Medium Voltage Distribution

Introduction Manual

HWX

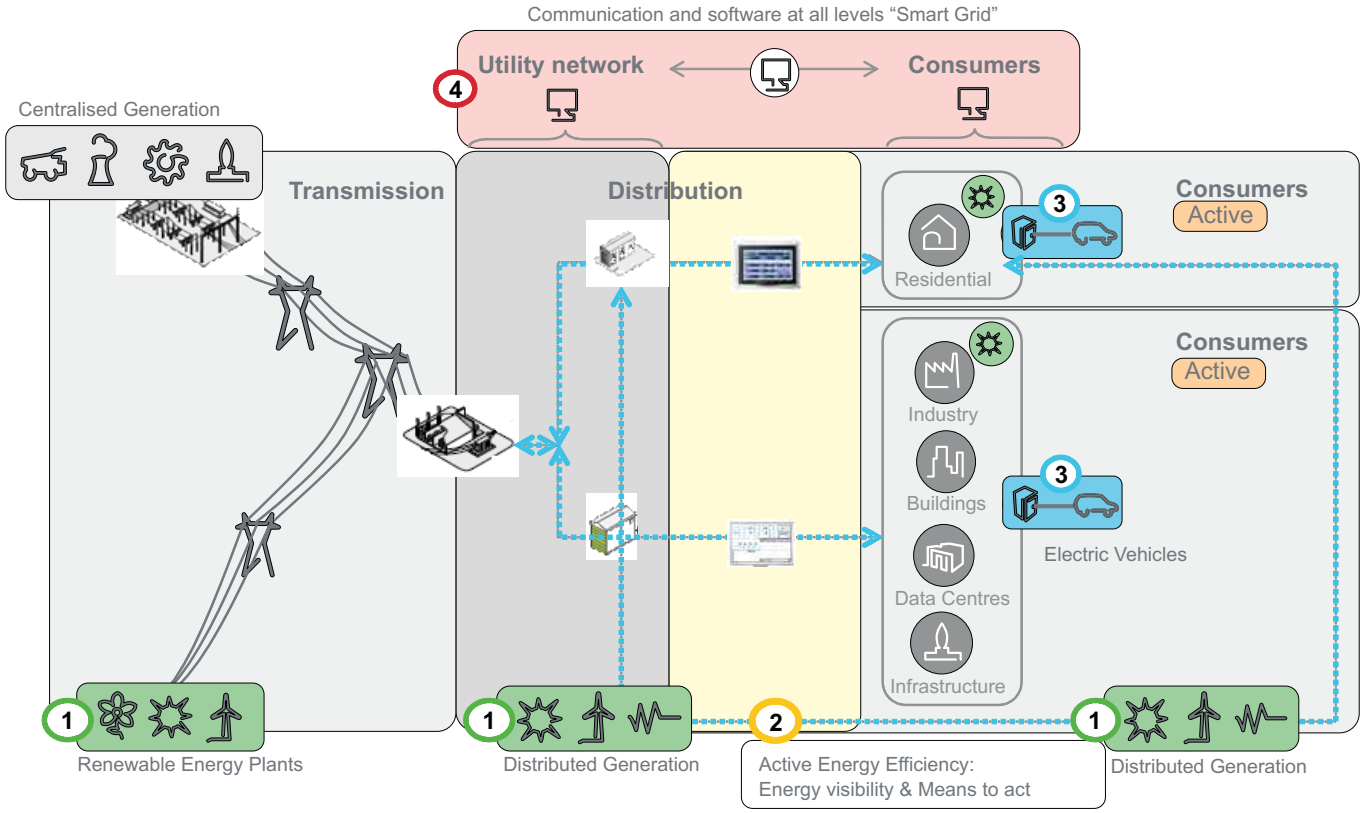
Air Insulated Vacuum Switchgear

Complete solution for process plants, power stations and other industries upto 12kV, 5000A, 50kA

Schneider Electric

The HWX Vacuum Switchgear is the result of extensive research by Steering Design Committee, comprising members of Schneider Electric from different countries. This circuit breaker, with identical component design, material specifications and manufacturing process is manufactured in several Schneider Electric locations world-wide, including India.

The user interface, which is the panel housing for the globally standardized breaker has been specifically designed for the technical requirements (as defined by leading Indian Consultants) of Indian industry and power plants.



HIGH SAFETY LEVELS

HWX is designed using the latest techniques to ensure that the highest level of operator safety is always maintained.

- Highest level of internal arc classification
- Rigid cubicle construction and 'rising' door/cover design
- Choice of 'Gas ducts with evacuation tunnel' or 'Arc deflector' for 40kA IAC range
- Foolproof interlocking and clearly visible indicators

EASY ACCESS TO ALL COMPARTMENTS

HWX has been designed for both front and rear access for ease of operation and maintenance. The functional design of front panel affords easy access to separate compartments within the cubicles. In addition, internal partitions can be quickly and easily removed to facilitate access for Installation, cabling and commissioning, as well as for inspection and maintenance.

HWX is the product of Schneider Electric (erstwhile Areva T&D) and has been in operation all over India and abroad. The product exhibits high reliability, quality, safety and is user friendly.

HWX has been fully type tested according to the latest IEC 62271-100 & 200 from internationally accredited test laboratories.

TECHNICAL OVERVIEW

Ratings	
Type	HWX
Rated Voltage	upto 12kV
Rated Continuous Current	upto 5000 A
Rated Frequency	50 Hz
Rated Interrupting Current	upto 50 kA
Rated Making Current	upto 125 kAp
Rated Short Time Current	upto 50 kA for 3 sec.
Operating Duty	O-0.3 sec-CO-3min-CO
Applicable Standards	IEC 62271-100 / 200 & IEC 62271-1
Power Frequency Withstand Voltage	28 kV / 35 kV rms*
Impulse Withstand Voltage	75 kVp / 95 kVp*
Degree Of Protection	IP4X external, IP2X internal (between compartments)
Type Of Mechanism	Motor charged, Stored energy, Spring operated
Special Switching Duties	Capacitor Bank Switching, Double line to ground fault
Quality System Certification	ISO 9001, 14001, 18001 (IMS Certified)
Seismic Sustainability*	Zone - V
Rated Single Capacitor Bank	400A Class C2 category
Rated Cable Charging Current	25A Class C2 category
Rated Line Charging Current	10A Class C2 category

* On Request

Customer benefits with unlimited possibilities

- Internal Arc tested upto 40 kA/1 sec for AFLR-PM with loss of service continuity-LSC(2B)
- Class S1, E2, M2, C2
- Fully type tested as per latest IEC standard
- Enhanced operator's safety with touch proof dead-front execution with all operations behind closed door
- Tested for Zone V seismic duty
- Natural cooled running busbar upto 5000A at 50 deg C ambient with Copper and Aluminium upto 4000A
- Single Breaker principle: 3150A natural cooled and 5000A with force cooling
- Positive Interlocks between all drives, doors, and covers to nullify chances of any faulty operations
- Unique Duplicate Busbar design for bi-directional power flow with easy changeover from front bus to rear bus and vice-versa

HWX IS DEFINED AS FOLLOWS

- Partition Metallic (PM): It is provided with metallic shutters and partitions between adjacent compartments.
- Loss of Service Continuity (LSC) - 2B: Service of the main busbar and the cable compartment are ensured when normal maintenance operations are carried out in one of the compartments of the main circuit (example circuit breaker compartment).
- Internal Arc Classification (IAC) - AFLR: It is Accessible from Front, Lateral and Rear with one second duration in all compartments.
- Ambient conditions as per IEC 62271-1 :

Temperature Class :	"Minus 5 indoors" *	Min / max ambient temperature :	-5 / 40 deg C *
Average relative humidity:	≤ 90 %	Installation altitude above sea level :	≤ 1000m **

* other values available on request
** Higher altitude correction factor applicable

APPLIED STANDARDS

HWX switchgear units meet following standards and regulations :

Switchgear	IEC 62271-200 & IEC 62271-1
Internal arc classification (IAC), LSC 2B	IEC 62271-200
Circuit-breaker	IEC 62271-100
Earthing switch	IEC 62271-102
Isolating truck	IEC 62271-102
Current transformers	IEC 60441-1
Voltage transformers	IEC 60442-2
Voltage Detecting Systems	IEC 61243-5, IEC 61958
Protection against accidental contact, foreign bodies and water	IEC 60529

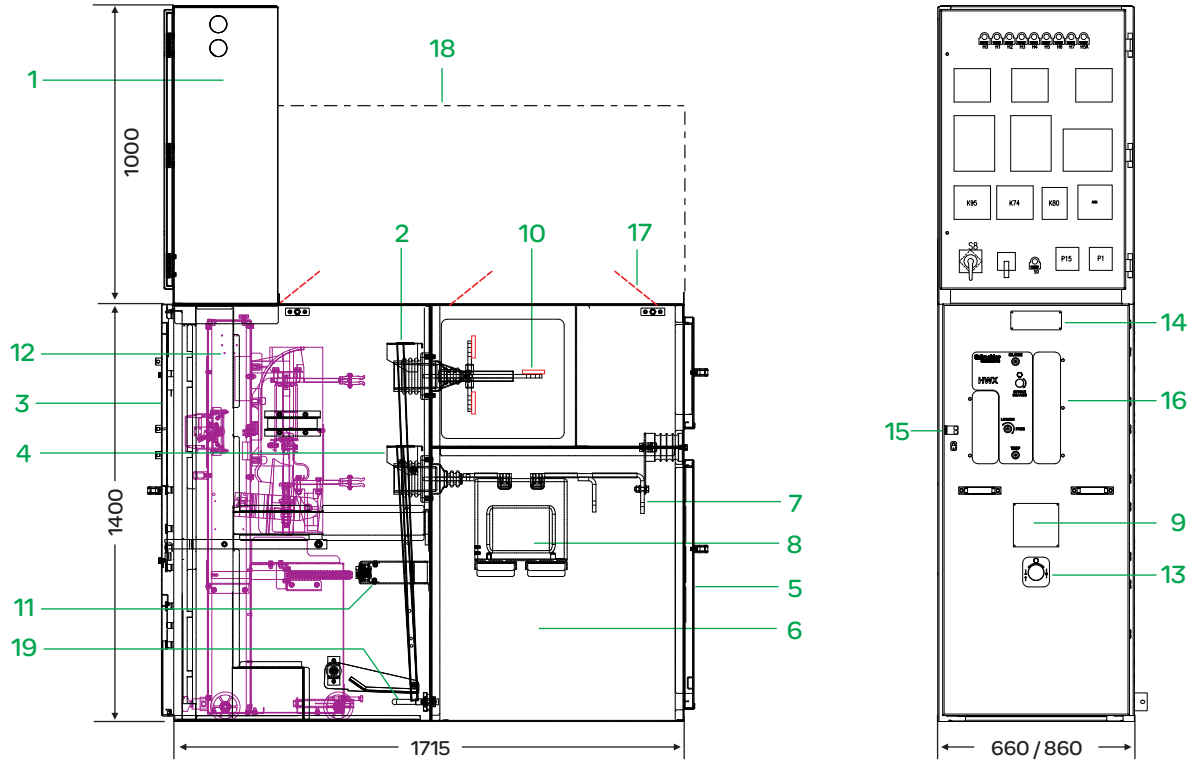
DIMENSIONS AND WEIGHTS

Panel Type	Rated Current (A)	Panel width (mm)	Panel depth (mm)	Weight approx (kg)
Feeder panel with Circuit-Breaker	≤ 1600	660	1715/1865[γ]	750
	2000/2500/3150	860	1715/1865[γ]	950
	4000[α]/5000	860	1715/1865[γ]	1250

[γ] Against enquiry
[α] Upto 4000A, Aluminium busbar available

- Panel Height : 2400 mm including 1000 mm low voltage chamber
- Number of Power Cable runs : 2 x 3C x 400 mm^2 or 6 x 1C x 1000 mm^2 within standard panel
  Extension cable box (350 / 500mm depth) required for additional cable run
- Number of Control Cables : Low voltage chamber can accommodate 400 ways terminal block,
  200 nos. 1.5 mm^2 PVC un-tinned bundled conductor on left & right side each

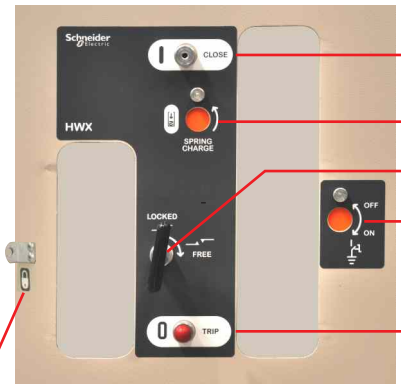
Panel Overview



HWX with roll on floor circuit-breaker truck

1 Low-voltage cabinet with control device
2. Safety shutter suitable for bus bar spouts
3 Front door
4 Safety shutter suitable for circuit spouts
5 Cable compartment cover
6 Cable & CT compartment
7 Cable terminations
8 Cast Resin Current Transformers
9 Rating plate
10 Busbars (Cu/Al)
11 Racking arrangement
12 Circuit breaker truck
13 Rack - in / out access
14 Feeder description
15 Pad locking facility
16 Viewing window
17 Pressure relief flaps
18 Gas duct chamber (IAC requirement-optional)
19 Earthing

Panel Operating Facia



Manual closing access
Spring charging access
Lock / Free operation access
Earthing truck operation access
Manual tripping access
Door pad locking

Circuit Breaker Operating Facia

'ON' Push button
Rating Sticker
Access for Spring Charging
Test/Service position locking with Cubicle
Charge/Free Indication
Condition of Circuit reaker
No. of operations
'OFF' Push button
Positioning padlock

Typical Variants

Panel Options :

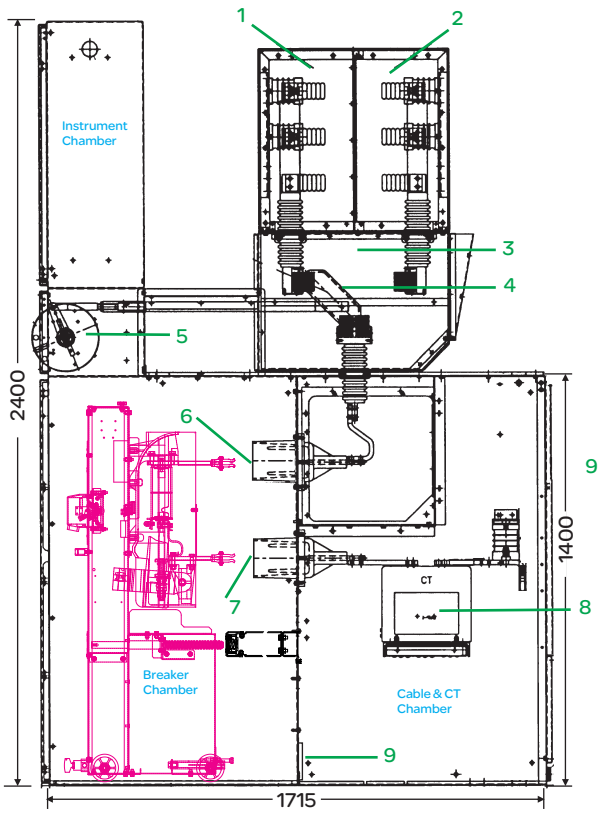
- Circuit Breaker Panel (I/c & O/g)
- Bus Section Panel (Auto & Non-Auto)
- Bus Riser Panel (Optional PT)
- Vacuum Contactor Panel (HWC)
- Cable In, Cable Out Panel (CICO)
- Double Bus Bar Panel (DBB)
- Unit panel with side entry cable box
- Bus Duct Entry (Top & Bottom)
- Panel with rear earthing switch

Trolley Options :

- Vacuum Circuit Breaker (PT & w/o PT)
- Vacuum Contactor Unit (VCU)
- Bus / Line Metering Truck (BPT / LPT)
- Bus / Circuit Earthing Truck (BET / CET)
- Link Truck
- Bus / Circuit Earthing Breaker

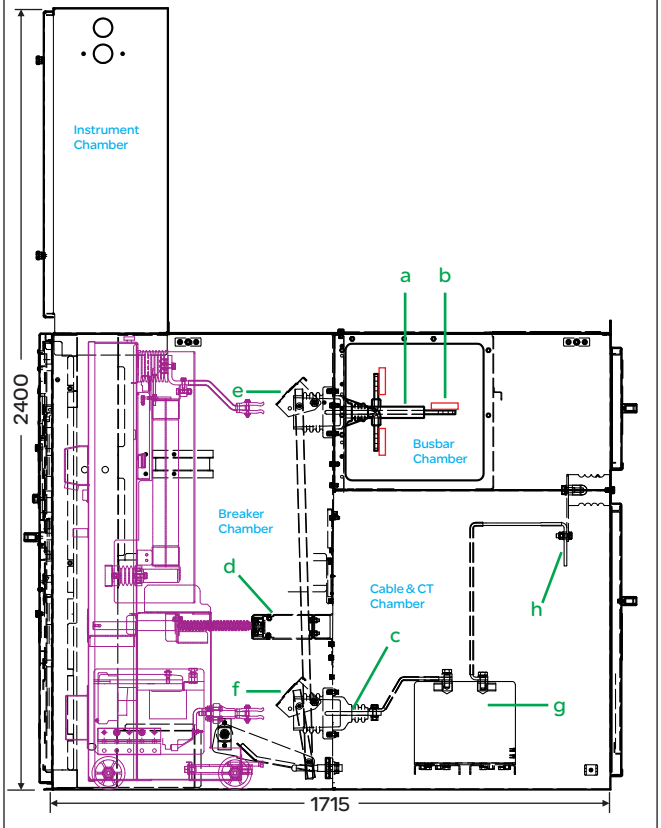
Typical Sectional Views

Double Bus Bar Panel (660 / 860 mm wide)



1. Front Bus Chamber
2. Rear Bus Chamber
3. Isolator Chamber
4. Change-over Switch
5. Operating Disc
6. Busbar Spout
7. Circuit Spout
8. Current Transformer
9. Main Earth bus

Vacuum Contactor Panel (660 mm wide)



a. Busbar Spout
b. Running Busbar
c. Circuit Spout
d. Racking Arrangement
e. Busbar Shutter
f. Circuit Shutter
g. Current Transformer
h. Cable Termination

Salient Configurations

Covering all market segments

Busbar Orientation :

- The Busbar systems is insulated with HT heat shrinkable PVC sleeves for full voltage application.
- All joints are covered by removable soft PVC shrouds
- Busbars and tap off joints are colour coded
- Busbar support is rigid and made of non -hygroscopic , anti-tracking high quality epoxy resin
- Aluminium busbar design available upto 4000A thermal rating

- Through and through busbar chamber facilitates "tunneling effect" for better ventilation
- Louvers / cooling ducts are provided with fine MS wire mesh allowing a gap of < 1mm, suitable for degree of protection IP4X
- Top mounted draw PT ergonomically designed, user friendly, providing better personnel safety by means of insulated operating handle

Panel with top mounted Draw-Out PT

Infra-red IRSS window

Rear cover viewing window :

- The cable box of the panel can be accessed through the removable bolted rear cover with an inspection window made of poly-carbonate and tested for internal arc fault, 40kA
- Cable termination can be clearly visible and inspected from outside the panel without opening any rear cover
- For dual CT arrangement, terminals of CT in close vicinity of rear cover, are easily visible
- Infra-red window (IRSS) on rear cover for thermal imaging as optional feature.

Safety shutter :

- Breaker truck movement operates safety shutters.
- With circuit breaker withdrawn, the safety shutters close so that no live parts are accessible.
- The shutters can be pad locked in the closed position.
- For higher reliability, bus side and cable side shutters have independent operating mechanisms

Cable gland plate :

- Sufficient cable headroom is provided for cable termination
- Distance between cable gland plate and terminal lug is >700mm
- For bottom cable entry, a removable 3 mm MS gland plate provided for 3 core cables
- For single core cables, a non-magnetic gland (usually aluminium) plate has been incorporated

Vacuum Interrupter :

Schneider Electric's present Vacuum Interrupter Technology was pioneered in UK and Germany, a patented expertise since last 50 years. World class, fully automated and computer-controlled manufacturing facility available in Saltlake Works, Kolkata, India with annual capacity of 80,000 Interrupters.

Applications up to 24 kV in air

New Generation " VG " Range :

- Short circuit levels up to 63 kA
- Rated voltages up to 40.5 kV
- Rated current up to 3150 A
- Impulse voltage withstand up to 200kVp in Air and 250 kVp in SF6
- Power levels up to 2800 MVA
- All model certified in a large number of circuit breakers satisfying all major standards such as IEC, ANSI and Chinese requirements
- All type tests performed in acknowledged power test stations

Customer Benefits :

- State of the art device based on latest technologies, successful for more than 50 years
- Environmental-friendly, certified to ISO 14001
- Complete range for all application fields
- Absolutely maintenance - free design
- Complies with all major international and national standards viz. ANSI, IEC, GOST & GB.
- 100 Interruptions at full Short Circuit current (DC Component > 100%)
- Very high mechanical and electrical endurances - 30,000 Close-Open operations at full load current

Protection Relay :

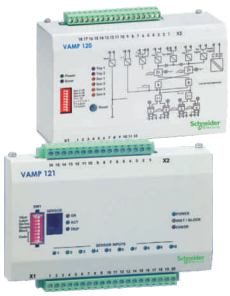
The protection unit is chosen based on

- Requirement of protection functions
- Communication protocol (IEC 103 / IEC 61850 / MODBUS / Others)
- Choice of ports (Redundant ports)
- Number & types of analog inputs & digital inputs / outputs

MiCOM The MiCOM range of relays offers varying levels of functionality and hardware options to best suit the protection requirements, and allows the customer to choose the most cost effective solution for their application.
The 20, 30 and 40 series hardware platforms are the building blocks of the MiCOM protection relay range providing the capability for a wide variety of protection, control, measurement, monitoring and communication.

SEPAM Breaking new ground back in 1982, Merlin Gerin launched Sepam, the first multi-functional, digital protection relay. Today, we have the extended Sepam range : series 10, 20, 40 and 80.
More than 250 000 Sepam relays have been installed in over 130 countries and in every sector of activity:

- energy production and distribution
- infrastructure: airports, tunnels, public transportation, water treatment
- industry: automobile, mines, semiconductors, metallurgy, petrochemicals
- commercial sector: shopping centres, hospitals.



VAMP Schneider Electric Vamp type relay specializes in arc flash protection for power systems.
VAMP relays are already used in nearly 80 countries to protect applications from overhead line feeders and substations to power plants and industrial power systems.

The unique arc fault protection functionality enhances the safety of both people and property and has made Vamp a leading brand in arc protection worldwide.

SAFETY FEATURES :

In addition to normal safety features, Schneider Electric design engineers have added the following to make HWX panel totally safe for operators:

- HV compartments are tested for internal arcs and the pressure release flaps are located in such a way to guide the bi-products away from the operator.
- Single point padlocking interlock on VCB push button (ON/OFF) can ensure total operational interlock.
- If louvers are provided, as is the case with higher current ratings, a safety flap covers the louvers in case of internal arc and protects the operator from arc bi-products.
- The panel offers a dead front execution and a door is provided for further protection. The door is hinged and designed to withstand internal arcing at 40kA for one second.
- The panel is 100% insulated and there is no access to any live part. All joints are insulated.
- In addition to normal interlocks, safety is reinforced at the door which is interlocked so that it cannot be opened with the breaker in closed position. All operations are possible with the door closed, thus guaranteeing independent operator safety.
- A sliding earth connection arrangement for the auxiliary plug and socket ensures continuous earthing when the trolley is withdrawn.
- The Schneider Electric design assures totally safe and operator independent operation for busbar and circuit earthing, one of the most critical areas in switchgear operation.
- The breaker cannot be pushed in the panel beyond the "test" position if the front door is open. The unique feature protects the operator even in the remote event of leakage from the vacuum interrupter.
- Provision of rear inspection window on cable chamber and optional "Infra-red Window" for thermal imaging.

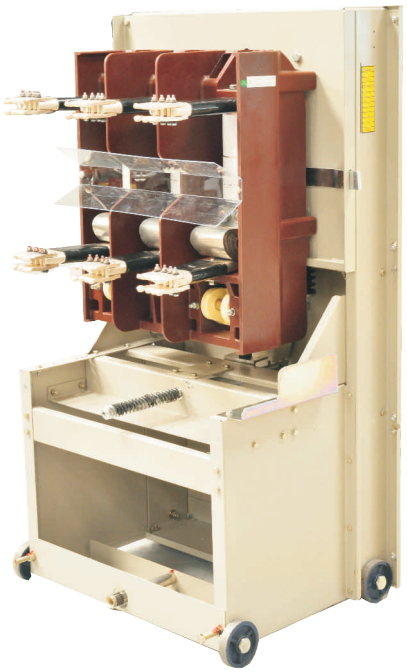
RELIABILITY ENSURED BY :

- Proven design of our Vacuum Circuit Breaker, manufactured in 16 global locations- all to identical specifications, materials, and processes.
- Sturdy, simple, and robust operating mechanism with life expectancy of 30,000 operations.
- Metal-to-metal joints throughout the cubicle are gasketted for zero gaps, as is the joint between the two panels with special T-type gaskets. This makes it additionally safe in case of exposure to steam or water jets (as in case of bursting of industrial pipes). The arrangement is generally suitable for IP-4X protection, unique in the industry and other possible options for degree of protection are available on request.
- Unique busbar support arrangement gives improved support compared with conventional busbar support and reduces chances of flashover.
- Special auxiliary switch and motor limit switch to prevent dust and a double break motor limit switch.
- Louvers, when provided, are fitted with fine wire mesh, complying with IP-4X.
- Bus and cable side safety shutters with independent mechanisms, (Gravity fall type) All low voltage conductors crimped with compression type lugs are terminated on pressure type terminals- no bare joints.
- Electrical and mechanical anti-pumping features.
- Dust proof trip and / or closing coil to prevent sluggish plunger movement.
- Control cable bunch is routed through metallic conduit in HV compartment.
- Tested for use in areas with high altitude and seismic activity.
- Maximum level of personnel safety achieved through Internal Arc protection upto 40kA for one second AFLR category.
- Sheet Steel enclosure available both in Alu Zinc & painted CRCA.
- Standard floor mounted panel design, Base frame mounting is optional.

HWX Family

Covering all market segments

Feeder Panel



VCB Truck

Vacuum Contactor Unit

4000 / 5000A VCB

6.6kV, 400A VCU trolley

Manufacturing facilities in India

HWX switchgear with withdrawable circuit breaker is manufactured at the state of art facilities in Vadodara and Kolkata, India. Both facilities have the capability to cater domestic as well as export markets. The facility also houses sheet metal fabrication and busbar machining processes in addition to switchgear assembly.

The facility is designed to work according to world class manufacturing practices. A departure from the traditional batch production concept to single piece flow concept enhances the productivity.

Factory has complete high voltage testing facilities and a dedicated FAT area for customers to inspect the functionality of complete switch boards.

Both the units have manufacturing capabilities of world class circuit breaker drives catering for domestic and export market with annual capacity of 40,000 drives.

A full-fledged R&D team and a well equipped laboratory constantly endeavours to develop new features in our product range. Panel modifications are done to meet specific customer requirements.

High emphasis is given on the quality of incoming material, and strict control of production processes ensures good quality product delivered to customers. Both facilities at Vadodara & Kolkata are certified by IMS, covering ISO 9001 (QMS), ISO 14001 (EMS) and ISO 18001 (OHSAS).

Dust Proof Air-conditioned manufacturing setup

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