





Pantograph Type Center-Break Type Double-Break Type Vertical-Break Type

Standards IEC 62271-102 IEC 62271-1



Elimsan High Voltage Disconnectors

# High voltage disconnectors General information



All Elimsan high voltage disconnectors have common properties as given below;

- Application
- > Regulations
- ) Test
- Earthing Switches
- Disconnector and earthing switch machanism
- Auxiliary switch
- ) Installation
- ) Maintenance

Type test of the Elimsan High Voltage disconnectors are carried out in well known international laboratories such as CESI-Italy and KEMA-Holland.

#### **Application**

Disconnectors ensure mechanical isolation of electrical systems. When a disconnector is open, visible isoloted space is obtained. Elimsan High Voltage disconnectors can be easily applied to all types of substations. If desired, disconnector poles can be equipped with an earthing system.

#### Regulations

The disconnectors are manufactured in compliance with IEC 62271-102, IEC 60694 standards.

#### Test

Type test of the Elimsan High Voltage disconnectors are carried out in well known international laboratories such as CESI-Italy and KEMA-Holland. All required electrical and mechanical routine test are also carried out, during manufacturing of disconnectors

# Earthing switches

Earthing blade moves by rotating about 90 degrees. While disconnectors are closed, earthing blade is in the parallel position to the ground.

Earthing blade is wanted to close, operating mechanism can be operated by hand or a motor. Earthing blade rotates around the pivot until it settles into the

fix contacts through the transmission from the mechanism. After earthing blade settles into the fix contacts, earthing blade can not be opened due to the any external factors in this position. It means safe earthing is ensured

# Disconnector and earthing switch machanism

Depends on the requirements disconnector and earthing switch mechanism can be motor controlled or manual. There is an electrical interlocking between disconnector and earthing mechanism in motor controlled system. Before the disconnector is opened, earthing switch can not be operated. The system is also mechanically locked. In manual operation unless disconnector is open, earthing switch can not be closed.



## **Auxiliary switch**

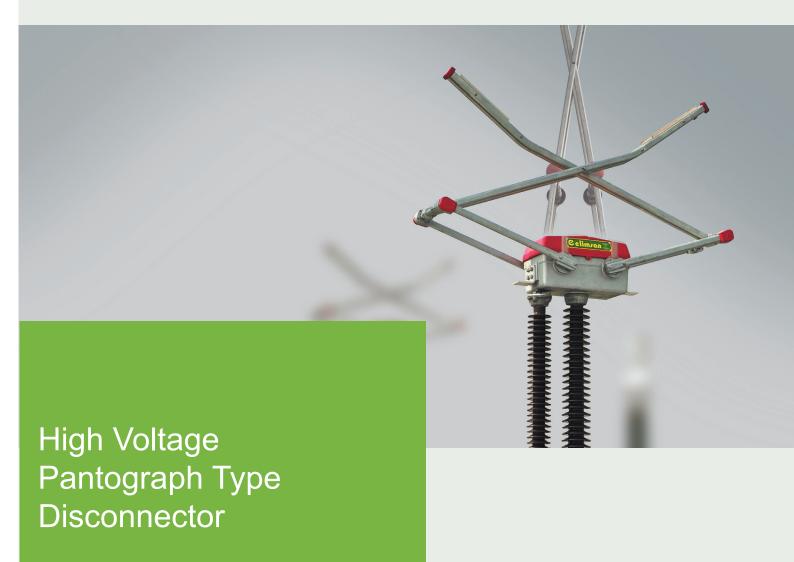
Auxiliary switch receives motion from the operating mechanism. This switch unit does not change position until the arms of the disconnectors are not changed.

#### Installation

Elimsan High Voltage disconnectors are shipped in the form of pre –assembled units, which have to be assembled at site. Disconnectors are designed in order to be easily installed and adjusted at site.

## Maintenance

Normally, Elimsan High Voltage disconnectors do not require maintenance. It is sufficient to clean only the insulators once every four or five years.



Leak-proof mechanism High safety Easy operating system

# High voltage disconnectors Pantograph type

# **Design and drive**

# High safety and mechanical rigidity, even in the short circuit

Elimsan pantograph type disconnectors (EDP) are designed in double scissors form and it contains operating mechanism, mechanism of current arms, insulator, earthing switches (if needed). Current arms are manufactured from aluminum alloy profiles, designed to ensure high safety and mechanical rigidity, even in the short circuit.

The connection terminals are placed at both sides of mechanism of current arms. Pantograph arms are permanently lubricated for miantenance free operation.

The operation mechanism is placed on the chassis and drives the mechanism of the current arms through a rotating insulator. The operation mechanism is leak-proof and made of noncorrosive material and can be manufactured up to IP65 protection level.

Each pole of the pantograph type disconnector is operated with an individual operation mechanism for disconnectors over 170 kV. The motion from the operating mechanism istransmitted by operating insulator to the



Disconnector type		EDP-145	EDP-170	EDP-245	EDP-362	EDP-420	EDP-525	
A- Distance between ins ulator and fixed contact	mm	2600	2920	3450	5075	5075	5675	
B- Height of disconnector arm (in closed position)	mm	2400	3110	3700	5450	5450	6050	
C- Height of insulator	mm	1500	1700	2300	2900	3350	4400	
D- Width of disconnector mechanism	mm	435 550						
E- Width of disconnector arm	mm	500 597						
F- Distance from top of mechanism to insulator	mm			Customer re	equirements			
G- Height of ground to top of mechanism	mm			Customer re	equirements			
H- Minimum isolating distance	mm	1500	2100	2540	3500	3500	4150	
J- Lenght of disconnector arm (in open position)	mm	2500	2060	2500	2210	22	210	
K- Catching range mm	mm	300	300	450	500	500 550		
L	mm	50						
M	mm			5	0			

Main dimension of EDP disconnector

# High voltage disconnectors Pantograph type

mechanism of current arms and from there it sent to the pantograph arms. Up to 170 kV, three phases pantograph disconnectors can be controled by one operating mechanism.

#### Safety and durability

The arms rise and catch hanger type fixed terminal securely. In this position current arms have to apply enough pressure on contacts for transmitting current properly but this pressure shouldn't cause erosion and deformation on contacts. Mechanism of current arm ensures lock

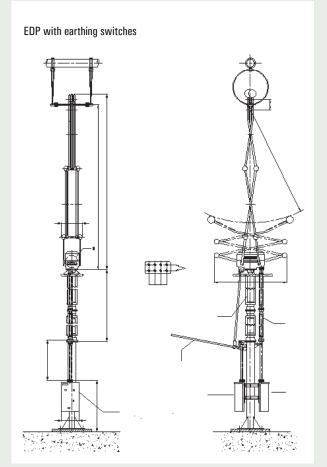
according to dead point position and only the operation mechanism can change this position. The movement of current arms are prevented from the effect of external forces. The disconnector can not be opened even in severe conditions of nature such as strong winds, earthquake, etc.

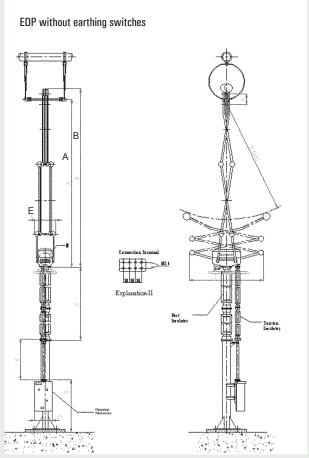
Ice-layers that form because of the bad weather conditions can be broken easily by opening and closing forces of current arms opening and closing operations can be performed.

# Connection

Hanger type fix terminals are connected to the bar by flexible conductors. The connection terminals are placed at both sides of mechanism of current arms for the second system.

The fix contacts of 145, 170, and 245kV pantograph type disconnectors are connected with single conductor and fix contacts of 362 kV, 420kV and 550 kV disconnectors are connected with double flexible conductor





# High voltage disconnectors Pantograph type

Pantograph type disconnecton			EDP-145	EDP-170	EDP∙245	EDP-362	EDP-420	EDP-525
Rated voltage		kV	145	170	245	362	420	525
Rated normal current		Α	1250-4000	1250-4000	1250-4000	1250-4000	1250-4000	1250-4000
Rated peak withstand current		kA (peak)	100	100	100	125	125	125
Rated short time withstand current (1s.)		kA (rms)	40	40	40	50	50	50
Rated 1 min power freguency	To earth and between poles	kV (rms)	275	325	460	450	520	620
withstand voltage (50 Hz)	Across the isolating distance	kV (rms)	315	375	530	520	610	760
Rated lighting impulse	To earth and between poles	kV (peak)	650	750	1050	1175	1425	1550
Withstand voltage (1,2/50 $\mu$ s)	Across the isolating distance	kV (peak)	750	860	1200	1175 (+205)	1425 (+240)	1550 (+315)
Rated switching impulse	To earth and between poles	kA(peak)				950	1050	1175
withstand	Across the isolating distance class	kA(peak)				950	1050	1175
Voltage (250/2500 µs)	Across the isolating dist. class B	kA(peak)				800 (+295)	900 (+345)	900 (+450)
Discharge inception voltage		kV (peak)	>95	> 110	> 160	> 230	>270	> 335
Three whose breaking accepts	Inductive, capacitive	А	2	2	1.5	1	1	1
Three-phase breaking capacity	Resistive	А	3	3	3	2	2	2
Admissible mechanical	Static and dynamic'5fc	N	4000	4000	5600	5600	5600	5600
Terminal load	Static	N	1000	1000	2000	2000	2000	2000
Overall height of support insulator		mm	1500	1700	2300	2900	3350	4400
On earthing switch			+E	+E	+E	+E	+E	+E





High Voltage Center Break Type Disconnector

> Robust steel structure Adjustable arms Easy operating system

### High voltage disconnectors Center break type

to have maintenance free disconnectors. The steel components are hot-dip galvanized to protect disconnectors from atmospherical effects.

# Separate control systems

The disconnector and earthing units are operated with separate control systems. The motion transmitted to the rotating feet from the operating mechanism, is immediately transferred to the other phases by the cross levers and ensures simultaneous drive of all three phases.

Current arms are rotated 90 degree and become parallel each others when EDC is open.

Depends on the requirements, disconnectors can be delivered manual or motor controlled. All of three disconnectors' phases are activated by only one operating



# Design and drive

#### Strong and functional structure

The center-break type disconnector (EDC)'s chassis are made of steel. Support insulators are on top of rotating feet on the chassis. The support insulators carry aluminum current arms. Axis deviations can be easily corrected by adjusting bolts on the rotating feet. If required, disconnector can be equipped with an earthing unit. The earthing unit has an indivual operating mechanism. All parts are designed

Disconnector type		EDC-36	EDC-52	EDC-72	EDC-123	EDC-145	EDC-170	EDC-245	EDC-362	EDC-420	EDC-525
A	mm	720	720	1250	1520	2000	2300	2750	3800	4100	4100
В	mm	620	620	1000	1300	1700	2050	2500	3500	3500	3500
С	mm	759	900	1150	1675	2000	2150	2670	3270	4300	4300
D	mm	350	350	550	750	900	1075	1300	1800	2250	2250
E	mm	1000	1250	1500	2000	2600	3000	4000	Customer requirements		
F	mm	1300	1500	2000	2600	3400	4000	5200	Customer requirements		
G	mm	500	690	1080	1380	1800	1820	2400	2715	3715	3715

Main dimension of EDC disconnector

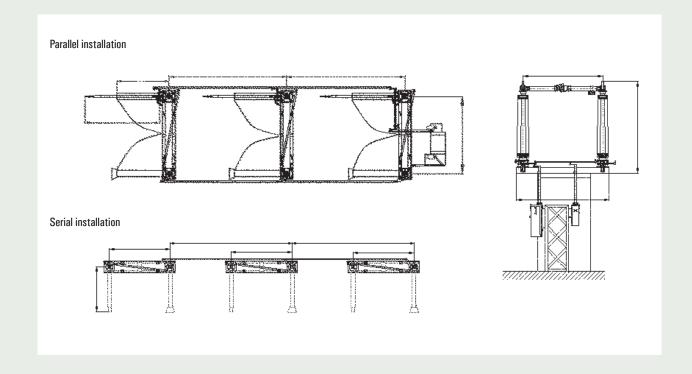
# High voltage disconnectors Center break type

mechanism (up to 245 kV) and earthing unit is activated by another separated operating mechanism. Adjustment is possible with the motion pipes placed between the phases. There is a mechanical and electrical interlocking facility between disconnector and earthing units. Thus the earthing blade cannot be closed when the disconnector is in "closed" position.

Ice-layers formed because of the bad weather conditions can be broken easily by opening and closing forces of current arms thus opening and closing operation are performed

# Connection

Disconnectors are connected to the system through the terminals. These terminals' are cylindrical, and they are made of electrolytic copper with silver coating these terminals rotate also on their axis. These terminals' diameters and lengths are variable depends on the disconnectors' voltage and current ratings. There is one / two earthing bolt on the chassis for earthing connections



# High voltage disconnectors Center break type

Centre break type d	isconnector		EDC-36	EDC-52	EDC-72	EDC-123	EDC-145	EDC-170	EDC-245	EDC-362	EDC-420	EDC-525
Rated voltage		kV	36	52	72.5	123	145	170	245	362	420	525
Rated normal current		Α	800-1600	1250- 2500	1250- 2500	1250- 2500	1250- 4000	1250- 4000	1250- 4000	1250- 4000	1250- 4000	1250- 4000
Rated peak withstand current		kA (peak)	80	80	80	100	100	80	100	125	125	125
Rated short time current (1s.)		kA (rms)	31.5	31.5	31.5	40	40	31.5	40	50	50	50
Rated 1 min power freguency	To earth and between poles	kV (rms)	70	95	140	230	275	325	460	450	520	620
Withstand voltage (50 Hz)	Across the isolating distance	kV (rms)	80	110	160	265	315	375	530	520	610	760
Rated lighting impulse	To earth and between poles	kV (peak)	170	250	325	550	650	750	1050	1175	1425	1550
Withstand voltage (1,2/50 ms)	Across the isolating distance	kV (peak)	195	290	375	630	750	860	1200	1175 (+205)	1425 (+240)	1550 (+315)
Rated switching	To earth and between poles	kV (peak)								950	1050	1175
impulse withstand  Voltage	Across the isolating distance class A	kV (peak)								950	1050	1175
(250/2500 ms)	Across the isolating distance class B	kV (peak)								800 (+295)	900 (+345)	900 (+450)
Discharge inception		kV (rms)	>22	>34	>48	>80	>95	> 110	>160	> 230	> 270	>335
Three-phase breaking capacity	Inductive, capacitive	А	2	2	2	2	2	2	1.5	1	1	1
отеакту сарастту	Resistive	А	3	3	3	3	3	3	3	2	2	2
Admissible mechanical	Static and dynamic	N	4000	4000	4000	4000	4000	4000	5600	5600	5600	5600
Terminal load	Static	N	1000	1000	1000	1000	1000	1000	2000	2000	2000	2000
Overall height of support insulator		mm	445	560	770	1220	1500	1700	2300	2900	3350	4400
On earthing switch			+ E	+ E	+E	+E	+E	+E	+E	+E	+E	+E



High Voltage Double Break Type Disconnectors

> High mechanical rigidity Electrical and mechanical interlocking Support insulators

# **High voltage disconnectors**

#### Double break type

If required, disconnector can be equipped with earthing units. The earthing unit has an individual operating mechanism. All parts have been permanently lubricated and designed to have maintenance free operation.

The steel components are hot-dip galvanized to protect from atmospherical effects. The connection terminals are placed on the insulators at both sides.

### Robust structure

Design and drive

The Double side break type (EDB) disconnectors chassis are made of steel. Rotating feet on the chassis carries moving insulators, each phase comprise 2 fixed insulator connected to chasis at both side and one rotating insulator connected to rotating feet in the middle. Rotating insulators carry current arms.

Current arms are manufactured from aluminum alloy profiles for 123 kV disconnectors and over, up to 123 kV from electrolitic copper. Axis deviation on the insulators can be easily adjusted by the bolts on the rotating feet.

# High mechanical rigidity

Double break type system ensures high mechanical rigidity and safe current transmission in short circuit. It requires less distance between the phases. The disconnector can be delivered as manual or motor controlled.



Three poles of disconnector and earthing unit could be activated by only one operating mechanism (up to 245 kV). Adjustment is possible through the connection levers placed in between the



Disconnector type		EDB-12	EDB-36	EDB-52	EDB-72	EDB-123	EDB-145	EDB-170	EDB-245	EDB-420
Figure		1	1	1	1	2	2	2	2	2
A	mm	740	1150	1170	1240	1800	2200	2500	3300	5200
В	mm	215	440	560	770	1220	1500	1700	2300	3650
C	mm	360	585	850	950	1700	1900	2100	2700	4400
D	mm	700	800	950	1100	1700	2000	2300	3300	
E	mm	320	550	820	900	1600	1800	2000	2600	4300
F	mm	840	1250	1400	1500	1550	2500	2800	3600	5800
G	mm				Cus	tomer requirem	ents			
Н	mm				Cus	tomer requirem	ents			

Main dimension of EDB disconnector

### High voltage disconnectors Double break type

poles. There is a mechanical and electrical interlocking facility between the disconnector and earthing units thus, earthing contacts can not be closed when the disconnector is in "closed position".

Disconnector and earthing unit are operated with an individual operation mechanism. The motion transmitted from the operation mechanism trough the rotating insulator is immediately transferred to the other phases by the cross levers and ensures simultaneous drive of all three phases. Each phase is operated by an individual mechanism over 245 kV disconnectors.

## Special locking system

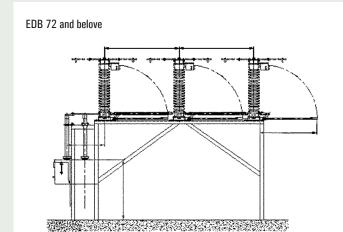
Current arms rotate through rotating insulator that is in the middle of each phase. Because of the lengths of motion transmission pipes between the phases are adjustable, to ensure simultaneous motion for each phase, the positions can be adjusted accurately. Unnecessary motions are restricted by mechanical stoppers.

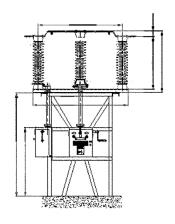
Mechanism system ensures electromechanical lock in open and closed position. This interlock prevents motions may be caused by external factors such as short circuit forces, winds, and earthquake.

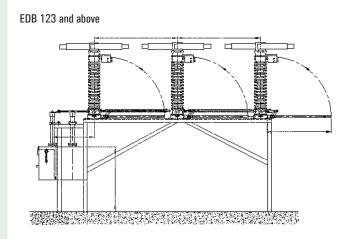
Ice-layers that form because of the bad weather conditions can be broken easily by opening and closing forces of current arms thus opening and closing operation are performed.

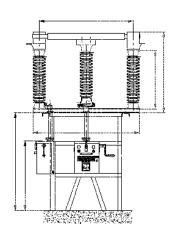
### Connection

The main circuit connections are placed on the insulators and both sides. It is suitable for fixing any kind of connection means



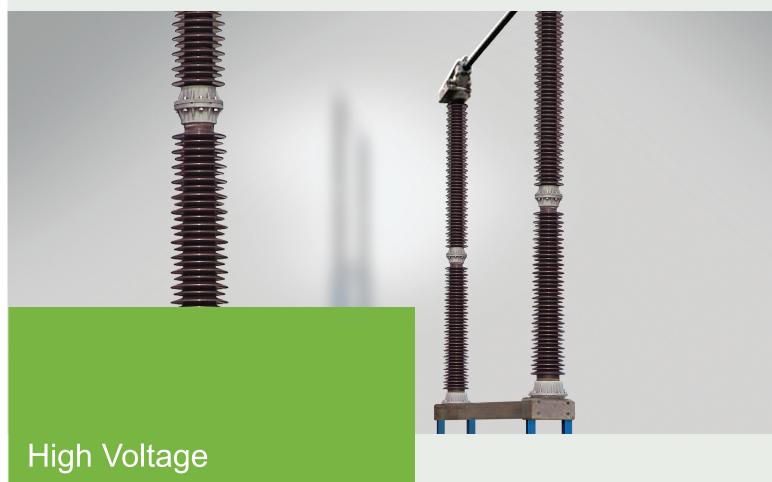






# High voltage disconnectors Double break type

Double break type disc	onnector		EDB-12	EDB-36	EDB-52	EDB-72	EDB-123	EDB-145	EDB-170	EDB-245	EDB-420
Rated voltage		kV	12	36	52	72	123	145	170	245	420
Rated normal current		А	1250- 4000								
Rated peak withstand current		kA (peak)	80	80	80	80	100	100	100	100	125
Rated short time current (1s.)		kA (rms)	31,5	31,5	31,5	31,5	40	40	40	40	50
Rated 1 min power freguency with-	To earth and between phases	kV (rms)	28	70	95	140	230	275	325	460	520
stand voltage (50 Hz)	Across the isolating distance	kV (rms)	32	80	110	160	265	315	375	530	610
Rated lighting impulse	To earth and between phases	kV (peak)	75	170	250	325	550	650	750	1050	1425
withstand voltage (1,2/50 ms)	Across the isolating distance	kV (peak)	85	195	290	375	630	750	860	1200	1425 (+240)
Rated switching impulse withstand	To earth and between phases	kV (peak)									1050
voltage (250/2500 ms)	Across the isolating distance	kV (peak)									900 (+345)
Three-phase	capacitive, enduc- tive	А	2	2	2	2	2	2	2	1.5	1
breaking	resistive	A	3	3	3	3	3	3	3	3	2
Static mechanical		N	400	400	400	400	500	500	800	1000	2000
terminal loads		N	130	130	130	130	170	170	250	330	660
On earthing switch			+ E	+ E	+ E	+ E	+E	+E	+E	+ E	+E



High Voltage Vertical Break Type Type Disconnectors

> Multi functional design Seperate operating mechanism Strong structure

# High voltage disconnectors

#### Vertical break type

fix contacts are manufactured from electrolytic copper). If required, disconnector can be equipped with an earthing unit.

The earthing unit has a separate operating mechanism. All parts have been permanently lubricated and designed to have maintenance free disconnectors.

The steel components are hot-dip galvanized to protect from atmospherical effects. The connection terminals are placed at both sides of the support insulators. During the closing process, disconnector arm moves to down first and when reach to the contact level, it goes into contact through moving along its axis for the disconnectors over 72.5 kV; thus ensure high safety and additional lock against external effects.



# Steel chasis

Design and drive

The Vertical type disconnector (EDV)'s chassis are made of steel. Rotating feet on the chassis carries operating insulators for the 72.5 kV disconnectors and over.( For the 52 kV rated voltage disconnectors and less, use operating rod and support insulators)

Each phase comprise 2 fix insulator connected to chasis at both side and one moving operating insulator connected to rotating feet at the end. Support insulators carry current arms and fixed contact.

# Protected against hard atmospherical effects

Current arms are manufactured from aluminum alloy profiles (For 52 kV and less, current arms and

### Less distance between phases

Vertical type breaking system require less distance between the phases. The operating mechanism is put inside a box that is made from aluminum alloy or stainles steel (Up to IP65).

Disconnector type		EDV-12	EDV-36	EDV-52	EDV-72	EDV-123	EDV-145	EDV-170	EDV-245	EDV-420
Figure		1	1	1	1	2	2	2	2	2
A	mm	740	1150	1170	1240	1800	2200	2500	3300	5200
В	mm	215	440	560	770	1220	1500	1700	2300	3650
C (in closed position)	mm	360	585	850	950	1700	1900	2100	2700	4400
D	mm	700	800	950	1100	1700	2000	2300	3300	
E	mm	320	550	820	900	1600	1800	2000	2600	4300
F	mm	840	1250	1400	1500	1550	2500	2800	3600	5800
G	mm				Cus	tomer requirem	ents			
Н	mm				Cus	tomer requirem	ents			

#### High voltage disconnectors Vertical break type

## Adjustable control system

The disconnector can be delivered as manual or motor controlled. Three poles of disconnector and earthing unit could be activated by only one driving mechanism (up to 170 kV). Adjustment is possible through the connection levers placed in between the poles. There is a mechanical and electrical interlocking facility between the disconnector and earthing units thus, earthing contacts can not be closed when the disconnector is in "closed position".

High safety to external factors Disconnector and earthing unit are operated with an individual operating mechanism.

The motion transmitted from the operating mechanism trough the operating insulator isimmediatelytransferred to the other phases by the cross levers and ensures simultaneous drive of all three phases. Current arms rotate through operating insulator and rise to upward in open position. By the means of adjustable lengths of motion transmission pipes between the phases, 3 phases' motion can be adjusted accurately. The stoppers restrict the motion at required position. Mechanism system ensures mechanical lock in open and

closed position. This provides safe operation against external factors, such as short circuit forces, winds, and earthquake.

Ice-layers that form because of the bad weather conditions can be broken easily by opening and closing forces of current arms thus opening and closing operation are executed.

### Connection

The main circuit connections are placed on the post insulators at both sides. It is suitable for connecting bus bar with 4 bolts other type of connection means are possible.

EDV 52 and less

# High voltage disconnectors Vertical break type

Vertical break type disconnector			EDV-12	EDV-36	EDV-52	EDV-72	EDV-123	EDV-145	EDV-170	EDV-245	EDV-420
Rated voltage		kV	12	36	52	72	123	145	170	245	420
Rated normal current		А	1250- 4000								
Rated peak withstand current		kA (peak)	80	80	80	80	100	100	100	100	125
Rated short time current (1s.)		kA (rms)	31,5	31,5	31,5	31,5	40	40	40	40	50
Rated 1 min power freguency	To earth and between phases	kV (rms)	28	70	95	140	230	275	325	460	520
withstand voltage (50 Hz)	Across the isolating distance	kV (rms)	32	80	110	160	265	315	375	530	610
Rated lighting impulse	To earth and between phases	kV (peak)	75	170	250	325	550	650	750	1050	1425
withstand voltage (1,2/50 ms)	Across the isolating distance	kV (peak)	85	195	290	375	630	750	860	1200	1425 (+240)
Rated switching impulse withstand	To earth and between phases	kV (peak)									1050
voltage (250/2500 ms)	Across the isolating distance	kV (peak)									900 (+345)
Three above breeling	capacitive, enductive	А	2	2	2	2	2	2	2	1.5	1
Three-phase breaking	resistive	А	3	3	3	3	3	3	3	3	2
Static mechanical		N	400	400	400	400	500	500	800	1000	2000
terminal loads		N	130	130	130	130	170	170	250	330	660
On earthing switch			+E	+E	+E	+E	+ E	+ E	+E	+E	+E







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