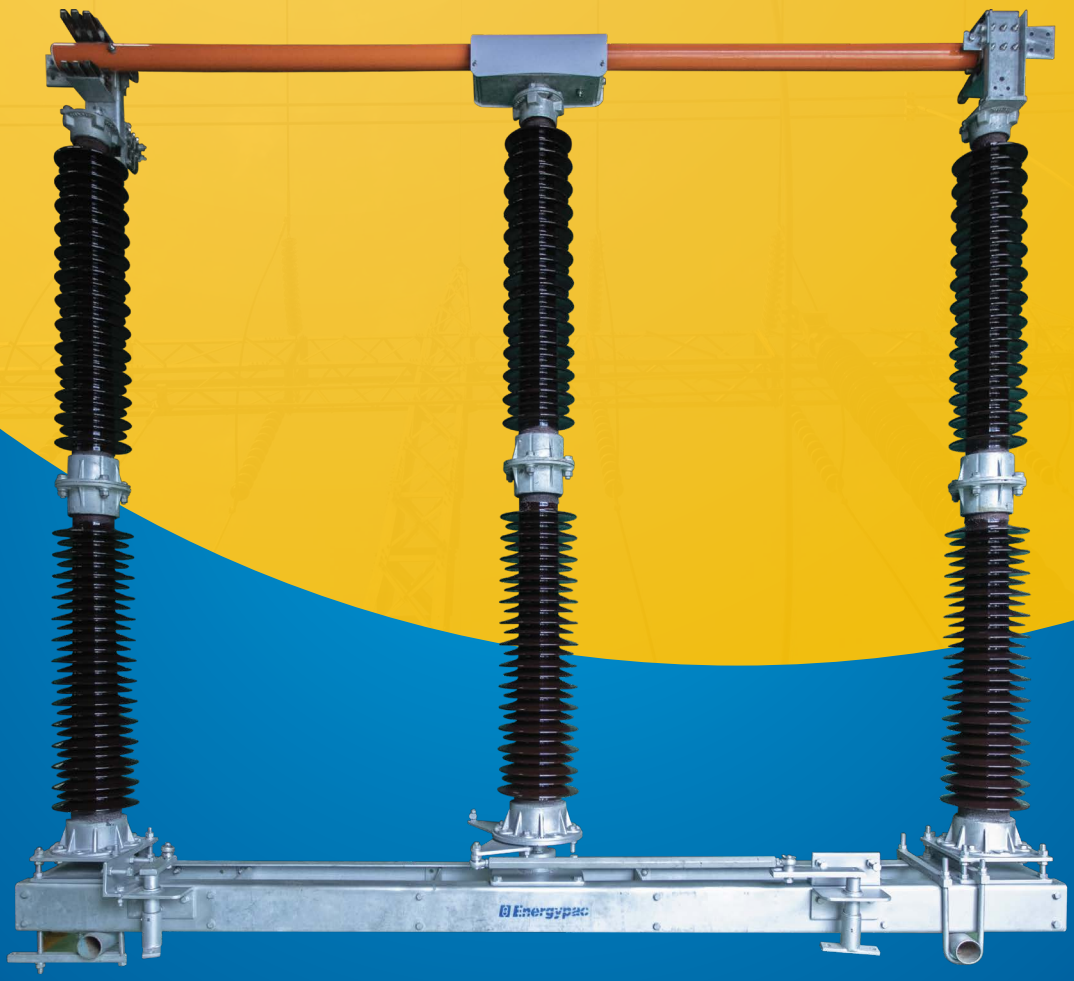
Energypac®
Engineering

COMPREHENSIVE SOLUTIONS FROM DESIGN TO DELIVERY



OUTDOOR OFFLOAD DISCONNECTORS & BYPASS SWITCHES


केन्द्रीय विद्युत अनुसंधान संस्थान
CENTRAL POWER RESEARCH INSTITUTE
बेंगलूर
BANGALORE
स्थापित 1960 ESTD 1960
CPRI
APPROVED
TYPE TESTED
UP TO 145kV
✓ Product range: Up to 245kV, 50kA, 3000Amp
✓ HC Copper contact parts
✓ Turn and twist mechanism for easy operation
✓ Contacts silver-plated for higher conductivity (Ag-Ag)

INDEX

TYPE ESB/ECB/EDB

Type of designation

Rated voltage: 12-245kV
Rated normal current: Up to 4000 Amps

- Versatile design allowing a wide variety of erection arrangements
- Simple construction, easy to install
- Self-cleaning contacts
- Low operating forces required
- All steel parts hot-dip galvanized

Disconnectors

Energypac manufactures outdoor offload disconnectors of the following types:

- Single break - type ESB
- Center break - type ECB
- Double break - type EDB

The disconnector comprise of the following main assemblies:

- The main current carrying parts called as the male-female assembly
- Support insulators mounted between the current carrying parts and base
- The bottom base assembly
- The operating mechanism box
- Interstack, interphase and down operating pipes
- Earthing switch and its operating mechanism box wherever called for
- Supporting structure mounted between the base and the ground

Energypac manufactures disconnectors with the current carrying parts mainly of copper alloys with proper electro plating.

Disconnectors can be supplied suitable for horizontal upright mounting, vertical mounting on support structure or underhung mounting on substation gantry structure and can be manually operated or motor operated. Disconnectors can also be setup for series, parallel or tandem arrangement.

Single break type

Single break type gang operated disconnectors, used for current transfer/coupling of buses at two different heights, arranged in tandem are available in following ranges:

- Rated voltage from 12kV to 36kV
- Rated current up to 4000 Amps
- Short time current rating up to 31.5kA

Center break type

Two post rotating center break design are available in the following ranges:

- Rated voltage from 12kV to 145kV
- Rated current up to 4000 Amps
- Short time current rating up to 50kA

Double break type

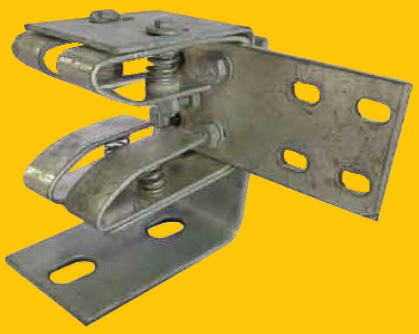
Center pole rotating double break disconnectors with turn and twist mechanism are available in the following ranges:

- Rated voltage from 12kV to 245kV
- Rated current up to 4000 Amps
- Short time current rating up to 50kA

Contacts

For single break, the current transfer contacts consists of butt type contacts which are of direct entry banging type and the breaking position is vertical. In case of center break type, the current transfer takes place through the reverse loop silver plated copper female finger contacts and silver plated copper male contact rod.

Male contact



Female contact

In case of the double break type, the current transfer takes place through the self-wiping turn & twist type contact. This again consists of the silver plated copper fixed finger contacts and the moving silver plated copper contacts mounted on the rotating arm of the disconnector.

Turn & twist main contact

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TYPE ESB/ECB/EDB

Dimensions of disconnectors

Single break disconnectors:

Type: ESB/ESBE

- Very low civil engineering profile
- Available for flexible/rigid busbar layouts
- Current transfer through single finger hinge contacts
- Gang operation
- Structured to suit requirements

Voltage kV	Dimensions in mm (reference only)		
	a	b	c
12	720	600	500
36	865	750	615

Note:

A= Base Channel Length
B= Pole to Pole Center Distance
C= Pole Height

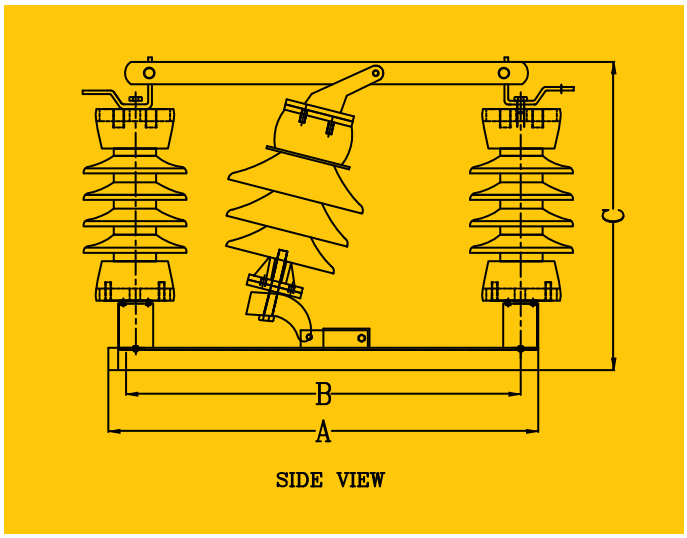

Fig: General arrangement of 11kV isolator with earth switch

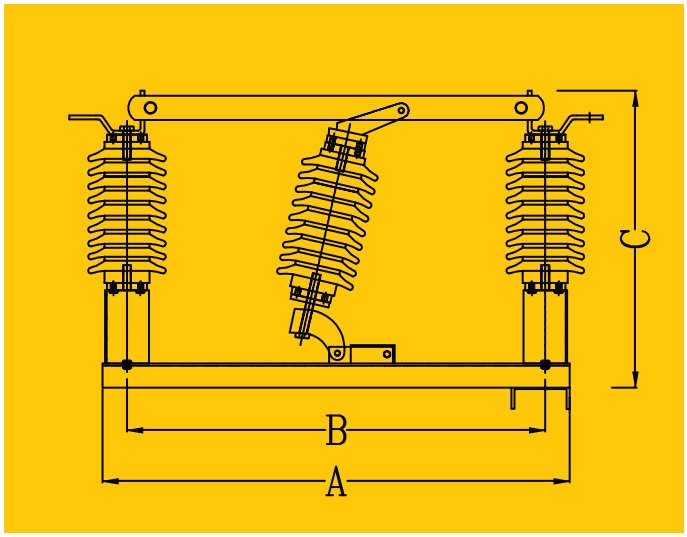

Fig: General arrangement of 36kV isolator with earth switch

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TYPE ESB/ECB/EDB

Center break disconnectors:

Type: ECB/ECBE

· Very low operating torque

· Self-wiping contacts

· Simultaneous operation of 3 poles by single operating mechanism up to 145kV

· Structured to suit requirements

Voltage kV	Dimensions in mm (reference only)		
	a	b	c
12	870	600	550
36	1070	750	900
145	2125	1700	1900

Note:

A= Base Channel Length
B= Pole to Pole Center Distance
C= Pole Height

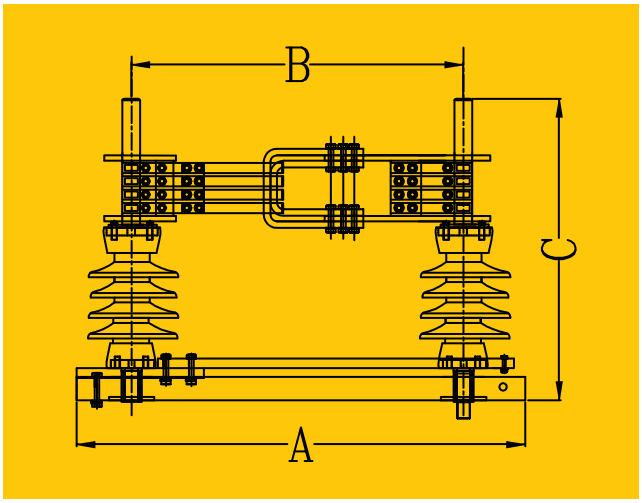

Fig: General arrangement of 12kV isolator with earth switch

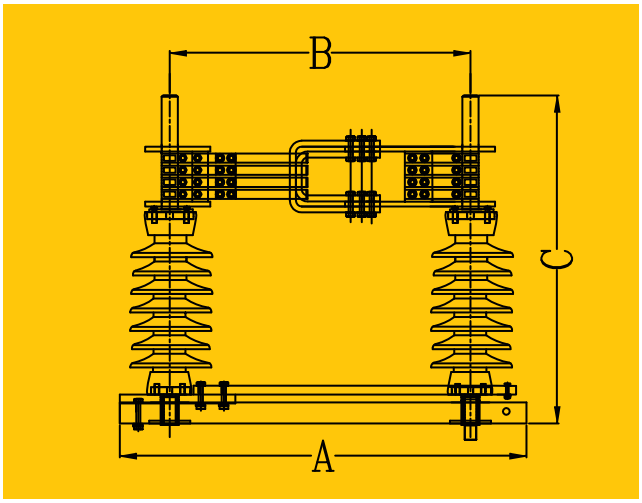

Fig: General arrangement of 36kV, 3 pole center break disconnecting switch

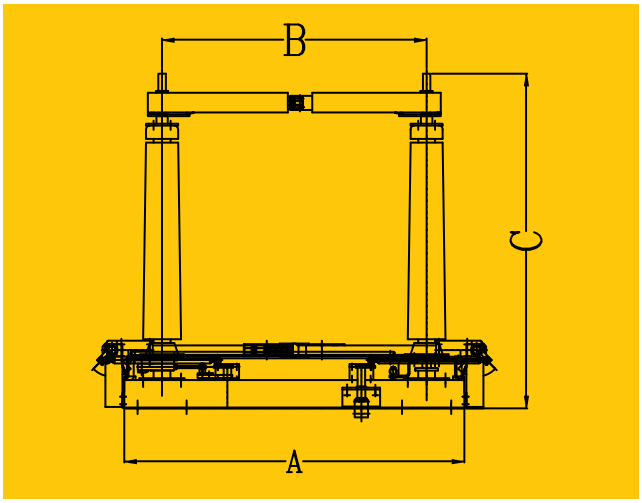

Fig: 145kV, 3 pole center break disconnecting switch

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TYPE ESB/ECB/EDB

Double break disconnectors:

Type: EDB/EDBE

· Turn and twist contacts

· Vertical/horizontal terminal take off

· Totally enclosed actuator assembly

· Simultaneous operation of 3 poles by single operating mechanism up to 245kV

· Structured to suit requirements

Voltage kV	Dimensions in mm (reference only)		
	a	b	c
12	870	600	500
36	1070	750	650
145	2430	2130	1850
	2220	2000	1600
245	3150	2800	2600

Note:

A= Base Channel Length
B= Pole to Pole Center Distance
C= Pole Height

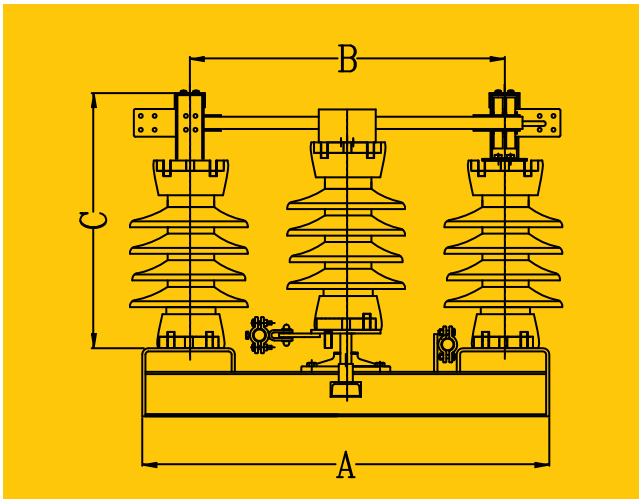

Fig: General arrangement of 12kV double break disconnecting switch

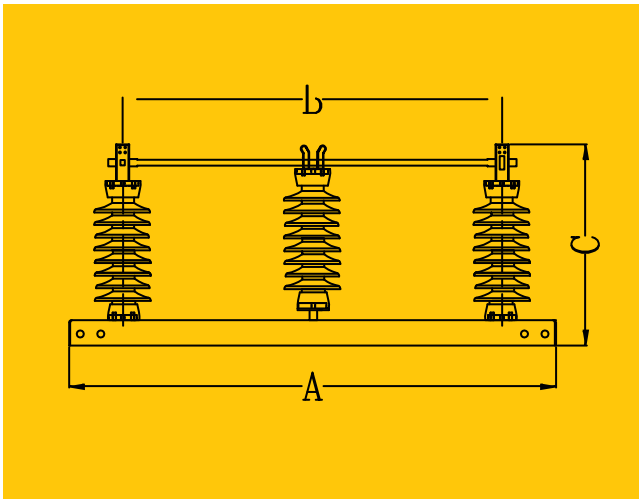

Fig: General arrangement of 36kV double break disconnecting switch

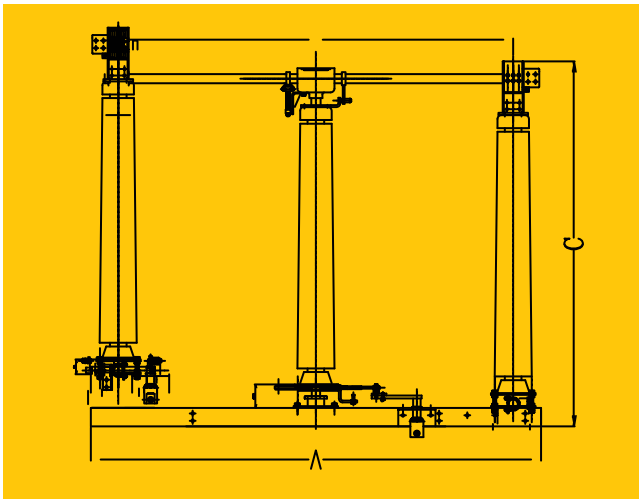

Fig: General arrangement of 145kV double break disconnecting switch

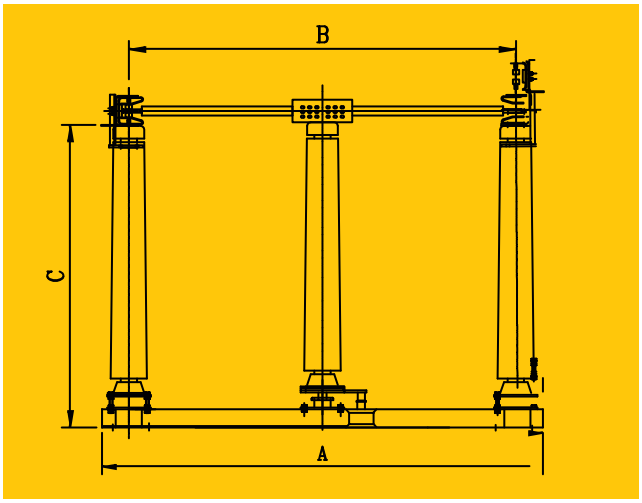

Fig: General arrangement of 245kV double break disconnecting switch

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TYPE ESB/ECB/EDB

Single break disconnectors (ESB/ESBE)

Rated Voltage	Rated Current	Rated Short Time Current For 3 Secs	Rated Peak Short Circuit Current	Power Frequency Withstand Voltage 50Hz For 1 Min		Lightning Impulse Withstand Voltage 50Hz For 1.2/50ms	
				To Earth	Across Isolating Distance	To Earth	Across Isolating Distance
kV	A	kA	kV	kV	kV	kV	kV
12	630A-4000A	25kA-31.5kA	62.5-78.75	28	32	75	80
36	630A-4000A	25kA-31.5kA	62.5-78.75	70	80	170	195

Center break disconnectors (ECB/ECBE)

Rated Voltage	Rated Current	Rated Short Time Current For 3 Secs	Rated Peak Short Circuit Current	Power Frequency Withstand Voltage 50Hz For 1 Min		Lightning Impulse Withstand Voltage 50Hz For 1.2/50ms	
				To Earth	Across Isolating Distance	To Earth	Across Isolating Distance
kV	A	kA	kV	kV	kV	kV	kV
12	630A-4000A	25kA-31.5kA	62.5-78.75	28	32	75	80
36	630A-4000A	25kA-31.5kA	62.5-78.75	70	80	170	195
145	1250A-4000A	40kA-50kA	100-125	275	315	650	750

Double break disconnectors (EDB/EDBE)

Rated Voltage	Rated Current	Rated Short Time Current For 3 Secs	Rated Peak Short Circuit Current	Power Frequency Withstand Voltage 50Hz For 1 Min		Lightning Impulse Withstand Voltage 50Hz For 1.2/50ms	
				To Earth	Across Isolating Distance	To Earth	Across Isolating Distance
kV	A	kA	kV	kV	kV	kV	kV
12	630A-4000A	25kA-31.5kA	62.5-78.75	28	32	75	80
36	630A-4000A	25kA-31.5kA	62.5-78.75	70	80	170	195
145	1250A-4000A	40kA-50kA	100-125	275	315	650	750
245	1250A-4000A	40kA-50kA	100-125	460	530	1050	1200

TYPE ESB/ECB/EDB

Description

The disconnectors consist of separate poles which can be arranged for single-pole operation or linked together by operating rods to form 2 or 3 pole units. Each pole consists of a base frame with bearings, post insulators and current carrying parts (conductor arms) with contacts and terminals.

Base frame

For all sizes up to 245kV, the base frame is of welded or bolted design and has minimum four fixing holes. The base frame of all type of disconnector consists of a channel section and has minimum four fixing holes. On this base frame, bearings are fixed and on these bearings, the post insulators are mounted. A rod suited under the base frame connects the bearings, allowing the insulators to be rotated together.

Earthing switches

Earthing switch can be supplied for mounting as an integral part of the disconnector or for separate mounting as an independent unit operated either by a manual or motor operating mechanism.

The earthing switch consists of a fixed contact made of silver plated copper mounted on the hamper assembly and silver plated moving contacts mounted on moving arm of the earth switch blade.

The earth switches are designed for short time withstand current of up to 40kA for 3 seconds.
The earth switches are provided with counterbalancing weights to ensure smooth operation during their opening.

Operating mechanism

Different operating mechanisms can be supplied based on the customer requirements. Currently the following operating mechanisms are offered:

- Manually operated mechanism
- Manually operated geared mechanism
- Motor operated mechanism

Motor operated mechanisms are also provided with emergency manual operation for use in case of power failure for maintenance.

The mechanisms are housed in cabinets made of sheet steel or aluminium. Auxiliary switches having silver plated copper contacts with positive wiping action with adequate number of NO and NC contacts and long wiping contacts as per specific requirements of the customer can be provided.
Suitable terminal blocks made of highly non-inflammable thermosetting plastic are provided for terminating control and auxiliary wiring.

Front door of the operating mechanism box is provided with good quality gaskets which on compression, when the door is closed, ensure high degree of protection against polluted atmosphere. All the sheet steel boxes undergo metal treatment before they are taken for powder coating/galvanzing.

Insulators

A wide range of insulators, meeting the requirements of IEC-168 of the stack type are available with various cantilever strengths, creepage distances and insulation levels to meet the customer specifications.

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TYPE ESB/ECB/EDB

Terminal connectors

Terminal connectors of rigid or flexible type suitable for horizontal/vertical take offs are offered to meet specification. The connector is cast with aluminium alloy and designed so that the joint runs cooler than the associated busbars.

Fig: Rigid type terminal connector

Interlocks

Mechanical constructional interlock is provided between the disconnector and earth switch to ensure that the disconnector cannot be closed when the earth switch is closed and vice versa. An electro mechanical bolt coil interlock is also provided to ensure that disconnector can be closed only after all external interlocking conditions are met.

Installation

Disconnectors are delivered in identifiable parts and assemblies. Assembly of disconnector and commissioning of the same is to be carried out as per the instructions furnished in the erection and commissioning manual supplied along with equipment.

Maintenance

These disconnectors offered are virtually maintenance-free.

All the bearings provided are sealed for life and need greasing. All contacts are to be checked and cleaned during annual maintenance.

The electrical components in the operating mechanism are to be checked and appropriately maintained and the gear is to be greased for smooth operation.

Routine tests

Prior to delivery at factory, the disconnectors are assembled and following routine tests are carried out as per the relevant standards:

1. Mechanical Test:
- Operating mechanism
- Operating universal joints and links
- Auxiliary contact
- Interlock

2. Voltage test on:
- Auxiliary contact
- Operating mechanism

3. Functional test on:
- Main circuit and attachment
- Beam and bearing
- Earthing switch

4. Measuring contact resistance of the main circuit

Type-tests

Disconnectors offered have been successfully type tested as per IEC-62271-102 and ANSI 37.30 standards at CPRI, India.

Standard

The disconnectors are designed to meet the requirement laid down by IEC-62271-102 and ANSI 37.30.

Fig: Disconnector for rural type distribution line

TYPE DISCONNECT SWITCH

Type: Disconnect Switch

Voltage: 15.5kV and 38.0kV

Current: 600 and 1250 ampere continuous

Momentary: 40,000 amperes momentary

Bil: 110kV and 200kV

Purpose: Distribution class, single pole, single throw disconnects provide a durable switch for line sectionalizing or isolating equipment on distribution circuits. They are quality constructed to ensure stable high current capability and full thermal capacity under the required duties of today's load and short circuit conditions.

Blade design: Truss-type construction of formed copper bars have increased width at hinge for greater rigidity, thus minimizing side deflection and maintaining positive alignment when closing switch.

Formed steel channel base: Base and backstrap are rugged hot-dipped galvanized steel and has a dead-ending hole at each end.

Minimum current interchanges: Uniform conductivity is assured through utilization of hard drawn copper bar in forming one-piece stationary contacts and terminal pads. Design reduces current interchange points to a minimum.

Contacts: High pressure line type, both clip and hinge ends.

Tin plated terminal pads: Accommodate terminals for either aluminium or copper conductors.

Positive blade lock and pryout: Blade latch prevents switch opening under high momentary current. Easy opening is assured through pryout assist.

Insulators: Suitable, characteristics available upon request.

Vertical or underhung mounting: Easily adaptable to single or double cross arm construction.

90˚ blade stop: Stop can be field removed for 180˚ blade travel.

Special application: Variations to meet specific customer requirements are available upon request.

Option terminals: Switches can be furnished with any terminal arrangement documented.

Stainless steel loadbreak hooks: For use with portable loadbreak tool.

Benefits:

- Uniform strength and conductivity with no hidden defects
- Washers act as a bearing assuring easy blade opening, even after long exposure to contaminated atmosphere
- Assures proper blade alignment during closing
- Prevent nuisance openings and opening under fault conditions
- Stop pin can be removed if 180˚ blade travel is required
- Accommodates either brass or aluminium terminals

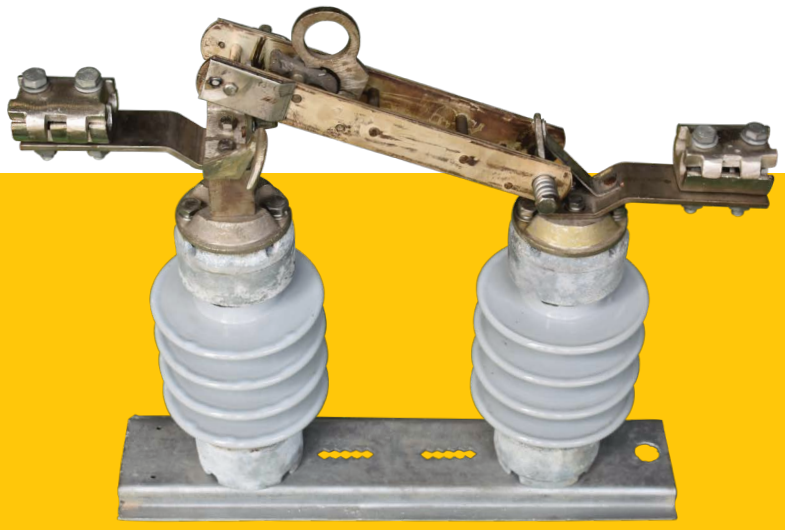

Fig: Distribution class disconnect

TYPE DISCONNECT SWITCH

Max design	Bil	MOM	All dimensions are in mm (reference only)						
kV	kV	kA	B	C	D	E	H	P	T
15.5	110	40	302	381	648	190	178	248	216
38.0	200	40	378	457	724	152	254	324	292

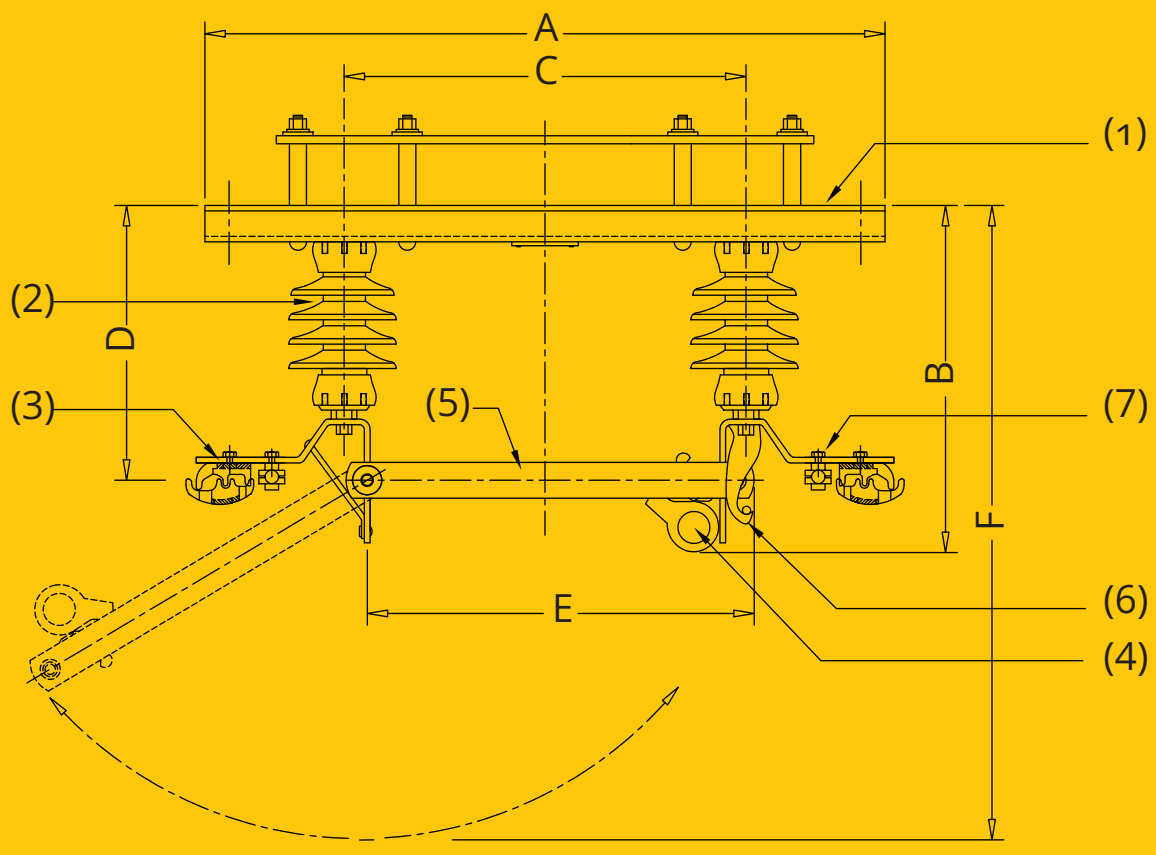

Fig: Dimension and ordering information

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TYPE ACR BYPASS SWITCH

Type: ACR Bypass

Fused Disconnect Switch

Voltage: 15.5kV and 38kV

Current: 100 ampere or 200 ampere fuse holder rating, 600 ampere disconnect switch rating

Momentary: 28,000 amperes momentary on switch

Bil: 110kV and 200kV

Companion Switch

Voltage: 15.5kV and 38kV

Current: 600 ampere continuous

Momentary: 40,000 amperes momentary on switch

Bil: 110kV and 200kV

Combination:

The bypass disconnect combination consists of:

1. A fuse cutout and a single pole disconnect switch mounted in tandem on a common base.
2. A separately mounted single pole companion disconnect switch. The fuse cutout provides the bypass component of the combination. The disconnect switches provide for isolation of the oil circuit recloser.

Purpose: Fused bypass combinations for substation mounting.

Insulators: Two bolt bridge type for #4 Sol. to 666.6 MCM ACSR or ¾" I.P.S copper are included.

Application: For use when there is maximum requirement for safety and continuity of service. The fused ACR bypass disconnect combination provides safe isolation of the ACR while maintaining service continuity with a fuse protected circuit.

Features: The cutout portion of the combination is base mounted and will accommodate both 100 ampere and 200 ampere fuse holders. The disconnect switches have 600 ampere continuous rating.

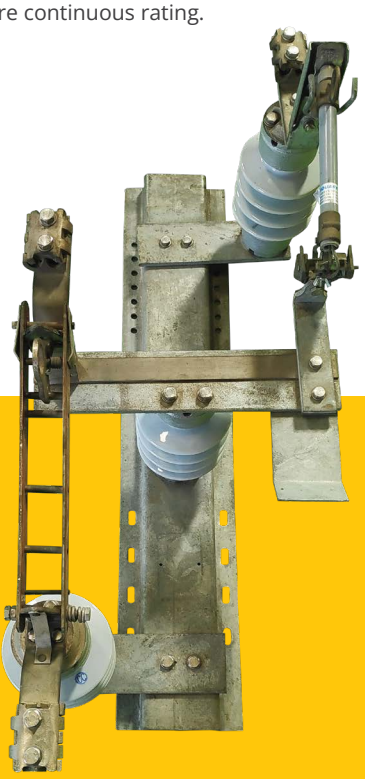
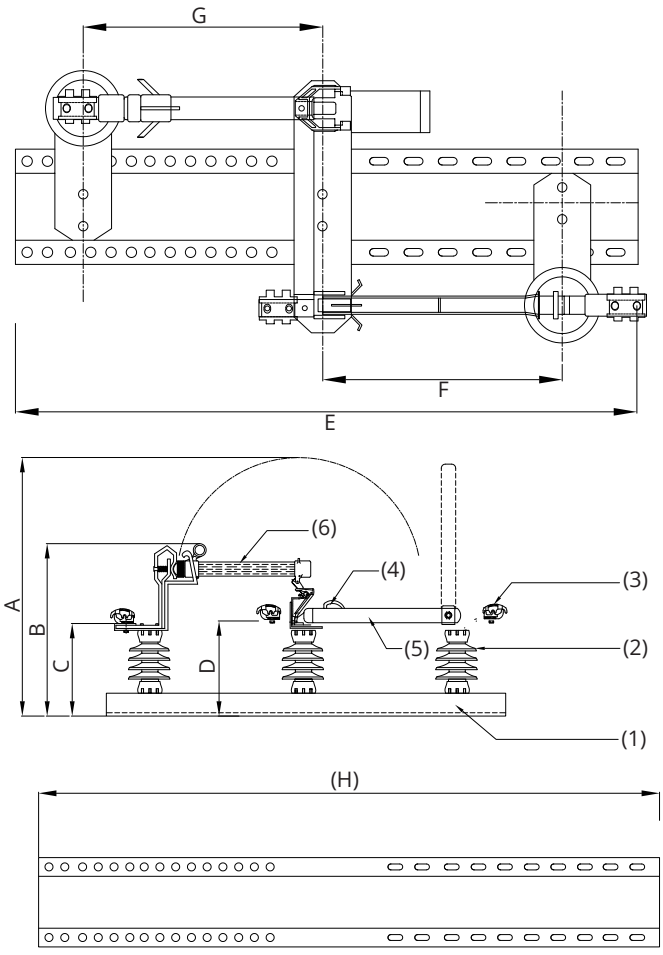


Fig: Fused disconnect switch

TYPE ACR BYPASS SWITCH

Fused Disconnect Switch

Max design	Fuse cont.	Bil	All dimensions are in mm (reference only)							
kV	Amp	kV	A	B	C	D	E	F	G	H
15.5	100	110	838	590	400	406	1168	381	460	1168



Features

- All current carrying parts are copper bar
- Silver washers between blade assembly and hinge
- Truss type blade assembly
- Positive blade latch
- Tinned terminal pads
- 900 field removal blade stop

Benefits

- Uniform strength and conductivity with no hidden defects
- Washers act as a bearing
- Assures proper blade alignment during closing
- Prevent nuisance openings and openings under fault conditions
- Easy opening
- Accommodates either bronze or aluminium terminals
- Stop pin can be removed if 180˚ blade travel is required

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TYPE AVR BYPASS SWITCH

Type: AVR Bypass

Voltage: 15.5kV and 25.8KV

Current: 1200 ampere continuous

Momentary: 61,000 amperes in closed and bypass positions.

Bil: 110kV and 150kV

Purpose: As a Voltage Regulator Bypass

Contacts: Reduced area---high pressure---silver overlay to silver plated copper.

Insulator: Suitable characteristics available upon request.

Base: Galvanized structural steel channel.

Terminal pads: ANSI standard four hole, tinned to accept copper or aluminium terminals.

Operation: The 1200A Regulator Bypass switch is a two pull sequence operated switch. For assured ease of operation under all switching conditions, the blade structure of the 1200-ampere switch is divided into two mechanically interlocked assemblies for enforced sequence operation, thus minimizing the possibility of operational error. Opening the lefthand blade of the switch moves the bypass blade into the bypass position, bypassing and partially disconnecting the regulator. Opening the right hand blade completes the disconnecting sequence and interrupts the regulator exciting current. 1200 ampere switches are equipped with the arcrupter expulsion interrupting device, which has sufficient ampere interrupting capacity for interruption of the regulator exciting current with no exposed arcing. While the means for interrupting exciting current is mounted on right hand blade for mechanical reason, the common terminal for the series and shunt coils may be connected to either disconnect blade.

Expansion joints: On 1200 ampere switches to prevent misalignment due to expansion and contraction of heavy, rigid conductor, it is suggested that expansion joints be used.

Surge protection: Surge protectors are available and provide economical surge protection when mounted across the line terminals of the bypass switches.

Application: Applicable to all regulators that can be set on neutral for the switching operation. This includes all single-phase and three-phase types, except three-phase induction regulators.

Benefits:

- Minimizes the possibility of operator error
- Single pull both bypasses and disconnects the regulator or reconnects them to the line
- Minimize the operating effort of these heavy duty switches
- Interrupts the regulator exciting current and prevents arcing, damage to the switch contacts when disconnectiong the regulator
- Increases contact pressure and minimizes the possibility of contact damage when subjected to high fault current

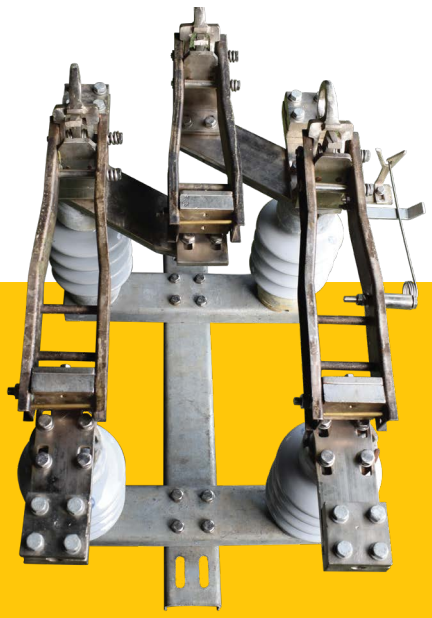
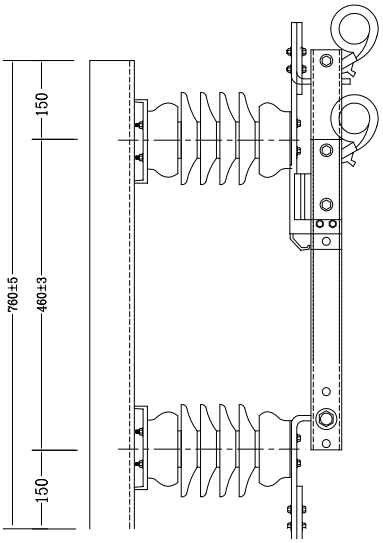


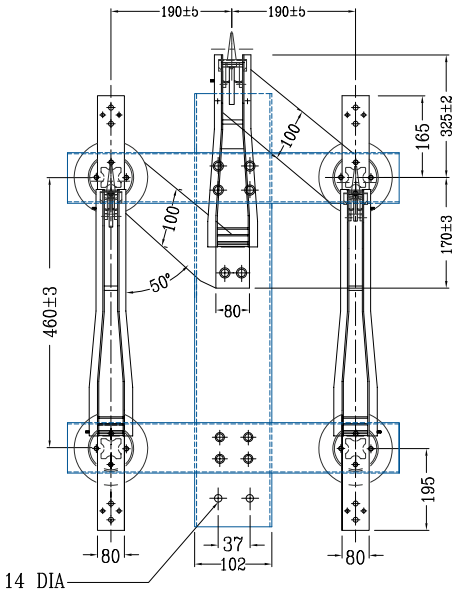
Fig: Voltage regulator bypass switch

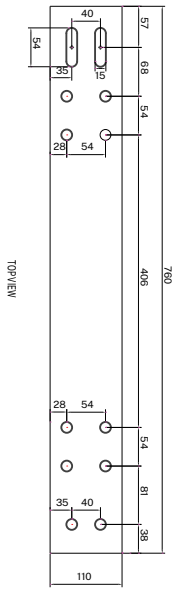
TYPE AVR BYPASS SWITCHES

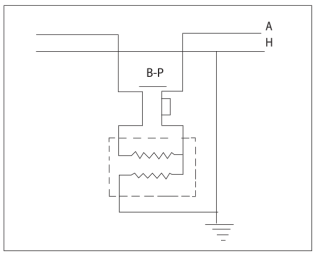
Dimension and ordering information

Max design kV	Amps. cont.	Bil kV	All dimensions are in mm (reference only)							
			B	C	D	H	J	L	P	T
15.5	1200	110	438	381	721	254	610	686	476	429

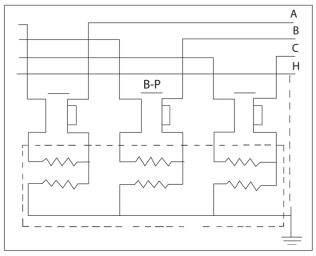




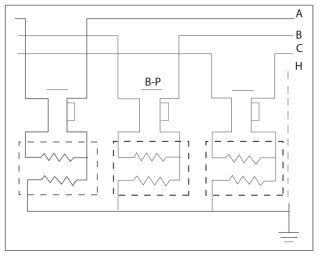




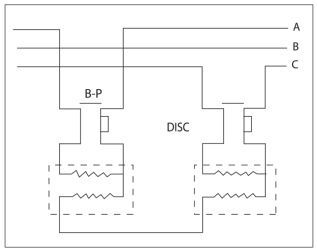
1 single phase regulator
Single phase-2 wire



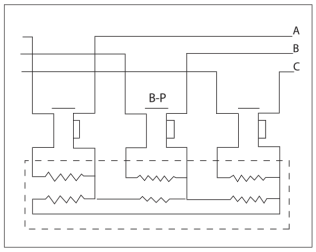
One 3 phase step regulator
3 phase-wye-3 or 4 wire



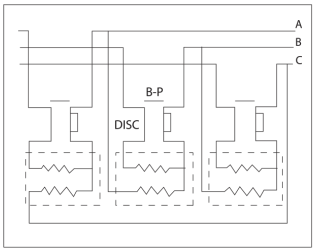
3 Single phase regulators
3 phase-wye-3 or 4 wire



2 Single phase regulators
3 Phase-open delta 3 wire



One 3 phase step regulator
3 Phase-delta-3 wire



3 Single phase regulators
3 Phase-delta-3 wire

Energypac® Engineering

TYPE ABS (AIR BREAK SWITCH)

Product: Air Break Switch

Type: ABS

Voltage: 15.5kV & 38.0kV

Current: 600 ampere continuous and 1250 ampere

Momentary: 40,000 amperes in closed position, 30,000 amperes in bypass position

Bil: 110kV and 200kV

Jaw contacts: Reverse loop-high pressure-silver plated copper.

Hinge contacts: Reduced area-high pressure-silver plated copper to silver plated high conductivity bronze.

Insulators: Suitable characteristics are available upon request.

Base: Galvanized structural steel channel.

Terminal pads: ANSI standard two hole, tinned to accept copper or aluminium terminals.

Application: For bypassing and disconnecting current transformers without load dropping and service interruption.

Operation: One pull on the 600A pull ring puts it through its proper and automatic switching sequence of bypassing the current transformer and disconnecting the transformer from service.

Features:

- Sequenced, make before break operation, both 600 & 1200 ampere ratings
- Single pull operation of 600 ampere ratings
- 2-pull operation of 1200 ampere ratings
- Reverse loop contacts on 600 ampere ratings

Benefits:

- Minimizes the possibility of operator error
- Single pull both bypasses and disconnects the current transformer or reconnects them to the line
- Minimize the operating effort of these heavy duty switches
- Interrupts the exciting current and prevents arcing, damage to the switch contacts when disconnecting
- Increases contact pressure and minimizes the possibility of contact damage when subjected to high fault current

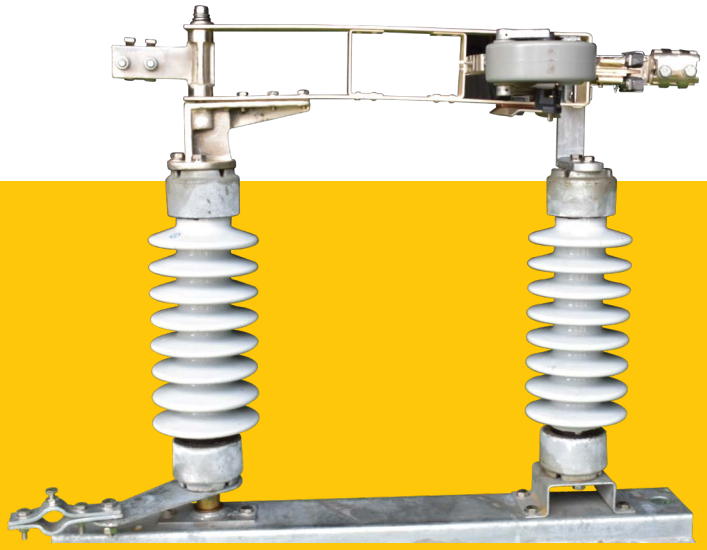


Fig: Air break switch

TYPE ABS BYPASS SWITCH

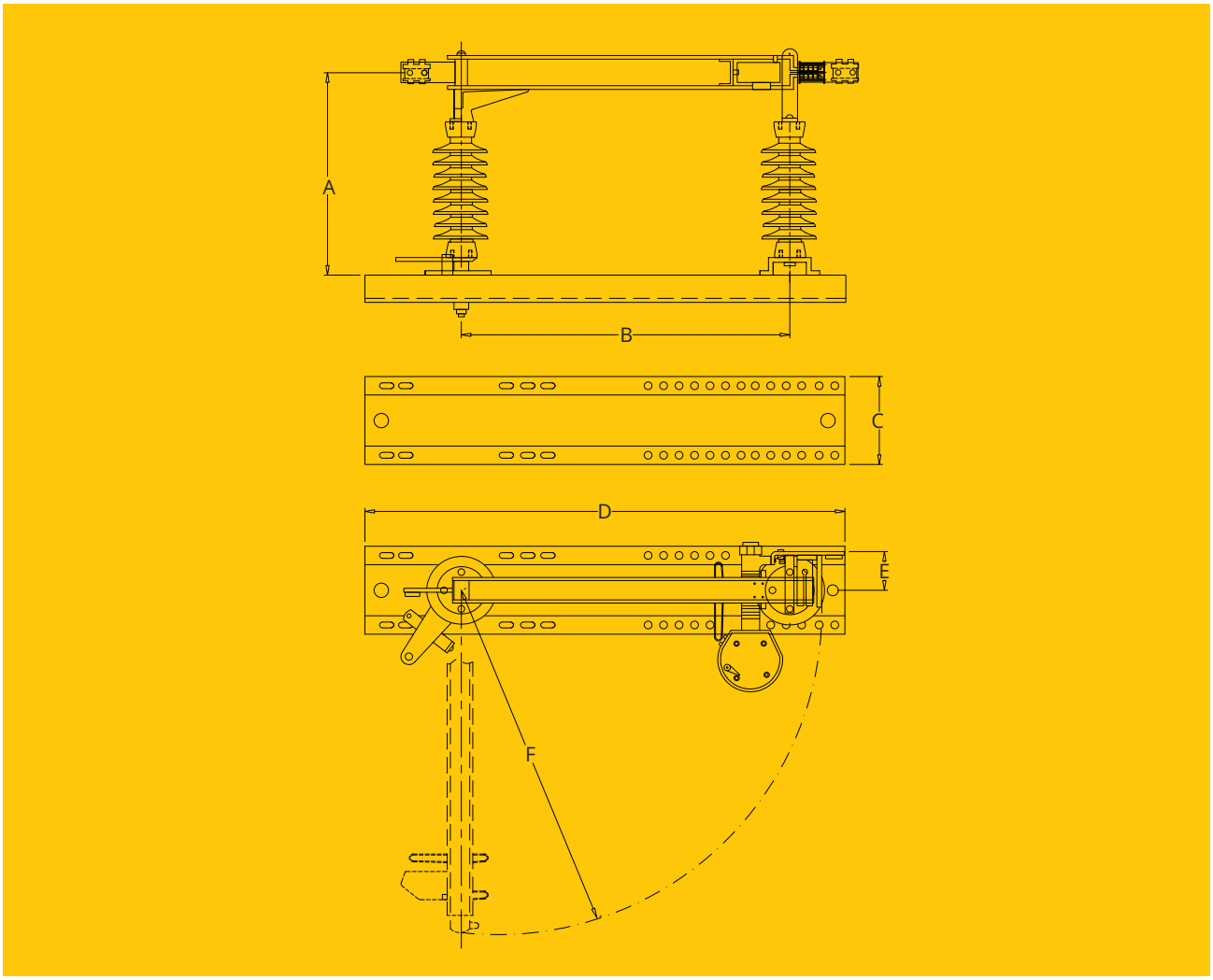
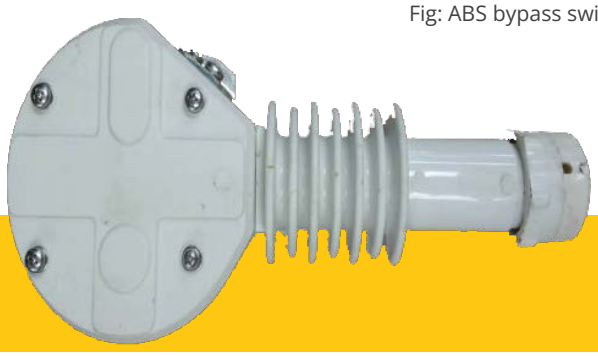


Fig: ABS bypass switch



Load interrupter for ABS

Arc extinguishing chamber (load interrupter) contains of metal parts and plastic chamber and serves for extinguishing of electric arc, which ensure from disconnection of electrical current from electrical circumference by overloading or short circuit.

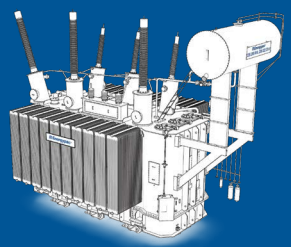
EXPLORE OUR PRODUCTS

1. Open your camera or QR code scanner. Point your device at the QR code

2. Wait for camera to recognize and scan QR code

3. Click proceed or view QR code details, when appears

4. Click the **link** or "visit url" or "go to website" to read the information



POWER TRANSFORMER

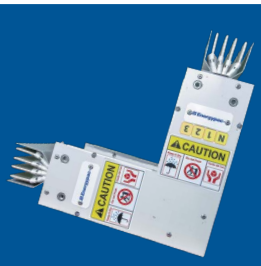
DISTRIBUTION TRANSFORMER
(OIL FILLED)

DISTRIBUTION TRANSFORMER
(DRY TYPE)

INSTRUMENT TRANSFORMER

VACUUM CIRCUIT BREAKER

SWITCHGEAR



BUSBAR TRUNKING SYSTEM

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