

 **MEGAWIN**

Continue to Innovate

Optimum Solution for Distribution Networks

PARAS DR/DC ▶

15kV, upto 2500A, 31.5kA, Arc Proof,
Air- insulated, Metal Clad,
Withdrawable type Switchgear

- Fully Type Tested
- E2, C2, M2 Rated
- Internal Arc A FLR 31.5kA/1 sec



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PAPRAS



INTRODUCTION

MEGAWIN began its operations in the year 1988 with the manufacture of medium voltage switchgear. Product range covered Switchgear for system voltages from 3.6kV to 36kV. Today, MEGAWIN is one of India's largest private sector companies having FIVE manufacturing units, all situated in the industrial city of Salem, Tamil Nadu.

With over three decades of experience, MEGAWIN gained extensive expertise in designing, manufacturing and marketing of high technology products through a dedicated work force of over 500 people employed at various levels.

PARAS RANGE OF SWITCHGEAR

PARAS panels are Air Insulated, Metal clad, withdrawable type Vacuum Circuit Breaker panels. They are feature filled, safe, environment friendly and easy to operate. PARAS panels can be used for any kind of application ranging from Power Plants, Primary and secondary substations to wide range of industrial applications.

The PARAS range of panels are born out of collaboration between the Research and Devel-

opment team in Megawin and the Engineers in PBSI. With an idea of designing a panel that would be suitable for all Medium voltage switchgear applications across the world, the development and design team have put together a world class product that is state-of-the-art in terms of functionality, dimension, safety features, usability and simplicity.



Maximum
Functionality

Small
Dimension

Very Safe

Easy
Usability

Simplicity

The PARAS panels consists of a withdrawable Air Insulated Vacuum circuit breaker, Instrument transformers, Protection relays with a full set of accessories, interlocks and with MS sheet enclosure. All the compartments are segregated by metallic partitions and the live parts are Air Insulated. The panel is modular in construction, which allows additional panels to be lined up beside each other to form a switchboard, interconnected by busbars.

Standards

The switchboard and main apparatus it contains comply with the following Standards:

- IEC 62271-1 for general purposes.
- IEC 62271-200 for the switchgear.
- IEC 62271-102 for the earthing switch.
- IEC 60071-2 for the insulation coordination.
- IEC 62271-100 for the circuit-breakers.
- IEC 60529 for degree of protection.

Electrical Characteristics

Rated Voltage	15	kV
Rated power frequency withstand voltage	38	kV / 1 min
Rated lightning impulse withstand voltage	95	kV
Rated frequency	50 / 60	Hz.
Rated short time withstand current	31.5	kA / 3 sec
Peak Current	81	kA
Internal Arc	31.5	kA / 1 sec
Main Bus bar Current	1250/2500/3150	A
Degree of Protection	IP4X	

APPLICATION

PARAS switchgear can be used in transformer and switching substations, in all kinds of applications - primary & secondary distribution level

Power Generation
Companies

Power
Transmission

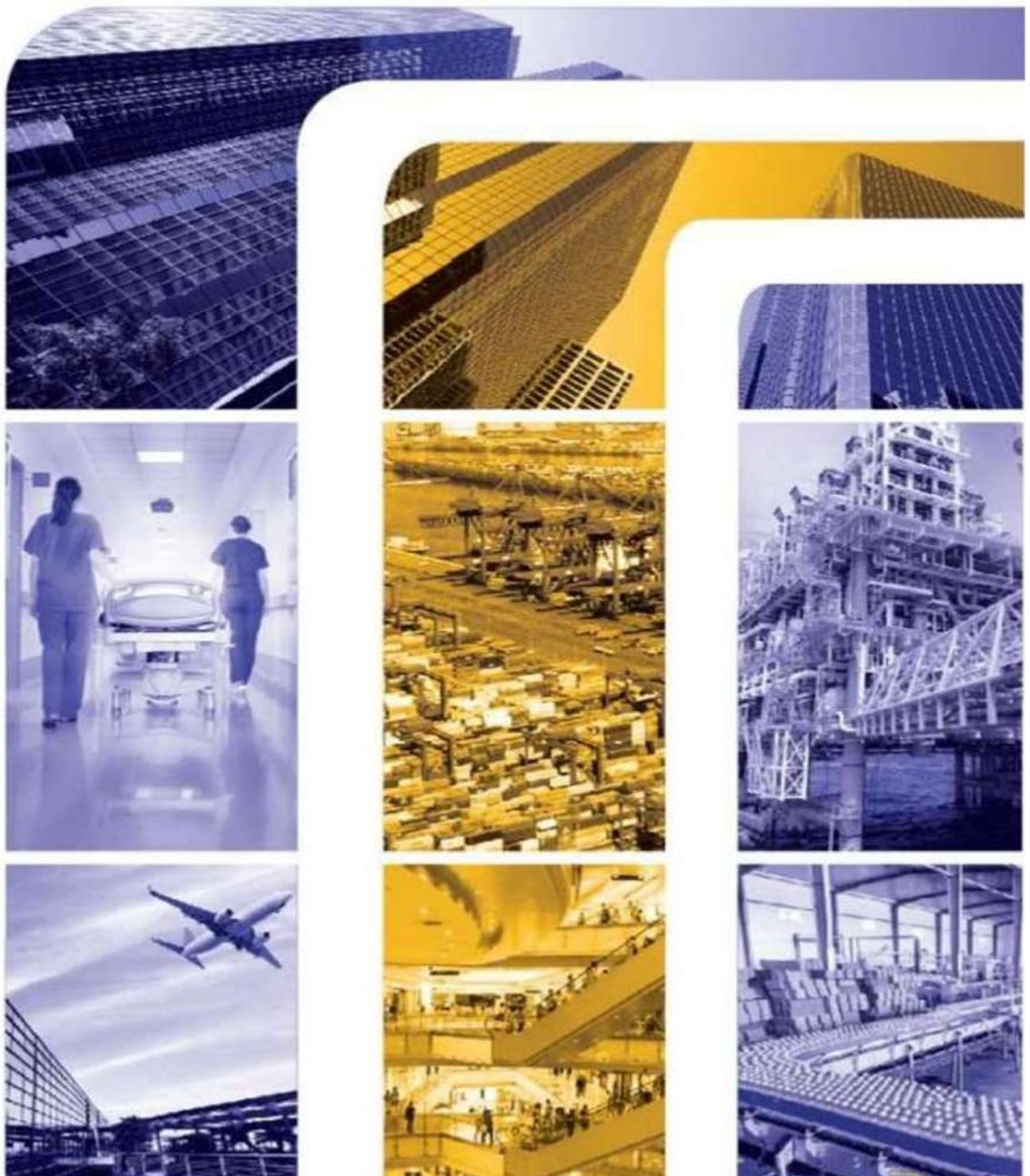
Power
Distribution

PARAS Switchgear can be used for all kinds of applications



PARAS Switchgear can be used in all Consumer segments

- Infrastructure
- Malls, Hospitals, Tall Towers and Other Large Buildings
- Process Industries
- Airports and Sea Ports
- Oil And Gas & Many More





IEC Classification



IEC CLASSIFICATION

As per the IEC 62271-200 standard, new definitions and classifications of Medium Voltage switchgear have been introduced.

According to the IEC 62271-200, PARAS range of switchgear can be defined as follows.

1 Metal Clad Switchgear - All Live Parts Are Compartmentalized

Each PARAS panel unit consists of four compartments. The three compartments breaker compartment, busbar compartment and cable compartment have high voltage parts. Each panel is also fitted with a low voltage compartment, where all the auxiliary equipment is housed.

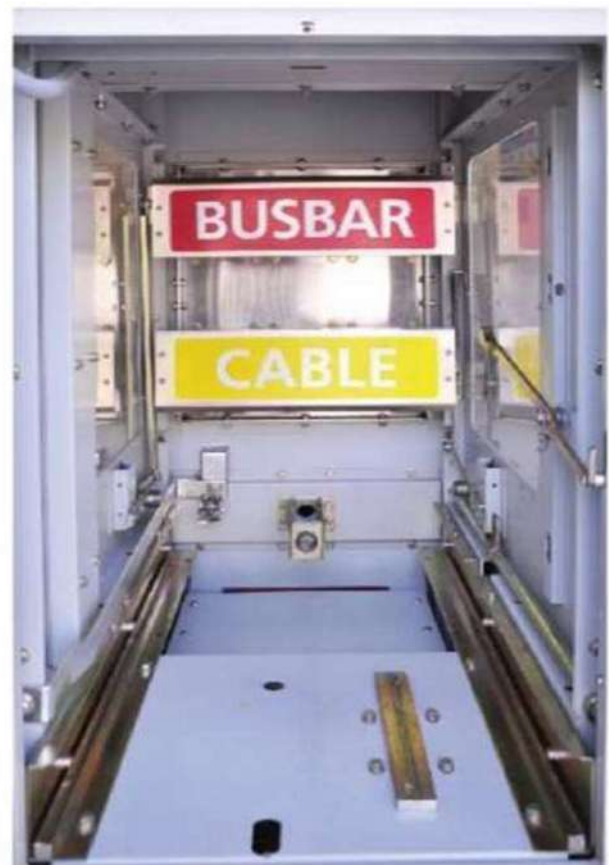
The Panels are Internal Arc protected by default and is provided with a duct for evacuation of the gases produced by an arc. The compartments are segregated from each other by metallic partitions.

2 Loss of Service Continuity - LSC-2B

Loss of Service Continuity category, medium voltage parts are separated, i.e., the busbars, circuit-breaker and cable compartments are physically and electrically segregated. It provides a guarantee that there is a high level of protection for the operators; when a compartment containing a main circuit is open, the other compartments and/or functional units may remain energized.

3 Partition Class - PM

PARAS switchgear provides continuous metallic partitions and shutters. Metallic partitions and shutters or metallic parts of them shall be connected to the earthing point of the switchgear.



4 Interlock-controlled Accessible Compartment

All compartments containing High Voltage parts are fully protected. At times of high voltage presence, compartments are interlock controlled and cannot be opened for normal operation and/or maintenance.

As per the design, all normal operations are performed with the panel doors closed. The compartment containing high-voltage parts may be opened by authorized personnel, special procedures are required; interlocks need to be defeated and special tools are necessary.

5 Internal Arc – IAC A FLR 31.5KA 1sec.

The PARAS panel is certified for Internal Arc classification – IAC A FLR upto 31.5KA for the duration of 1 second. This provides maximum possible protection for the operator.



INTERLOCKS AND SAFETY

PARAS range of panels guarantee the highest level of safety and reliability through several interlocks, padlocks and accessories

All operations are done behind closed doors

Operating levers require little force to operate

The CB truck cannot be racked-in unless

- The CB LV plug is connected with the withdrawable CB truck
- The CB is in open condition
- The Earthing Switch is in open condition

The CB cannot be closed unless

- The withdrawable CB is completely in "service" or "test" position
- The operating mechanism spring is charged.

The access orifice of earthing switch cannot be operated unless

- The withdrawable CB is in "test"/"Disconnected" position

The access to cable compartment is not possible unless

- The earthing switch is closed.

The CB cannot be put into "service" position unless

- The front door of the panel is closed.

Padlocking facility on face plate of every switch operation

1. VCB front door
2. Manual Spring charge
3. Manual Close
4. Manual Trip
5. Manual Rack IN/OUT
6. Manual Earth switch operation



INTERNAL ARC PROTECTION

In a modern medium voltage switchgear, personnel safety must necessarily take priority. This is why the PARAS switchgear is designed and tested to withstand an internal arc due to a short-circuit current of the same current level as the maximum short-time withstand level.

The tests have been conducted to prove that the metal housing of PARAS switchgear is able to protect personnel near the switchgear in the case of an internal arc fault. An internal arc is a highly unlikely fault, although it can theoretically be caused by various factors, such as:

- Dielectric faults of solid insulation materials (e.g. cable terminations, voltage and current transformers)
- Over-voltages generated by the operation of a component.
- Inadequate training of the personnel installing or operating the equipment
- Breakage or tampering of the safety interlocks.
- Inadequate preparation of cable terminals.
- Entry of small animals and/or vermin into the switchgear (i.e. through un-blocked, unused openings).
- Material left behind inside the switchgear during maintenance operations.



The PARAS switchgear is designed to notably reduce the incidence of these causes for faults, but some of them cannot be eliminated completely. The internal arc produces the following phenomena

1. Large release of energy causes an increase in the internal pressure.
2. This leads to increase in temperature.

3. The arc flashover causes bright light
4. The explosion creates a very loud noise
5. Internal material of the switchgear is melted, vaporized and destroyed in the process

Unless suitably protected, these phenomena would have very serious consequences for the personnel. Apart from the shock and the bruise, injuries can even lead to fatality.



Internal Arc Test

The internal arc test verifies that the compartment doors remain closed and that no components are ejected from the switchgear, even when subjected to very high pressures, and that no flames or gases penetrate, thereby ensuring safety of the personnel present near the switchgear.

The test also ensures that no holes are produced in external accessible parts of the housing, and finally, that all the connections to the earthing circuit remain intact, hence guaranteeing the safety of personnel, who may access the switchgear after the fault.

The PARAS switchgear fully conforms to all the five criteria indicated by the IEC standards – IEC 62271-200.

The IAC classification is proved by the test according to the following designations:

1. General: Classification IAC (initials for Internal Arc Classified) Accessibility: A, B or C (switchgear accessible to authorized personnel only (A), to all (B), not accessible due to installation (C))
2. F, L, R – Access from the Front (F- Front), from the sides (L – Lateral) and from the rear (R-Rear)
3. Test values: Test current in kilo amperes (kA), & duration in seconds (s).

PARAS Switchgear is Classified
IAC A FLR 31.5kA, 1 sec.



Major Components



CIRCUIT BREAKER – PARAS VCB 15S/15M

PARAS VCB is one of the most versatile vacuum circuit breakers. Available in both cassette form and roll-on-floor form, the Paras VCB boasts of exceptional mechanical and electrical characteristics. The Circuit breakers are very easy to operate and require little or no maintenance.

1 Vacuum interrupters

The PARAS VCB uses vacuum as the interrupting medium. Thanks to the unequalled properties of vacuum and the breaking technique used, the current interruption takes place without arc chopping and without over-voltages. Restoration of the dielectric properties following interruption is extremely rapid.

Capable of breaking fault current upto 31.5kA, the powerful interrupters use the most advanced interruption techniques. The application of Axial magnetic field to a high-current vacuum arc permits the arc to be maintained in a diffuse mode, and hence is suitable for breaking high current. The contact profile evenly distributes the arc to the entire surface of the contacts. This increases the life of the interrupter. The contacts are made of Copper Chromium and are vacuum brazed to the copper terminals. A metallic bellow allows movement of the moving contact-terminal group, at the same time guaranteeing that the vacuum is maintained in the interrupter.

Interrupters used in PARAS are zero current interrupters and are free of any re-striking phenomena. Also, these interrupters are sealed by single shot brazing. So, once the components are brazed, the interrupters are sealed for life and the



Capable of breaking fault current upto 31.5kA, the powerful interrupters use the most advanced interruption techniques.

2 Operating Mechanism

The PARAS VCBs come with two types of mechanisms.

A. Spring Mechanism

PARAS VCBs can be fitted with the simple, ever-dependable mechanical operating mechanism which uses the stored energy of springs for its operation.

The closing spring is charged either electrically or manually. It latches at the end of the charging process and serves as an energy store. When fully charged, the closing spring has sufficient energy for a Open-Close-Open operation. The force is transmitted from the operating mechanism to the pole assemblies via operating rods.

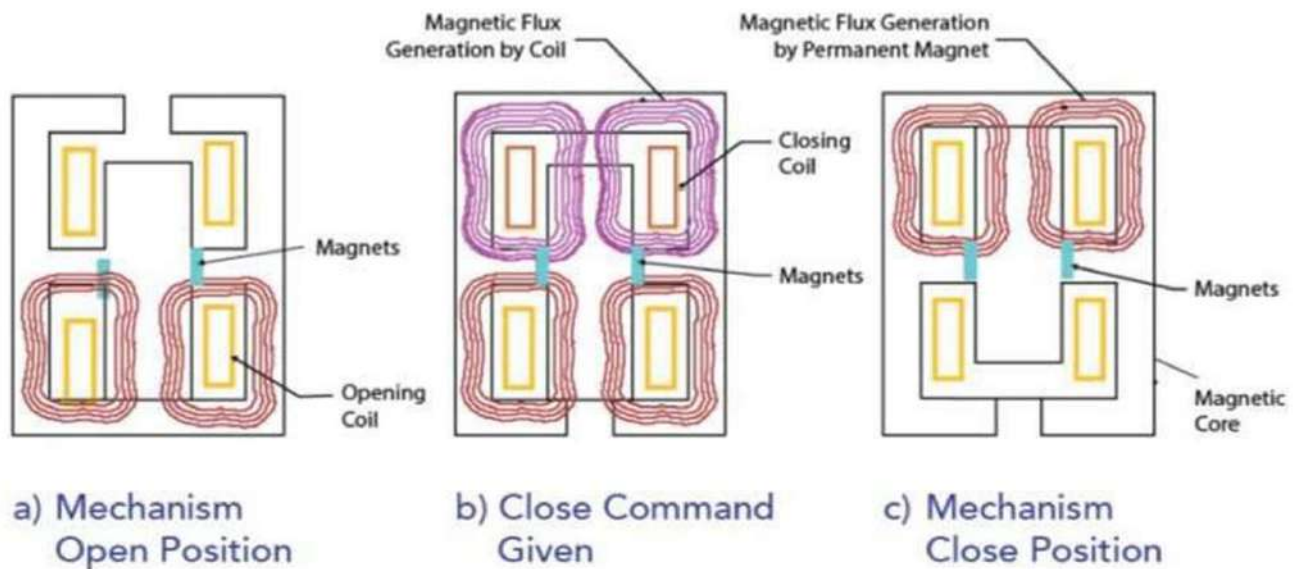
To close the breaker, the closing spring can be unlatched either mechanically by means of the local "ON" pushbutton or electrically by remote control. The closing spring charges the opening springs as the breaker closes. When the closing spring is fully discharged, it can be charged again automatically by the motor or manually.

The charging state of the closing spring can be checked electrically by means of a position switch.



B. Magnetic Actuator Mechanism

PARAS VCBs also come with the modern, state of the art, highly reliable magnetic actuators which uses forces from magnets for operating the circuit breaker. Permanent magnets are used for latching and electro magnets are used for operating the mechanism.



The actuator is a bi-stable magnet system, in which switchover of the armature to the relevant limit position is effected by the magnetic field of two electrically excited coils. The armature is held magnetically in the limit positions by the fields. Switching operations are released by excitation of one of the two coils until the retaining force of the permanent magnets is exceeded.

As Shown in Fig 1 (a), the plunger is latched in bottom position by the magnetic field of the permanent magnets.

Fig 1 (b) illustrates the closing operation: the upper coil is electrically charged and the magnetic energy of the upper coil starts to attract the plunger. When a certain level of current in the coil is exceeded, magnetic attraction of the upper coil makes the plunger move. When the final position is securely reached, as in fig 1(c), the remaining current in the coil improves the latching process. The combination of permanent magnetic flux and electromagnetic flux leads to a very

high force that damps out mechanical oscillations very effectively. Some milliseconds later, the coil current is switched off. The closed position of the vacuum-interrupter contacts and the charged contact springs are latched with the static hold-force that is generated only by the permanent magnets. Current in the coils is not required as long as the circuit-breaker shall stay in this position.

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Emergency manual opening operations are also possible using a special crank

A key component of the mechanism is the Electronic control unit. This device provides and monitors the energy required to switching the circuit breaker. Electrolytic capacitors provide the necessary surge power for energizing the opening and closing coils in the actuator. It stores the electrical energy for a complete Open-Close-Open operating cycle. After such an operating cycle, the capacitor recharges within less than 10 s.



COMPARISON	MAGNETIC MECHANISM	SPRING MECHANISM
Mechanical Life	>100,000	10,000
Moving parts	8	60
Power consumption	25W	200-350W
Operating voltage range	50-120%	70-110%
Maintenance	Negligible	Required
Switching Frequency	120 C-O	30 C-O
Opening/Closing time	20-30ms	40-50ms
Weight of mechanism	45Kg	100Kg

3 Poles

The PARAS VCB uses vacuum interrupters that are located within a simple U-shaped housing made of insulating material. Housing the interrupter in the pole makes the circuit breaker particularly sturdy and protects the interrupter itself against shocks, and deposits of dust.



4 Truck

The PARAS VCB comes in two forms of trucks. One is the Roll-on-floor Truck and the other is the cassette Truck. The Roll-on-Floor truck is identical to the cassette truck except that the base is fitted as part of the truck. The Cassette truck is withdrawn from the panel on an external trolley, whereas the Roll-on-Floor truck can be withdrawn from the panel on its own. The truck is fitted with a wheel and screw system which makes the operations for racking the apparatus into and out of the switchgear unit possible with the door closed.

5 Operator interface

The front part of the circuit-breaker provides the user interface. It features the following equipment:

- ON Push Button
- OFF Push button
- Operations Counter
- Mechanical Indication of Circuit breaker ON/OFF status
- Mechanical Indicator of the status of mechanical springs
- Aperture for manual charging of operation mechanism springs

PARAS VCB complies with the IEC 62271-100 standard for circuit-breaker.

The Roll-on-Floor truck is identical to the cassette truck except that the base is fitted as part of the truck.



EARTHING SWITCH

The standard Earthing Switch provided on the PARAS panel is meant for earthing the cable side or circuit side of the breaker. Busbar earthing is achieved through the earth switch on the bus coupler panel.

The earth switch has fault make capacity and can withstand the short circuit current. Earthing switch is fully interlocked with the breaker and is manually operated from the front of the switchboard. The earth switch operations can be performed from the front of the panel with the front door closed. Earth switch operations can be secured by means of padlocks.

Earth switch can only be switched ON if the withdrawable VCB truck is in test/disconnected position or outside the cubicle

Access to the cable compartment is interlocked with the earth switch. The cable compartment can be opened only if the earth switch is in ON condition.

Earthing switch is fully interlocked with the breaker and is manually operated from the front of the switchboard.



OTHER KEY COMPONENTS

1 Main Busbars

The busbar compartment contains the main busbar system connected to the upper isolating contacts of the circuit-breaker by means of epoxy-insulated spouts. The main busbars are made of Copper. The busbars are covered with insulating material and busbar joins are insulated using transparent clip-on type insulation shroud.

2 Earthing Busbar

The earthing busbar is made of copper and it runs longitudinally throughout the switchgear, thereby guaranteeing maximum personnel and installation safety.

3 Feeder Connections

The cable compartment contains the epoxy-insulated cable spout for connection of power cables to the lower contacts of the circuit-breaker. The feeder connections are made of copper and they are round edge busbars.



It is a single busbar compartment along the whole length of the switchgear.



4 Insulating Spouts & Shutters

The circuit breaker compartment is connected through bus spouts to the busbar compartment and through cable spouts to the cable compartment. The insulating spouts are of single-pole type and are made of epoxy resin. The metallic shutters are activated automatically during movement of the circuit-breaker from the racked-out position to the operation position and vice versa. The shutters can also be locked in open position manually and can be padlocked independently after the circuit breaker is fully withdrawn.

5 Cables

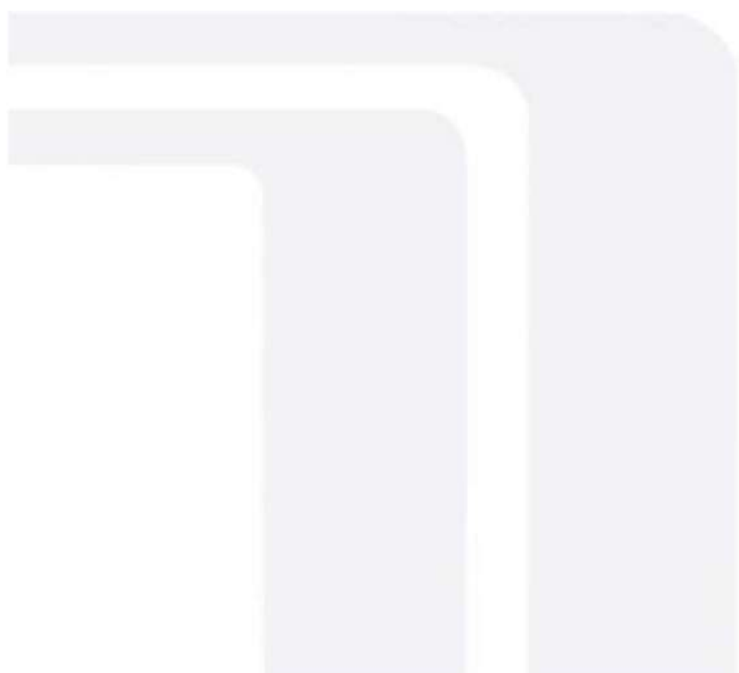
One or more runs of single core or three core cables can be used depending on the rated current, the unit dimensions and the cable cross section.

6 Gas Exhaust Duct

The gas exhaust duct runs along the whole length of the switchboard. Each High voltage compartment is fitted with a flap, that opens outwards, on its top surface. The hot gases generated by the internal arc causes the flap to open, allowing the gas to pass into the duct. Evacuation from the room of the hot gases and incandescent particles produced by the internal arc must normally be carried.



Protection & Metering



INSTRUMENT TRANSFORMERS

Ring Type Current Transformers

The toroidal transformers are of the epoxy resin insulated type and are used for measurement and protection. They can be used both for measuring phase currents or for detecting the earth fault current.

They conform to the new IEC 61869-2 Standards



Voltage transformers

The voltage transformers are of the epoxy resin insulated type and are used for measurement and protection. They are available for fixed assembly or for installation on withdrawable trucks. The Voltage transformers can also be mounted on the breaker trolley. They are fitted with HRC medium voltage protection fuses.

They conform with the IEC 61869-3 Standards.

On Cassette type designs, the withdrawable trucks allow replacement of the fuses with the switchgear in service. Racking out the VT truck automatically causes closure of a metallic segregation shutter between the live parts of the switchgear and the VT Compartment.

Withdrawable type voltage transformers can be installed in the breaker compartments of incoming/outgoing feeders for power cable side voltage measuring.

Protection Relays and metering

PARAS panels can be fitted with Megawin make M140 series protection relays or a wide range of Megawin make auxiliary relays. Any other make of Electronic Relays, meters and other auxiliary devices can also be provided.



Electronic Transformers

Current and Voltage sensors

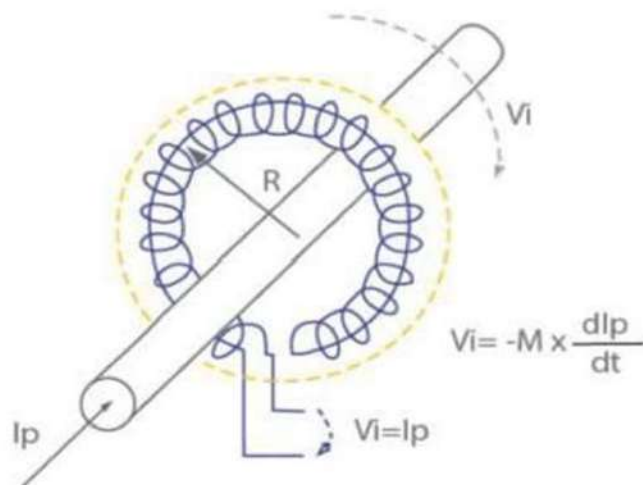
The electronic Current and Voltage sensors are designed to replace the Current and Voltage transformers.

CURRENT SENSORS

Current sensor replaces conventional Current Transformers in Medium voltage system using Rogowski coil for sensing current. Passing the primary current through inductive coil with air core, a voltage proportional to di/dt is induced in air wound coil around the current carrying conductor. Sensors have no magnetic core and hence do not saturate and provide very high accuracy in both protection and metering applications. Terminal blocks are not used since Rogowski Coils can be open-circuited without any risk of developing voltages dangerous for personnel and equipment. In addition, a cable is part of the Rogowski Coil and the whole setup is accuracy-tested. Therefore, there is no need for additional cabling and calculation of lead burden impedance/influence and also facilitating fast installation on-site without any tools.

VOLTAGE SENSORS

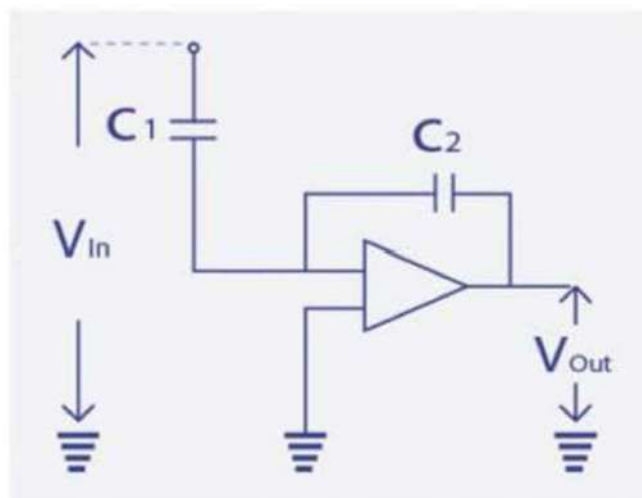
Voltage sensors are Capacitive Voltage Dividers that can replace a voltage transformer in a medium voltage network. It consists of two capacitors which divide the input signal. Current proportional to dv/dt is derived through capacitor connected across voltage line to ground. By integrating these signals, voltage proportional to system voltage can be obtained inside electronics. Since the voltage sensor has no iron core, there is no danger of damage due to Ferro-resonance phenomena



Sensors have no magnetic core and hence do not saturate and provide very high accuracy in both protection and metering applications.



Since the voltage sensor has no iron core, there is no danger of damage due to Ferro-resonance phenomena



Sensors are simple devices that provide a range of benefits and possess unique characteristics that can be leveraged to make the electrical network more reliable.

- **High Accuracy.** As NO secondary/magnetizing current division (CT) or primary winding resistance (PT).
- **Linearity** for wide range **and hence standardization possible.**
- **Accuracy** with linearity make **same sensor** suitable for **Protection and Metering.**
- **NO Remanence** and associated repeatability/linearity errors.
- **NO Saturation** and associated heavy magnetizing current.
- **NO Heat** and Associated problems.
- **NO Cooling Oil** and Associated maintenance.
- **No Ferro resonance** and associated problem for voltage sensing.
- Tremendous advantages are achieved by using Sensors in the place of conventional CT/PT, as NO IRON IS USED.
- VERY SAFE as
 - **NO Dangerous** voltage due to open circuit of CT.
 - **NO Fuse failures** due to short circuit of PT and loss of energy meter readings at that time.
 - **NO Fuse Failure** relays .

PROTECTION AND METERING SOLUTION USING CURRENT AND VOLTAGE SENSOR

Megawin MF 790c Feeder Manager

The MF790c Feeder manager is a packed solution that is designed to work with current and voltage sensors. It is packed with features and functionality. The feeder manager can accept inputs from three current and six voltage sensors



PROTECTION

Three Stages of Protections

- Low set (IDMTL/DTL)- Used for grading. (IEC Characteristics)
- Wide set with DTL-Can be used as Low set to minimize the trip time for over load conditions or can be used as second High set with time delay.
- High set- instantaneous protection for clearing nearer fault with heavy current. Transient free highset with operating time <15 ms @5x setting.

Individual three stage protections for phase fault and earth fault

Reset time delay to take care of flashing fault

Sensitive Earth Fault Protection

- Tuned to fundamental frequency
- most useful for high resistance earth fault.

Blocking of any protection elements with A/R or external digital input.

Circuit Breaker Monitoring

- Trip circuit supervision
- Protection trip count alarm
- $\sum I^2$ – summation of the squared

Fault current at the time of tripping - alarm

Voltage Protections

- Single/Three phase over voltage protection.
- Single /Three phase under voltage protection

- Residual voltage protection (ndr).
- Two stages of protections for O/V, U/V and Residual V.
- With inverse (IEC characteristics) and definite time delay characteristics.

Circuit Breaker Fail Protection (CBF)

- Dedicated current setting
- Detection time setting

Other Protections

- Master trip function with configurable hand reset trip contact
- DC healthy protection.
- Repeat relay for external/non trip functions through digital inputs with hand reset option output contact (ex: Transformer Buchholz, oil temp, wdg temp)
- Self monitoring

METERING

Measurements

- System Frequency
- Three - Phase to Neutral voltages
- Three - Phase to Phase voltages
- Three- Phase to Neutral voltages of other end of the breaker
- Three - Phase Currents.
- Residual Current.
- All three (+/-/0) Sequence Currents.
- All three (+/-/0) Sequence voltages
- Individual phase Real power
- Individual phase Reactive power
- Individual phase Apparent power.
- Individual phase Power factor
- All three phases Average Power factor
- MVA Demand (three phase)
- MW Demand (three phase)

Measurements – Four Quadrant

- Individual phases Imported leading PF reactive energy
- Individual phases Imported lagging PF reactive energy
- Individual phases Exported PF leading reactive energy
- Individual phases Exported lagging PF reactive energy
- Total active energy Imported
- Total active energy Exported
- Total apparent energy Imported
- Total apparent energy Exported
- Total reactive energy Imported - lag
- Total reactive energy Exported - lag
- Total reactive energy Imported - lead
- Total reactive energy Exported - lead

Additional Measurements

- Protection Trip Count
- $\sum i^2$ —summation of the squared fault current at the time of fault tripping
- Last bus side supply interruption duration
- Last line side supply interruption duration.
- Cumulative Supply interruption time for bus and line side separately

Data Records

- 100 fault records with time and date stampings
- 500 event records with 5ms resolution with-time and date stampings and 200 simultaneous events possible in each event records.

ANNUNCIATION

- Visual indications will start flashing on sensing its input function (If set as HAND RESET in case of configurable input)
- The same function can be configured to initiate audible alarm externally through digital output.
- On accepting the fault, the audible alarm will reset and the LEDs will glow steady. On Reset, the LEDs will get off.
- Non Trip alarm and Trip alarm can be separated

CONTROL

- The breaker can be controlled with local push buttons (TRIP, CLOSE) or from remote through digital inputs or through communication
- For Remote/Local same switch alternative-presses will change the functions.
- There is dedicated "control password" available to change from LOCAL to REMOTE or vice versa
- TRIP LOCK facility is to lock the breaker in tripped condition for feeder maintenance.
- Two configurable push switches
- Password lock for setting and control (two passwords)
- Inbuilt closing logic.

COMMUNICATION

- Front Universal Serial Bus (USB) PORT can be used to connect to a laptop/Personal Computer
- Rear end RS 485 PORT is provided
- Protocol: IEC 60870-5-103 or
- IEC 60870-5-104 OVER ETHERNET CONNECTOR optional.
- The Feeder Manager can be connected to external RTU/MODEM/Converter to communicate to far end or computer. All data from the relay such as fault records, event records, and metering functions can be communicated to far end through external Modem/GPRS GATEWAY.
- The Feeder Manager will also accept commands to Trip/Close/Reset and also change settings group from remote end.

VISUAL INDICATION

Mimic

- Breaker OPEN/CLOSE status
- Indicating LEDs, showing the status of the voltage inputs
- Voltage input status at different levels of voltage on either side of the breaker
- Power flow direction with dual colour LED.

LCD Display

- 16 × 2 character LCD display
- 4 digital alphanumeric Password protected settings.
- 16 LETTERS-Feeder identification label
- Trip information with PHASE INDICATIONS & Time stampings .

Fixed Visual Indications

- DEVICE HEALTHY
- General protection
START/TRIP
- DC HEALTHY
- CAP/SPRING CHARGE
- TRIP CIRCUIT HEALTHY
- VOLTAGE TRIP
- PHASE TRIP
- EARTH TRIP
- SYSTEM SETTING LED
- WIDSET
- HIGHSET
- Ready to ACCEPT
- Ready to RESET
- LOCAL/REMOTE
- TRIP LOCKED

Configurable Visual Indications

Eight dual coloured (red/yellow) LED indications (16 indications).

- Can be SET to provide indications for any of the internal functions like protection elements operations (Ex: SEF) /push switch operations.
- Can be SET to provide indications for any of the External functions through digital inputs (Ex: Bucholtz trip)
- Can be set for self reset/ hand reset (through Accept/Reset push buttons)

AUTO-RECLOSE FUNCTIONS

- Five trips, four dead times, four re-closes-MULTISHOT Auto reclose.
- Independent dead times for P/F, E/F, SEF in each shot.
- Blocking of the Reclose shots using Protection functions and vice versa feature is available.
- Block Auto reclose as a whole- Auto reclose ON/OFF facility.
- Block AUTO RECLOSE based on the type of fault tripping for each shot-P/F IDMT, E/F IDMT, P/F WIDSET, E/F WIDSET, P/F HIGHSET, E/F HIGHSET, SEF.
- Common reclaim time which starts immediately upon reclose (dead) time.
- LOCKOUT for unsuccessful reclosure.
- AUTO RECLOSE CYCLE STARTED/LOCKOUT indication can be programmed.

SECTIONALIZING FUNCTIONS

- Supply interruption count for trip =4
- Supply interruption count should have exceeded the set value & All phases current and voltages should be zero followed by a fault, to trip the sectionalizer. (This will ensure opening the sectionalizer during dead time of upstream auto reclose)
- If auto reclose function is made OFF Sectionalizing function setting will appear.
- Sectionalizing function can also be made ON/OFF.
- Reclaim time (sequence reset time) - Completion of this time will initiate the Supply interruption count for trip freshly.
- Automatic group change based on direction of power flow-AGBD facility.

If above is set, after AGBD set time the present protection group will automatically change to next even group if power flow is in forward direction (or next odd group if power flow is in reverse direction).

COLD-LOAD PICK UP FUNCTION

- After long time supply interruption, if breaker is closed the settings need to be changed to cater for immediate inrush load current
- This is achieved with group change facility. Any group will switch over to group 10 (GT) if cold load is opted.
- During this Cold load pickup, load based reset to original group or time based reset to original group or both can possible to set
- If load based reset is opted then group 9/10 will use its wide set setting as under current set with time delay to do this function.

DIGITAL INPUTS

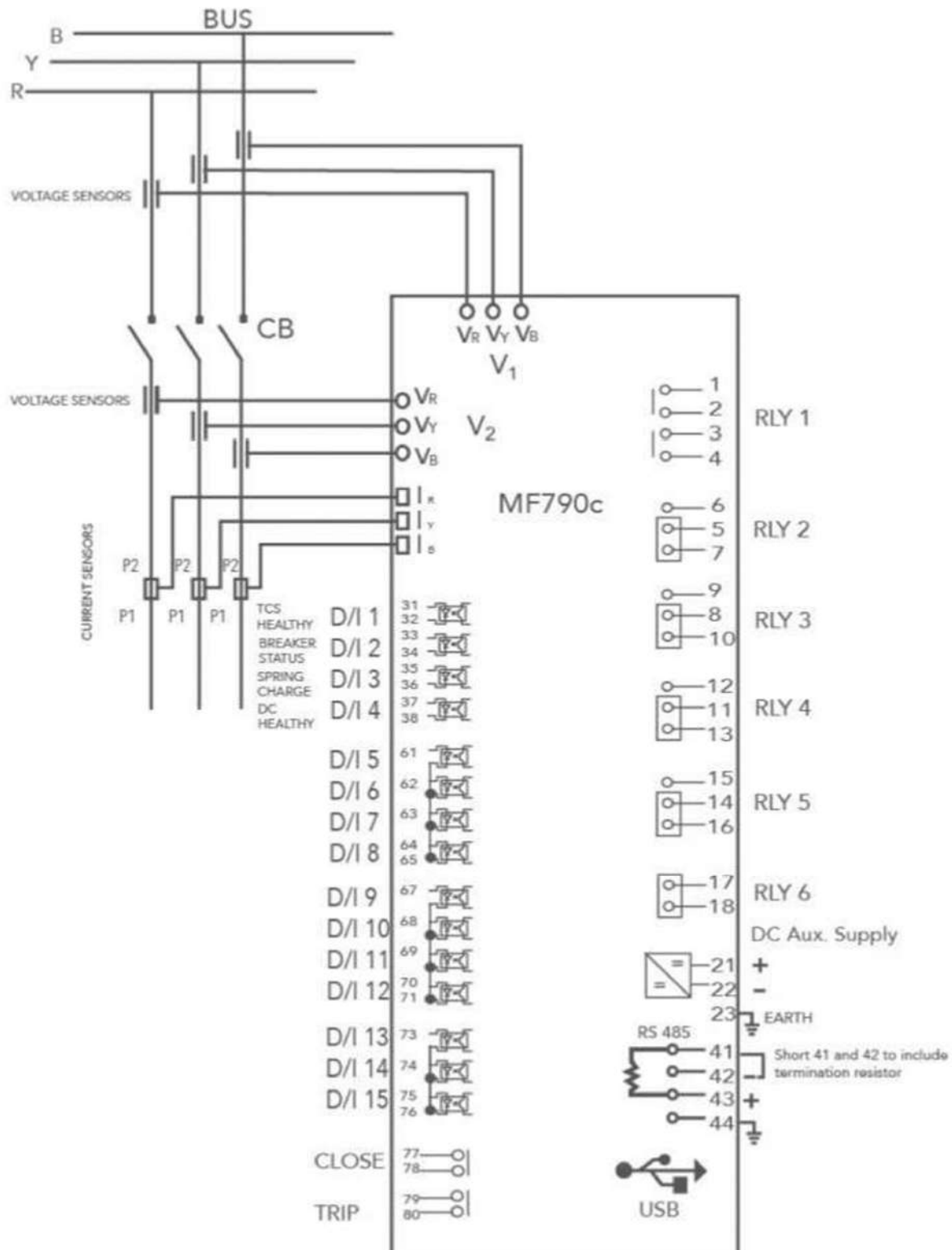
- Total numbers of DIGITAL INPUT –15
- 4 numbers are dedicated for DC Healthy, TCS, Capacitor / Spring Charge, Breaker status (all these are linked to closing function)
- 11 numbers are configurable.
- Each configurable input can be inverted. Each DI can have delay up to 24 hrs either on pickup or on drop off or on both.

DIGITAL OUTPUTS

- Total numbers of DIGITAL OUTPUT –8
- 3 numbers are dedicated for Device Healthy, Trip, Close
- 5 numbers are configurable for any or many of the 100 functions
- Each configurable output can be set as hand /electrical reset, self reset. Each configurable contact is changeover in nature.



TYPICAL CONNECTION DIAGRAM FOR MF790C



TYPE TESTING

The PARAS range of switchgear are all completely type tested as per the latest IEC standards. Tests for both frequencies 50Hz. and 60Hz. has been conducted at 15kV Voltage.

IEC type tests performed

- Short-time and peak withstand current: The test shows that the main power and the earthing circuits withstand the stresses caused by the passage of the short-circuit current without any damage. All PARAS switchgear is tested for fault current of 31.5kA for 3 seconds

Tests for both frequencies 50Hz. and 60Hz. has been conducted at 15kV Voltage.

- Temperature rise: The temperature rise test is carried out at the rated current value of the switchgear unit and shows that the temperature does not become excessive in any part of the switchgear.
- Internal arc capability: All PARAS switchgear are certified for Internal Arc A FLR 31.5kA, 1 second

PARAS range are rated for 95kV Lighting impulse.

- Dielectric test : These tests verify that the switchgear has sufficient capability to withstand the lightning impulse and the power

frequency voltage. PARAS range are rated for 95kV Lighting impulse. Power frequency is performed as part of the routine tests in our factory.

- Making and breaking capacity of circuit-breaker: The Circuit breaker is subjected to multiple fault current duties.

All PARAS switchgear is tested for fault current of 31.5kA for 3 seconds

- Line and Cable charging & Capacitor duties: The circuit-breaker is subjected to the rated current and short-circuit current breaking tests. It is subjected to the opening and closing of capacitive and inductive loads, capacitor banks and/or cable lines.
- Earthing switch making capacity: This is to test if the PARAS earthing switch can be closed on to an existing short-circuit.

PARAS VCB is type tested for E2, C2, M2 class)

- Mechanical operations of circuit-breaker and earthing switch: The PARAS VCBs are certified for M2 class – 10,000 mechanical operations.

Routine Tests Performed

Routine tests for both the Circuit breaker and the PARAS Panel are conducted at Megawin Electric factory, where they are manufactured.

The routine tests on the Circuit breaker are

1. Dimensional checks
2. Mechanical alignment checks
3. Measurement of Circuit breaker characteristics
 - a. Closing Time (ms)
 - b. Opening Time (ms)
 - c. Contact Mismatch (ms)
 - d. No. of Bounces
 - e. Bounce Time (ms)
 - f. Rebound (mm) (during opening)
 - g. Closing Speed (m/s)
 - h. Opening Speed (m/s)

Routine tests performed on the Panel

1. Dimensional checks
2. Visual Inspection
3. Power frequency tests
 - a. Power circuit
 - b. Control circuit
4. Insulation resistance for
 - a. Power circuit
 - b. Control circuit
5. Primary and secondary current injection tests
6. Operational and Functional tests



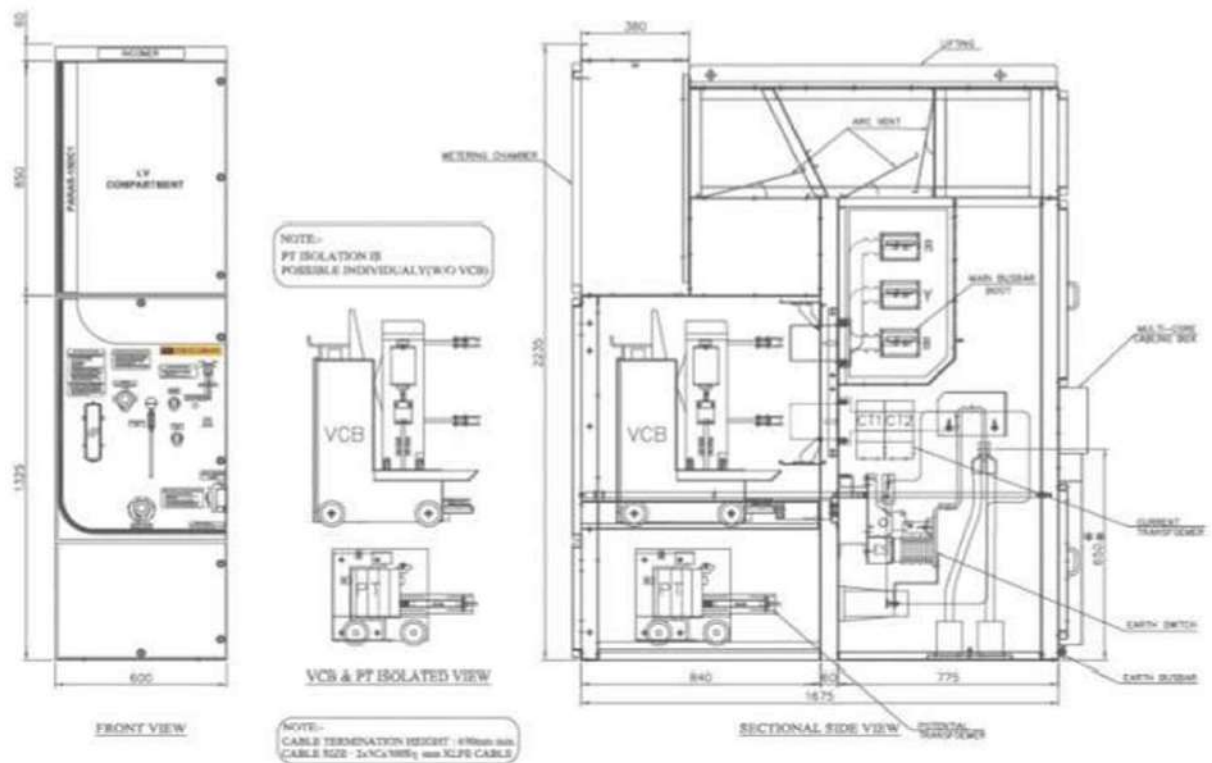
Technical Parameters



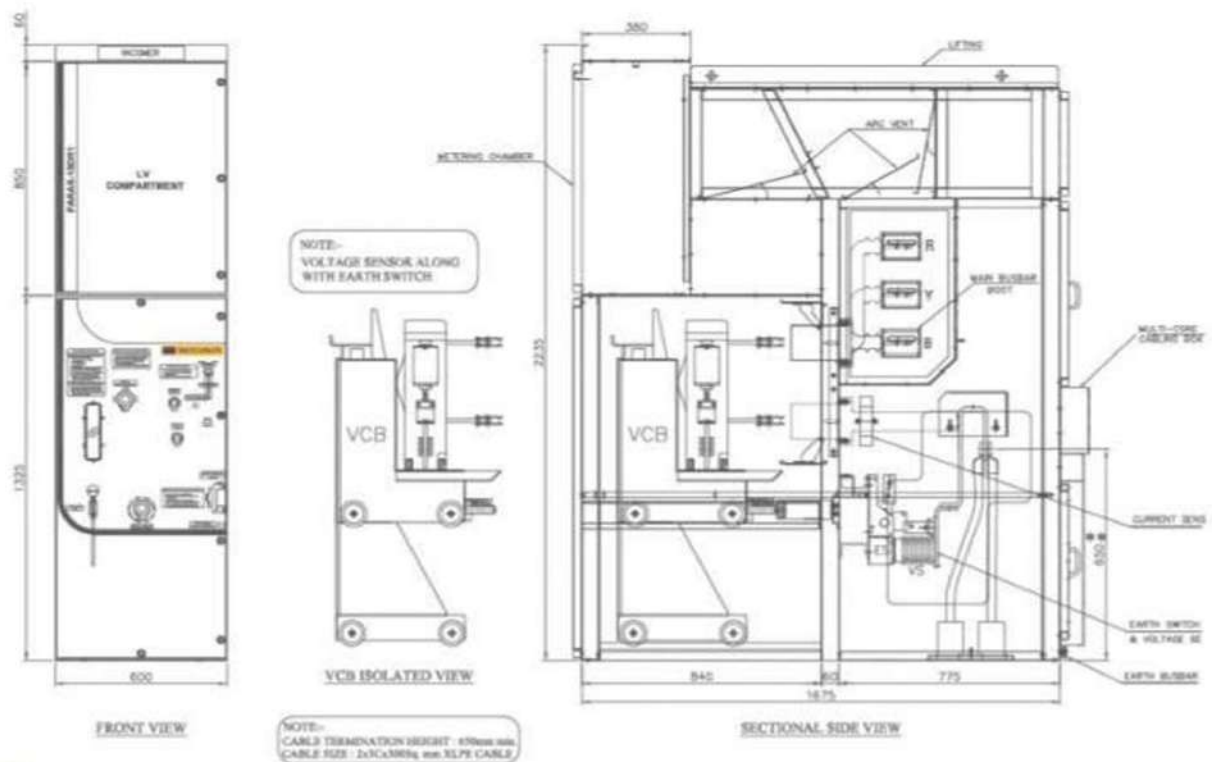
GUARANTEED TECHNICAL PARAMETERS

	PARAS-15DR1/DC1	PARAS-15DR2/DC2
Rated Voltage	15kV	15kV
Rated Current	630A/1250A	2500A
Rated Frequency	50Hz, /60Hz.	50Hz. /60Hz.
Power Frequency Withstand Voltage	38kV (rms) for 1 min.	38 kV (rms) for 1 min.
Lighting Impulse withstand Voltage	95kV peak	95kV peak
Short time current withstand capacity	31.5 kA/3sec	31.5kA/3sec
Internal arc withstand capacity	31.5 kA/1sec(AFLR)	31.5 kA/1sec(AFLR)
Rated line charging current	10A	10A
Rated making current	81.9kA	81.9kA
Rated Cable Charging Breaking Current	25A	25A
Rated capacitor bank breaking current	400A	400A
Operating Sequence	O-0.3s-CO-3min-CO	O-0.3s-CO-3min-CO
Degree of protection for overall enclosure	IP4X	IP4X
Degree of protection for internal partition	IP2X	IP2X
Design ambient temperature	50°C	50°C
Site Extensibility	Extensible on both sides	Extensible on both sides
Type of Access	Front & Rear	Front & Rear
Loss of Service continuity	LSC-2B	LSC-2B
Partition Class	PM	PM
Circuit Breaker type	PARAS-15DR1 - Floor rolling trolley & PARAS-15DC1 - mid mounted cassette	PARAS-15DR2 - Floor rolling trolley & PARAS-15DC2 - mid mounted cassette
Breaking medium	Vacuum	Vacuum
Earthing Switch	Fully Integrated & Operated from front	Fully Integrated & Operated from front
Paint Shade	RAL7032 (Other shades upon request)	RAL7032 (Other shades upon request)
Overall dimension of each vertical	600(w) x 2100(h) x 1700(d)	800(w) x 2100(h)x1700(d)
Overall weight (Kgs)	700kgs approx.	900kgs approx.

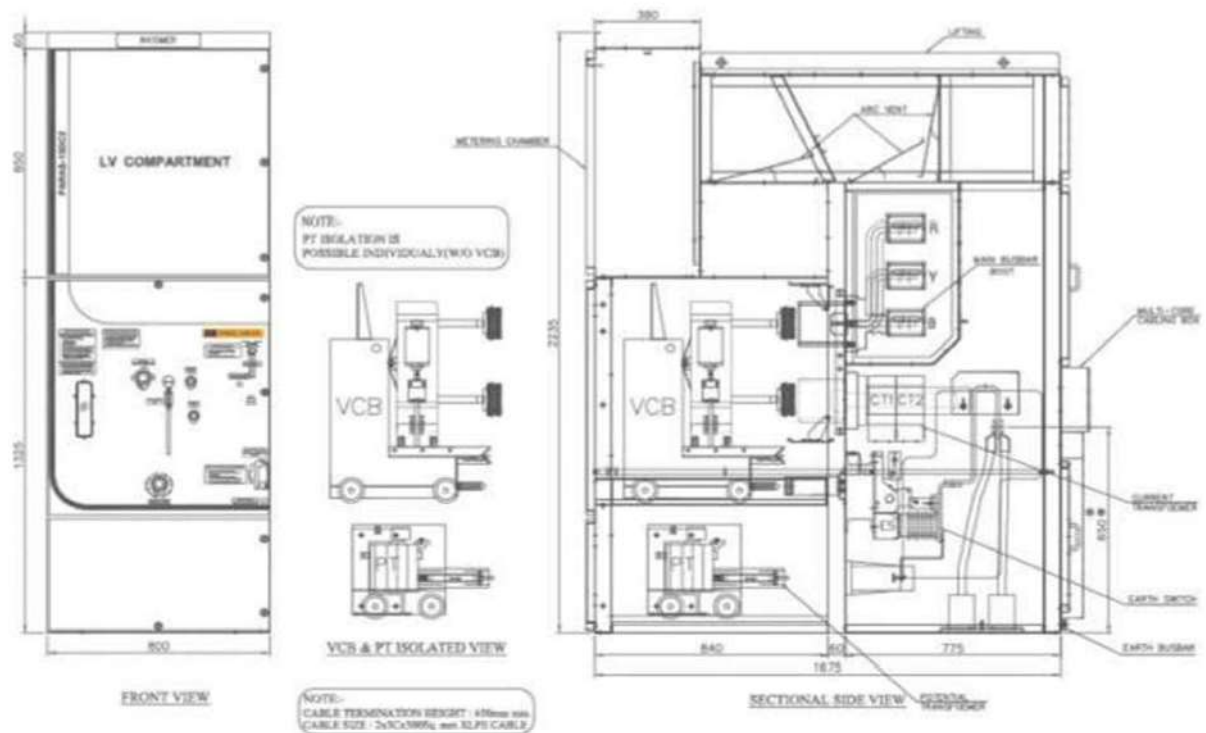
PARAS 15DC 1-11-FRONT & SECTIONAL VIEW FOR CASSETTE VCB AND WITH DRAW OUTLINE F1



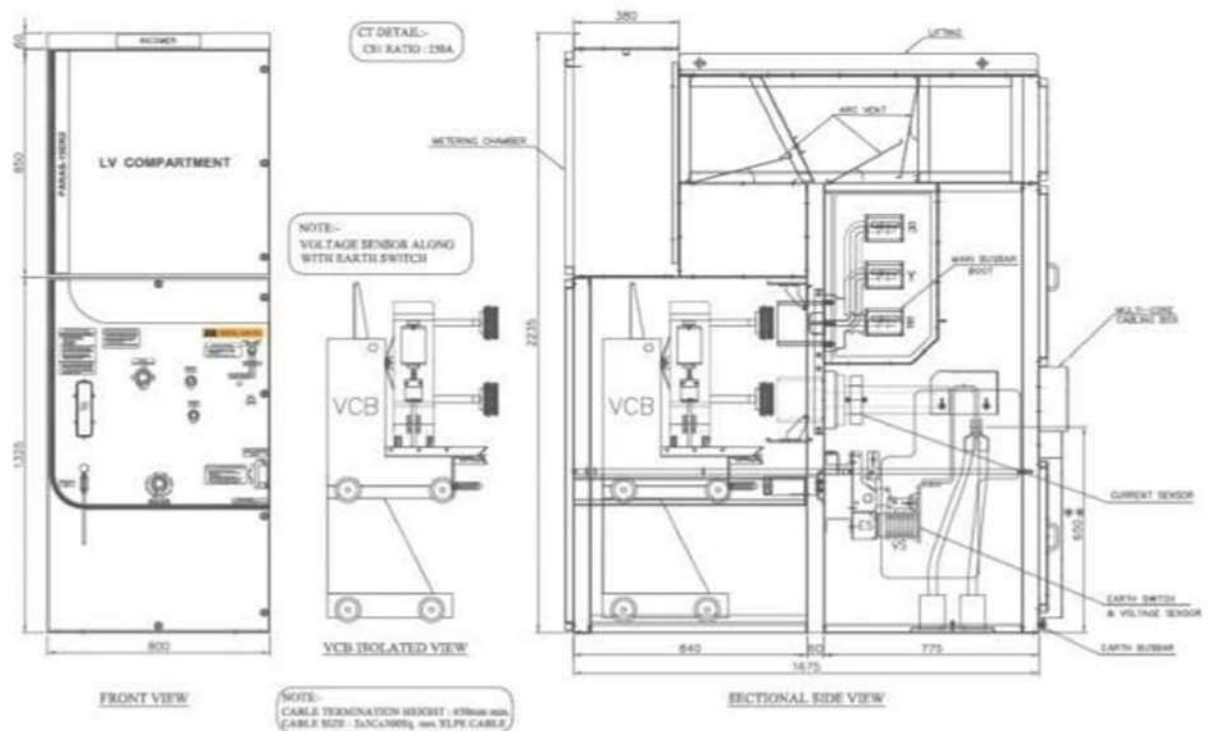
PARAS 15DR 1-11-FRONT & SECTIONAL VIEW FOR ROLL ON FLOOR VCB WITH CURRENT & VOLTAGE SENSORS



PARAS 15DC 2-T1-FRONT & SECTIONAL VIEW FOR CASSETTE VCB AND WITH DRAWOUT LINE PT



PARAS 15DR 2-T1-FRONT & SECTIONAL VIEW FOR ROLL ON FLOOR VCB WITH CURRENT & VOLTAGE SENSORS



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Switchgear & Breakers**



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