HWX Metal Clad Air Insulated Switchgear

The complete solution for process plants, power stations and other industries upto 12 kV, 3150 A, 44 kA

Technical Literature

AREVA T&D

AREVA

Global Product

MEDIUM VOLTAGE SWITCHGEAR

Customer benefits
> Conforms to IEC/IS 13118
> Total Operator Safety
> High Reliability
> User friendliness
> Easy changeover from front Bus to rear Bus and vice versa
> Minimum wear & tear
> Unique Duplicate Busbar design for bidirectional flow

The HWX Vacuum Circuit Breaker is the result of extensive research by a Steering Design Committee, comprising members from four AREVA T&D countries. This circuit breaker, with identical component design, material specifications and manufacturing process, is manufactured in several AREVA T&D locations world-wide, including India.
The user interface, which is the panel housing for this globally standardized breaker, has been specifically designed for the technical requirements (as defined by leading Indian Consultants) of Indian industry and power plants.

THE GLOBAL VACUUM CIRCUIT BREAKER

Suitability
HWX has been designed for the medium voltage range up to 12 kV with short circuit breaking current up to 44 kA.

One of the key features of this standardized design is the simple yet robust operating mechanism. With minimum linkages and greatly reduced operating energy levels, the HWX offers a minimum of 20,000 mechanical operations - often outliving its switchgear. All steel components are zinc plated with olive green passidium allowing them to withstand more than 100 hours of salt spray testing.

The vacuum interrupters are mounted in a phase segregated epoxy body for rigidity and additional insulation, also eliminating pole discrepancies. The high life operating mechanism coupled with our high quality vacuum interrupters results in 20,000 operations at normal current.

Standards
The vacuum circuit breaker conforms with the latest IEC and IS13118 standards. It is manufactured in line with AREVA T&D's global practices and processes.

CONSTRUCTION

The Basic Cubicle
The basic enclosure is metal clad with 4 distinct compartments:
> Circuit Breaker Compartment
> Relay & Instrument Chamber
> Busbar Compartment
> CT & Cable Chamber

Each of these compartments have been separately earthed.
> All doors and removable covers of the basic cubicle have long life, high quality cross-linked polyurethene gaskets.
> Any metal-to-metal joints inside the panel are design fitted to achieve zero gap. A special T-type gasket is provided between two panels for zero gap and aesthetics.
>The panels are designed to adapt to the standard ventilation of most substation rooms. For higher current ratings, louvers are provided with fine brass wire mesh allowing a gap of less than 1 mm.
> The breaker panel has been successfully tested for 2760 A without an internal cubicle and at 3400 A with 2 x 46 W fans fitted on a breaker truck cooling ducts on the top.
> All High Voltage compartments have been tested for internal use as per IEC standards.

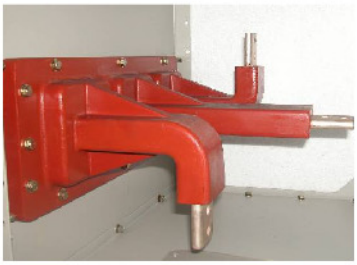
These have been successfully installed at JP Cement, Dalmia Cement, CPCL and IOCL Panipath.

Cooling duct for high current rating

CIRCUIT BREAKER COMPARTMENT

The circuit breaker compartment houses the circuit breaker trolley and potential transformer or control transformer, as required. The trolley is a horizontal isolating draw-out type.

The circuit breaker trolley has three distinct positions - service, test and isolated - with a locking facility in all three position as an additional feature. The service and test positions have limit switches with auxiliary contacts for interlock. For additional safety, the circuit breaker is operated in service and test position with the cubicle door closed. The test position is within the cubicle.



Busbar Spout

A flexible duly interlocked plug and sock contact arrangement is used for auxiliary supply. For additional protection these have dragging earth terminals.

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

The current transfer from circuit breaker compartment to CT/cable compartment and circuit breaker compartment is via seaed off bushings.

All trolleys of same ratings can be interchanged.

Shopfloor view

RELAY AND INSTRUMENT CHAMBER

The relays and instruments are mounted in a separate chamber which is totally segregated from the High Voltage chamber.

The operating instruments are located at a convenient maximum height of 1700 mm.
All relays are mounted on the hinged door. The maximum height has been maintained at 2000 mm. for easier reading. There is a provision to increase the height depending on the number of relays.

The control wire is of 1.1 kV grade and suitable for 2 kV rms for, 1 minute power frequency. In special cases, the auxiliary wiring conductor size can be increased. The color-coded cables are neatly bunched together with ferrules at either end of each wire as standard practice. The cable bunch is passed through PVC ducts.

For added safety and reliability, the cable bunch is routed through flexible metallic ducts when it passes through a high voltage compartment such as the breaker chamber, PT, etc.

The bus wiring is through grommets. A separate terminal stack is provided for inter-panel wiring.

BUSBAR COMPARTMENT CONSTRUCTION

The busbar chamber on top requires special tools for access. The size of the copper busbar changes according to the current rating. All copper-to-copper joints are tin or silver plated. Current carrying parts are made from copper. The busbar is fully insulated for 1 minute.

Power frequency withstands, voltage and heat shrinkable sleeves are used for protection and insulation. The joints are covered by monoplast compound and HT tape to avoid any trapped air causing corona discharge. As an optional feature, removable rigid PVC shrouds can be provided. The busbar and all tap off joints are colour coded.

The busbar support is rigid and made of non-hygroscopic, anti-tracking high quality epoxy.

DUPLICATE BRUSBAR ARRANGEMENT

This redundent busbar is in a separate module comprising a separate busbar chamber and change-over switch. The change-over switch is an off-load type and is duly interlocked with the circuit breaker truck.

The whole module can be fitted on top of the standard cubicle. The control unit is fitted below the instrument chamber along with the motor gear unit and manual change-over mechanisms.

The unique single stroke change-over design is a front operated movement and enables power transfer from front bus to rear bus and vice versa in a very short span of time.

Duplicate Busbar Arrangement

User friendly design

AREVA T&D Double Busbar Panel - Type HWX

Seal-off bushings are used between the isolator chamber and busbar chamber to achieve complete, secure isolation. The two individual busbar chambers are also separated by metallic barriers. Pressure relief flaps are provided on each busbar and isolator chamber to protect from internal arc fault. A contact position viewing window can be provided at the rear of the isolator chamber.

CT AND CABLE CHAMBER

A spacious cable chamber is located at the rear of the panel and can accommodate 6 Nos. single core 1000 sq.mm cables or 2-3 C, 300 sq.mm cables. The depth can be extended to accommodate a higher numbers of cables.

The cable box can be accessed through the removable bolted rear cover with a inspection window made of polycarbonate and tested for internal arc fault. Hence no rear wire guard is required. The cable box and bus duct entries have been designed for access from the top or bottom.

Sufficient headroom is provided for cable termination. The distance between cable gland plate and terminal lug is greater than 600 mm. For bottom cable entry, a removable 3-mm MS gland plate is provided.

For single core cable, a non-magnetic gland plate has been incorporated. These are in two half sections with adjustable built-in cable holding clamps.

EARTHING

HWX provides several options in totally safe and reliable earthing. A separate earthing trolley is provided for bus earthing and circuit earthing. These are tested for 40 kA for 1 seconds.

Rear cover viewing window

The earthing truck is designed so that it is impossible to earth a live circuit thus providing total operator safety.

If any attempt is made to insert the truck on a live circuit, it will generate an audio-visual alarm. It will also activate an interlock, so that even if the alarms are ignored, it will be impossible to insert the truck.

Adjustable cable holding clamp

Other safety interlocks features associated with the truck include:

> The Close earthing truck which cannot be inserted inside a cubicle.

> Earthing trucks which can be operated inside the cubicle only in service or test position.

> If electrical interlocking with an incomer is applicable, then earthing truck cannot be inserted without a secondary plug. Similarly, once the truck is inside the cubicle, the secondary plug cannot be withdrawn.

> Padlocking facilities are in position.

> The busbar earthing truck can be easily converted to circuit earthing or vice versa by reversing the connections, a feature which can be very useful on site.

SWITCHBOARD EARTHING

A copper earth bus of size 50 x 6 mm continuously runs at the bottom rear of the panel.
The earth bus is robust and capable of carrying full short circuit current for 1 second. Doors, covers and all non-current carrying metallic parts are earthed through flexible copper wires.This includes instrument casing and cable armour, which are also connected to the earth bus.
The earth bus has provisions for terminals at each end for connecting to grid earthing.

OPERATION

The circuit breaker is racked in or out by means of a manually operated drawer mechanism, which forms an integral part of the moving portion. Automatic metallic safety shutters are provided to cover the busbar and the circuit spouts, when the circuit breaker is taken out from its normal service position.

Ball bearing as third guide

The operating mechanism is assembled in a frame and then mountede on the truck. Sufficient energy for one closing operation is stored by charging the closing spring by means of the electric motor or manual hand crank. With the spring charged, the breaker can be closed and opened either mechanically or electrically and is suitable for O.C.O operation.
During closing operation, the closing spring is released and the tripping spring is charged to prepare for subsequent opening. The closing spring is recharged after every closing operation for instantaneous open duty.
The circuit breaker compartment is provided with a three point guide for easy withdrawal and insertion -- two of which are through base channel and roller bearing at the top of the truck.

QUALITY AND LIFE EXPECTANCY

The HWX is manufactured in ISO-9001 certified units.

Vacuum interrupters are sealed for life, minimizing the need for manual intervention and thus the possibility of human error.
Careful selection of materials including aluminium-bronze and stainless steel in the operating mechanisms reduces wear and maximizes service life.
The use of specially selected CRCA/coated steels, and corrosion resistant powder coating paint reduces corrosion, offering lower long-term maintenance and ownership costs.

INSTALLATION

The equipment is supplied with the truck inside and the circuit breaker is fully racked in an interlocked panel to avoid transit damage.
After unloading and unpacking, the panel can be erected either with foundation bolts or on foundation channels.

MAINTENANCE

The indoor vacuum circuit breaker type HWX from AREVA T&D needs minimal maintenance. Routine on site maintenance checks verify the smooth mechanism operation, condition of the power isolating contacts, general cleanliness, etc. No special tools are necessary for maintaining the breaker.

APPLICATIONS

The circuit breaker has proven experience world-wide for all types of switching including;
> Capacitor banks
> Cable charging current
> Low inductive current
> Motor Starting
> Rapid Auto-reclose Duty
> Double line to ground fault

RATINGS AND SPECIFICATIONS	
Type	HWX
Rated Voltage	up to 12kV
Rated Continuous Current	up to 3150 A
Rated Frequency	50 Hz
Rated Interrupting Current	up to 44 kA
Rated Making Current	up to 110 kAp
Rate Short Time Current	up to 44 kA for 3 seconds
Operating Duty	O-0.3sec-CO-3min-CO O-0.3sec-CO-15sec-CO-3min-CO
Application Standards	IEC56 and IEC298
Power Frequency Withstand Voltage	28 kV / 35 kV (on request)
Impulse Withstand Voltage	75 kV peak
Degree of Protection	IP55 (without louver upto 1250A & IP4x for higher rating)
Type of Mechanism	Motor charged, stored energy, spring operated
Special Switching Duties	Capacitor Banks Switching Double line to ground fault High DC Component Switching
Quality System Certification	ISO 9001
Seismic Sustainability	tested for seismic duty at 0.5g

Safe & Reliable

EASY TO OPERATE
To make the circuit breaker totally safe and operator independent, a set of interlocks are provided.

> The circuit breaker can be inserted only in open position (likewise the circuit breaker cannot be withdrawn in closed position). Attempt to draw out the closed circuit breaker will not trip the breaker. This is a positive interlock.

> The circuit breaker can operate only in one of the 3 defined positions: service, test or isolated. The breaker will not close in any of the intermediate positions.

> The circuit breaker cannot be inserted into service position until auxiliary contacts have been made. Similarly interlocks prevent auxiliary contacts from being disconnected if the circuit breaker is in the service position.

> All operating instruments are mounted at a convenient height of 1700 mms.

> Relays are mounted on hinged doors at a recording height of 2000 mms.

SAFETY MEASURES

In addition to normal safety features, AREVA T&D design engineers have added the following to make the HWX panel totally safe for the operator:

> All HV compartments are tested for internal arcs. In addition, the pressure release flaps are located to guide the bi-products in such a way that the operator is not exposed.

> 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.

> 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 re-inforced 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 dragging earth connection arrangement for the auxilliary plug and socket ensures continuous earthing when the trolley is withdrawn.

> The AREVA T&D 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. This unique feature protects the operator even in the remote event of leakage from the vacuum interrupter.

RELIABILY 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 a 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). This arrangement is suitable for IP54 protection, unique in the industry.

> 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 brass wire mesh

> 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

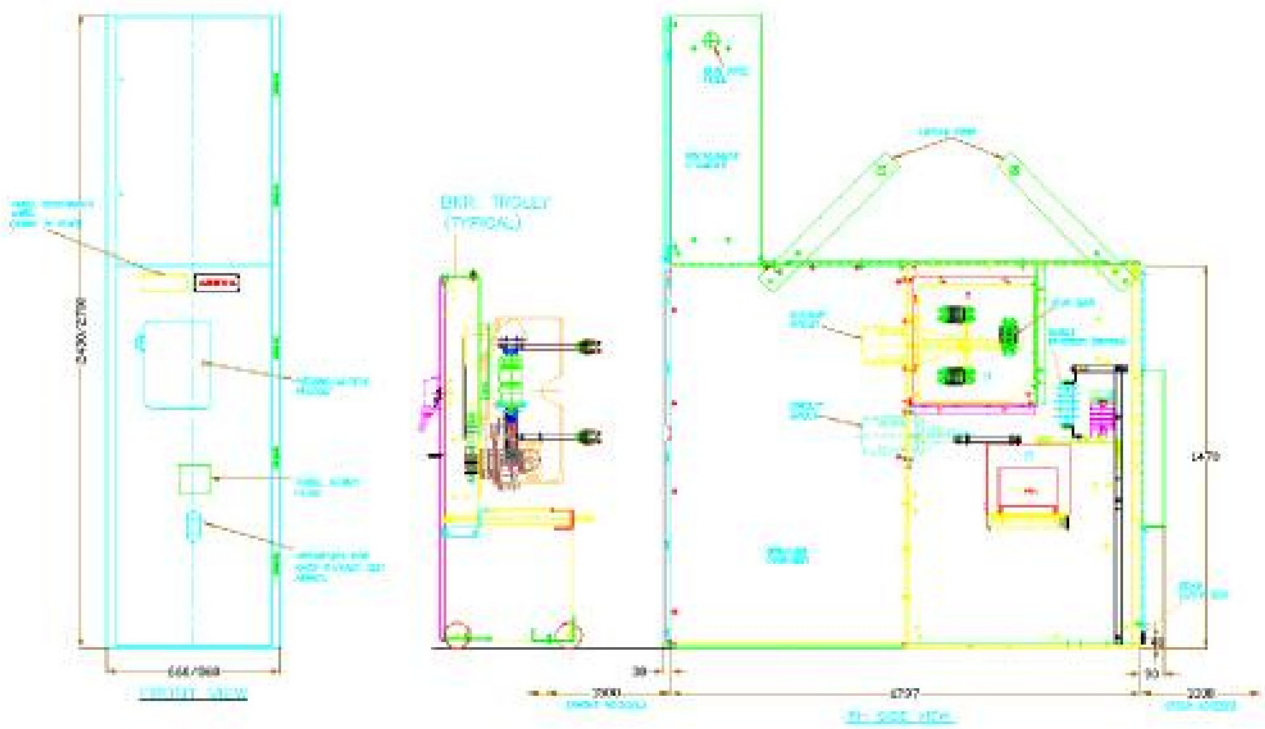
> Electrical and mechanical anti-pumping features

> Dust proof trip and/or closing coil to prevent sluggish plunger movement

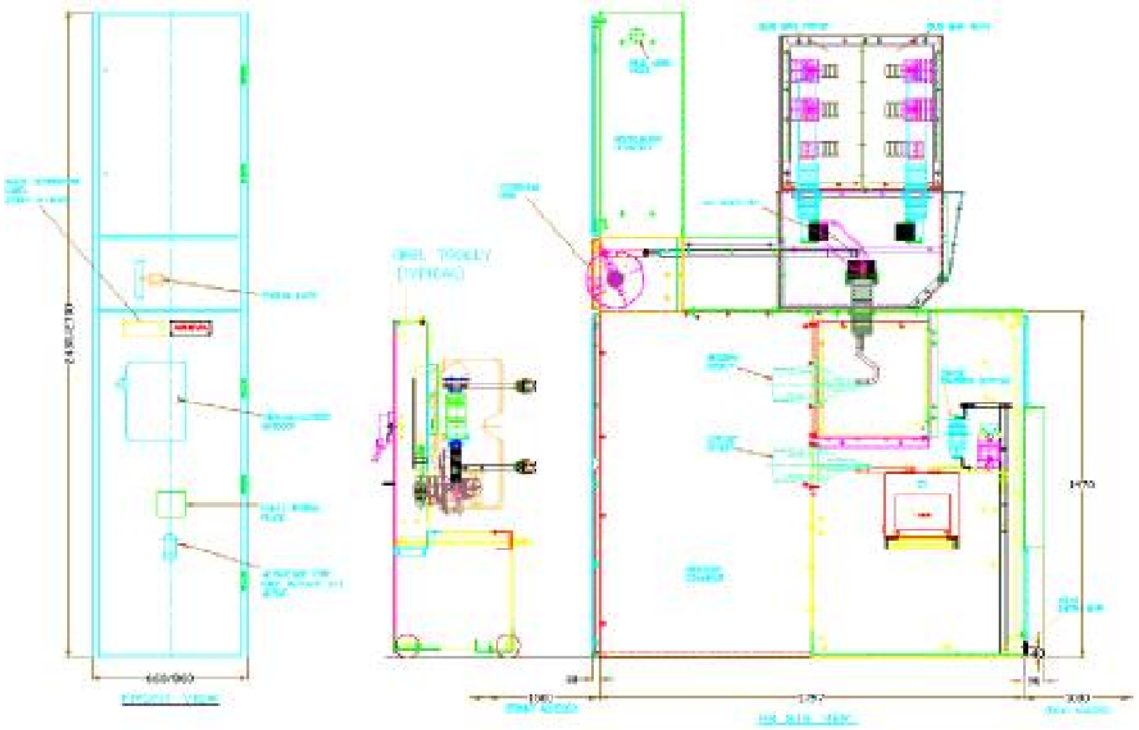
> Control cable bunch is routed through flexible metallic conduit when it passes through HV compartment

>Tested for use areas with high seismic activity.

FRONT & SECTIONAL SIDE VIEW OF HWX PANEL
upto 12kV, 2000A, 40kA



FRONT & SECTIONAL SIDE VIEW OF DOUBLE BUSBAR HWX PANEL
up to 12 kV, 2000A, 40 kA



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