



S&S POWER SWITCHGEAR EQUIPMENT LIMITED

SPECIALIST FOR



HIGH VOLTAGE DISCONNECTORS

- ✓ **CENTER BREAK DISCONNECTOR**
- ✓ **DOUBLE BREAK DISCONNECTOR**
- ✓ **PANTOGRAPH DISCONNECTOR**



S&S POWER SWITCHGEAR LIMITED

COMPANY HISTORY



S&S Power Switchgear Ltd (S&S) was established in 1975 in Technical collaboration with Brush Fusegear, UK for manufacture of Fuses. S&S introduced High Voltage Disconnecting Switches in 1978 collaborating with Southwales, UK.

S&S indigenously developed Outdoor Porcelain Clad Vacuum Circuit Breaker and introduced for the first time in Indian market.

S&S became the industry leader in the country in sales and market shares in Medium Voltage and High Voltage Disconnecter Industry.

The factory has state-of-the-art manufacturing facilities to produce high quality equipment. A world class Factory in Puducherry houses all third generation equipment and provides low cost high quality manufacturing facility for Disconnectors.

The products of S&S have been tested in internationally renowned Laboratories- Kema Holland and CESI-Italy. The type test conducted include Ice Breaking test for High Altitude installation of these Disconnectors.

S&S continues its success march backed by a strong team of quality Engineers and a fully equipped in house Research and Development department.

S&S is the only company in India to have sold more than 18,000 nos of Circuit Breakers and more than 25,000 nos of Disconnectors to all major Utilities in India and Worldwide.

Repeated orders from esteemed customers prove their confidence reposed on S&S products and timely delivery. S&S continues its thrust and introduced wide range of products to meet the customer's changing needs which are their core strength in staying ahead successfully in the competitive market.

Careful selection of automatic and semi-automatic machines enables S&S to manufacture quality products to meet the stringent customer requirements.

WHY S&S

- ✓ Quality products
- ✓ Detailed application study
- ✓ Dedicated team of engineering experts
- ✓ Timely execution of projects
- ✓ Complete after sales services
- ✓ Large Production Capacity
- ✓ Provide Customized Solutions
- ✓ Flexibility to adopt to Customer needs
- ✓ Long term experience in Disconnectors

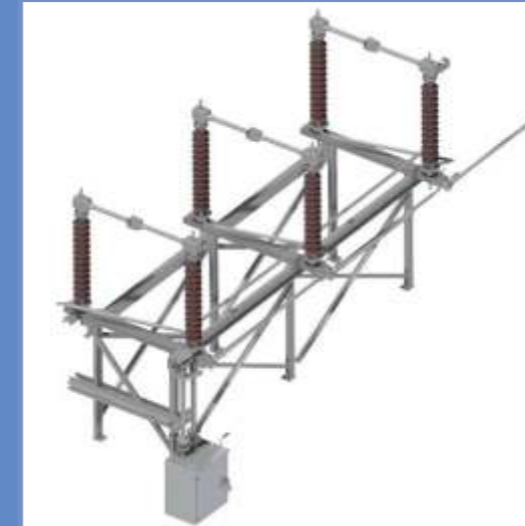


CORE VALUES

- ✓ Committed to achieve success focusing on customer satisfaction
- ✓ Delivering value
- ✓ Excellence in operations
- ✓ Provision of suitable platform for best electrical deals
- ✓ Quality Focused Team

EXCELLENCE IN SWITCHING & PROTECTION ENGINEERING

CENTER BREAK - OUTDOOR OFF LOAD DISCONNECTOR



RC 123kV



RC 36kV



RC 245kV



RC 420kV

DIMENSIONAL DETAILS

Main Dimensions (mm)				Rated Voltage	Rated Current	Rated STC	One minute Power frequency withstand voltage@50Hz		Lightning impulse withstand voltage 1.2/50μs		Switching impulse withstand voltage 250/2500μs	
							Phase to phase, Phase to earth	Across isolating	Phase to phase, Phase to earth	Across isolating	Phase to phase, Phase to earth	Across isolating
A	B	C		kV	A	kA/s – kAp	kVrms		kVp		kVp	
700	868	500		24	630 - 3150	Upto 31.5/3 - 80	50	60	125	145	-	-
	920			36			70	80	170	195	-	-
				40.5			95	105	200	220	-	-
1000	1253	650		72.5		Upto 40/3 - 100	140	160	325	375	-	-
1400/1500	1733	1150		123			230	265	550	630	-	-
1700/1500	2013	1350		145			275	315	650	750	-	-
2600/2850	2839	1700x300x300		245		Upto 50/1 - 125 63/1 - 160	460	530	1050	1200	-	-
4100	4262	4000x100x100		420			520	610	1425	1425 (+240)	1050	900 (+345)

FEATURES

- ▶ Very low Operating Torque
- ▶ Self-wiping contacts
- ▶ Simultaneous operation of 3 poles by single operating mechanism up to 420 kV.
- ▶ Individual pole operation for 420 kV (if required)
- ▶ Fully type tested as per IS 9921 and IEC-62271-102 Structure to suit requirements
- ▶ Special tests successfully done for Ice breaking, Low ambient applications & Seismic

COMPONENTS

- ▶ Hamper Assembly
- ▶ Support Insulator
- ▶ Disconnecter Base
- ▶ Inter Stack Coupling Pipes
- ▶ Inter phase Coupling Pipes
- ▶ Support Structure
- ▶ Operating Mechanism
- ▶ Interlocks

A. HAMPER ASSEMBLY

The Hamper assembly consists of two moving arms called the male and female arms, each mounted on the top of the rotating support insulators. The arms are made out of tubular or channel sections of Aluminium alloy depending on the current and voltage ratings of the disconnectors. The male copper contact and female copper contact fingers are silver plated and mounted onto the arms.

The male and female hamper assemblies are connected to the terminal stem by using either flexible copper strips or copper fingers for the safe transfer of current from the moving arm to the fixed terminal stem of the disconnector. The contact between the male and female contact is a line contact and the contacts provided are of the reverse loop type. Each contact finger is provided with a contact spring which, ensures that the required pressure is maintained.

The terminal stem onto which the terminal connector is fixed is made of aluminium alloy for 420kV disconnectors up to 2500 Amps & 245kV Disconnectors of 2500 Amps; and of copper for all 245kV and below Disconnectors up to 2000A. For 3150Amps rated disconnectors, only Copper terminal stems are used. Where copper terminals are provided with tin plated for connection to aluminium alloy terminal connectors. Contact corona rings are provided at the male and female hampers wherever necessary.

B. SUPPORT INSULATORS

In the case of the centre break disconnectors the support insulators are used to support metallic hampers of the disconnectors and to rotate through 90 degrees to open and close the disconnectors, to provide necessary insulation between live parts and ground. Insulator corona rings are provided on the insulators wherever necessary.

C. DISCONNECTOR BASE

In the case of the centre break disconnectors the support insulators are used to support metallic hampers of the disconnectors and to rotate through 90 degrees to open and close the disconnectors, to provide necessary insulation between live parts and ground. Insulator corona rings are provided on the insulators wherever necessary. Disconnecter base is made out of mild steel welded assembly. The base consists of two flanges at either ends for mounting the support insulators. These flanges are provided with the necessary holes at the required pitch circle diameter to match the holes provided on the base flange of the insulator.

The flanges are welded on the bearing shaft and are assembled with two numbers of bearings, in a bearing housing. These bearings are seated one on the top and another one on the bottom of the base assembly and these ensure free and smooth movement of disconnector arms. Bearing covers are provided to ensure that water and dust do not enter the bearings. Provision is made at the two ends of the bases to mount earth switches if required. Provision is also made on the base for mounting the mechanical constructional interlock between disconnector and earth switch wherever required. The base is provided with mounting arrangement at two points for fixing the disconnector base with the supporting structure. Earthing pad / earthing studs are provided at two points at the extreme ends of the base for connecting to the customers sub station earthing system.

D. INTER STACK COUPLING PIPES

Inter stack coupling pipes are provided to couple the two columns on the same phase of disconnector so as to ensure simultaneous rotation of the two poles columns driven by the common operating mechanism. The coupling pipes are linked to the base flange on which the insulator is mounted by metallic pin to ensure easy assembly / dismantling at site. Normally the inter pole coupling pipes are assembled on to the base and set at factory prior to despatch from works.

E. INTER PHASE COUPLING PIPES

Inter Phase coupling pipes are provided to couple the three phases of the Disconnecter and operate all the three phases from a common operating mechanism in the case of Mechanically Ganged three pole Disconnectors. These are not required in the case of single pole Disconnectors where each pole is operated by its own operating mechanism. The coupling pipes are linked to one base flange on each phase of the three pole disconnector. These are dispatched as loose items and are to be assembled at site. Provision is available to do minor adjustments in length of the coupling pipe to suit site conditions.

F. SUPPORT STRUCTURE

Wherever specified, support structure of tubular types for 420kV disconnector and lattice type for 245kV and below disconnectors with necessary foundation bolts can be supplied. Plates are welded on to this tubular support structure fabricated out of welded sheet steel for 420kV Disconnectors for mounting the operating mechanism boxes. The height of this support structure can be varied to accommodate the bus height as required by the purchaser's layout and system.

G. OPERATING MECHANISM

The operating mechanisms of the disconnectors / earth switches are mounted on to the structure on plates provided, being bolted with the angles that are provided on the mechanism box. Motor Operating mechanism or manual Operating Mechanisms can be supplied as per customer requirement.

I. INTER LOCKS

The following interlocks are provided for the Horizontal centre break disconnectors.

1. A Mechanical constructional interlock between the disconnector and earth switch has been provided to ensure that the Earth Switch can be closed only when the Disconnector is in the open position and vice versa.
2. An electrical (Bolt coil type) interlock has been provided in each motor operating mechanism for interlocking between manual and motor operation of Disconnector/Earth switch. This ensures that the motor circuit is cut off when the manual operation is under progress.
3. Optionally electro-mechanical (Castel key type) interlock can also be provided.

In some cases, only electrical bolt coils are provided as interlocks solely controlled by electrical circuits.

Based on customer needs either Electro- mechanical or Electrical interlocks will be provided.

Electrical contact is provided in the Electrical circuit of the Motor Operating Mechanism for the Purchaser to wire-in the external interlocks if any to ensure that the Disconnectors/Earth switch can be operated only if all the interlocking conditions are satisfied.

NOTE:

1. Horizontal Centre Break Disconnector can be supplied by us either without Earth switch, with Single Earth switch or with Double Earth switch.
2. Centre Break Disconnectors are normally offered for horizontal, normal level, upright mounting. But on request these can be offered for other types of mounting like series, vertical, higher level, under hung, tandem etc.,
3. Horizontal Centre Break disconnectors / Earth switches supplied by us are generally Mechanically Ganged for operation of all three poles from a common operating mechanism cabinet. However we can supply 420kV Centre Break Disconnectors with the three poles being operated by 3 separate mechanisms, which are electrically ganged to operate together, if so desired by the purchaser.
4. Horizontal centre break disconnectors can be supplied with the following ratings (included in our present range of manufacture).

Maximum Voltage	420kV
Maximum Current	4000A
Maximum short time with stand current	50kA r.m.s for 1 Sec with 125kA peak (or) 40kA r.m.s for 3 sec with 100kA peak.

5. unless specifically stated in our offer, all cabling and wiring external to our operating Mechanism cabinets are excluded from the scope of our offer.



FEATURES

- ▶ Turn and Twist Contacts
- ▶ Vertical and Horizontal terminal take off.
- ▶ Totally enclosed actuator assembly
- ▶ Simultaneous operation of 3 poles by single operating mechanism up to 420 kV.
- ▶ Individual pole operation for 420 kV (if required)
- ▶ Fully type tested as per IS 9921 and IEC-62271-102 Structure to suit requirements
- ▶ Special tests successfully done for Ice breaking, Low ambient applications & Seismic

COMPONENTS

- ▶ Rotating Hamper Assembly
- ▶ Fixed Contact Assemblies
- ▶ Support Insulators
- ▶ Disconnecter Base
- ▶ Inter phase Coupling Pipes
- ▶ Support Structure
- ▶ Operating Mechanism
- ▶ Interlocks

DOUBLE BREAK DISCONNECTOR COMPRISES

Double break disconnecter also known as center post rotating disconnecter provides isolation by way of circuit disconnections at the two ends (incoming & outgoing ends).

A. ROTATING HAMPER ASSEMBLY

The Rotating hamper assembly consists of a tubular section of Aluminium / Copper of adequate crosssection clamped at the centre point. It rotates 110° degrees for the closing / opening of the disconnecter. The size of the Aluminium / Copper tube and its thickness is selected based on the continuous and short time current carrying capacity of the required disconnecter. Silver plated copper contacts are fixed on to this rotating tube blade at either ends.

S&S Double Break Disconnecters are of a special design, have a turn and twist feature. In this design, the disconnecter blade first moves in the horizontal plane and after touching as topper on the fixed contact, the tubular blade itself rotates giving a twisting motion. Only during this twisting movement, the contacts mounted on the moving blade actually make contact with the fingers on the fixed contact assembly. This rotating motion of the blades ensures that adequate contact pressure is built up between the fixed and moving contacts for carrying the rated currents. This design also has a further advantage that during the closing operation of the disconnecter, the actual current carrying surfaces do not come into the contact till the twisting motion occurs, thereby ensuring that there will not be any damage to the surfaces of the contacts during the closing of disconnecter. The contacts are of self wiping type and the contact surfaces get cleaned while closing and opening of Disconnecter. This type of contact arrangement is called the pressure relieving reverse loop type. An actuator housing assembly hold the Aluminium / Copper tube. The turn and twist mechanism is clamped to the moving aluminium / copper blades. The actuator housing flange is then mounted on to top flange of the centre insulator of each pole.

B. FIXED CONTACT ASSEMBLIES

Each pole of the Disconnecter consists of two fixed contact assemblies. The fixed contact assembly consists of a housing on to which the Silver plated Copper contact fingers are mounted. Each contact finger is independently provided with a spring compression to ensure that the required contact pressure is maintained. The fixed contact assembly also consists of a terminal pad. The terminal connector is fixed on to this terminal pad on four/six holes provided thereon.

C. SUPPORT INSULATORS

The Double Break Disconnecter consists of three stacks of support insulators per pole or 9 stacks per 3 pole disconnecter. Out of the three insulators per pole, the outer two insulators are stationary and the centre insulator rotates through 118 degrees for closing/opening of the Disconnecter. Due to this reason, this type of Disconnecter is also referred to as the Double Break Centre post Rotating type disconnecter.

The fixed contact assemblies are mounted on top of the outer stacks of insulator which are stationary and the turn and twist mechanism along with the rotating hamper assembly is mounted on the centre stack of insulator.

The function of the outer stack of insulator is to keep the fixed contacts rigid, provide the necessary creepage distance and the insulation between the live parts and ground. The function of the centre stack of the insulator is to rotate through 118 degrees, provide the necessary creepage distance and the insulation between live parts and ground. Insulator corona rings are provided for 420kV/245kV Disconnecters.

D. DISCONNECTER BASE

Disconnecter base is made of mild steel welded assembly. The base consists of three flanges, two at either ends or one at the centre for mounting the support insulators. These flanges are provided with the necessary holes at the required pitch circle diameter to match with the holes provided on the insulator base flange. The two end flanges are welded on to the base of the disconnecter adaptors. The centre flange is welded to the bearing shaft. The bearing shaft is assembled with two bearings, in a bearing housing. These bearings are seated one on top and another on bottom of the bearing housing base assembly and thus ensure smooth and free movement of the Centre rotating post of the disconnecters. Bearing caps are provided to ensure that water and dust do not enter the bearings. Provision is made on the base for mounting the mechanical constructional interlock between disconnecter and earth switch wherever required.

The base is provided with mounting arrangements at four / eight points for fixing the disconnecter base to the supporting structure.

Earthing pad / earthing studs are provided at two points at the extreme ends of the base for connecting to the customer's substation earthing systems.

E. INTER PHASE COUPLING PIPES

Inter Phase coupling pipes are provided to couple the three phases of the Disconnecter and operate all the three phases from a common operating mechanism in the case of mechanically ganged three pole Disconnecters. These are not required in the case of single pole Disconnecters where each pole is operated by its own operating mechanism. The coupling pipes are linked to one base flange on each phase of the three pole disconnecter. These are despatched loose and are to be assembled at site. Provision is available to do minor adjustments in length of the coupling pipe to suit site conditions.

F. SUPPORT STRUCTURE

Wherever specified, support structure of tubular types for 420kV disconnecter and lattice type for 245kV and below disconnecters with necessary foundation bolts can be supplied. Plates are welded on to this tubular support structure fabricated out of welded sheet steel for 420kV Disconnecters for mounting the operating mechanism boxes. The height of this support structure can be varied to accommodate the bus height as required by the purchaser's layout and system.

G. OPERATING MECHANISM

The operating mechanisms of the disconnectors / earth switches are mounted on to the structure on plates provided, being bolted with the angles, that are provided on the mechanism box.

Motor Operating mechanism or manual Operating Mechanisms can be supplied as per customer requirement.

H. INTERLOCKS

The following interlocks are provided for the Horizontal Double Break disconnectors.

1. A mechanical constructional interlock between the disconnector and earth switch has been provided to ensure that the Earth Switch can be closed only when the Disconnector is in the open position and viceversa.
2. An electrical (boltcoil type) key type interlock has been provided in each motor operating mechanism for interlocking between manual and motor operation of Disconnector / Earth switch. This ensures that the motor circuit is cutoff when the manual operation is under progress.
3. Optionally electro-mechanical (Castel key type) interlock canal to be provided. In some cases, only electrical bolt coils are provided as interlocks solely controlled by electrical circuits.

Based on customer needs either Electro-mechanical or Electrical interlocks will be provided.

Electrical contact is provided in the Electrical circuit of the Motor Operating Mechanism for the Purchaser to wire in the external interlocks if any to ensure that the Disconnectors / Earth switch can be operated only if all the interlocking conditions are satisfied.

NOTE:

1. Horizontal Double Break Disconnector can be supplied by us either without Earth switch, with Single Earth switch or with Double Earth switch.
2. Double Break Disconnectors are normally offered for Horizontal, normal level, upright mounting. But on request these can be offered for other types of mounting like series, vertical; higher level, underhung, tandem etc.,
3. Horizontal Double Break disconnectors / Earth switches supplied by us are generally Mechanically Ganged for operation of all three poles from a common operating mechanism cabinet. However we can supply 420kV double Break Disconnectors with the three poles being operated by 3 separate mechanisms, which are electrically ganged to operate together, if so desired by the purchaser.
4. Horizontal double break disconnectors can be supplied with the following ratings (included in our present range of manufacture).

Maximum Voltage	420kV
Maximum Current	4000A
Maximum short time with stand current	50kA r.m.s for 1 Sec with 125kA peak (or) 40kA r.m.s for 3 sec with 100kA peak.

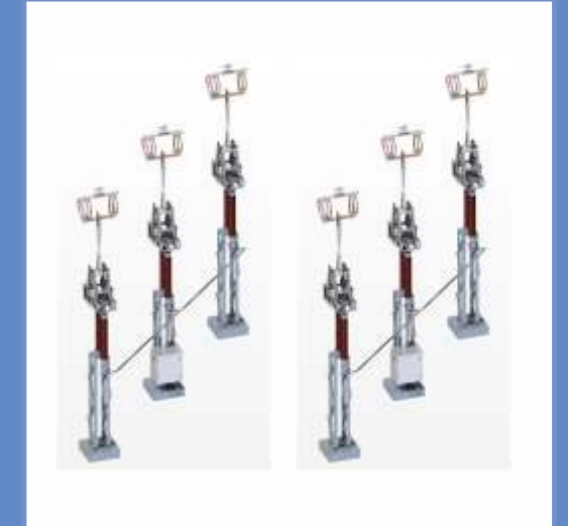
5. Unless specifically stated in our offer, all cabling and wiring external to our operating Mechanism cabinets are excluded from the scope of our offer.



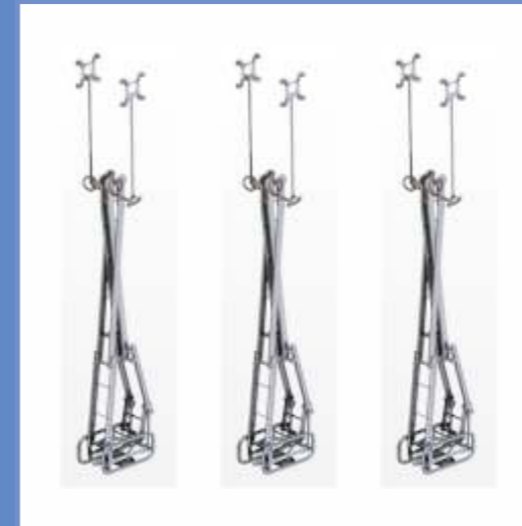
PANTOGRAPH - OUTDOOR OFF LOAD DISCONNECTOR



RP 123kV



RP 145kV



RP 245kV



RP 145kV

DIMENSIONAL DETAILS

Main Dimensions (mm)			Rated Voltage	Rated Current	Rated STC	One minute Power frequency withstand voltage@50Hz		Lightning impulse withstand voltage 1.2/50µs		Switching impulse withstand voltage 250/2500µs	
A	B	C				Phase to phase, Phase to earth	Across isolating	Phase to phase, Phase to earth	Across isolating	Phase to phase, Phase to earth	Across isolating
1490	5200	6500	kV	A	kA/s - kAp	kVrms		kVp		kVp	
1860	5500	8000	123	1250 - 3150	Upto 40/3 - 100	230	265	550	630	-	-
2832	6100	9000	145			275	315	650	750	-	-
4412	8000	12000	245			460	530	1050	1200	-	-
			420			520	610	1425	1425 (+240)	1050	900 (+345)

PANTOGRAPH DISCONNECTOR COMPRISES

FEATURES

- ▶ Very low civil engineering profile
- ▶ Trapeze contact fixing to suit upper bus arrangement
- ▶ 4 Point fixed contacts.
- ▶ Available for flexible / right busbar layouts
- ▶ Current transfer through multi-finger hinge contacts
- ▶ Meets IS-9921 and IEC-62271-102 standards
- ▶ Individual pole operation
- ▶ Structure to suit requirements

COMPONENTS

- ▶ Trapeze Contact
- ▶ Scissor Assembly
- ▶ Main Frame Assembly
- ▶ Support Insulators
- ▶ Operating Rod Insulator
- ▶ Support Structure
- ▶ Operating Mechanism
- ▶ Interlocks

A. TRAPEZE CONTACT

The trapeze contact consists of a Silver plated Copper tube suspended by adjustable dropper rods, quadruple or twin spacers, which are connected to upper quadruple or twin ACSR conductor bus. The complete assembly of sets of spacers, two Aluminium dropper rod sand one Silver plated Copper tube totally form the Trapeze contact of Pantograph Disconnecter.

B. SCISSOR ASSEMBLY

The scissor assembly contains the four point contacts of silver plated copper which makes contact with the suspended copper tube of this trapeze assembly. The copper contacts are mounted on the Aluminium alloy extrusions assembled in the form of a scissor. Current transfer contacts are provided at the joints to ensure smooth transfer of current from one moving part to the adjacent part. The scissor arms on one side have counter balance springs to ensure smooth operations. Current transfer contact consists of a male copper contact on one side and female contact finger assembly on the opposite side. Corona rings are provided on the scissor assembly at the upper contact point and also at the joints in the scissor assembly.

C. MAIN FRAME ASSEMBLY

Main Frame assembly consists of the main frame of the Pantograph Disconnecter on which the pantograph scissors are mounted. This assembly also has the terminal pad at either end for connecting the terminal connectors. The terminal pad is a plate of aluminium with four holes drilled on it for fixing the terminal connector. The main frame assembly also has the base plate for mounting it on top of the solid core support insulator. It also houses the bell Crank and levers connected to the down operating rod insulator for the operation of the Disconnecter.

D. SUPPORT INSULATOR

The support insulator is a solid core insulator which is primarily used to support the metallic pole of the Pantograph Disconnecter and also to provide the required insulation between the live parts and ground. An insulator coronaring is provided on top of the insulator. The lower portion of the support Insulator is mounted on to the support structure column.

E. OPERATING ROD INSULATOR

While the support insulator explained earlier gives the necessary rigid support for the metallic part (main frame assembly and scissors), the operating rod insulator is used primarily for operating the pantograph scissors and for providing insulation for the person operating the Pantograph. This

Insulator is also normally a solidcore insulator of lesser diameter and cantilever strength when compared to the support insulator. The upper end of the insulator is connected to a bell crank for operating the disconnecter and the lower end is connected to the operating mechanism through a down operating pipe.

F. SUPPORT STRUCTURE

Wherever specified, support structure of tubular types with necessary foundation bolts can be supplied. Plates are welded on to this tubular support structure fabricated out of welded sheet steel for mounting the operating mechanism boxes. The height of this support structure can be varied to accommodate the height of Upper and Lower bus heights as required by the purchaser's layout and system.

G. OPERATING MECHANISM

Operating mechanism is mounted on to the structure on three plates being bolted with three angles provided on the mechanism box. Normal Drive for Pantograph Disconnecter are Motorized Operating mechanism, with Manual operating provision for Emergency.

H. INTERLOCKS

The following interlocks are provided for the Horizontal centre break disconnectors.

1. A mechanical constructional interlock between the Main and earth switch.
2. An electro-mechanical castell key type interlock between Disconnecter and earth switch where earth switch is specified.
3. Electro mechanical castell Key Interlock between electrical and manual operation in motor operating mechanism.

Further Terminal are Provided in the electrical control circuit of the motor operating mechanism for customer to wire in external interlocks.

NOTE:

1. Pantograph disconnecter can be supplied by us with or without Earth switches. Earth switches where supplied are mounted an adaptor fixed to the support structure.
2. In case Pantograph Disconnecter with double earth switch are required, we can offer pantograph disconnecter with single earth switch additional separately mounted bus bar earth switch.
3. Pantograph type disconnectors are generally single pole operated disconnectors and can be electrically ganged to ensure three pole operation of the disconnecter.
4. Pantograph type disconnectors can be supplied with the following ratings (included in our present range of manufacture).

Maximum Voltage	420kV
Maximum Current	3060A
Maximum short time with stand current	50kA r.m.s for 1 Sec with 125kA peak (or) 40kA r.m.s for 3 sec with 100kA peak.

5. Unless stated specifically stated in our offer, all cabling and wiring external to our operating mechanism cabinet are excluded from the scope of our supply.

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