according to IEC 129 and 265.

MAIN CHARACTERISTICS

- High service reliability
- High dynamic and thermal strenght
- Compact design
- Choice of insulating supports
- Choice of load switching
- Manual or motor drive
- Locking in end position
- Operating lever with insulator
- Choice of interlocks with other equipment
- Fitting of earthing switch
- Fitting of VV fuse carriers
- Horizontal or vertikal installation

DESIGN

Disconnectors series RSA consist of three poles with three insulators per pole on common base, platform for supporting post, three-pole drive shaft and drive mechanism with drive linkage.

• Metal parts

All metal parts of disconnector and drive mechanism are made of hot dip galvanized steel profiles or of non-corrosive material.

• Current-carrying parts

Curent-carrying parts are made of hard-drawn high-conductance copper profiles and silver plated on contact areas.

• Insulating supports

Insulating supports are made of brown glazed hard porcelain, and silikon.
Their mechanical and dielectric properties comply with the relevant standards.
For normal atmospheric conditions creepage distance is 20 mm/kV. On special request insulating supports for polluted atmosphere with creepage distance 25 mm/kV or for very high pollution with 31 mm/kV can be supplied, according to IEC 815.

DESCRIPTION

Les sectionneurs tripolaires de série RSA sont destinés à l'air extérieur. Ils sont utilisés pour sectionnement et isolement des appareils connectés dans le réseau d'électrification.
S'il est nécessaire, ils peuvent être utilisés pour coupure des charges de ligne en ajoutant les dispositifis complémentaires.
Ils sont construits et essayés selon les recommandations CEI 129 et 265.

CARACTERISTIQUES PRINCIPALES

- Grande securité de commande
- Grande dureté dynamique et thermique
- Construction compacte
- Choix des supports isolants
- Choix de coupure de charge
- Commande manuelle ou à moteur électrique
- Verrouillage de la position extrême
- Levier de commande équipé d'un isolateur
- Choix de verrouillage par autre équipement
- Incorporation de commutateur à terre
- Installation du porte-fusible type VV
- Montage horizontal et vertical

CONSTRUCTION

Le sectionneur de séries RSA est composé de trois pôles avec trois isolateurs par pôle sunun châssis commun, d'une plate-forme pour support portant, d'un levier à actionne- ment tripolaire et de la commande avec tringlerie.

• Pièces métalliques

Toutes les piéces métalliques du sectionneur et d'accessoire pour l'actionnement et la connexion sont fabriquées en acier profilé zingué à chaud ou bien en matièere anticorrosive.

• Composantes conductrices de courant

Elles sont fabriquées en cuivre profilé de haute conductibilité, tiré à dur avec les surfaces de contact argentées.

• Supports isolants

Ils sont fabriqués en porcelaine dur avec glaçure brune à l'extérieur. Ils correspondent aux perscriptions au point de vue caractéristiques mécaniques et diélectriques.
Pour les conditions atmosphériques normales ils sont construits avec ligne de fuile de 20 mm/kV. A la demande particulière pour les conditions polluées la ligne de fuite est de 25 mm/kV et pour les conditions très-polluées 31 mm/kV selon les normes CEI 815.

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UGRADNJA

Tropolni rastavljač se formira tako da se prvo sva tri pola postave i pričvrste na zajedničko postolje, dok se pokretne izolacione potpore zajednički povežu sa kvadratnom cevi za tropolno pokretanje.
Na noseći stub se postavi i pričvrsti platforma, zatim postavi prethodno formiran rastavljač, a potom spaja sa prenosnim polužjem i pogonom za pokretanje.
Kod neuzemljenih sistema, tamo gde je sigurnost od primarnog značaja, postavlja se izolator na pogonskom polužju a kod uzemljenih to nije potrebno.

INSTALLATION

Three-pole disconnector is assembled by fitting the three poles onto the common base while linking the moving insulators by square profiled tube for three-pole operation.
The platform is fitted on the post and then preassembled three-pole disconnector is fitted onto it. Finally disconnector is connected with drive linkage to drive mechanism.
In systems with isolated neutral where the safety is of prime importance, an insulator is fitted in drive linkage, while in systems with earthed neutral it is not necessary.

MONTAGE

Le sectionneur tripolaire est formé de trois pôles séparés, préalablement posés et fixés sur un châssis commun, tandis que les supports ilosants mobiles sont connectés par un tuyau carré.
Poser et fixer la plate-forme sur le support portant, et ensuite poser le sectionneur préalablement formé, et connecter à la tringlerie de transmission et à la commande.
Dans les systèmes n'étant pas mis à la terre, où la securité a une importance primordiale, on installe un isolateur sur levier de commande, tandis que dans les systèmes mis à la terre ce n'est pas nécessaires.

MOĆ PREKIDANJA

Osnovni tip RSA rastavljača sposoban je da prekida neznatno linijsko opterećenje ili trajno opterećenje u okviru datih vrednosti dograđivanjem pomoćnih uredaja, pa su prema tome i tipizirani:

RSA – tropolni linijski rastavljač sa elektrolučnim rogovima za uključenje i prekidanje struje opterećenja vodova i transformatora u praznom hodu pri faktoru snage $\cos\varphi = 0,7$ maksimalne prekidne moći 0,5 MVA.

RSAP – tropolni linijski sklopka rastavljač sa ugrađenim brzim perima za uključenje i brzo prekidanje struje linijskog opterećenja pri $\cos\varphi = 0,7$ sledećih maksimalnih vrednosti:

BREAKING CAPACITY

Basic type of RSA disconnector is capable of interrupting very small line currents but for specific loads various auxiliary devices can be fitted and thus several types are distinguished:

RSA – Three-pole line disconnector with arcing horns for making and breaking line charging currents and unloaded trasformers at power factor 0.7 and max. breaking capacity 0.5 MVA.

RSAP – Three-pole line switch-disconnector with quick-action auxiliary contacts for making and breaking loads at power factor 0.7 with following max. ratings:

POUVOIR DE COUPURE

Le sectionneur de base type RSA peut couper une charge de ligne insignifiante ou bien une charge continue dans le cadre des valeurs données en ajoutant des dispositifs auxiliaires. Par consequent, les sectionneurs sont typisés à la manière suivante:

RSA – Sectionneur tripolaire de ligne avec cornes pour enclenchement et coupure de courant de lignes et de transformateurs à vide au facteur de puissance $\cos\varphi = 0,7$ et pouvoir de coupure max. 0,5 MVA.

RSAP – Sectionneur-interrupteur tripolaire à lames rapides jointes pour l'enclenchement et coupure rapide de courant de la ligne à $\cos\varphi = 0,7$ à des valeurs maximales suivantes:

Nazivni napon / Rated voltage / Tension nominale	kV	12	17,5	24	38
Nazivna struja prekidanja / Rated breaking current / Courant de coupure nominal	A	40	35	30	25

RSAK2 – tropolni linijski sklopka rastavljač sa dograđenim prekidnim komorama za uključenje i prekidanje nazivnih trajnih struja opterećenja do 200 A pri faktoru snage $\varphi = 0,7$.

RSAK2 – Three-pole line switch-disconnector with built-in arc chutes for making and breaking rated continuous currents up to 200 A at power factor 0.7.

RSAK2 – Sectionneur-interrupteur tripolaire de ligne avec des chambres de coupure supplémentaires pour l'enclenchement et coupure des courants continus nominaux jusqu'à 200 A à facteur de puissance $\cos\varphi = 0,7$.

Nazivni napon / Rated voltage / Tension nominale	kV	12	17,5	24	38
Nazivna struja prekidanja / Rated breaking current / Courant de coupure nominal	A	200	200	100	50

RSAK6 – tropolni linijski sklopka rastavljač sa dograđenim prekidnim komorama za uključenje i prekidanje nazivnih trajnih struja opterećenja do 630 A.

RSAK6 – Three-pole line switch-disconnector with built-in arc chutes for making and breaking rated continuous currents up to 630 A.

RSAK6 – Sectionneur-interrupteur tripolaire de ligne avec des chambres de coupure supplémentaires pour l'enclenchement et coupure des courants continus nominaux jusqu'à 630 A.

Nazivni napon / Rated voltage / Tension nominale	kV	12	17,5	24	38
Nazivna struja prekidanja / Rated breaking current / Courant de coupure nominal	A	400 630	400 630	*	*

* Na poseban upit

STRUJNE KARAKTERISTIKE — RATED CURRENTS — CARACTERISTIQUES DE COURANT

Nazivni napon Rated voltage Tension nominale	Nazivna trajna struja Rated continuous current Courant nominal continu	Nazivna podnosiva temena vrednost struje Rated peak withstand current Valeur de crête de courant nominal admissible	Nazivna kratkotrajna podnosiva struja (1 sec) Rated short-time current (1s) Courant de courte durée nominal admissible (1 sec.)
Un kV	In A	Idyn kA	Ith kA
12–17,5–24–38	200 400 630	31,5 40 50	12,5 16 20

DIELEKTRIČNE KARAKTERISTIKE — DIELECTRIC CHARACTERISTICS — CARACTERISTIQUES DIELECTRIQUES

Nazivni napon Rated voltage Tension nominale	Nazivni podnosivi atmosferski udarni napon Rated impulse withstand voltage Tension de tenue nominale aux chocs de foudre		Nazivni podnosivi napon 50 Hz; 1 min. Rated power frequency withstand voltage 1 min 50 Hz Tension de tenue nominale 50 Hz; 1 min.	
Un	Između polova i prema zemlji Between phases and to earth Entre pôles et vers la terre	Na rastavnom razmaku Across isolating distance Sur distance de sectionnement	Između polova i prema zemlji Between phases and to earth Entre pôles et vers la terre	Na rastavnom razmaku Across isolating distance Sur distance de sectionnement
kV	kV	kV	kV	kV
12	75	85	28	32
17,5	95	110	38	45
24	125	145	50	60
38	170	195	70	80

Rastavljači i sklopke rastavljači su izrađeni za normalne klimatske uslove, nadmorske visine do 1000 m za temperature –40 do +50°C, i rad u uslovima relativne vlažnosti od 80%.
Za nadmorske visine preko 1000 m ispitni naponi se uvećavaju za 10% za svakih sledećih 1000 m.

Disconnectors and switch-disconnectors are designed for normal climatic conditions for altitudes up to 1000 m, temperature range –40 to +50°C and relative humidity up to 80%.
For altitudes above 1000 m test voltages are increased by 10% for each 1000 m.

Les sectionneurs et les sectionneurs-interrupteurs sont fabriqués pour les conditions atmosphériques normales, d'altitude à 1000 m, températures de –40° à +50°C, et fonermnement dans les conditions de l'humidité relative de 80%.
Pour les altitudes dépassant 1000 m, les valeurs de tension d'essai sont augmentées pour 10% pour chaques 1000 m suivants.

TIPSKE OZNAKE / TYPE MARKING / MARQUES DE TYPE

RSA – 12 / 200 – 400
RSAP – 12 / 200 – 400
RSAK2 – 12 / 200 – 400
RSAK6 – 12 / 200 – 400

Rastavljač / Disconnector / Sectioneur

Nazivni napon / Rated voltage / Tension nominale kV

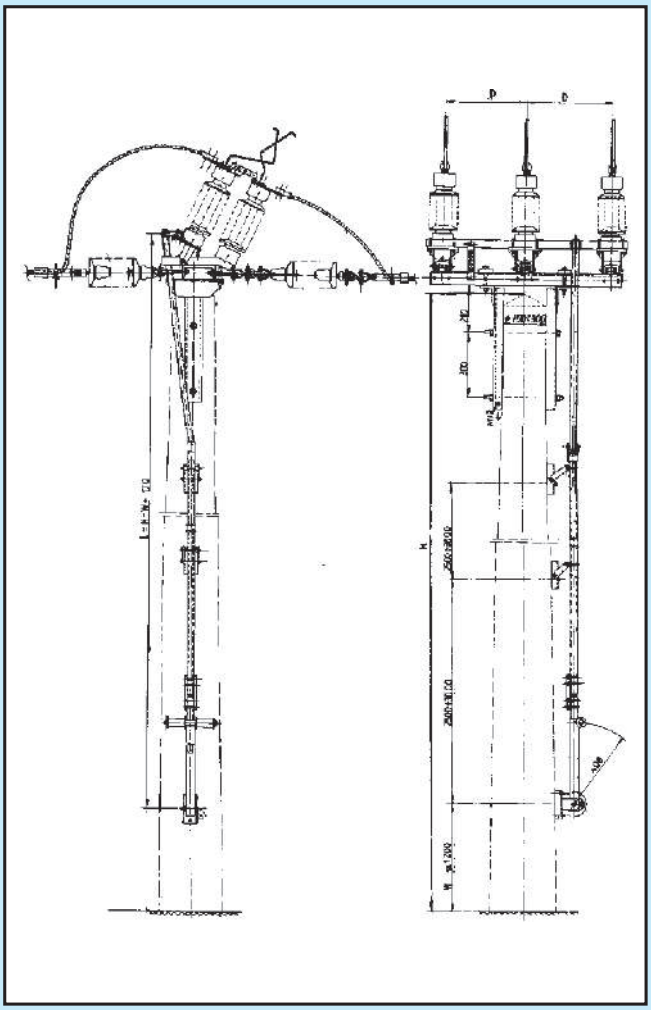
Nazivna struja / Rated continuous current / Courant nominal A

Razmak ose polova / Distance between pole axes / Distance entre les axes des poles mm

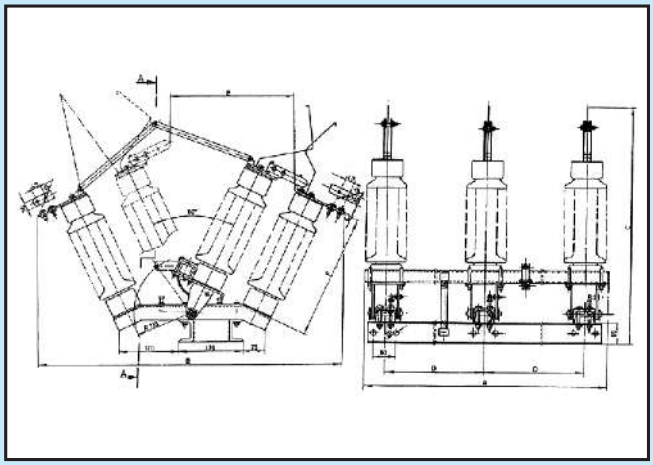
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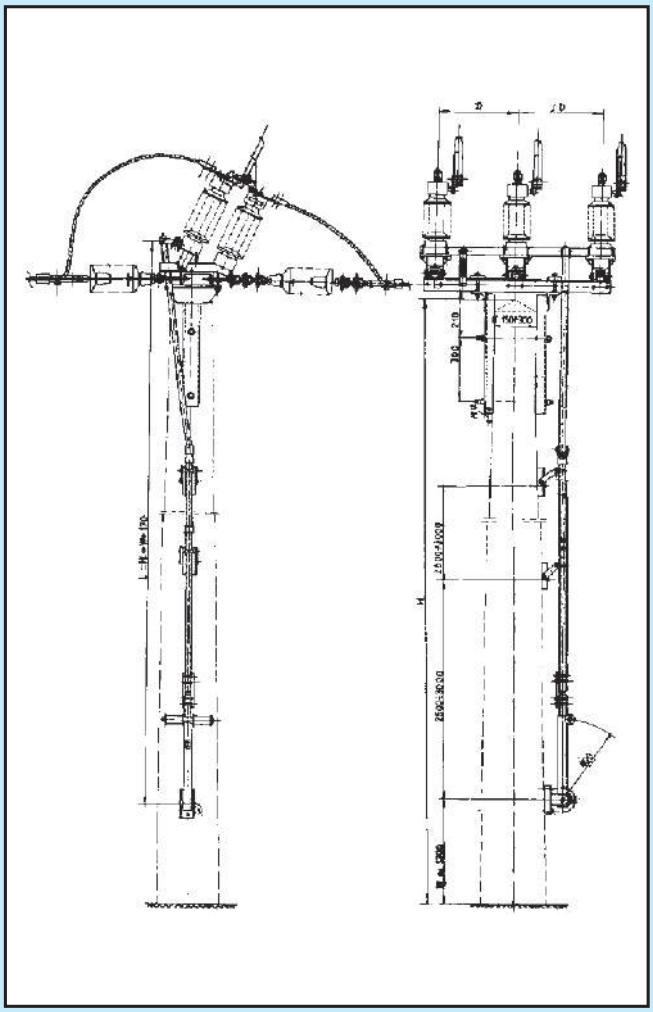
Rastavljač Tip RSA
Disconnector Type RSA
Sectionneur Type RSA



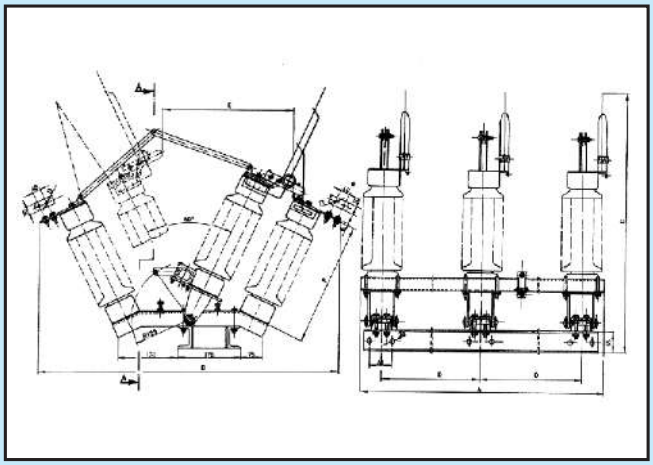
kV	mm					
	A	B	C	Dmin	E	F
12	900	890	650	400	380	290
17,5	900	890	650	400	380	290
24	1100	990	720	500	430	375
38	1300	1100	830	600	530	490



Sklopka rastavljač Tip RSAP
Switch-Disconnector Type RSAP
Interrupteur-sectionneur Type RSAP

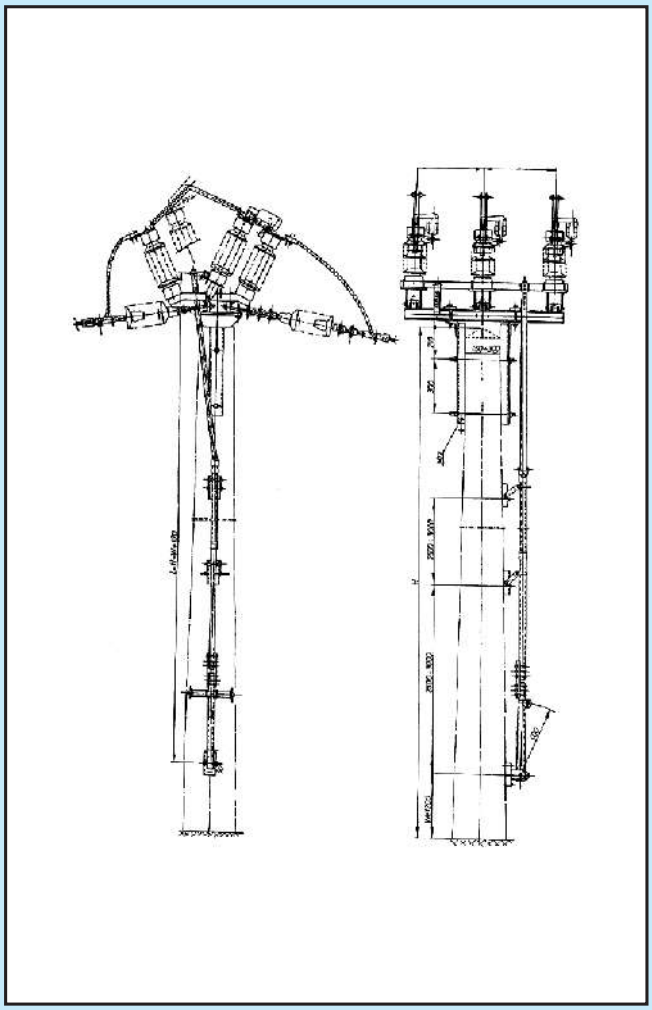


kV	mm					
	A	B	C	Dmin	E	F
12	900	890	810	400	380	290
17,5	900	890	810	400	380	290
24	1100	980	860	500	430	375
38	1300	585	1100	600	530	490

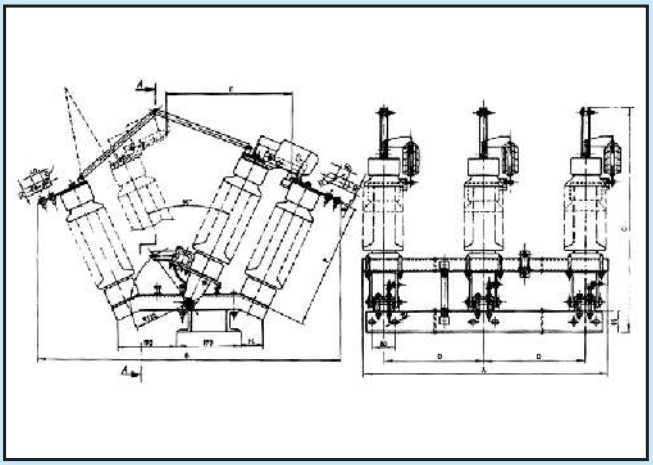


MINEL

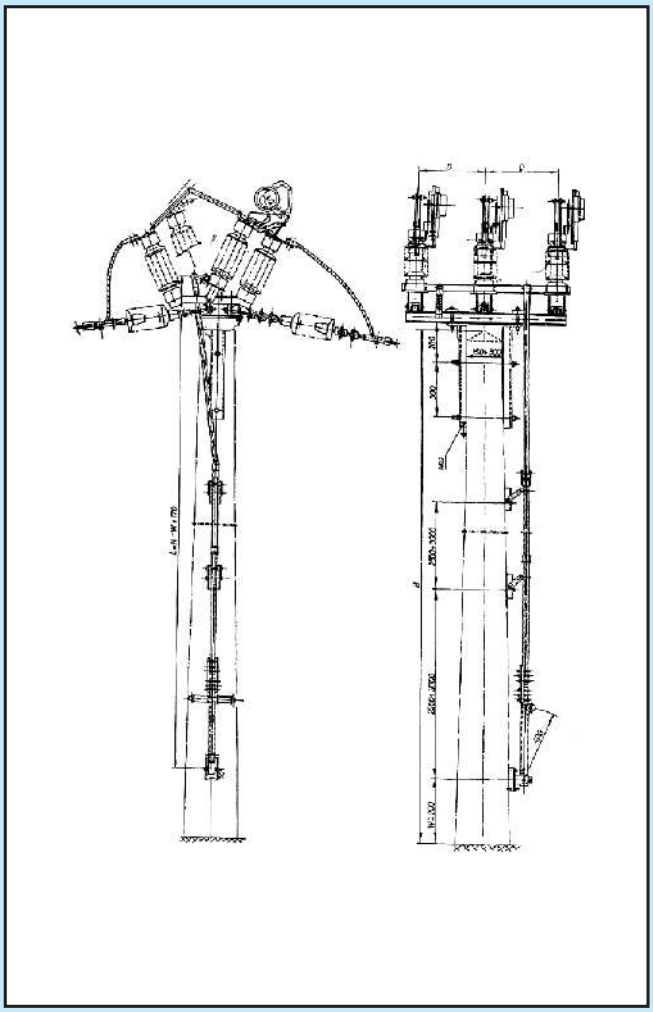
Sklopka rastavljač Tip RSAK2
Switch-Disconnector Type RSAK2
Interrupteur-sectionneur Type RSAK2



kV	mm					
	A	B	C	Dmin	E	F
12	900	890	570	400	380	290
17,5	900	890	570	400	380	290
24	1100	990	650	500	430	375
38	1300	1100	770	600	530	490

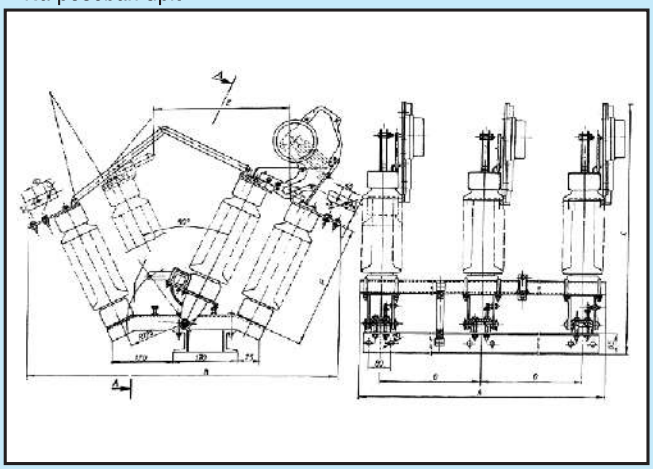


Sklopka rastavljač Tip RSAK6
Switch-Disconnector Type RSAK6
Interrupteur-sectionneur Type RSAK6



kV	mm					
	A	B	C	Dmin	E	F
12	900	890	630	400	380	290
17,5	900	890	630	400	380	290
24	*					
38	*					

* Na poseban upit



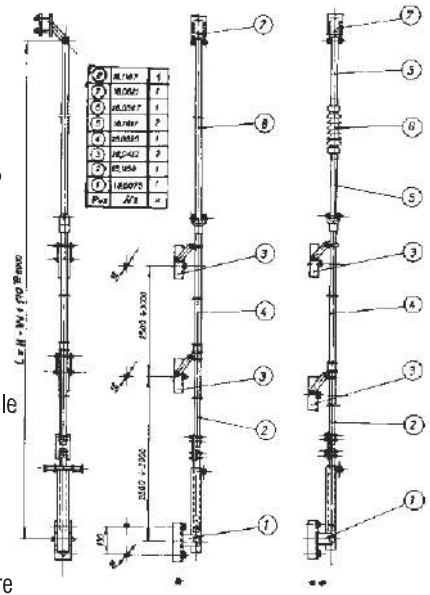
MINEL

ISO 9001
IQ Net
OQS

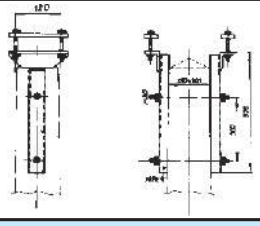
Ručni pogon Tip RP 13.B sa pogonskim polužjem:
* za uzemljeni sistem
** za neuzemljeni sistem

Hand drive Type RP 13.B with drive linkage:
* for earthed system
** for unearthed system

Commande manuelle Type RP 13.B avec trianglerie:
* pour le système mis à la terre
** pour le système non mis à la terre



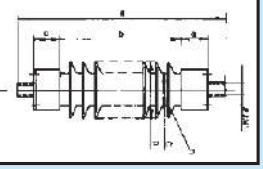
Noseća platforma
Supporating platform
Plate-forme du support



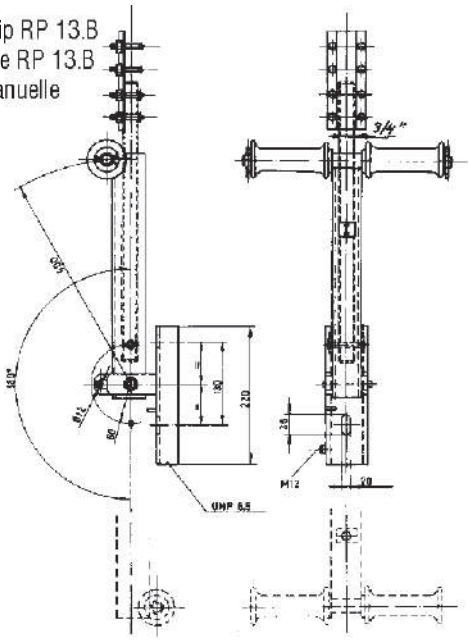
Izolator na polužju
Leverage insulator
Isolateur du levier de commande

poz. 6

N°	kV	mm							MASA
		a	b	c	D	d	H	n	kg
18.0367-4	12	58	179	Ø65	Ø125	Ø100	385	5	5,0
18.0367-4	17,5	58	179	Ø65	Ø125	Ø100	385	5	5,0
18.0367-5	24	58	269	Ø65	Ø125	Ø100	475	8	6,5
18.0367-6	38	58	375	Ø65	Ø125	Ø100	590	11	8,5



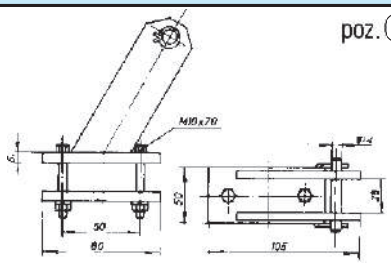
Ručni pogon Tip RP 13.B
Hand drive Type RP 13.B
Commande manuelle
Type RP 13.B



poz. 1

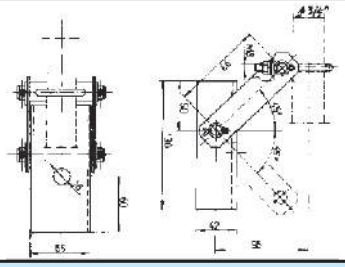
Pogonska poluga
Operating lever
Levier de commande

poz. 7

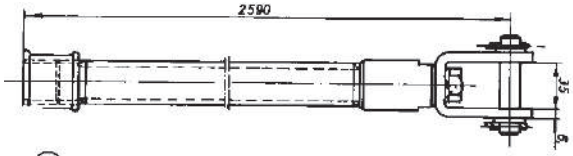


Pogonski zglob
Joint
Articulation

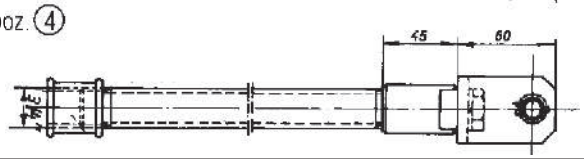
poz. 3



Cev sa zglobom
Jointed pipe
Tuyau articulè

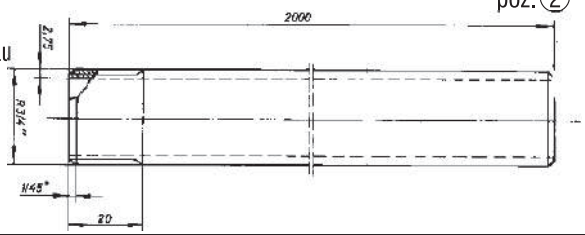


poz. 4

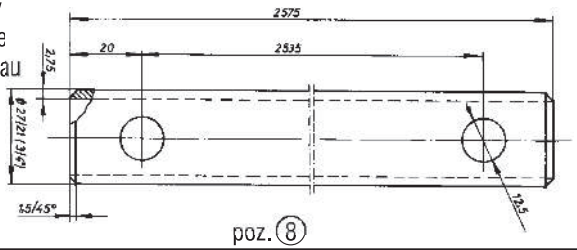


Cev
Pipe
Tuyau

poz. 2

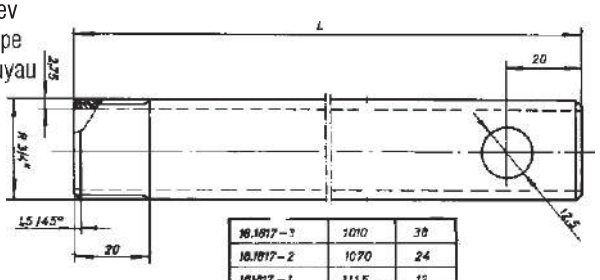


Cev
Pipe
Tuyau



poz. 8

Cev
Pipe
Tuyau



18.1617-3	1010	38
18.1617-2	1070	24
18.1617-1	1115	12
N°/	L	kV

poz. 5

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OPIS

Rastavljači iz ovog programa su tropolne izvedbe i namenjeni su za otvorene prostore.

Koriste se za selekcionisanje i izolovanje pridruženih aparata u mrežama za elektrifikaciju.

RASTAVLJAČ Tip RN

Osnovni tip namenjen je za provođenje nazivne trajne struje i može da prekida neznatno linijsko opterećenje.

RASTAVLJAČ Tip RNO

Formira se kada se na osnovni tip dograde opružna pera, koja prekidaju male struje, što znači isključenje transformatora i dugačkih vodova napajanja.

SKLOPKA-RASTAVLJAČ Tip RNK

Formira se kada se na osnovni tip dograde prekidačke komore koje mogu da prekidaju punu nazivnu struju.

Pri otvaranju rastavljača, tok struje se prenosi u komoru za gašenje luka, tako da se glavni kontakti otvaraju bez pojave luka.

Jedan od bitnih osobina osnovnog tipa RN rastavljača je fleksibilna montaža. Ako se radni uslovi mijenjaju tokom rada, rastavljač na licu mesta može biti opremljen sa opružnim perima (O), prekidačkom komorom (K), nosačima VV osigurača (SU) i zemljospojnicima (EUK).

Rastavljači su izrađeni i ispitani prema preporukama IEC 129 i 265.

OSNOVNE KARAKTERISTIKE

- velika pogonska sigurnost
- velika dinamička i termička izdržljivost
- izbor prekidanja opterećenja
- izbor izolacionih potpora
- izbor pogona za pokretanje
- blokada krajnjih položaja
- dogradnja VV osigurača (SU)
- dogradnja zemljospojnika (EUK)
- horizontalna i vertikalna montaža

KONSTRUKCIJA

Hiljade ugrađenih ovih rastavljača širom sveta dokazuju svoju pouzdanost i u najoštrijim pogonskim uslovima.

Sve komponente su izrađene od nerđajućih materijala, a njihovi izolatori od glazirane keramike i silikona.

Rastavljači mogu biti montirani vertikalno ili horizontalno a njihova stabilna konstrukcija izdržava veliko mehaničko i elektrodinamičko naprezanje.

Širok opseg opreme je razvijen za ovaj tip rastavljača da bi zadovoljio najrigoroznije uslove rada i obezbedio laku montažu i apsolutnu pouzdanost funkcionisanja i naznačenih karakteristika.

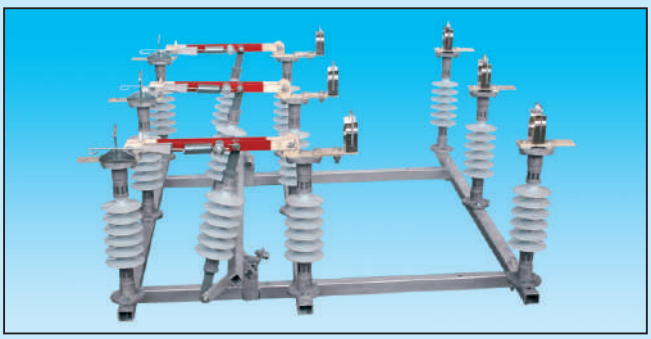
Program takođe uključuje ručni pogon koji može imati električnu blokadu za daljinsku kontrolu kao i elektromotorni pogon.

Uz pomoć uređaja za brzo reagovanje motorni pogon može biti upotrebljen za zatvaranje pri visokim strujama bez pojave luka, jer je varničenje smanjeno na minimum sa uređajima za brzo reagovanje.

Oprema za stub i drugi korisni elementi kompletiraju ovaj linijski rastavljač.



RNO 12; 24; 38 kV/(200 A÷1250 A)-SU



RNO 12; 24; 38 kV/(200 A÷1250 A)-SU

TIPSKE OZNAKE

Rastavljač	RN	– 12 kV÷38 kV/630–1250 A
Rastavljač sa opružnim perima	RNO	– 12 kV÷38 kV/630–1250 A SU
Sklopka-rastavljač sa prekid. komorom	RNK	– 12 kV÷38 kV/630–1250 A SU – EUK

Nazivni napon

Nazivna struja

Nosači VV osigurača

Zemljospojnik

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DESCRIPTION

The disconnectors of this type designation are outdoor three-pole designs.

They are applied for sectionalizing and isolating of the associated apparatusses in electric power networks.

DISCONNECTOR Type RN

It is a basic type of the disconnector, intended for conducting of rated current and can break just negligible loads.

DISCONNECTOR Type RN

It is formed when the spring-type arcing horns are incorporated on basic type, enabling the breaking of small currents – the switching-off of transformers and long feeders.

DISCONNECTOR Type RNK

It is formed when the interruption chambers with full rated current breaking capability are incorporated on basic type.

During the opening of disconnector, the current flow is transferred to the interrupting chamber, enabling the opening of main contacts without arcing between them.

One of the main features of basic type of RN disconnectors is the flexible mounting. If the service conditions have changed during service life, the disconnector can be equipped with arcing horns (O), interrupting chamber (K), fuse-base of HRC fuses (SU) and earthing switches (EUK) on site.

Disconnectors are manufactured and tested according to IEC 129 and 265 standards.

BASIC FEATURES

- high service safety
- high dynamic and thermal strength
- switching options
- insulating support options
- drive mechanism options
- interlocking of end positions
- incorporating of HRC fuses (SU)
- incorporating of earthing switches (EUK)
- horizontal and vertical mounting

DESIGN

Thousands of these disconnectors in service all over the world prove the reliability in most severe conditions.

All components are made of stainless materials, and the insulators of glazed porcelain and silicon.

The disconnectors can be mounted vertically or horizontally and their stable design withstands high mechanical and electrodynamical stresses. Wide range of application is developed for this type of disconnectors, to satisfy the most severe service conditions and ensure easy mounting and absolute reliability of operation and rated characteristics.

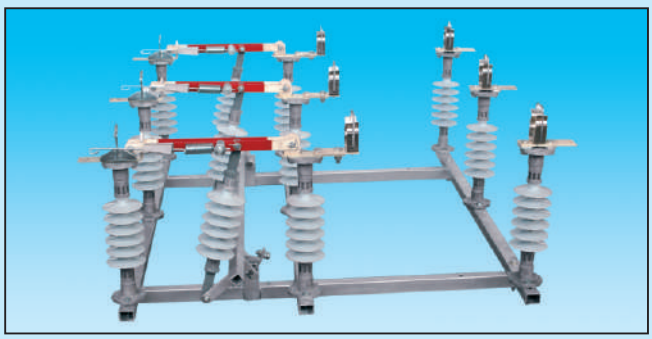
The manufacturing program comprises manual operating mechanism also, having optionally the electrical interlocking for remote control, as well as the motor operating mechanism.

With the help of the high-speed device, the motor operating mechanism can be used for closing on high currents without arcing (arcing is reduced to minimum with high-speed devices).

The equipment for mounting on pole and other accessories complete the range this line disconnector.



RNO 12; 24; 38 kV/(200 A÷1250 A)-SU



RNO 12; 24; 38 kV/(200 A÷1250 A)-SU

TYPE DESIGNATION

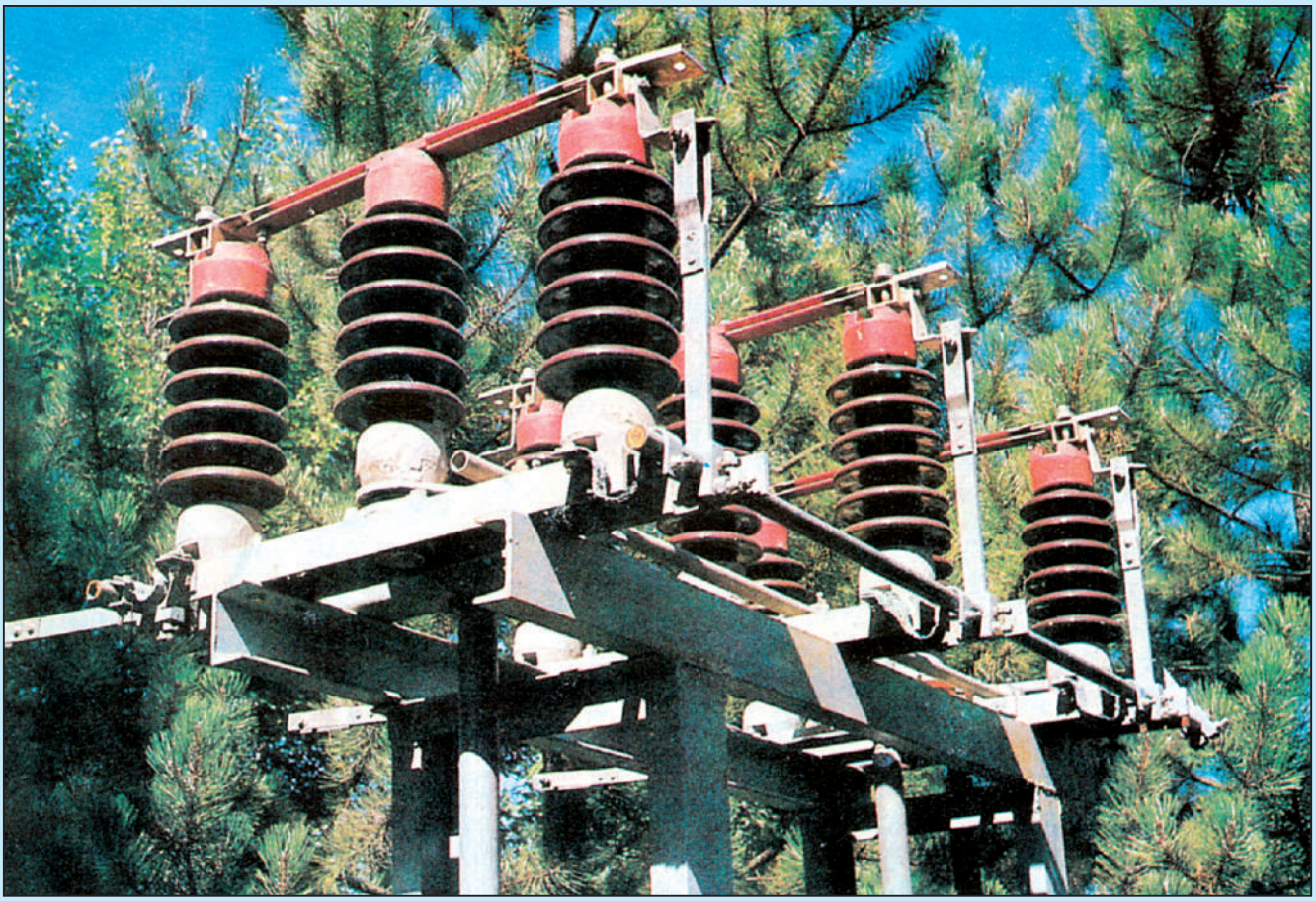
Disconnector	RN	– 12 kV÷38 kV/630–1250 A						
Disconnector with spring-type arcing horns	RNO	– 12 kV÷38 kV/630–1250 A		SU				
Switch-disconnector with interrupting chamber	RNK	– 12 kV÷38 kV/630–1250 A		SU	–	EUK		
		Rated voltage						
			Rated current					
				HRC fuse base				
						Earthing switch		

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Outdoor switching apparatusses
12 to 72,5 kV
630A up to 3150 A

- **DISCONNECTORS, TYPE: RSTJa, RSTa, RSTZa**
- **HRC FUSE BASE, TYPE: POS, POSV**



THREE-POLE DISCONNECTOR: Type RSTZ-38-630/50-1200

GENERAL

The family of disconnectors type RST covers outdoor single-pole and three-pole disconnectors with or without earthing switches, for rated voltages from 12 up to 72,5 kV.

Disconnectors made with insulating supports of the insulating level for 17,5 kV are intended to be used from 12 up to 17,5 kV, while for all other rated voltages disconnectors have the insulating supports with the appropriate insulating level.

All of these disconnectors are manufactured as single-pole designs, three-pole designs are derived by combining of appropriate number of poles, and mutual coupling via lever tube.

Standard design of these disconnectors is intended for switching on and off of negligible currents.

If equipped with the arc quenching horns, these disconnectors can break small currents, e.g. currents of unloaded transformer (magnetizing currents).

The disconnectors of this family are intended for rated currents 630–3150 A, as shown on the enclosed outline drawings. The disconnectors are conventionally intended for horizontal-standing position (RST). Upon request they can be delivered for vertical-hanging (RSTV) or vertical mounting (RST).

Disconnectors are made for standard climatic conditions: altitudes up to 1000 m above sea level, ambient temperatures form –40 up to +50°C, service under relative air humidity conditions up to 80%. For altitudes greater than 1000 m above sea level the testing voltages should be increased by 10% at each of the next 1000 m.

All disconnectors of this family are tested according to the IEC 129 and IEC 265 standards.

DESIGN

Three-pole disconnectors of the RST family consist of three separate poles, mutually coupled via operating tube lever.

Each separate pole has three equal insulating supports; the middle support being the rotating one, rotating during »closing« and »opening« for 90°. The poles are mounted on common chassis. The positions of the separate poles, when mounted, should be in the same plane.

Each pole of the disconnector type RST consists of three basic units:

- chassis with fixing and pole coupling elements
- insulating supports
- current carrying parts.

Beside these units, the disconnectors with earthing switches have the following additional parts: earthing blades and elements for their coupling and operating.

DISCONNECTOR POLE CHASSIS

The chassis is made of »U« steel profile. The bearing for the rotating insulating support is placed on the chassis, coupled with the operating elements of poles.

All steel parts are properly protected by hot-dip galvanizing.

INSULATING SUPPORTS

Cylindricaly-shaped insulating supports are made of high-quality porcelain, glazed in brown colour. On the insulating support ends equal steel fittings are fixed, protected by hot-dip galvanizing. The fixing of the fittings to the porcelain core is done with the sulphuric cement.

The core of the insulating support has the equal inner core diameter and rib diameter on both ends.

Therefore, the insulating supports have the same breaking force in standing and hanging position. The design of the insulating supports comply with the IEC 273 standards.

For standard ambient conditions, the supports are manufactured with the creepage distance of 20 mm/kV. Upon special request, for highly polluted conditions the distance of 22 mm/kV is used, and for very highly polluted conditions the value of 31 mm/kV applies, all according to the IEC 815 standard.

CURRENT CARRYING PARTS

By all disconnector designs current carrying parts can be distinguished in two groups:

1. Fixed contacts with terminals, at both ends of fixed insulating supports, in following versions:

   a) flat terminals acc. to DIN 46206 — disconnector type RST

   b) cylindric terminals acc. to DIN 56206 — disconnector type RSTa

Flat terminals with fixed contact are made of one single piece of copper.

Cylindric terminals are moulded of copper alloy and the fixed cibtact is made number od cooper bar.

2. Contact blades mounted on rotating insulating supports, made of special number of copper bars.

On both ends of contact blades, springs for ensuring the proper contact pressure are located.

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EARTHING SWITCHES

The design of current carrying parts is such that for all disconnector versions two breaking points of electric circuit exist.

All contact and terminal parts are silver plated.

Earthing switches are intended for earthing of overhead line when the disconnector is opened, and they can be added to the RST disconnector as accessory.

The disconnectors with incorporated earthing switches have the designation RSTZ, RSTZa.

Earthing switches are designed according to the rated peak withstand currents.

Contact parts are silver plated and steel parts hot-dip galvanized.

The mechanical interlocking between the main contact blades and earthing switches enable the absolute service safety of the disconnector.

Main contact blades and earthing switches have e the separate operating rods.

The operating of the disconnector can be done via pneumatic or electric-motor drives, with the possibility to choose between them, for putting the disconnector in operation on site or by remote control.

DRIVES

The drives are the separate units and normally they incorporate all control and signalling elements.

The features of the electric-motor drives are given in separate catalogue.

CURRENT FEATURES

Rated voltage Un (kV)	Rated continuous current In (A)					Rated peak withstand current I_{dyn} (kA)	Rated short time withstand current (1 sec) I_{th} (kA)
12 – 17,5 – 24 – 38 – 52 – 72,5	630	1250	1600	–	–	50	20
	630	1250	1600	2500	–	75	30
	–	–	1600	2500	3150	100	40
	–	–	–	2500	3150	125	50

DIELECTRIC FEATURES

Rated voltage	Rated lightning impulse withstand voltage		Rated power-frequency withstand voltage 50 Hz;1 min.	
Un	to earth, between poles	across the isolating distance	to earth, between poles	across the isolating distance
kV	kV	kV	kV	kV
12	75	85	28	32
17,5	95	110	38	45
24	125	145	50	60
38	170	195	70	80
52	250	290	95	110
72,5	325	375	140	160

* Rated tensile force on terminals 1000 N

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TYPE DESIGNATION

RST – Three-pole disconnector with flat terminals

RSTZ – Three-pole disconnector with earthing position switches

RTSa – Three-pole disconnector with cylindric terminals

RSTZa – Three-pole disconnector with earthing switches and cylindric terminals

RSTV – Three-pole disconnector for hanging position

RSTJ – Single-pole disconnector with flat terminals

RSTJa – Single-pole disconnector with cylindric terminals

IMPORTANT NOTICE

The catalogue shows the versions of three and single-pole disconnectors with manual drives RP4 and RP5 as the standard delivery versions.
Upon special request of domestic and world market, we have delivered also the following versions in higher series:

- THREE-POLE DISCONNECTOR type RSTa with electric motor drive type MPR-50C (export – NIGERIA, LIBYA)
- THREE-POLE DISCONNECTOR type RSTZa with electric motor drive type MPR-50C for main contact blades and manual drive RP4 for earthing switches (export – NIGERIA, BULGARIA, ALBANIA, LIBYA)
- THREE-POLE DISCONNECTOR type RSTa for vertical mounting heights up to 11 m, with manual drive RP9 (export – NIGERIA)
- THREE-POLE DISCONNECTOR type RSTZa for vertical mounting with manual drive RP8 for main blades and earthing switches (export – NIGERIA)
- THREE-POLE DISCONNECTOR type RSTV for rated current 3150 A for hanging position, heights up to 9 m, with manual drive RP4 (substation in ALU-KOMBINAT Podgorica – YU)
- THREE-POLE DISCONNECTOR type RSTa, RSTZa with two earthing switches and manual drives RP4 (export – USSR)
- THREE-POLE DISCONNECTOR type RSTa, RSTZa for vertical mounting on wooden »A«-type poles with manual drives RP4 (ELEKTROVOJVODINA – YU)
- THREE-POLE DISCONNECTOR type RSTa for vertical mounting with manual drives RP4 or RP5, on concrete three level poles for sectionalizing of the radial grid (ESB), heights up to 11 m

The disconnectors type RST, RSTa with or without earthing switches can be mounted on all types of poles and support structures, due to accommodating of the operating levers and drives.

ORDERING EXAMPLE

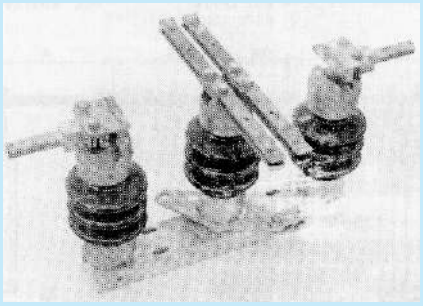
Rated voltage (kV)	(*) Pole-centre distance, min. (mm)
12	600
17,5	600
24	600
38	700
52	800
72,5	1200

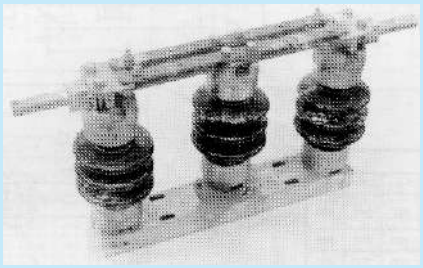
If the customer does not indicate the required polecentre distance, values in this table are valid!

RST Z a 12 – 630 / 50 – 600

- RST – Three-pole disconnector
- Z – Earthing switches
- a – Cylindric terminals DIN 46206
- 12 – Rated voltage (kV)
- 630 – Rated current (A)
- 50 – Rated peak withstand current (kA)
- 600 – Pole-centre distance (mm) (*)

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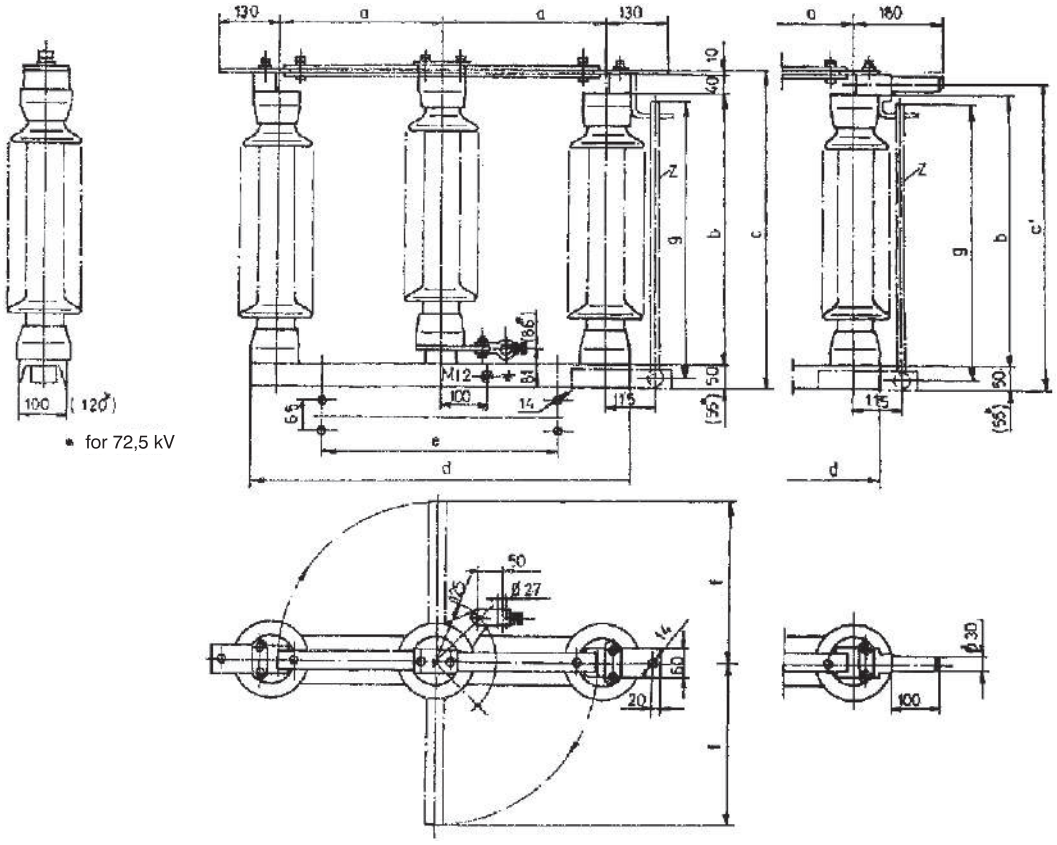


DISCONNECTOR POLE type RSTa 12 kV, 1250 A

RST 630 A
RSTZ 630 A

DISCONNECTOR POLE

RSTa 630 A
RSTZa 630 A

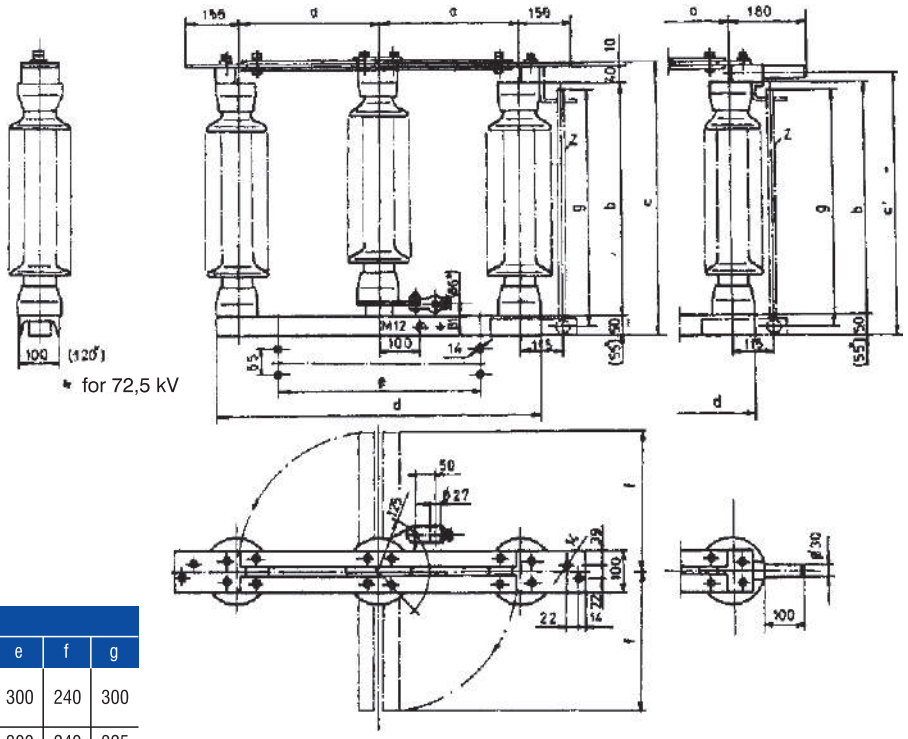


Type	Un (kV)	In (A)	(mm)							
			a	b	c	c'	d	e	f	g
RST	12 / 17,5	630	250	316	416	386	600	300	240	300
RSTa	24		250	340	440	410	600	300	240	325
RSTZ	38		300	445	545	515	700	400	280	430
RSTZa	52		350	575	675	645	800	500	340	565
	72,5		500	770	875	845	1100	800	490	755

RST 1250 A
RSTZ 1250 A

DISCONNECTOR POLE

RSTa 1250 A
RSTZa 1250 A

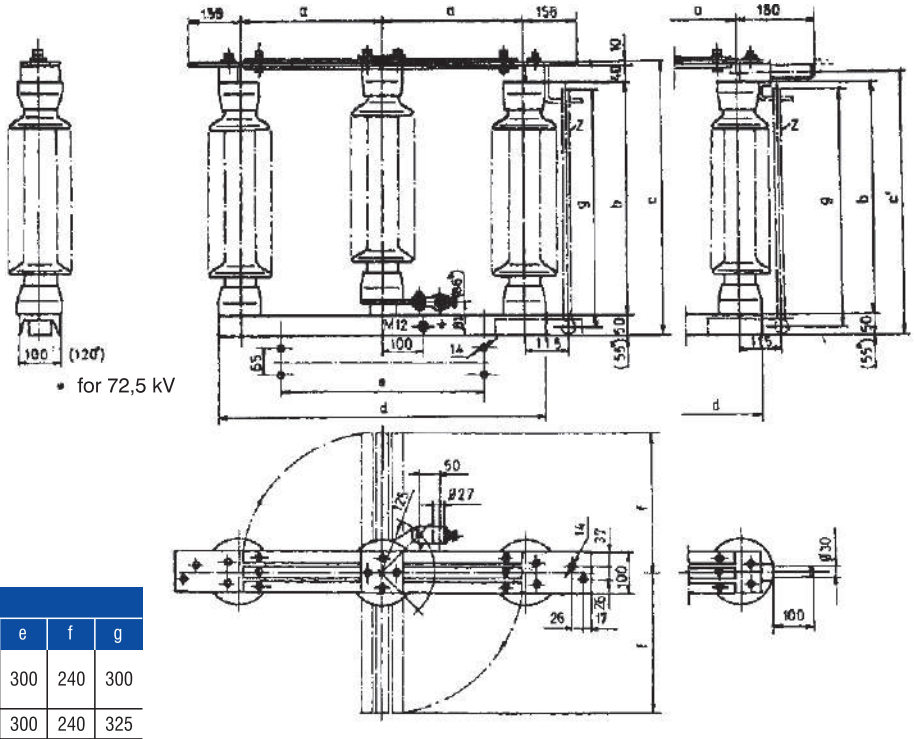


Type	Un (kV)	In (A)	(mm)							
			a	b	c	c'	d	e	f	g
RST	12 / 17,5	1250	250	316	416	386	600	300	240	300
RSTa	24		250	340	440	410	600	300	240	325
RSTZ	38		300	445	545	515	700	400	280	430
RSTZa	52		350	575	675	645	800	500	340	565
	72,5		500	770	875	845	1100	800	490	755

RST 1600 A
RSTZ 1600 A

DISCONNECTOR POLE

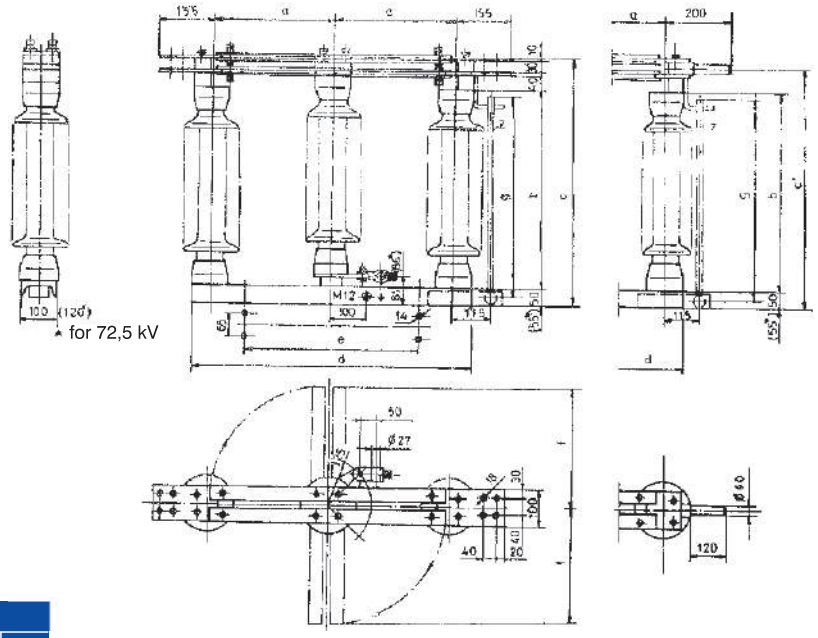
RSTa 1600 A
RSTZa 1600 A



Type	Un (kV)	In (A)	(mm)							
			a	b	c	c'	d	e	f	g
RST	12 / 17,5	1600	250	316	416	386	600	300	240	300
RSTa	24		250	340	440	410	600	300	240	325
RSTZ	38		300	445	545	515	700	400	280	430
RSTZa	52		350	575	675	645	800	500	340	565
	72,5		500	770	875	845	1100	800	490	755

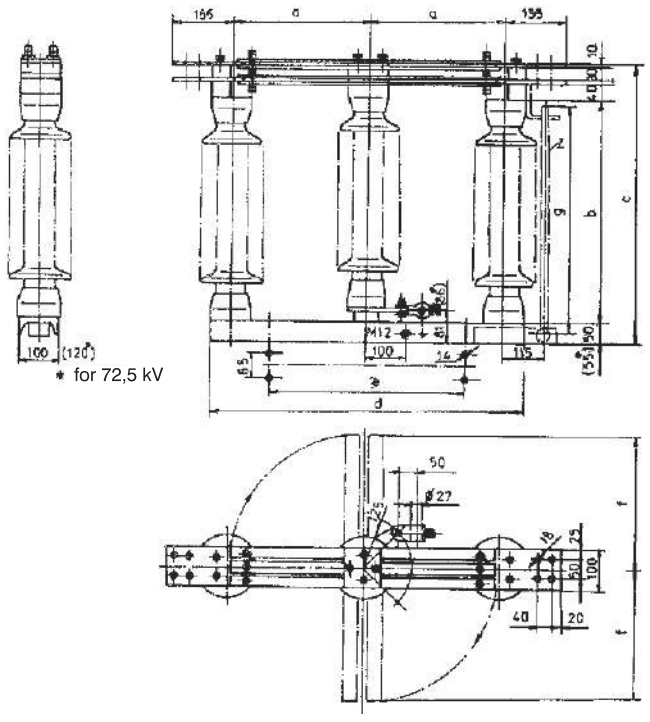
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RST 2500 A DISCONNECTOR POLE RSTa 2500 A
RSTZ 2500 A RSTZa 2500 A



Type	Un (kV)	In (A)	(mm)							
			a	b	c	c'	d	e	f	g
RST	12 / 17,5	2500	250	316	416	386	600	300	240	300
RSTa	24		250	340	440	410	600	300	240	325
RSTZ	38		300	445	545	515	700	400	280	430
RSTZa	52		350	575	675	645	800	500	340	565
	72,5		500	770	875	845	1100	800	490	755

RST 3150 A DISCONNECTOR POLE
RSTZ 3150 A

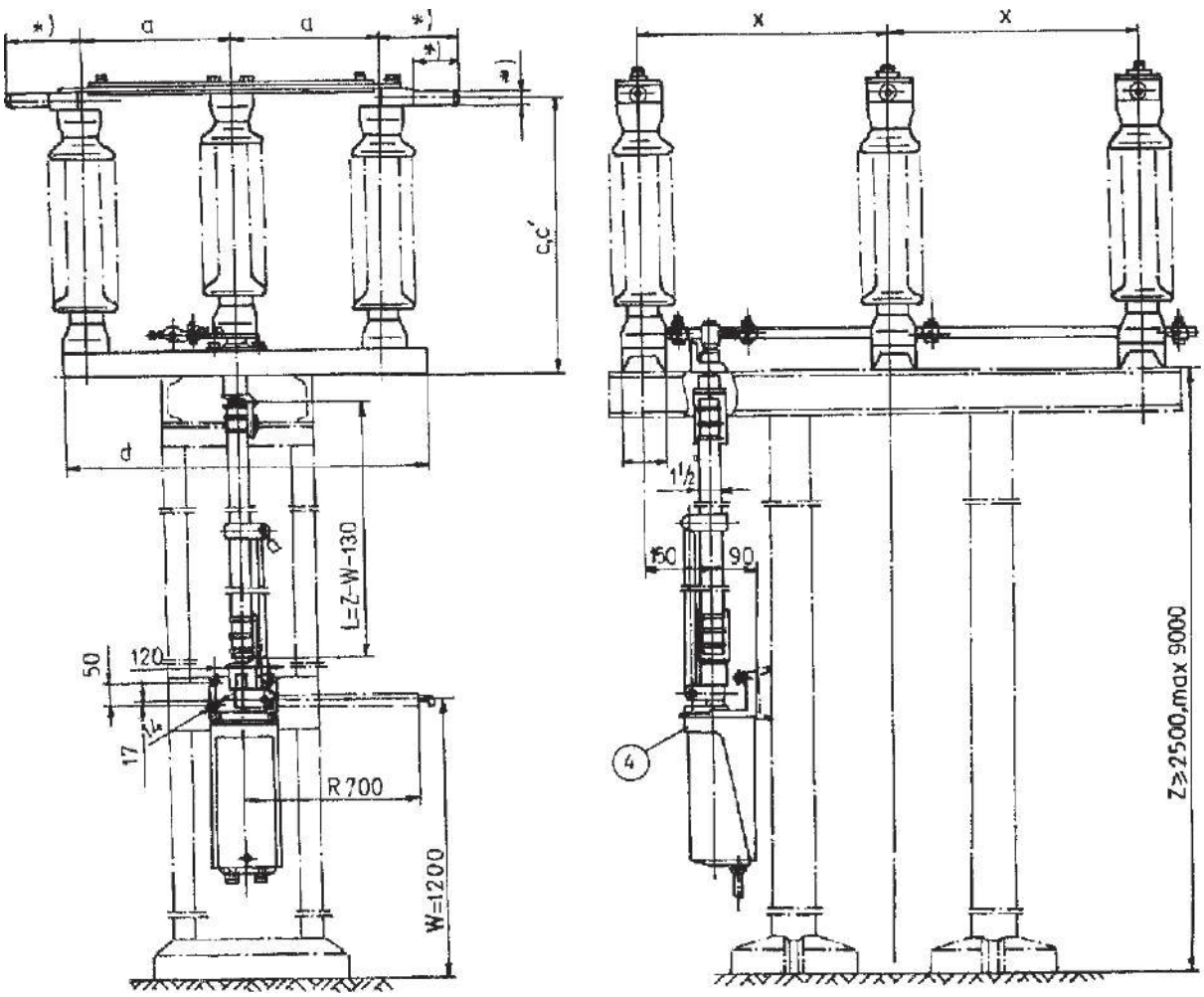


Type	Un (kV)	In (A)	(mm)						
			a	b	c	d	e	f	g
RST	12 / 17,5	3150	250	316	456	600	300	240	300
	24		250	340	480	600	300	240	325
RSTZ	38		300	445	585	700	400	280	430
	52		350	575	715	800	500	340	565
	72,5		500	770	915	1100	800	490	755

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THREE-POLE DISCONNECTOR
TYPE RSTa (RST)
with manual drive RP4-2

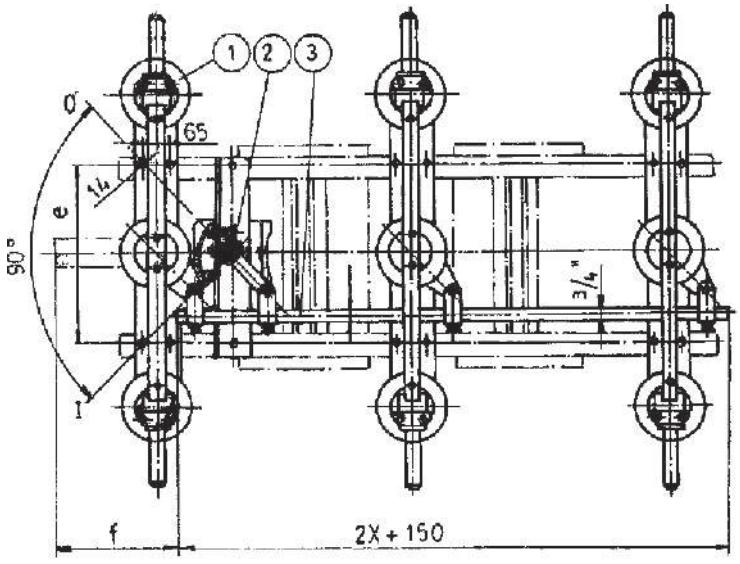


LEGEND

POS.	pcs..
1. DISCONNECTOR POLE, RSTa (RST)	3
2. DRIVE BEARING	1
3. LEVER TUBE 3/4"	1
4. MANUAL DRIVE	1

Tip	Un (kV)	In (A)	(mm)					
			a	cc'	d	e	f	x**) min
RST RSTa	12 / 17,5	630–3150	250	*)	600	300	240	600
	24		250	*)	600	300	240	600
	38		300	*)	700	400	280	700
	52		350	*)	800	500	340	800
	72,5		500	*)	1100	800	490	1200

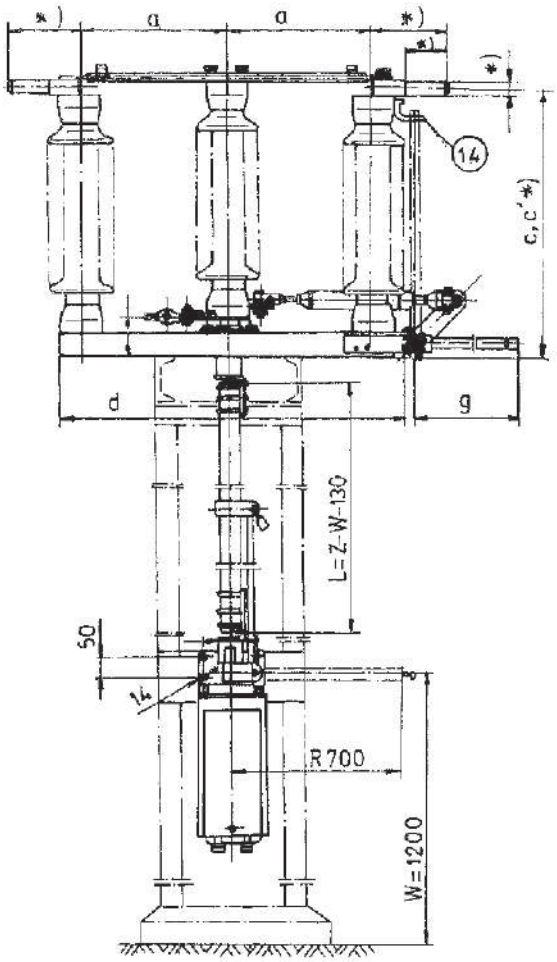
*(*) dimensions defined on disconnector poles
(**) if X not specially ordered, the disconnectors will be delivered with the minimal value of pole-centre distance

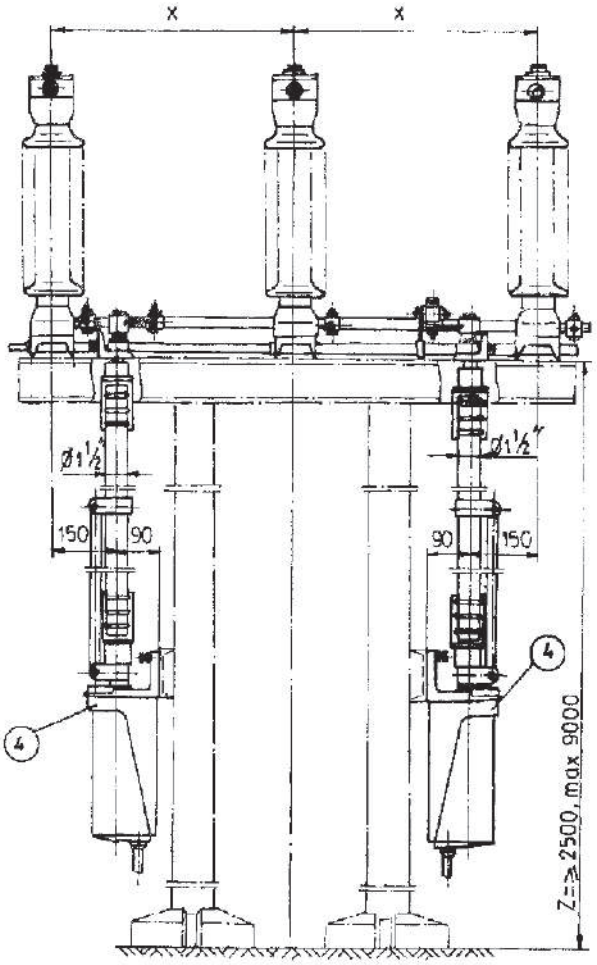


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THREE-POLE DISCONNECTOR WITH EARTHING SWITCH TYPE RSTZa (RSTZ)



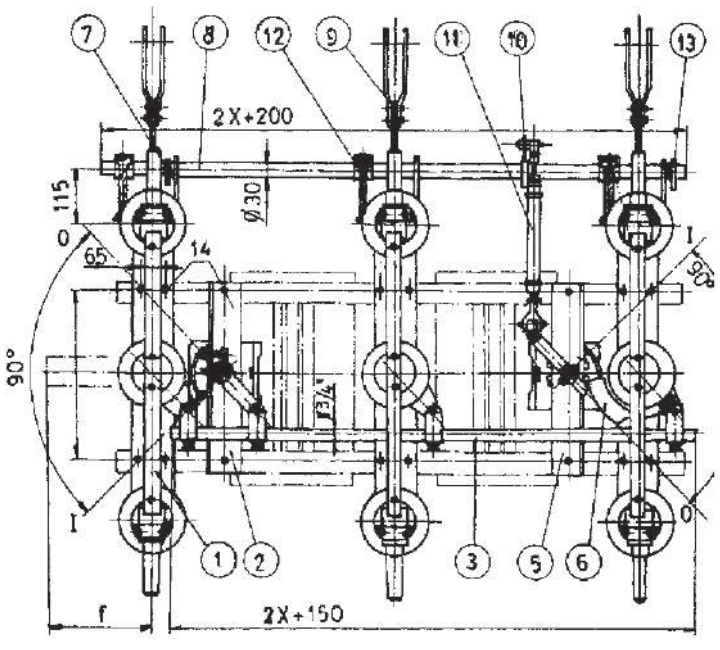


LEGEND

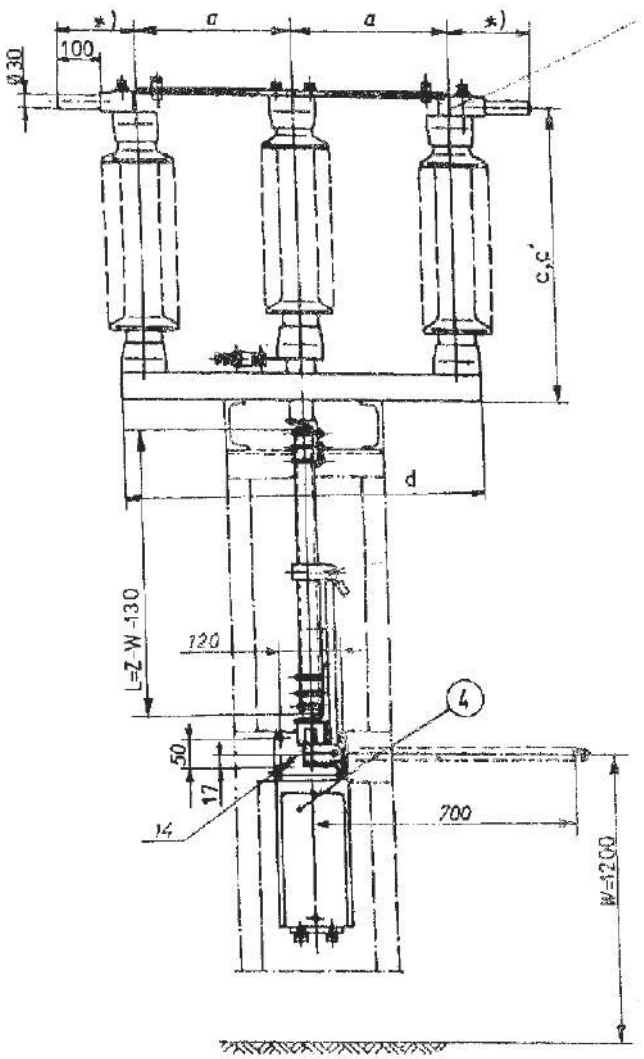
POS.		pcs.
1.	DISCONNECTOR POLE, RSTB (RST)	3
2.	DRIVE BEARING	1
3.	LEVER TUBE	1
4.	MANUAL DRIVE RP4-2	2
5.	DRIVE BEARING	1
6.	MECHANICAL INTERLOCKING	1
7.	BRACKET	3
8.	EARTHING AXLE DIA.30	1
9.	EARTHING BLADE	3
10.	LEVER	1
11.	OPERATING LEVER	1
12.	FLEXIBLE EARTHING CONNECTION	3
13.	POSITION LIMITER (STOPPER)	2
14.	EARTHING TERMINAL	3

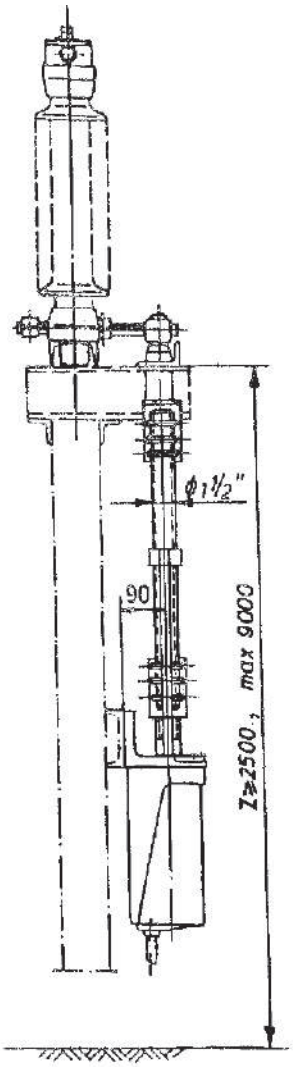
Type	Un (kV)	In (A)	(mm)						
			a	c/c'	d	e	f	g	X**) min
RSTZ RSTZa	12/17,5	630–3150	250	*)	600	300	240	300	600
	24		250	*)	600	300	240	325	600
	38		300	*)	700	400	280	430	700
	52		350	*)	800	500	340	565	800
	72,5		500	*)	1100	800	490	755	1200

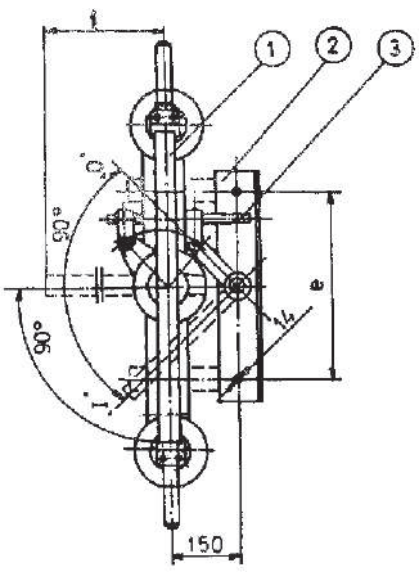
(*) dimensions defined on disconnector poles
(**) if X not specially ordered, the disconnectors will be delivered with the minimal value of pole-centre distance, according to the table.



SINGLE-POLE DISCONNECTOR
TYPE RSTJa (RSTJ)
with manual drive RP4-2







LEGEND

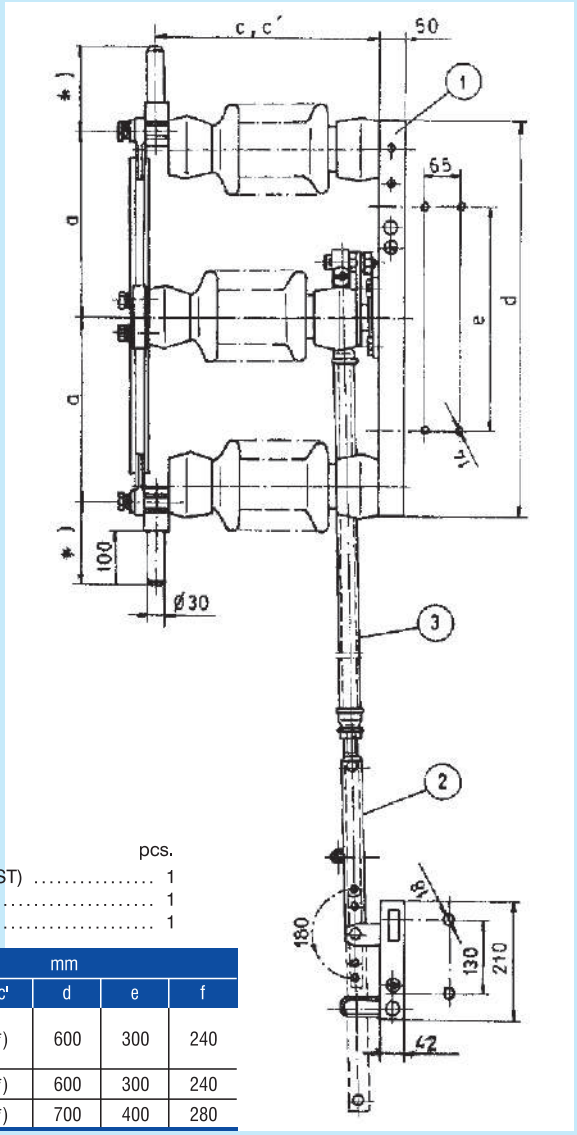
POS.	pcs.
1. DISCONNECTOR POLE, RST2 (RST)	1
2. DRIVE BEARING	1
3. LEVER TUBE	1
4. MANUAL DRIVE RP4-2	1

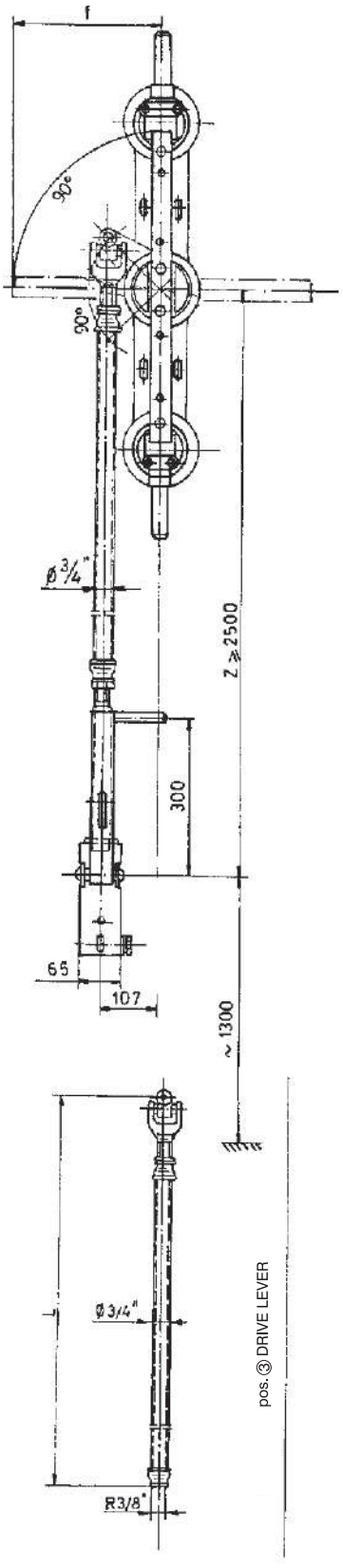
Type	Un (kV)	In (A)	mm				
			a	cc'	d	e	f
RSTJ	12/17,5	630	250	*)	600	300	240
RSTJa	24	1250	250	*)	600	300	240
	38	1600	300	*)	700	400	280

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SINGLE-POLE DISCONNECTOR
TYPE RSTJa (RSTJ)
with manual drive RP5 for vertical mounting



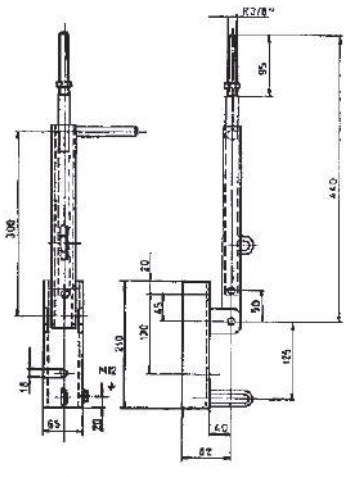


LEGEND

POS.		pcs.
1.	DISCONNECTOR POLE, RSTa (RST)	1
2.	MANUAL DRIVE RP5	1
3.	DRIVE LEVER	1

Type	Un (kV)	In (A)	mm				
			a	cc'	d	e	f
RSTJ	12/17,5	630	250	*)	600	300	240
RSTJa	24	1250	250	*)	600	300	240
	38	1600	300	*)	700	400	280

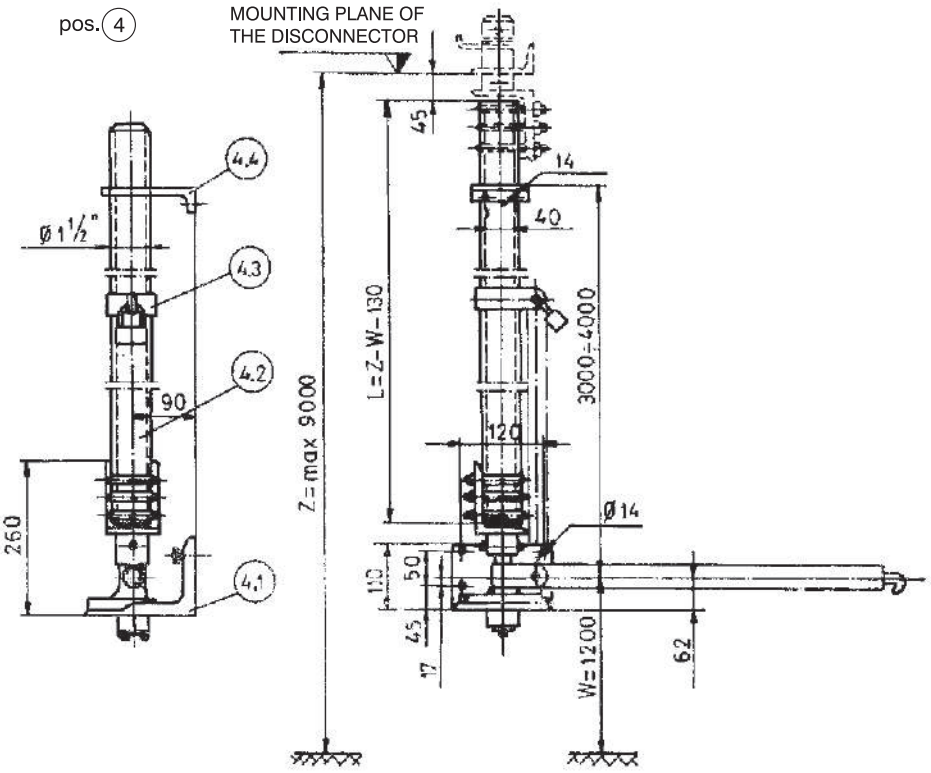
*) dimensions defined on disconnector poles



pos. ② manual drive RP5

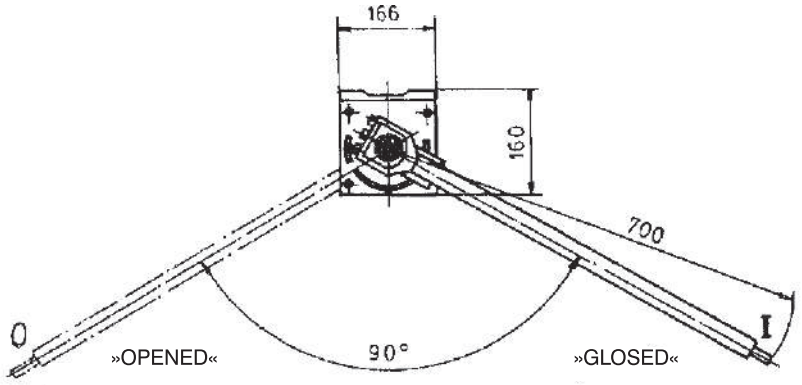
pos. ③ DRIVE LEVER

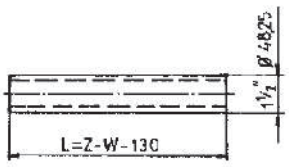
MANUAL DRIVE
TYPE RP4-1
with drive accessories



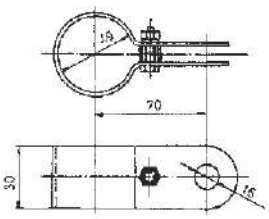
LEGEND

POS.	pcs.
4.1. MANUAL DRIVE RP4-1	1
4.2. DRIVE TUBE	1
4.3. CLAMPING RING FOR PADLOCK	1
4.4. GUIDE (FOR HEIGHTS Z > 3000)	1

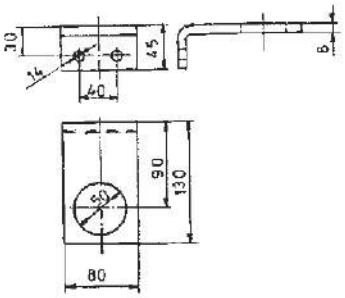




pos. 4.2 DRIVE TUBE



pos. 4.2 CLAMPING RING FOR PADLOCK

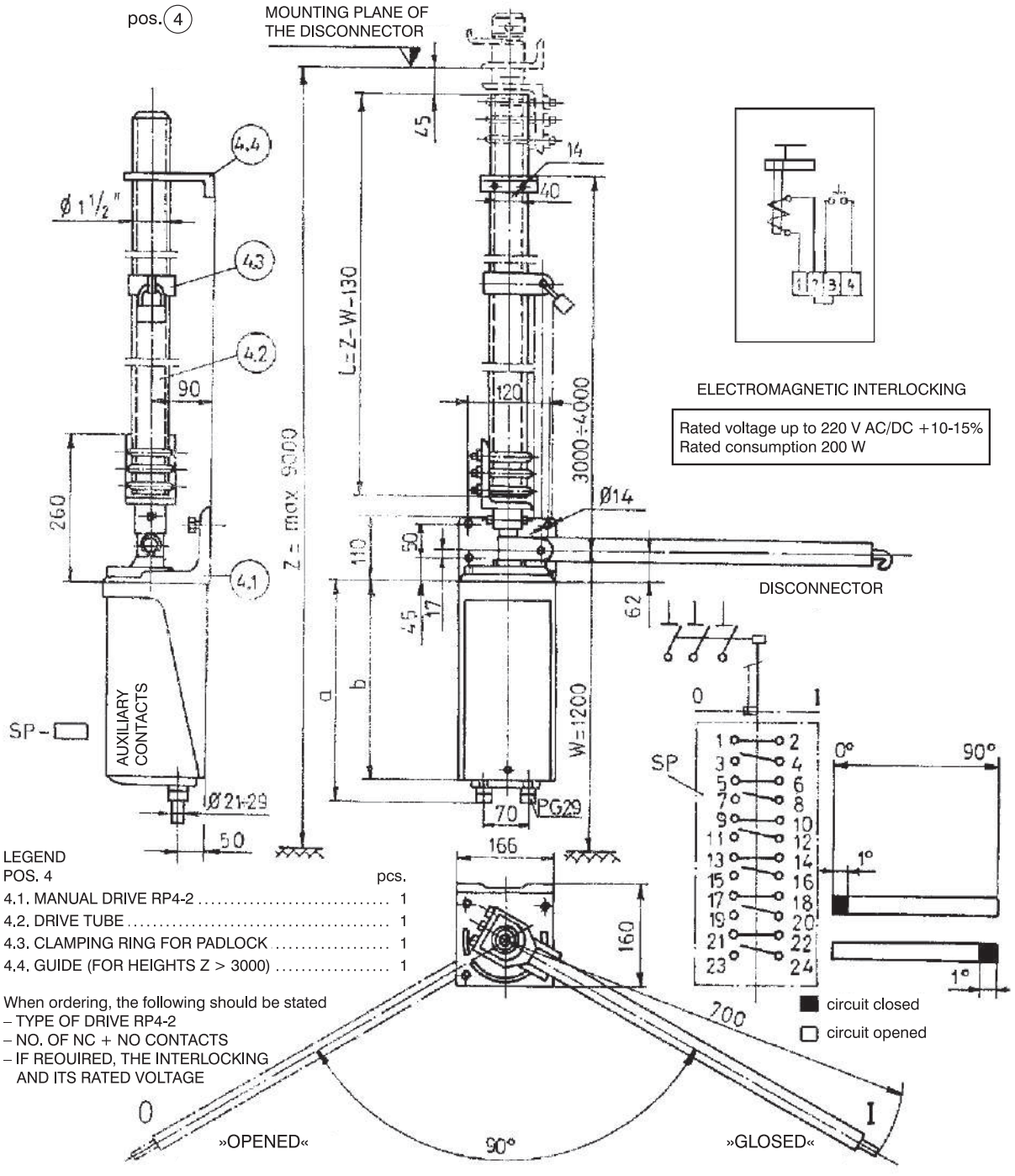


pos. 4.2 GUIDE

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MANUAL DRIVE
TYPE RP4-2
with drive accessories

- with auxiliary signalling contacts
- with electromagnetic interlocking



LEGEND

POS. 4	pcs.
4.1. MANUAL DRIVE RP4-2	1
4.2. DRIVE TUBE	1
4.3. CLAMPING RING FOR PADLOCK	1
4.4. GUIDE (FOR HEIGHTS Z > 3000)	1

When ordering, the following should be stated
– TYPE OF DRIVE RP4-2
– NO. OF NC + NO CONTACTS
– IF REQUIRED, THE INTERLOCKING AND ITS RATED VOLTAGE

AUXILIARY CONTACTS

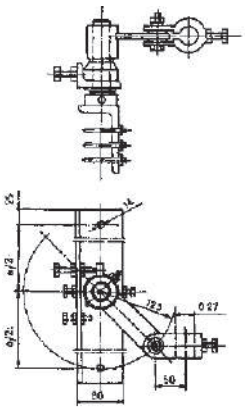
Type	No + NC contacts*)	a	b	TEHNICAL DATA
SP-2	2 + 2	250	220	Rated voltage ≈ 220 V AC/DC Rated continuous current ≈ 10 A Breaking capacity = 2 A ~ 10 A Time constant T ≤ 20 ms
SP-4	4 + 4	250	220	
SP-6	6 + 6	340	310	

*) The ratio of NO / NC as well as the higher No. of them – at special request

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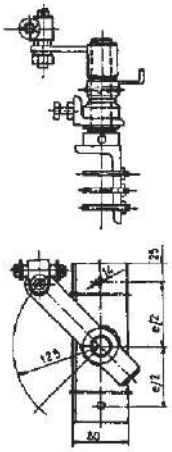
OPERATING ACCESSORIES



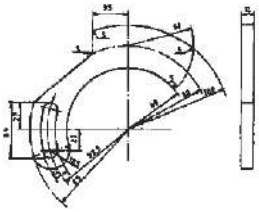
pos. 2
DRIVE BEARING



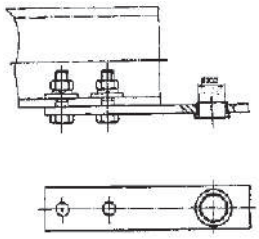
pos. 3
LEVER TUBE



pos. 5
DRIVE BEARING



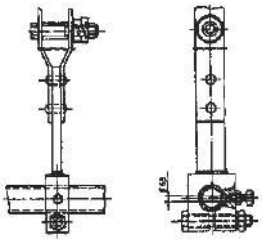
pos. 6
MECHAN.
INTERLOCKING



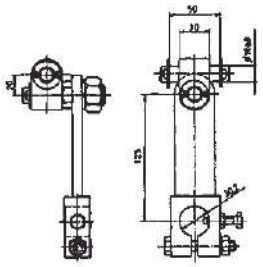
pos. 7
BRACKET



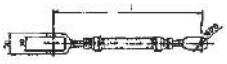
pos. 8
EARTHING AXLE



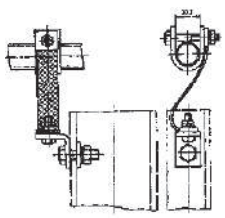
pos. 9
EARTHING BLADE



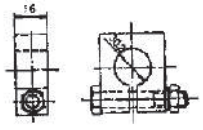
pos. 10
LEVER



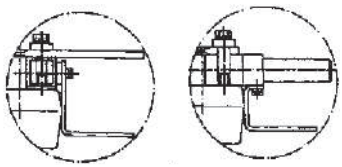
pos. 11
DRIVE LEVER



pos. 12
FLEXIBLE
EARTHING
CONNECTION



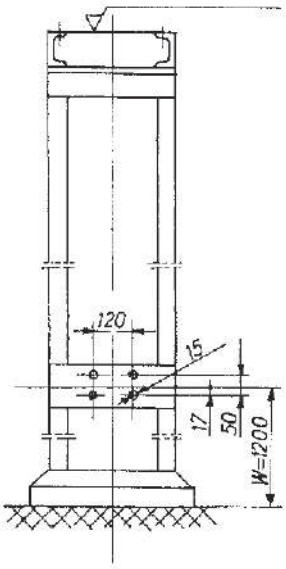
pos. 13
POSITION
LIMITER

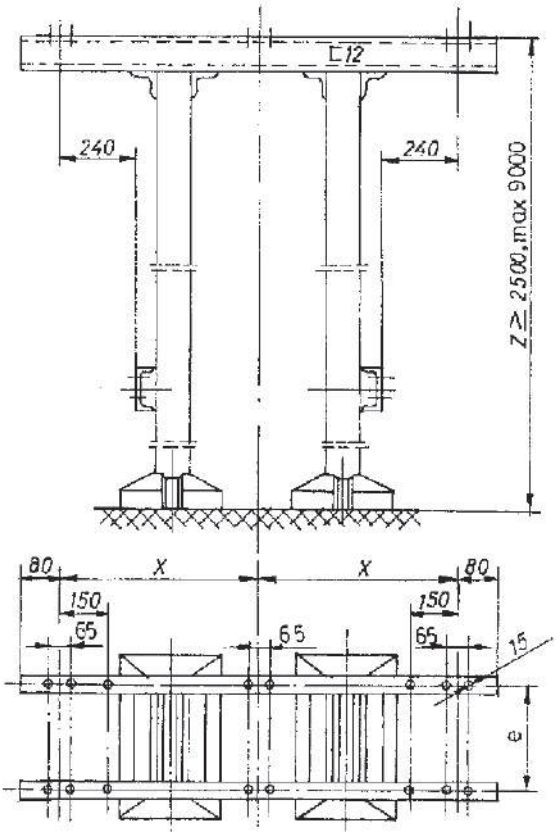


pos. 14
EARTHING
CONTACT
FOR
RSTZ

pos. 14
EARTHING
CONTACT
FOR
RSTZa

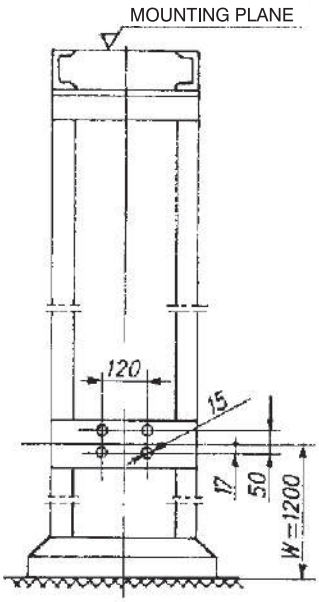
SUPPORT STRUCTURE LAYOUT
for three-pole disconnector

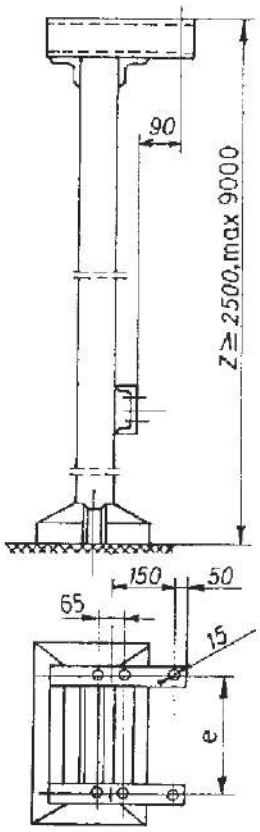




Type	Un (kV)	In (A)	mm	
			e	Xmin
RST	12/17,5	630–3150	300	600
	24		300	600
RSTa	38		400	700
	52		500	800
	72,5		800	1200

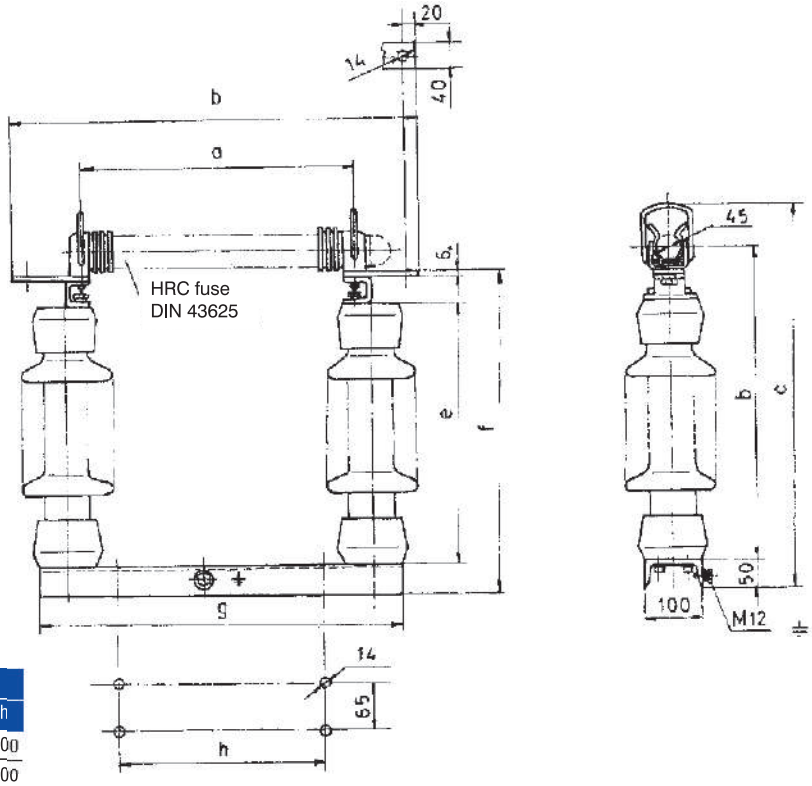
SUPPORT STRUCTURE LAYOUT
for single-pole disconnector





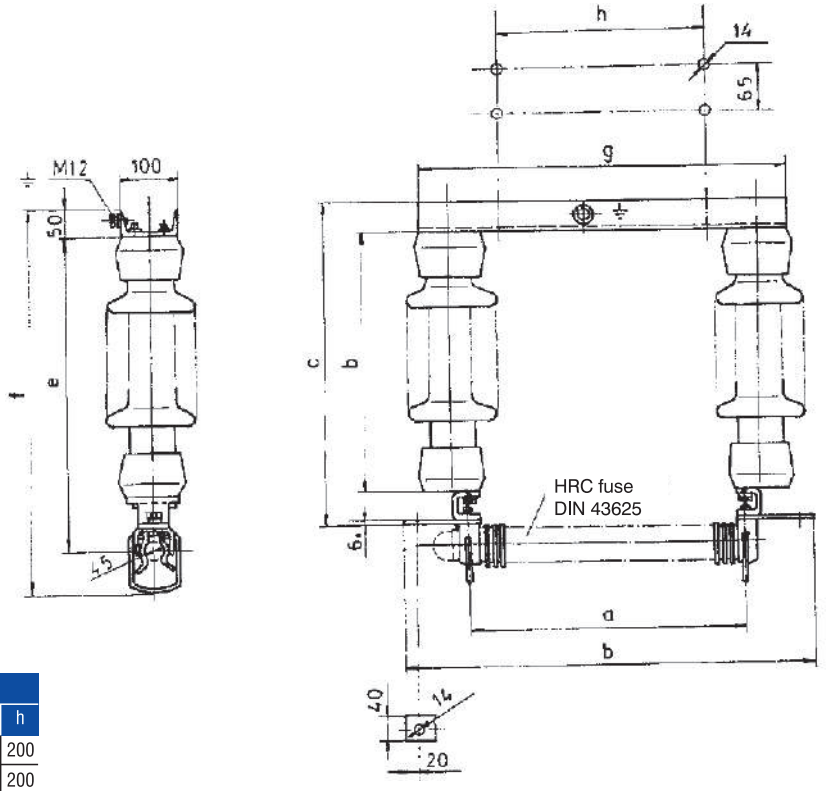
Type	Un (kV)	In (A)	mm	
			e	Xmin
RST	12/17,5	630–3150	300	600
	24		300	600
RSTa	38		400	700
	52		500	800
	72,5		800	1200

HRC FUSE BASE
for horizontal and vertical mounting
type POS



Type	Un (kV)	In (A)	mm							
			a	b	c	d	e	f	g	h
POS-12	12	200	325	408	512	555	316	412	479	200
POS-17,5	17,5	200	325	408	512	555	316	412	479	200
POS-24	24	200	475	432	536	705	340	436	629	350
POS-38	38	200	570	537	641	800	445	541	724	450

HRC FUSE BASE
for hanging positon mounting
type POSV



Type	Un (kV)	In (A)	mm							
			a	b	c	d	e	f	g	h
POSV-12	12	200	325	408	512	555	316	412	479	200
POSV-17,5	17,5	200	325	408	512	555	316	412	479	200
POSV-24	24	200	475	432	536	705	340	436	629	350
POSV-38	38	200	570	537	641	800	445	541	724	450

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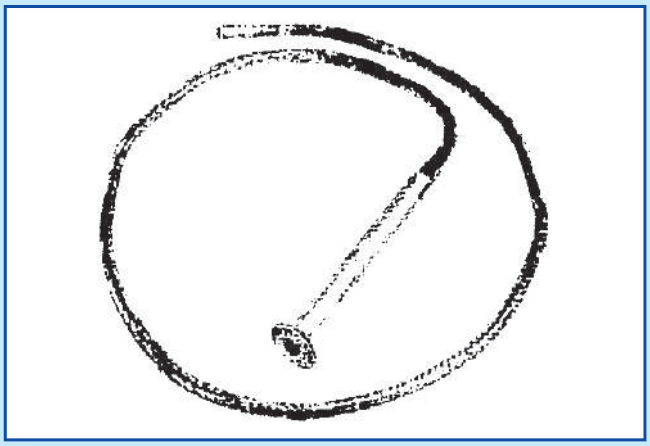
High-voltage fuse cutout switch type MROS 7,2–38 kV 3–100 A



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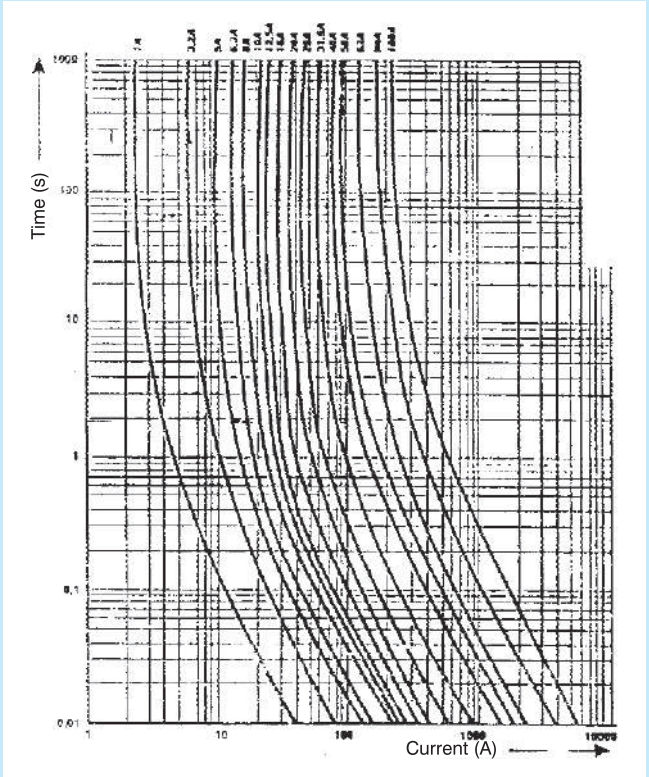
Fuse element



Rated voltage:	7.2 kV 12 kV 17.5 kV 24 kV 27 kV 27/38 kV 38 kV
Rated current:	1–100 A
Standards:	IEC 282-2

FUSE CARTRIDGE	
Rated voltage (kV)	Rated current (A)
7.2	100
12	100
17.5	100
24	100
27	100
27/38	40
38	40

Time-current characteristic



FUSE ELEMENT							
Rated voltage (kV)	7.2	12	17.5	24	27	27/38	38
Rated current (A)	1	1	1	1	1	1	1
	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	5	5	5	5	5	5	5
	6.3	6.3	6.3	6.3	6.3	6.3	6.3
	8	8	8	8	8	8	8
	10	10	10	10	10	10	10
	12.5	12.5	12.5	12.5	12.5	12.5	12.5
	16	16	16	16	16	16	16
	20	20	20	20	20	20	20
	25	25	25	25	25	25	25
	31.5	31.5	31.5	31.5	31.5	31.5	31.5
	40	40	40	40	40	40	40
	50	50	50	50	50		
	63	63	63	63	63		
	80	80	80	80	80		
	100	100	100	100	100		

TECHNICAL DATA:

Breaking capacity of the fuse element is 100 MVA. Expulsion automatic cutout cartridge assembled with fuse element ensures the guaranteed time-current characteristic for all rated currents, and automatic disconnecting after burn-out.

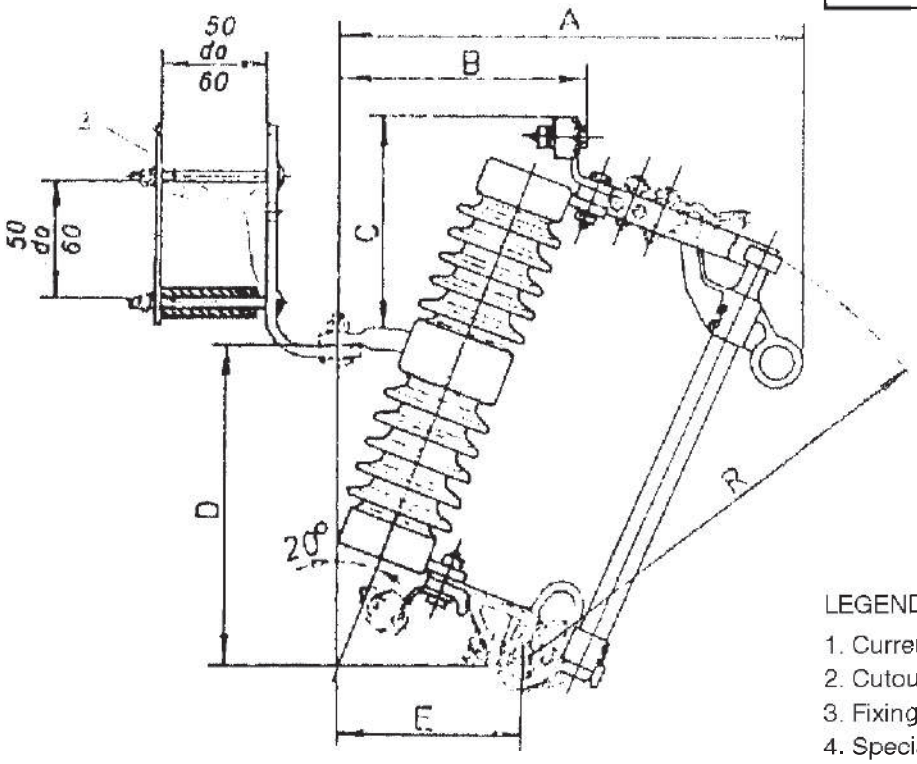
The burned-out fuse element can be easily changed by removing the automatic cutout cartridge with the help of special insulating rod, replacing of fuse element, and then by reassembling the complete fuse cartridge in the fuse base. Thus, the apparatus is enabled for service. Fuse elements are shipped in 5 piece packing in appropriate carton box.

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High-voltage fuse cutout switch type M ROS 7, 2-38 kV,100 A

Rated voltage	7,2–38 kV
Rated current	100 A
Standards	IEC 282-2



LEGEND:

1. Current terminal
2. Cutout fuse cartridge
3. Fixing on all type of profiles
4. Special type outdoor support porcelain insulator

DESCRIPTION:

High-voltage fuse cutout switch type MROS 7,2–38 kV, 100 A is a combination of high-voltage expulsion fuse and (automatic) cutout switch.

APPLICATION:

High-voltage fuse cutout switch type MROS 7,2–38 kV, 3–100 A is used for overcurrent protection (overload, short-circuit currents), mainly on pole-mounted transformers, in outdoor switchgear substations, for protection of house transformers etc...

It is intended for application in tropical climatic conditions also. Upon special request, the fixing element can be delivered in the shape of clamping ring for wooden pole.

FEATURES:

High-quality manufacturing of high-voltage fuse cutout switch type MROS 7,2–38 kV, 100 A enables safe manipulation in various climatic conditions. Mechanically it represents a homogenous unit.

All contact parts ensure good electrical conductivity and high mechanical strength. The surface protection of metallic parts is done properly.

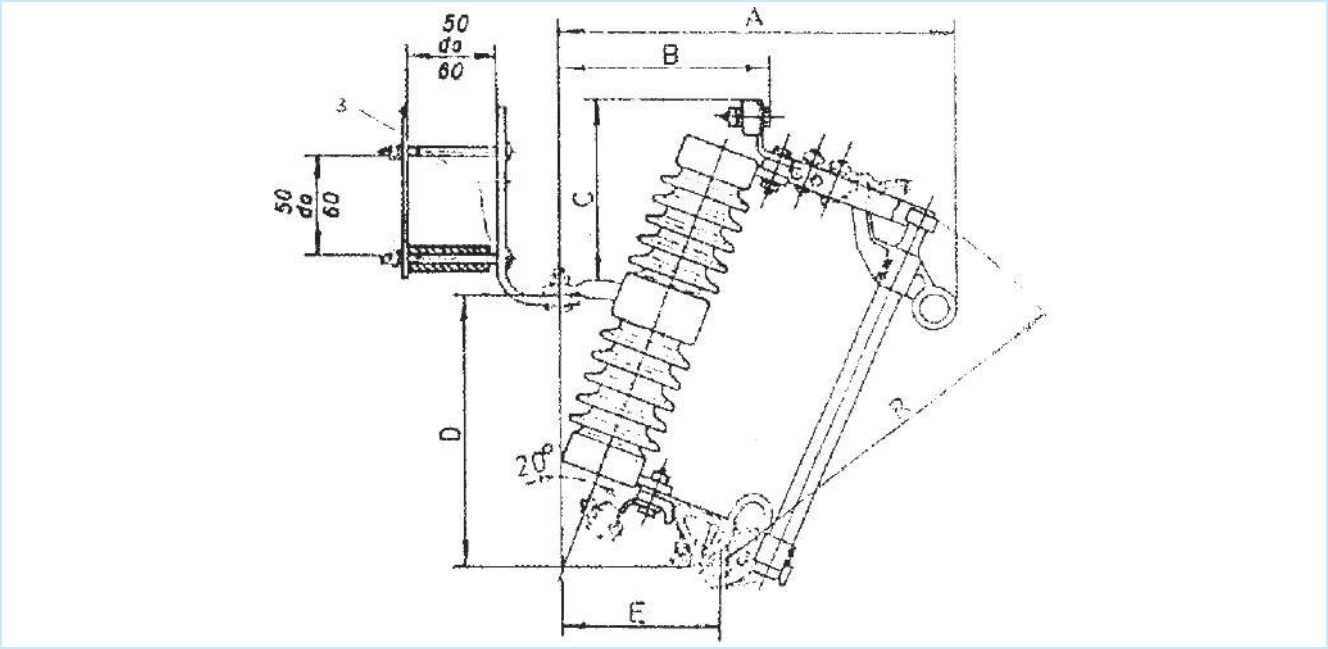
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TECHNICAL CHARACTERISTICS

Voltage characteristics

Highest system voltage (kV)	Withstand voltage 1 min 50 Hz, dry (kV)	Withstand voltage 10 sec,50 Hz, wet 1,2 μs (kV)	Lightning impulse withstand voltage, (kV)
7.2	27	24	60
12	35	32	75
17.5	45	36	95
24	55	42	125
27	55	42	125
27/38	75	60	150
38	75	60	170



CHARACTERISTICS AND DIMENSIONS

basic type of fuse cutout switch MROS

Type	Highest system voltage (kV)	Rated current (A)	Impulse withstand voltage (kV)	Breaking capacity		Dimensions (mm)						m
				Symm. (A)	Asymm. (A)	A	B	C	D	E	R	kg
MROS 7.2–100	7.2	100	95	3500 7100 8000	5000 10000 12000	400	195	165	210	300	400	6
MROS 12–100	12	100	95	2800 5600 8000	4000 8000 12000	400	195	165	210	300	400	6
MROS 17.5–100	17.5	100	110	2800 5600 8000	4000 8000 12000	440	205	165	220	300	400	7
MROS 24–100	24	100	125	2500 4000 8000	4000 8000 12000	450	220	175	235	300	500	8
MROS 27–100	27	100	125	2500 4000 8000	4000 8000 12000	450	220	175	235	300	500	8
MROS 27/38–100	27/38	100	150	2500 4000 8000	4000 8000 12000	475	230	190	255	300	550	11
MROS 38–100	38	100	170	2500 4000 8000	4000 8000 12000	475	230	190	255	300	550	11

sarel

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Medium voltage switchboard
12÷24 kV

SYStem-6



General

SYStem-6 M. V. switchboard is composed by a stardarized, modular and compact series of protected and internally arc-proofed panels, eauipped with SF6 insulated on-load switches.

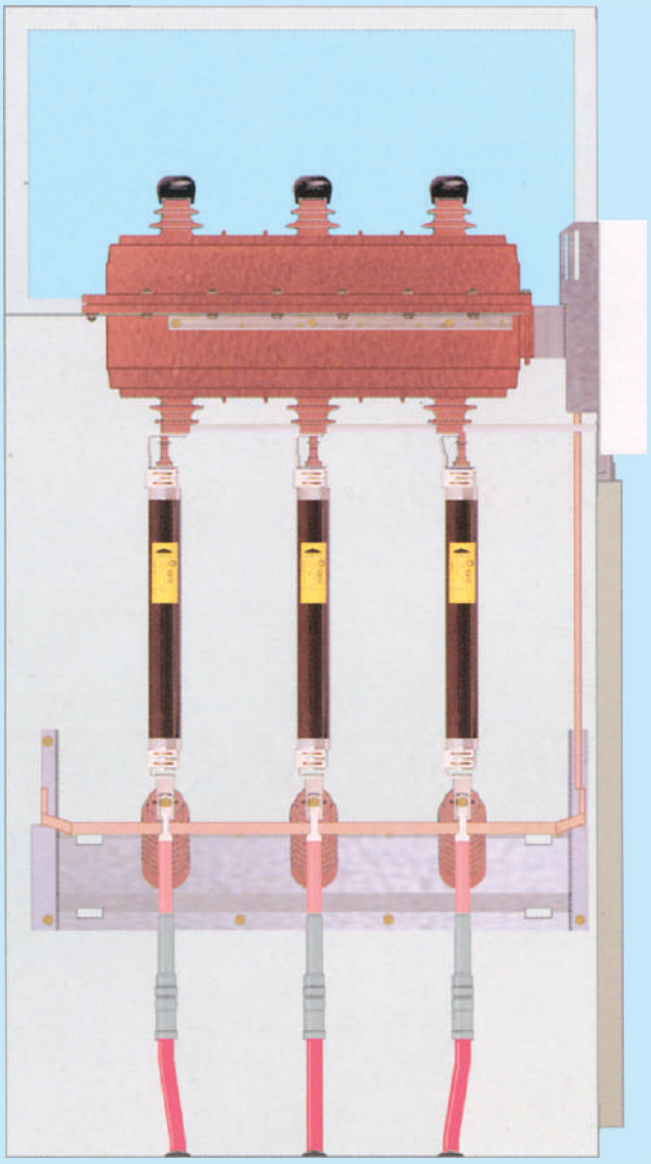
Complex switchboard configurations can be realized using the standard panels.

Each panel is eauipped with mechanical interlocks and a movable mimic diagram, which grant the maximum safety of operation.

Arc-proof execution allows to employ these panels even in extreme conditions.

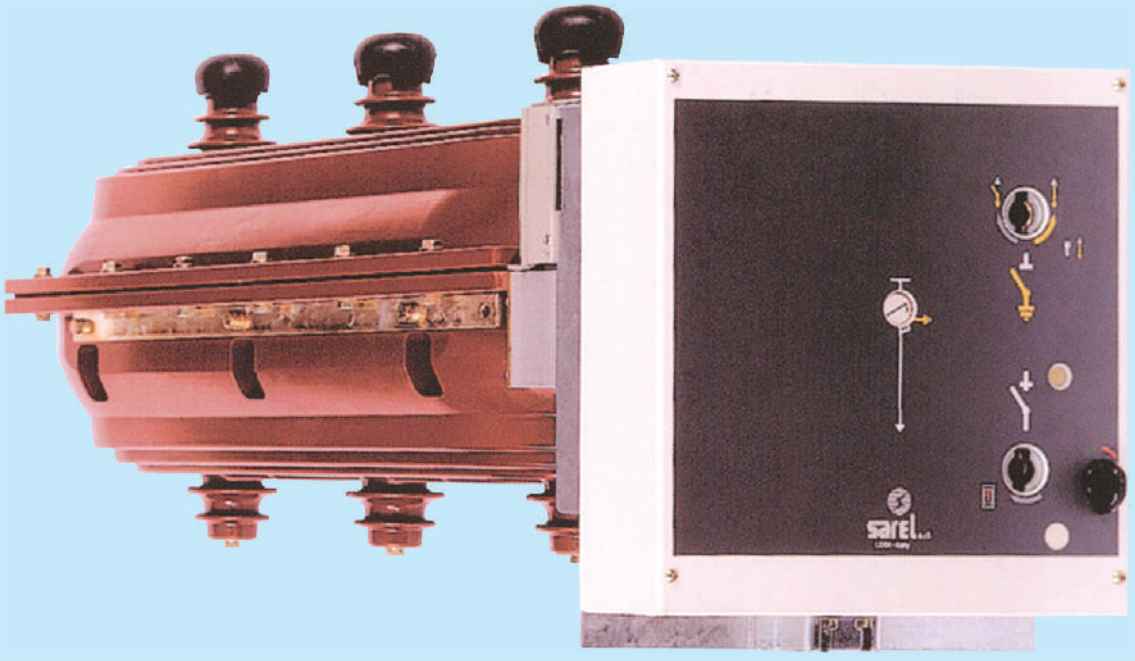
SYStem-6 switchboard complies to the following Standards:

CEI EN-60298
IEC 60298
DPR 547



Electrical characteristics

Rated voltage		kV	12	17,5	24
Insulating level 50 Hz 1 min. (kV rms.)	Insulation	kV	28	38	50
	Isolation	kV	32	45	60
Insulating level 1,2/50 ms (kV peak)	Insulation	kV	75	95	125
	Isolation	kV	85	110	145
Rated current		A	630 – 800		
Short-time withstand current (1 sec.)		kA	16 – 20		
Withstand internal arc		kA	12,5 – 16		
Protection degree			IP2X		



On-load switches type IM6S – IM6P

MINEL

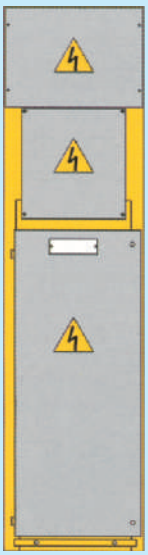
ISO 9001
IQ Net
OQS

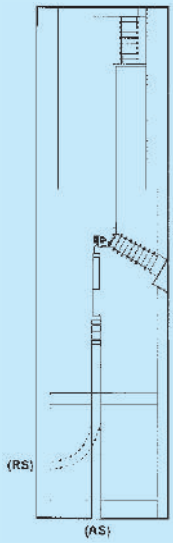
sarel

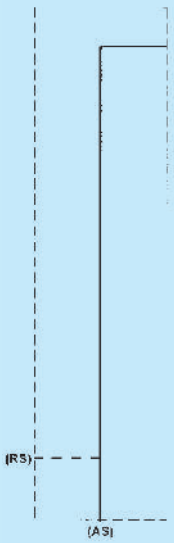
Panels



AS – RS







AS Incoming cable – RS Bus riser

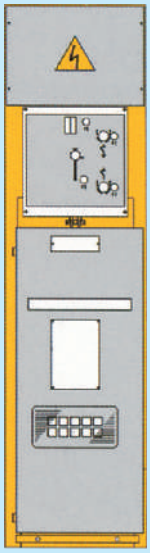
Basic equipment
Busbars L = 500
Cables L = 375

Optional accesories
Voltage indicators

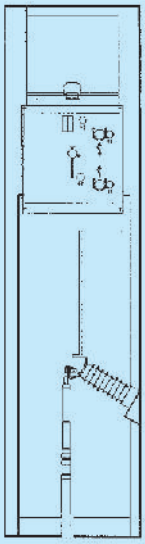
ISO 9001
IQ Net
OQS

Panels

»I«





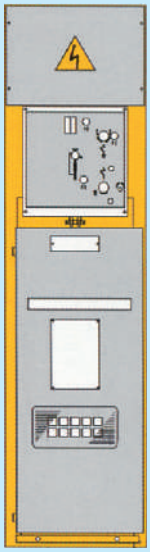


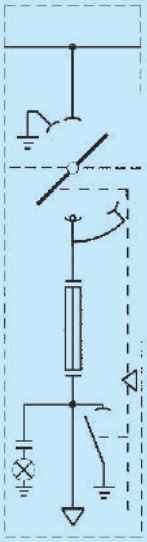
»I« Incoming or outgoing

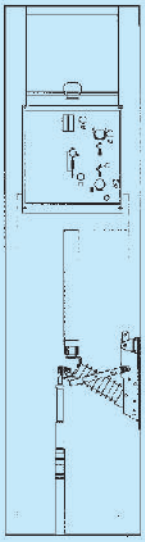
Basic equipment
Busbars
On-load switch IM6
KS operating mechanism
Earth switch
Voltage indicators

Optional accesories
KP operating mechanism
Tripping coil (KP operating mechanism)
Motor operating mechanism KSM
Auxiliary contacts
Key interlock
Heater resistence 17W 220 Vac
Low voltage auxiliary compartment

»TM«







»TM« Feeder with on-load switch-fuse with blow-out fuse tripping

Basic equipment
Busbars
On-load switch-fuse IM6-F
KP operating mechanism
3 Striker fuses
Earth switch at the upper and lower side of fuses
Voltage indicators

Optional accesories
Tripping coil (KP operating mechanism)
Auxilary contacts
Key interlock
Heater resistence 17 W 220 Vac
Low voltage auxiliary compartment

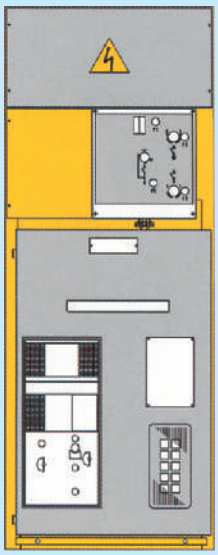
MINEL

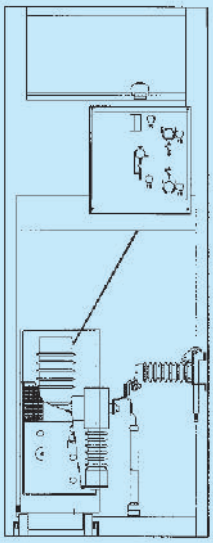
ISO 9001
IQ Net
OQS

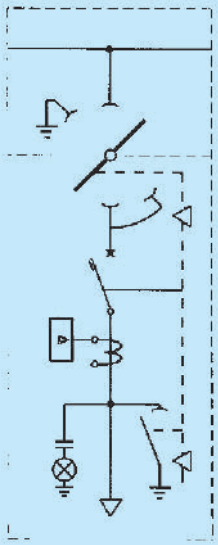
sarel

Panels

ITD-HAD





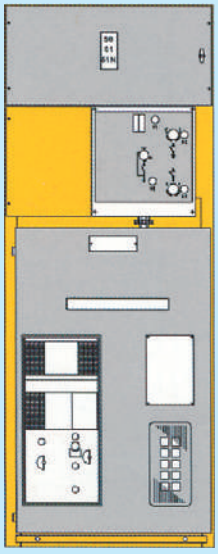


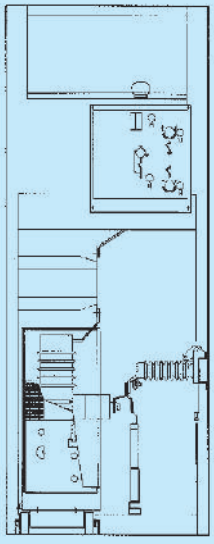
ITD-HAD Feeder with SF6 circuit breaker with built-in relays

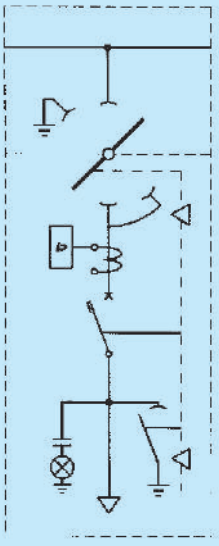
Basic equipment
Busbars
On-load switch IM6-D
KS operating mechanism
SF6 automatic circuit breaker with integrated protection and tripping coil
Earth switch at the upper and lower side of automatic circuit breaker
Voltage indicators

Optional accesories
Auxiliary contacts
Key interlock
Heater resistence 17W 220 Vac
Low voltage auxiliary compartment
Motor operating mechanism for SF6 automatic circuit breaker

ITI-HAD







»ITI-HAD« Feeder SF6 circuit breaker with CTs and indirect relay

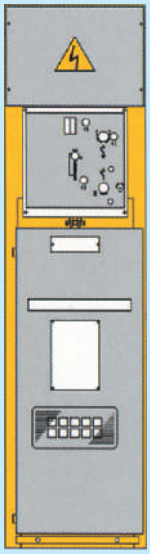
Basic equipment
Busbars
On-load switch IM6-D
KP operating mechanism
SF6 automatic circuit breaker with tripping coli
Earth switch at the upper and lower side of automatic circuit breaker
Voltage indicators
3 Current transformers
Microprocessor secundary protection

Optional accesories
Auxilary contacts
Key interlock
Heater resistence 17 W 220 Vac
Low voltage auxiliary compartment
Motor operating mechanism for SF6 automatic circuit breaker

ISO 9001
IQ Net
OQS

Panels

»MV«





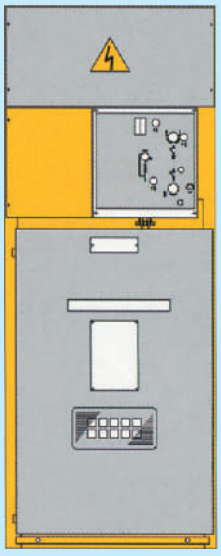


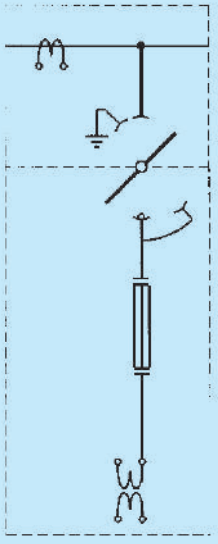
»MV« Metering with VT

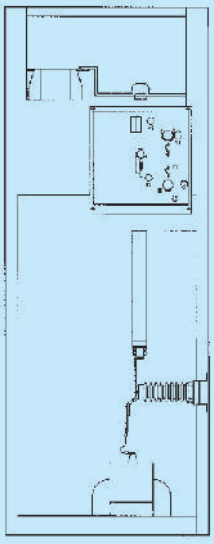
Basic equipment
Busbars
On-load switch IM6
KS operating mechanism
Earth switch
3 Fuse bases with MV side
3 Fuse bases with LV side
3 Voltage transformers

Optional accesories
Auxiliary contacts
Heater resistence 17W 220 Vac
Low voltage auxiliary compartment

»MA«





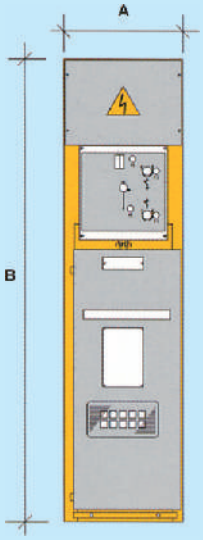


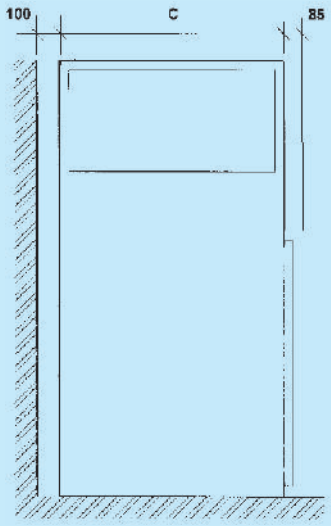
»MA« Metering with CT and VT

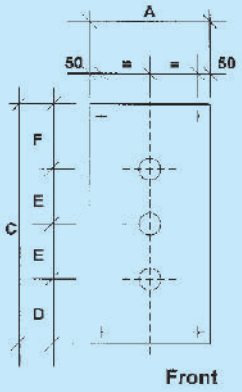
Basic equipment
Busbars
On-load switch IM6
KS operating mechanism
Earth switch
3 Fuse bases with MV side
3 Fuse bases with LV side
3 Voltage transformers
2 Current transformers

Optional accesories
Auxilary contacts
Heater resistence 17 W 220 Vac
Low voltage auxiliary compartment

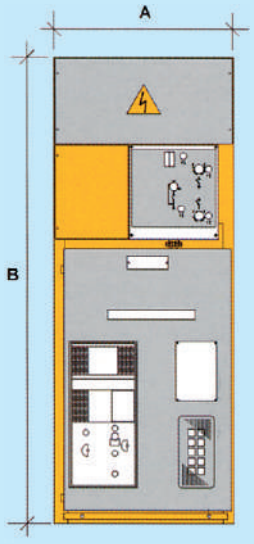
Panel floor fixing and incoming cables



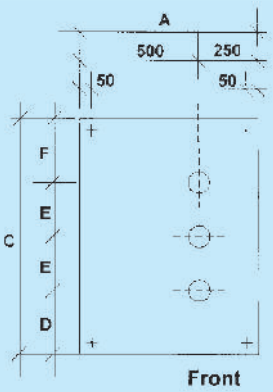




TYPE	12 – 17,5 Kv						24 Kv					
	A	B	C	D	E	F	A	B	C	D	E	F
AS–RS	375	1600	900	270	230	170	375	1600	1000	270	230	270
	500	1950					500	1950				
I	375	1600	900	270	230	170	375	1600	1000	270	230	270
	500	1950					500	1950				
TM	375	1600	900	270	230	170	375	1600	1000	270	230	270
	500	1950					500	1950				
MV	375	1600	900	–	–	–	375	1600	1000	–	–	–
	500	1950					500	1950				
MA	750	1600	900	–	–	–	750	1600	1000	–	–	–
	750	1950					750	1950				







TYPE	12 – 17,5 Kv						24 Kv					
	A	B	C	D	E	F	A	B	C	D	E	F
ITD-HD4	750	1600	900	270	230	170	750	1600	1000	270	230	270
	750	1950					750	1950				
ITI-HD4	750	1600	900	270	230	170	750	1600	1000	270	230	270
	750	1950					750	1950				

Weight

Type	Width (mm)	Weight (kg)	Type	Width (mm)	Weight (kg)
AS 300	300	100	TM	500	155
AS 500	500	115	MV 500	500	260
RS–300	300	100	MA 750	750	355
RS–500	500	115	ITD-HD4	750	325
I	500	140	ITI-HD4	750	360



Ring-main unit **SYStem-6** switchboard

MINEL

ISO 9001
IQ Net
OQS

sarel

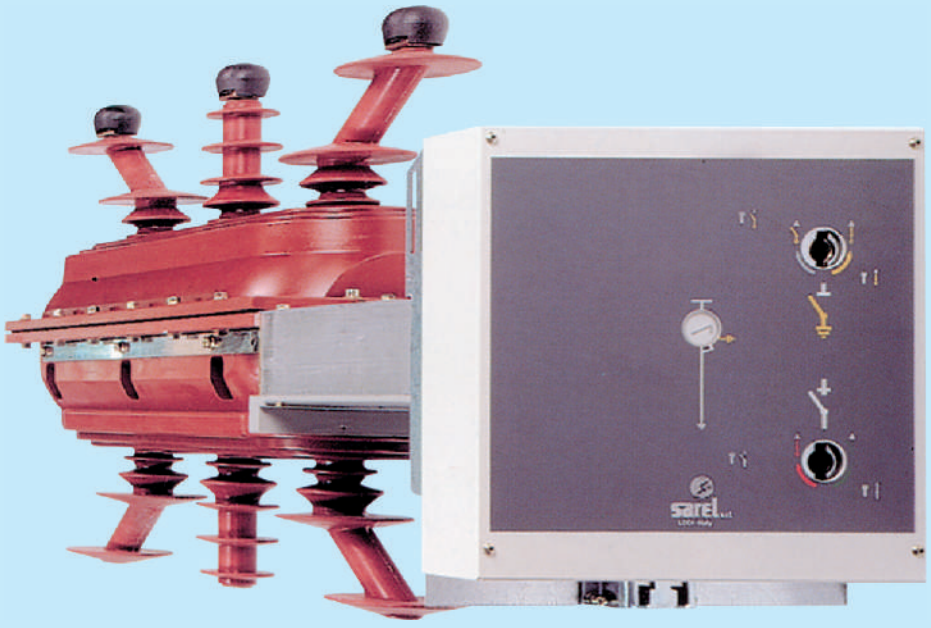
On-load switch »IM6«
36 kV

SYStem-6



Electrical characteristics

Rated voltage		kV	36
Insulating level 50 Hz 1 min. (kV rms.)	Insulation	kV	70
	Isolation	kV	80
Insulating level 1,2/50 µs (kV peak)	Insulation	kV	170
	Isolation	kV	195
Rated current		A	400
Short-time withstand current (1 sec.)		kA	12,5
Making capacity		kA	31,5
Breaking capacity	Mainly active load	A	400
	Ring charge	A	400
	No load transformers	A	6,3
	No load cables	A	16



On-load switches type IM6S – IM6P

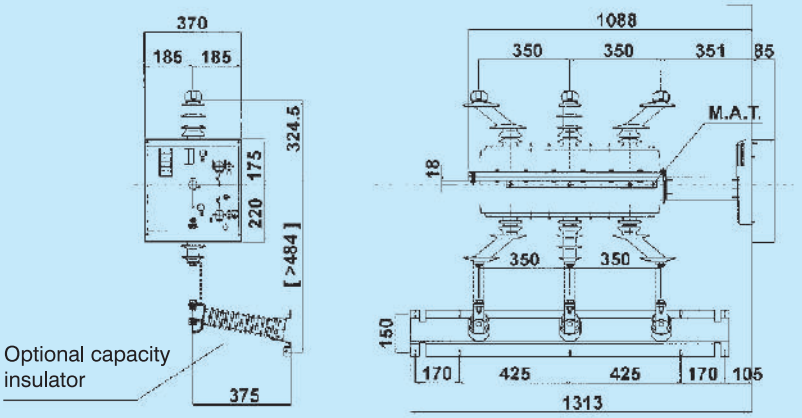
MINEL

ISO 9001
IQ Net
OQS

sarel

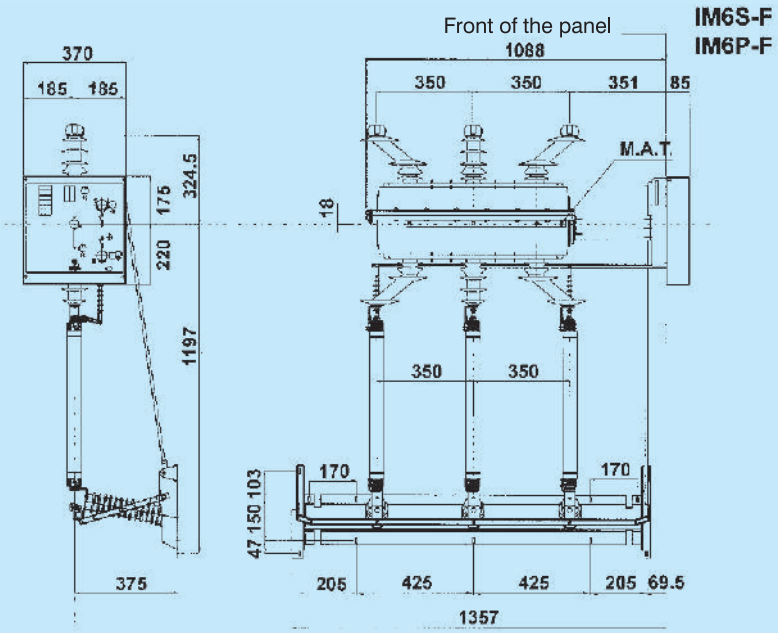
Dimensions

IM6S
IM6P



36 kV	
PANELS DIMENSIONS	
Rated voltage	36
Depth	1400
Width	750 – 1100
Height	2250

IM6S-F
IM6P-F

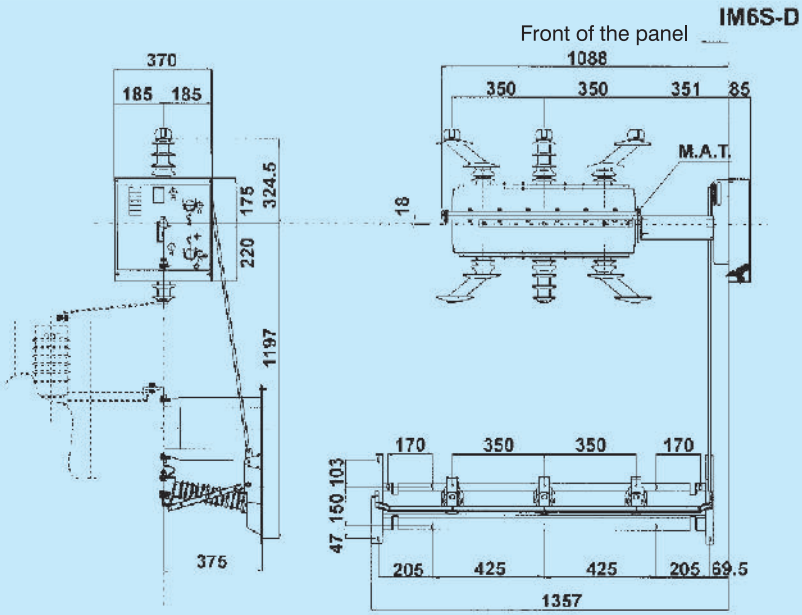


SYStem 6 36 kV



Medium voltage switchboard equipper with SF_6 on-load switch

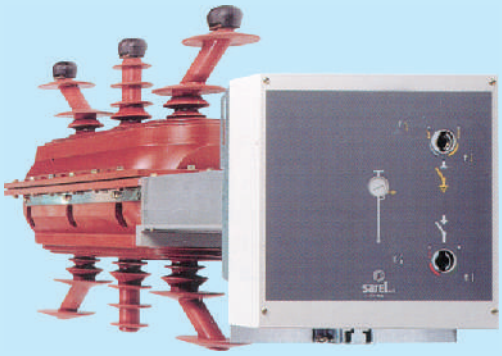
IM6S-D



Generalities

SYStem-6 MV switchboard is composed by a standarized, modular and compact series of panels, eauipped with SF6 insulated on-load switches. Complex switchboard configurations can be realized using the standard panels. Each panel is equippedwith mechanical interlock and movable mimic diagram, which grant the maximum safety ofoperation.

SYStem-6 switchboard complies to thefollowing Standards:
CEI EN-60298
IEC 60298
DPR 547



SF6 on-load switches type IM6S

ELECTRICAL CHARACTERISTICS

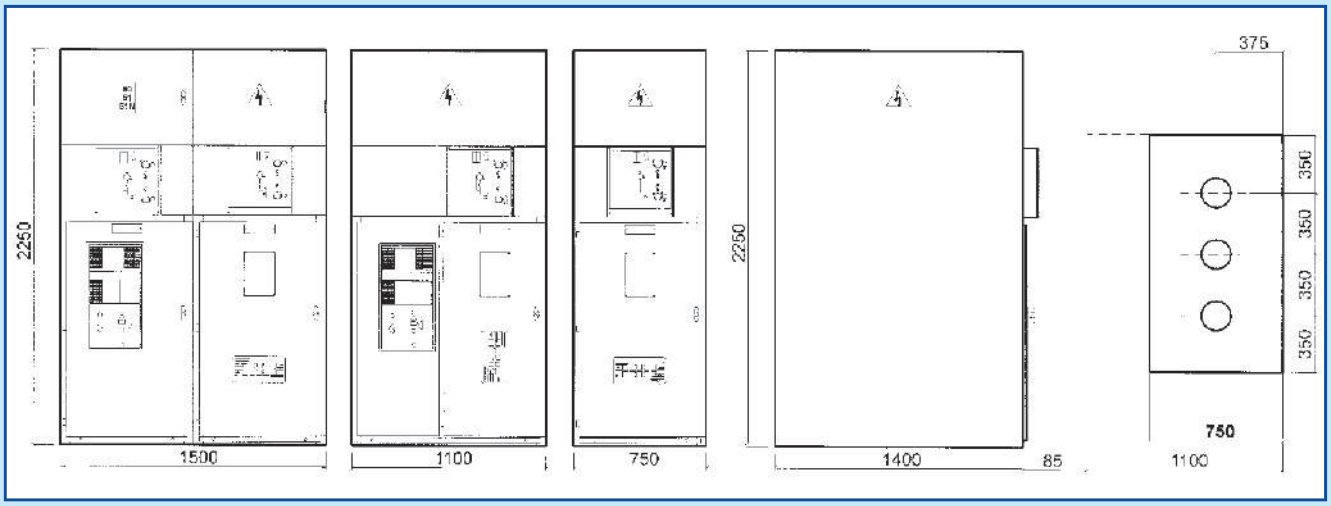
Rated voltage		kV	36
Insulating level 50 Hz 1 min. (kV rms.)	Insulation	kV	70
	Isolation	kV	80
Insulating level 1,2/50 ms (kV peak)	Insulation	kV	170
	Isolation	kV	195
Rated current		A	400
Short-time withstand current (1 sec.)		kA	12,5
Withstand internal arc		kA	12,5
Protection degree			IPX2

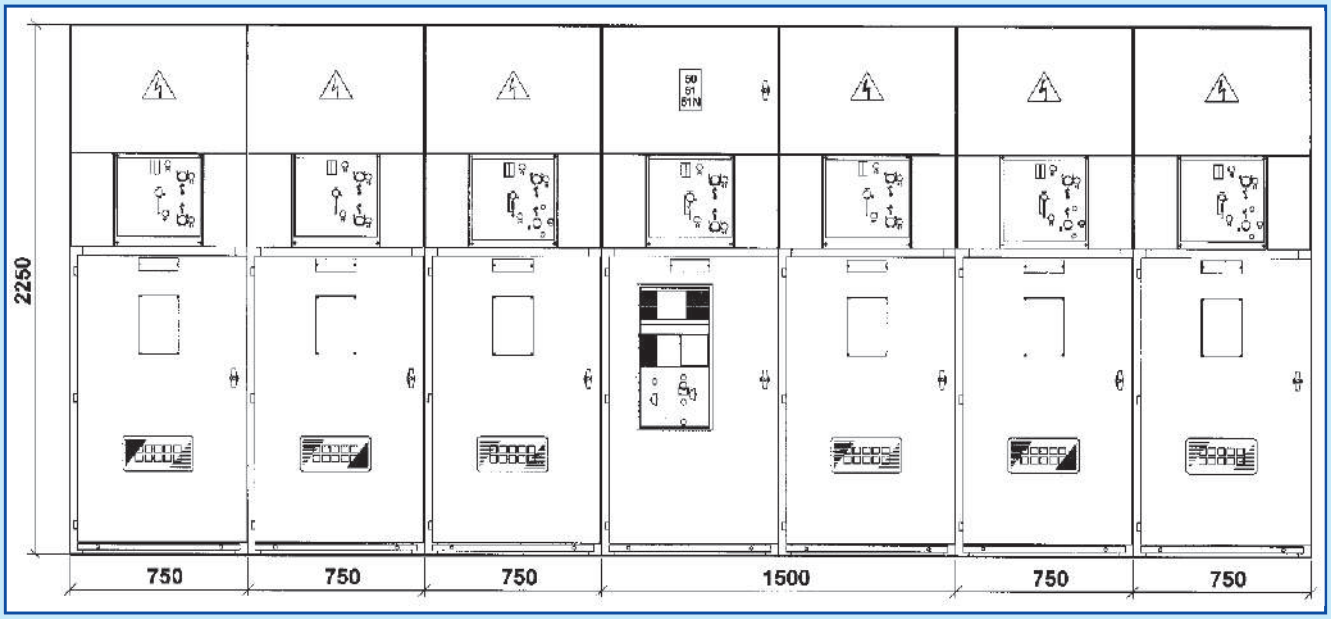
MINEL

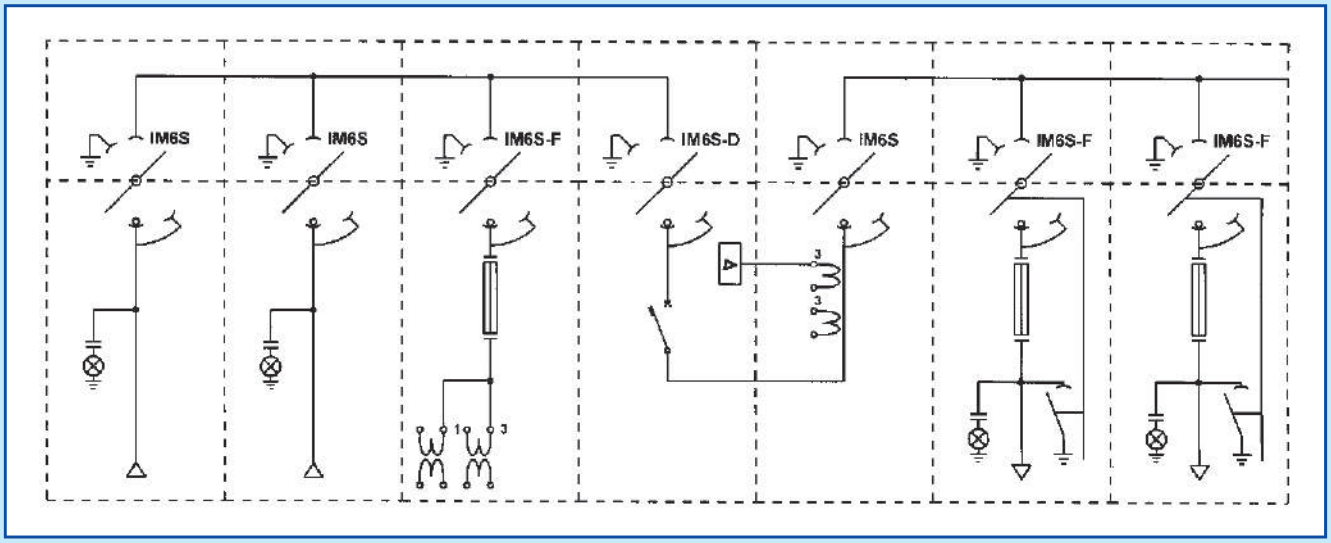
ISO 9001
IQ Net
OQS

sarel

Standard panels



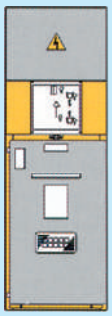


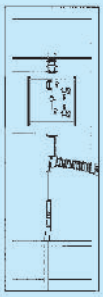


ISO 9001
IQ Net
OQS

Panels

»I«





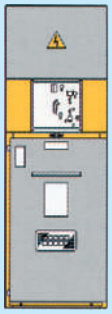


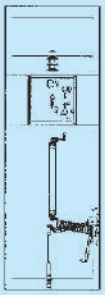
»I« Incoming or outgoing

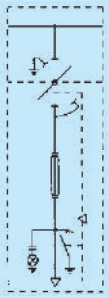
Basic equipment
Busbars
On-load switch IM6
KS operating mechanism
Earth switch
Voltage indicators

Optional accesories
KP operating mechanism
Tripping coil (KP operating mechanism)
Motor operating mechanism K SM
Auxilary contacts
Key interlocks
Heater resistence 250 W 220 Vac
Low voltage auxiliary compartment

»TM-S«





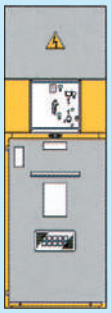


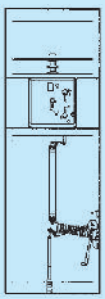
»TM-S« Feeder with on-load switch-fuse with blow-out fuse tripping

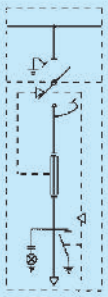
Basic equipment
Busbars
On-load switch-fuse IM6-F
KS operating mechanism
3 Fuses
Earth switch at the upper and lower side of fuses
Voltage indicators

Optional accesories
Auxilary contacts
Key interlocks
Heater resistence 250 W 220 Vac
Low voltage auxiliary compartment

»TM-P«







»TM-P« Feeder with on-load switch-fuse with blow-out fuse tripping

Basic equipment
Busbars
On-load switch-fuse IM6-F
KS operating mechanism
3 Striker fuses
Earth switch at the upper and lower side of fuses
Voltage indicators

Optional accesories
Tripping coil (KP operating mechanism)
Auxilary contacts
Key interlocks
Heater resistence 250 W 220 Vac
Low voltage auxiliary compartment

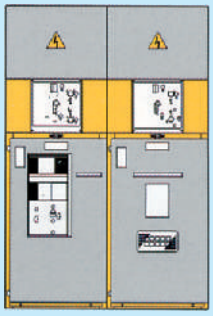
MINEL

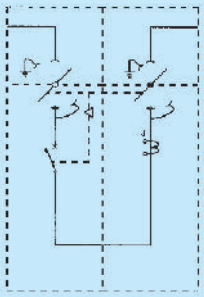
ISO 9001
IQ Net
OQS

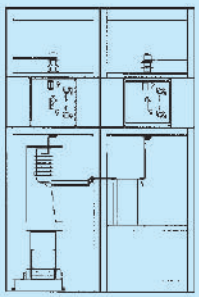
sarel

Panels

»ITI2-HAD«





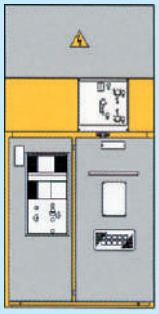


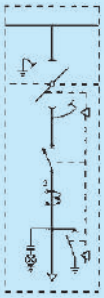
»ITI2-HAD« Main SF6 circuit breaker with double switches CT and indirect relay

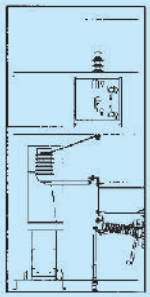
Basic equipment
Busbars
N.2 On-load switches IM6-D
N.2 KS switch operating mechanisms
SF6 automatic circuit breaker with tripping coil
Earth switch at the upper side of automatic circuit breaker
Voltage indicators

3 Current transformers
Microprocessor secondary protection
Optional accesories
Auxilary contacts
Key interlocks
Heater resistence 250 W 220 Vac
Low voltage auxiliary compartment
Motor operating mechanism for SF6 automatic circuit breaker

»ITI-HAD«





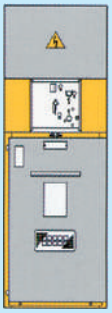


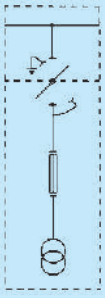
»ITI-HAD« Feeder with SF6 circuit breaker with CT and indirect relay

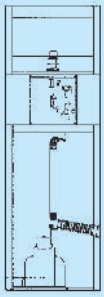
Basic equipment
Busbars
On-load switch IM6-D
KS operating mechanism
SF6 automatic circuit breaker with tripping coil
Earth switch at the upper and lower side of automatic circuit breaker
Voltage indicators

3 Current transformers
Microprocessor secondary protection
Optional accesories
Auxilary contacts
Key interlocks
Heater resistence 250 W 220 Vac
Low voltage auxiliary compartment
Motor operating mechanism for SF6 automatic circuit breaker

»MV«







»MV« Metering with VT

Basic equipment
Busbars
On-load switch-fuse IM6
KS operating mechanism
Earth switch
3 Fuse bases with fuses MV side
3 Fuse bases with fuses LV side
3 Voltage transformers

Optional accesories
Auxilary contacts
Heater resistence 250 W 220 Vac
Low voltage auxiliary compartment

MINEL

PROIZVODNI PROGRAM:

- Tropolni rastavljači za zatvorene prostorije, nazivnih napona 3–38 kV, nazivnih trajnih struja od 2000–4000 A.
- Jednopolni samoispadajući osigurači (osigurači sa automatskim otvaranjem) za otvorene prostore, nazivnih napona 7,2–38 kV, nazivnih struja do 200 A.
- Jednopolna i tropolna postolja osigurača za zatvorene prostorije ili za otvorene prostore, nazivnih napona 3–38 kV, nazivnih struja do 200 A.
- Tropolne kombinacije rastavljači-osigurači, rastavljači sa osiguračima, sklopke rastavljači sa osiguračima, za zatvorene prostorije, nazivnih napona 3–38 kV, nazivnih struja do 200 A.
- Tropolne sklopke-rastavljači za zatvorene prostorije, nazivnih napona 3–39 kV, nazivnih trajnih struja od 200–2500 A, po licenci firme FELTEN & GULLEAUME.
- Tropolni i jednopolni rastavljači za otvorene prostore, nazivnih napona 7,2–52 kV, nazivnih trajnih struja od 200–3150 A.
- Jednopolne i tropolne sklopke-rastavljači za otvorene prostore, nazivnih napona 12–38 kV, nazivnih trajnih struja do 630 A, nazivnih moći prekidanja do 630 A pri $\cos \varphi = 0{,}7$.
- Signalne sklopke, ručne i elektromotorne pogone za pokretanje, kao i mehaničke i elektromagnetne blokove rasklopnih aparata.
- Razvodna VN postrojenja sa čvrsto ugrađenim električnim aparatima, nazivni napon do 24 kV – Tip HGKN 12 i 24.
- Razvodna VN postrojenja sa izvlačivim aparatima, nazivni napon do 24 kV – Tip EA, MA 12 i 24.
- Kompaktna VN postrojenja sa vazdušnom izolacijom, nazivni napon do 24 kV – Tip EF 12 i 24.
- Razvodna NN postrojenja.
- Razvodni NN ormari.

MANUFACTURING PROGRAMME:

- Indoor, three-pole isolating switches, rated voltages 3 up to 38 kV, rated currents 200 up to 4000 A.
- Outdoor, single-pole drupout fuses, rated voltages 7,2 up to 38 kV, rated currents up to 200 A.
- Outdoor and indoor, single- and three-pole fuse bases, rated voltages 3 up to 38 kV, rated currents up to 200 A.
- Indoor, three-pole combinations isolating switches-fuses, isolating switches with fuses, load break switches with fuses, rated voltages 3 up to 38 kV, rated currents up to 200 A.
- Indoor, three-pole load break switches, rated voltages 3 up to 38 kV, rated currents 200 up to 2500 A, manufactured under FELTEN & GUILLEAUME licence.
- Outdoor, single-and three-pole isolating switches, rated voltages 7,2 up to 52 kV, rated currents 200 up to 3150 A.
- Outdoor, single-and three-pole load break switches, rated voltages 12 up to 38 kV, rated currents up to 630 A, rated breaking capacity up to 630 A $\cos \varphi = 0{,}7$.
- Auxiliary switches, manual and motor operated mechanisms, and mechanical and electromagnetic interlocking devices of switches.
- H.T. Switchboards with fixed mounted electrical gear, rated voltages up to 24 kV, Types HGKN 12 and 24.
- H.T. Swichboards with drawout electrical gear, rated voltages up to 24 kV, Types EA, MA 12 and 24.
- Compact H.T. Switchboards with air-insulator, rated voltages up to 24 kV, Types EF 12 und 24.
- L. V. Switchgears
- L. V. Switchboard

PROGRAMME DE PRODUCTION:

- Sectionneurs tripolaries pour l'intérieur, de tensions nominales 3 à 38 kV, de courants nominaux du 200 à 4000 A.
- Fusibles unipolaires automatiques (fusible avec ouverture automatique) pour l'extérieur, de tensions nominales 7,2 à 39 kV, de courants nominaux jusqu'à 200 A.
- Socles unipolaries et tripolares des fusibles pour l'intérieur, on pour l'extérieur, de tensions nominales 3 à 38 kV, de courants nominaux jusqu'à 200 A.
- Combinaisons tripolaires sectionneurs-fusibles's ectionneurs à fusibles, interrupteurs-sectionneurs à fusibles, pour l'intérieur, de tensions nominales 3 à 38 kV, de courant nominal jusqu'à 200 A.
- Interrupteurs-sectionneurs tripolaires pour l'intérieur, de tensions nominales 3 à 38 kV, de courants nominaux de 200 à 2500 A, suivant la licence de FELTEN & GULLEAUME.
- Sectionneurs tripolaires et unipolaires pour l'extérieur, de tensions nominales 7,2 à 52 kV, de courants nominaux de 200 à 3150 A.
- Interrupteurs-sectionneurs unipolaires et tripolaires pour l'extérieur, de tensions nominales 12 à 38 kV, de courants nominaux jusqu'à 630 A, pouvoir de coupure jusqu'à 630 A à $\cos \varphi = 0{,}7$.
- Interrupteurs de signalisation, commandes manuelles et à moteur électrique de démarrage, ainsi que les verouillages mécaniques et électromagnetiques pour les appareils de connexion.
- Installations de distribution H. T. avec les appareils électriques incorporés fixes, de tensions nominales jusqu'à 24 kV – Types HGKN 12 et 24.
- Installations de distribution H. T. avec les appareils débrochables, de tensions nominales jusqu'à 24 kV – Types EA, MA 12 et 24.
- Installations compactes H. T. avec isolation d'air de tensions nominales jusqu'à 24 kV – Types EF 12 et 24.
- Installations de distribution basse tension.
- Armoires de distribution basse tension.

REFERENCE LIST / REFERENCE LIST / LISTE DE REFERENCE

No.	Zemlja izvoza / Country / Pays	Br. ugovora / Contract No. / No. du Contrat	Naziv inokupca / Buyer / Acheteur	Tip aparata / Type of equipment / Type	Količina / Q'ty / Quantite
1.	Alžir / Algeria / Algérie	2/0747 XK.A	SONELGAZ	RSL 36/200	30.000
2.	Alžir / Algeria / Algérie	16/88 DAS	KAHRIF	RSL 36/200	8.000
3.	Alžir / Algeria / Algérie	19/MT-91	ENEL	KL 36/400	12.000
4.	Sirija / Syria / Sirie	5035	PEE/DAMASCUS	RNO 24	6.500
5.	Sirija / Syria / Sirie	5041	PEE/DAMASCUS	MROS 24	22.500
6.	SSSR / USSR / Union Sov.	096-0486/80453	SORELEKTRO	RST 38/630	1.200
7.	SSSR / USSR / Union Sov.	50-1086/61739	SORELEKTRO	MRT 24/630	5.500
8.	Burma / Burma / Birmanie	15-IV/90	EPC	RSK 24/400	800
9.	SR Nemačka / Germany / Allemagne Feder.	198/I	SIEMENS	RST 17,5/1250	400
10.	Grčka / Greece / Grece	15/91	THEOFILOU	KL 24/630	50
11.	Nigerija / Nigeria / Nigeria	0058/89	EL. IMPEX/DOFIA	RST 17,5/1250	250
12.	Togo / Togo / Togo	15/68	(INVEST IMPORT)	RS 24/200	100
13.	Turska / Turkey / Turquie	46/853-1	ENKA	KL 24/630	250
14.	Albanija / Albania / Albanie	9/89	(EMO/OHRID)	RST 38/1250	150
15.	SR Nemačka / Germany / Allemagne Feder.	15151/90	FELTEN & GUILLEAUME	RSK 24/400	240
16.	IR. Iran / ABE Teheran Branch	088/01	ABE TEHERAN BRANCH	RSK624/630	45

Štamparija »Merak«