EcoStruxure™ Innovation At Every Level

Power

Masterclad™

SQUARE D™

Medium Voltage Metal-Clad Switchgear



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Life Is On Schneider Electric

Overview

As a leading manufacturer of electrical distribution equipment for over 120 years, Square D™ has long had a reputation for quality, service, and technical innovation. Today, as a major switchgear manufacturer in the international marketplace, Square D continues to lead the industry with ISO 9001 certification. Along with high-quality equipment, we offer engineering and support staff who are considered the best in the industry.

The quality of Square D Masterclad™ Medium Voltage Metal-Clad Switchgear stems from a design and manufacturing process that focuses on long-term switchgear performance with the highest degree of reliability. Reliable performance and safety are enhanced by the rugged construction of Masterclad switchgear. The switchgear consists of individually grounded, compartmentalized steel structures to protect operating personnel and equipment.

Based on specific customer application needs, Schneider Electric™ engineers and technicians select the appropriate standard sections and bus configurations, with the ability to customize where needed. After the specified circuit breakers, instrument and control power transformers, relays, meters, and other components are selected and approved, all are factory-assembled, wired, and tested as a complete assembly. This testing is performed to ensure reliability by energizing the control circuits and verifying the specified sequence of operation for each metal-clad switchgear project along with the ANSI C37.20.2 production tests.

Masterclad switchgear components include available state-of-the-art electronics like ION power quality monitoring and EASERGY protective relays, EcoStruxure™, integrated racking, and automatic throwover systems.

Standardization of the design incorporates a series of basic modular units, control packages, and instrumentation. For most switchgear ratings, circuit configurations, and functions, one basic size unit is used. These features provide application flexibility, versatility, and efficiency, reducing lead time and engineering time spent on planning and laying out the switchgear.

Applications

Masterclad medium voltage switchgear is used in a wide variety of switching, control, and protective applications including electric utility generation and distribution systems, data centers, industrial plants, commercial buildings, hospitals, municipal pumping stations, wastewater treatment plants, transportation systems, and pipeline stations. Transformers, motors, generators, capacitors, distribution lines, and feeder circuits are protected by this class of switchgear. Most of the Masterclad switchgear specified for these applications is relied upon to provide critical main service entrance protection and controls.



Standard features

Masterclad offers a customizable solution for demanding medium voltage applications. Rugged construction is coupled with low maintenance 3-cycle vacuum circuit breakers.

A comprehensive design testing program has been performed by Schneider Electric. The switchgear and breakers are designed and tested in accordance with all applicable ANSI standards C37.04, C37.06, C37.09, and C37.20.2. The switchgear and breakers meet the requirements of ANSI, IEEE, NEMA, and generally exceed IEC standards.

Metal-clad switchgear includes:

- Air-insulated switchgear defined by ANSI C37.20.2
- UL listed equipment
- Indoor and outdoor options with one or two high breaker arrangements
- Also available as arc resistant structurestype 2B for 5 and 15 kV class
- Removable (drawout) circuit breaker
- Compartmentalized enclosure with grounded barriers
- Isolated low voltage compartment
- Automatic gear driven shutters
- Automatic shutters in VT, CPT, and fuse truck compartments
- Epoxy insulated busbars
- Mechanical interlocks
- Disconnect style instrument transformers
- Continuous grounded breaker and auxiliary trucks, in and between test/disconnected and connected positions

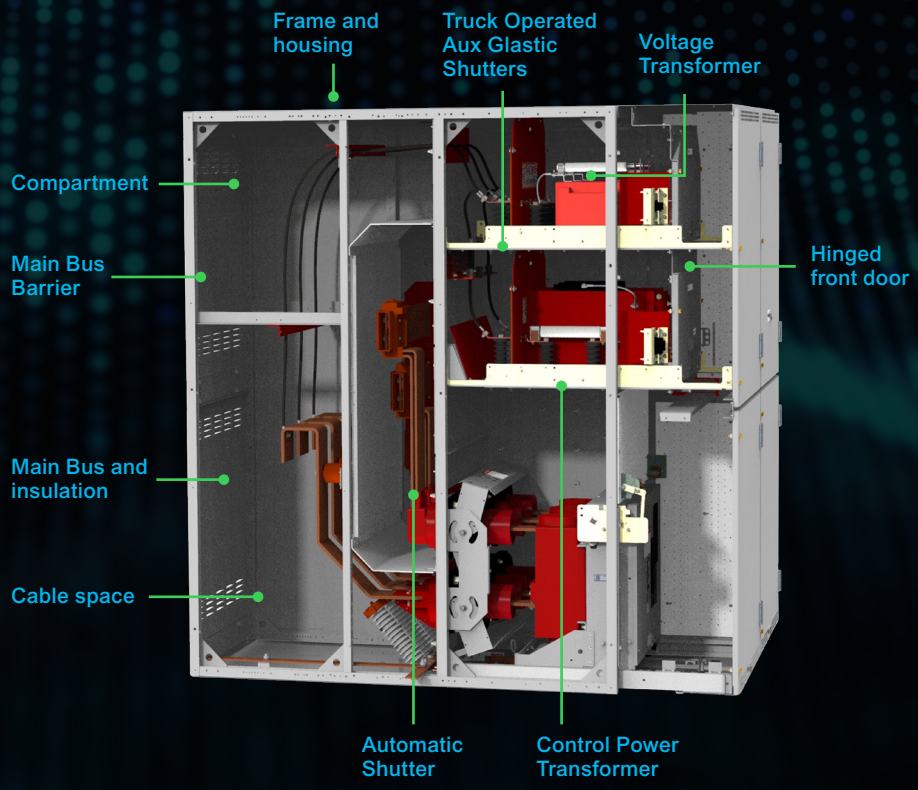
Optional:

- Cutting edge relays
- Thermal Monitoring
- Removable Shorting Device
- Integrated Racking
- Electric Racking Device
- Test Cabinet
- Test Jumper
- Automatic and Manual Ground and Test Unit
- T-Handles – Locking or Non-Locking
- Lug Termination Boots
- Floor Plates
- Cable Supports

Ratings:

- 4.76 – 15 kV (to 13.8 kV nominal)
- 1200 – 4000 amperes
- 25 kA to 63 kA
- 60 and 95 kV BIL
- 27 kV
- 1200 – 2000 amperes
- 16 kA to 40 kA
- 125 kV BIL

Available as fully assembled, semi-assembled, or OEM components



Benefits

Reliability is the main priority. The VR vacuum circuit breakers are designed for long life. The interrupter's copper chromium contacts, hermetically sealed for life in a vacuum, are protected from external atmospheric influences. Dust, moisture, and all other possible contaminants are sealed out. This state-of-the-art vacuum interrupter design is capable of up to 10,000 no load operations.

The high dielectric strength of the vacuum environment allows a very short clearing time during fault interruption to limit the energy dissipated into the arc. Total fault clearing time is less than 3-cycles and contact travel is only 3/8 to 1/2 inch, depending on the ratings of the circuit breaker. The short stroke produces less mechanical shock to the operating mechanism.

Together, with a total commitment to quality, these features provide long life with high reliability.

Masterclad structure types

Masterclad



Masterclad AR



NEMA3R
Non-walk-in



NEMA3R
Walk-in Outdoor
walk-in switchgear





Masterclad components

Frame and housing

Precision-formed steel frames and inner panels, painted by the superior powder coating process, provide a strong rust-resistant structure with rigid alignment of components.

Compartment barriers

Grounded metal barriers separate the main compartments: breaker, main bus, cable, instrument/ relay (low voltage area), and auxiliary (VT and/or CPT).

Main bus barriers

The main bus pass-through barriers between bays are track-resistant, flame-retardant glass polyester. Optional porcelain inserts are available and are mounted with glass polyester components.

Main bus and insulation

The main bus and runbacks are insulated with a track resistant, flame-retardant epoxy coating established by the fluidized bed process. Bus support standoff insulators are glass polyester at 5 and 15 kV and (optional) porcelain and epoxy at 5 and 15 kV. Bus joints come standard with insulated vinyl boots. Access covers are provided so the main bus inspection can be achieved from the front and rear of the gear. Rated for 105 deg C operation. The bus can be ordered in 1200 A/2000 A copper or aluminum, tin or silver plated. 3000 A copper can only be tin or silver plated.

(optional)

Lug termination boots can be special-ordered for quick installation.

Voltage transformers

Front accessible, drawer-mounted on rails voltage transformers can be completely withdrawn from the connected position. In the withdrawn position, shutters are activated to cover the energized stationary components for operator safety. The voltage transformers are disconnected and momentarily grounded during movement to the withdrawn position. The voltage transformer (VT) truck can be completely removed from the equipment by using the lift truck with side rails attached.

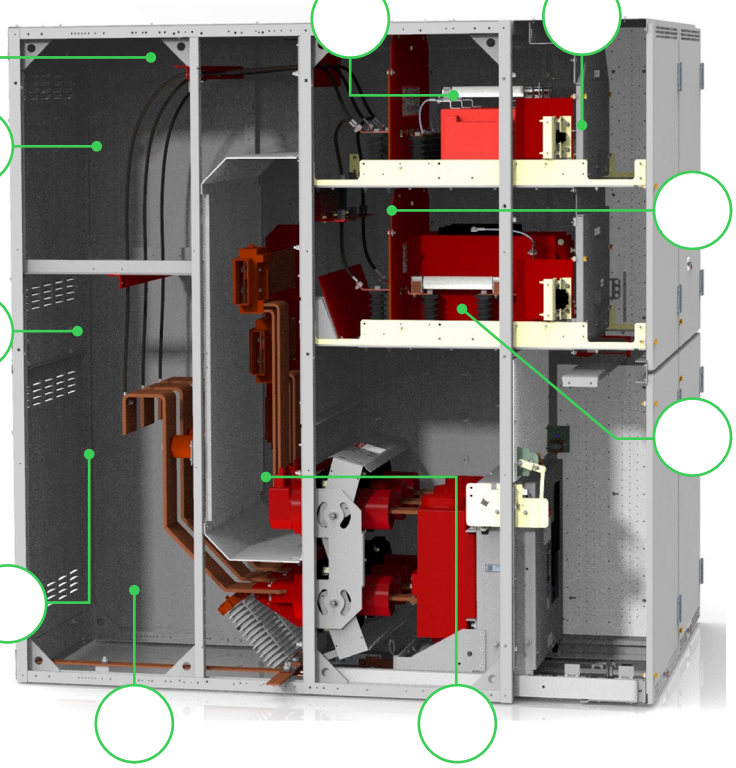
The auxiliaries can be connected for either line or load side connections.

Hinged front door

Relays and metering instruments are mounted on the doors in standardized arrangements to satisfy customer requirements. Each breaker compartment door has a racking access port, also provided with an electric racking device door adapter to allow moving the circuit breaker to or from the connected position with the door closed.

Options:

- Single full height door with "one high" construction
- T handles lockable and non-lockable
- Padlock hasp



CPT/VT truck-operated glastic shutters

When either truck is withdrawn from its connected position, the glass polyester shutter barrier assembly closes when the truck reaches the fully withdrawn position, protecting personnel from possible energized stationary contact.

Control power transformers

Front accessible control power transformers rated up to 15 kVA are drawer-mounted on rails and can be completely withdrawn from the switchgear for ease of maintenance. In the withdrawn position, shutters are activated to cover the primary energized components for operator safety. The control power transformer (CPT) is momentarily grounded during movement to the withdrawn position.

CPTs larger than 15 kVA are fixed mounted in the rear of the equipment.

A circuit breaker from the secondary of the CPT is key interlocked with the drawout truck and must be opened before the drawout truck can be withdrawn.

The drawout truck can be completely removed from the front of equipment by using the lift truck with side rails attached.

Cable space

Top or bottom power cable entry space is provided. Space for surge arrestors, cable supports, and cable termination pads vary with design and system requirements.

Automatic shutters

When the breaker is withdrawn from the connected position, the racking mechanism linkage positively rotates the grounded metal shutters into a position which covers the energized components.

Masterclad breaker compartment features

Safety locking provisions

The safety shutters may be locked in the closed position by padlocking or by key interlock to prevent the racking of a circuit breaker to the connected position when required by customers' operation process or maintenance procedures. Additional interlocks prevent the breaker from accidental removal. Bushing type current transformers are front accessible, located behind the shutters and mounted on the primary insulating bushings. Space will permit one or two current transformers per phase on the line/load bushings of each circuit breaker compartment. This allows a maximum of four total per phase (two on the line side bushing and two on the load side bushing) with ANSI standard relay accuracy class rating and two total per phase (one on the line side bushing and one on the load side bushing) for higher relay accuracies.

Racking system

The high-quality, gear-driven racking mechanism is center-mounted on the cell floor, providing balanced movement of the breaker between cell positions. The racking system is coordinated with safety interlocks to prevent movement of the breaker unless main contacts are in the open position.

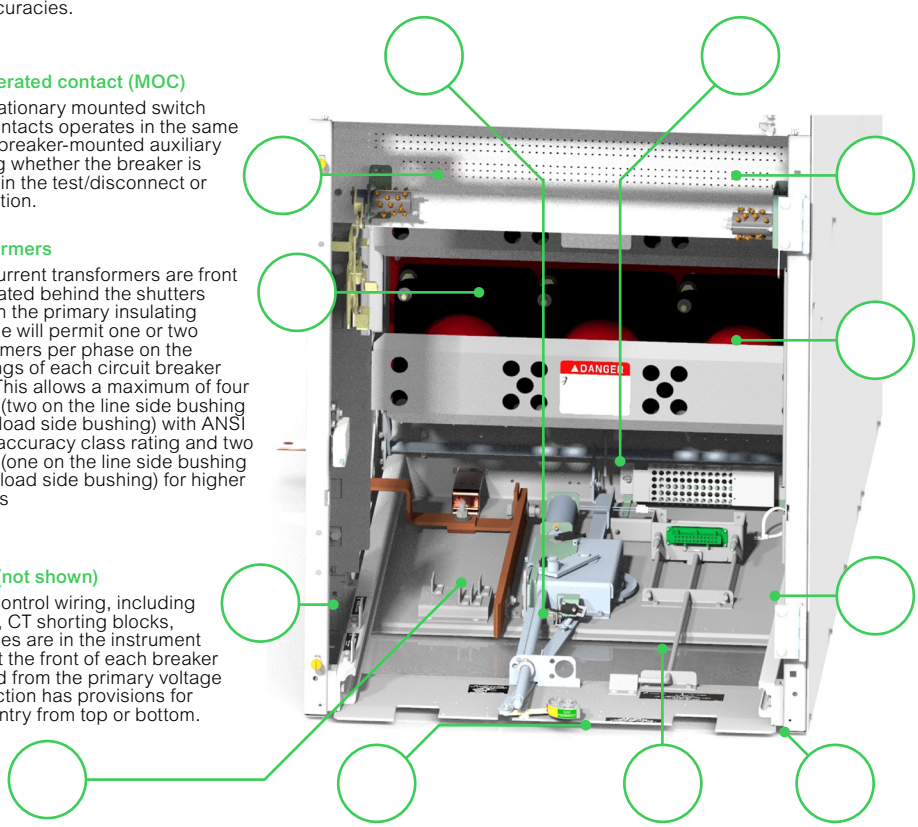
Optional racking solutions allow for remote racking without being in front of the equipment.

Mechanism operated contact (MOC)

An (optional) stationary mounted switch with 10 or 13 contacts operates in the same position as the breaker-mounted auxiliary switchindicating whether the breaker is open or closed in the test/disconnect or connected position.

Current transformers

Bushing type current transformers are front accessible, located behind the shutters and mounted on the primary insulating bushings. Space will permit one or two current transformers per phase on the line/load bushings of each circuit breaker compartment. This allows a maximum of four total per phase (two on the line side bushing and two on the load side bushing) with ANSI standard relay accuracy class rating and two total per phase (one on the line side bushing and one on the load side bushing) for higher relay accuracies



Truck operated contact (TOC)

An (optional) stationary mounted switch with 10 or 13 contacts provides an electrical indication of the position of the circuit breaker in the cell connected position or test/ disconnected position.

Primary bushings/stationary main contacts (behind shutters)

Standard glass polyester (or optional porcelain) insulating bushings are used to support the stationary primary disconnect contacts. The same bushings provide insulated mounting provisions for the current transformers.

Secondary control receptacle (female)

The breaker control receptacle automatically engages the secondary disconnect when the circuit breaker is racked to the connected position. The secondary control receptacle can be manually connected to the breaker while in the test/disconnect position for testing by rotating the receptacle handle and pulling towards the breaker.

Control wiring (not shown)

All secondary/control wiring, including terminal blocks, CT shorting blocks, and other devices are in the instrument compartment at the front of each breaker section, isolated from the primary voltage areas. Each section has provisions for control wiring entry from top or bottom.

Code plates

By coordinating with code plate mounted on breaker, ensures the breaker is rated for the cell.

These code plates also prevent ground and test units from being installed in the wrong cell.

Breaker position indicator

The breaker position indicator displays the position of the breaker within the cell. The rotation of the colored indicator is driven by the racking mechanism providing clearly visible indication with the front door either open or closed.

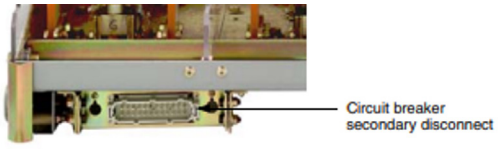
Green = Test/disconnected position
Yellow = Transport position
Red = Connected position

Spring discharge interlocks

Both opening and closing springs in the breaker are automatically discharged when the circuit breaker is installed or removed from the breaker from the compartment.

Breaker positioning rails (x2)

Each breaker cell comes equipped with positioning rails to capture the breaker that guides rollers on the breaker when entering the compartment. Each side of the breaker has two guide rollers to provide a rigid breaker alignment within the cell's connection points. Note that the guide rollers are side-mounted on the breaker and are different from the wheels (used for transport) beneath the breaker truck.



9a Secondary disconnect on breaker (male)

Options

Metering
PowerLogic series meters provide power and energy meters and software for power monitoring and energy management. View power and energy data to improve efficiency, power availability, and reliability.

Relays
Schneider Electric offers a wide variety of protection relays, including overcurrent protection, arc protection, motor protection, transformer protection and control, generation protection, capacitor bank protection, differential protection, auto-reclose and check synchromism, voltage and frequency protection, circuit breaker failure and relays engineered to specific transfer schemes.

Continuous thermal monitoring (CTM)
EcoStruxure easily monitors temperature with wireless sensors installed on the busbar to measure temperature differences between phases exceeding a set threshold and absolute temperatures exceeding a set threshold via acentral data concentrator. CTM eliminates the cost of third-party IR scanning.

Other benefits include detection of thermal runaway occurring between annual surveys, increased MTBF of the main electrical switchboard, automatic alarming and notification, and long-term trending to detect slow deterioration and reduce the possibility of a catastrophic failure. Optional environmental data is available for more accurate analyses.

Removable shorting devices (RSD)
The VR RSD is a horizontal drawout auxiliary device designed for use with Masterclad switchgear. Each RSD is designed specifically for use within a designated compartment. The RSD provides an economical means to connect line and load terminations, often used to temporarily connect a circuit or bus section to the main bus in the Masterclad switchgear. A code plate on the RSD restricts the inserting of the unit into any other compartment for which it is not designed. A keylock(s) is provided to prevent connecting or disconnecting the RSD device under a load.

Integrated racking
Each circuit breaker cabinet has its own independent integrated racking device and controls. This allows the user to safely rack the circuit breaker from the disconnected/test position to the connected position or vice versa using a handheld pendant connected to a 50 ft cable. Once the circuit breaker is in the connected position the operator can close and open the circuit breaker. Breaker operation can be performed using the pendant in either the test or connected position.

Electric racking device (ERD)
The electric racking device mounts on the breaker cell door and allows the operator to electrically rack the breaker in and out from a distance.

Test cabinet
The test cabinet is used to externally test the breaker functions while the breaker is outside of the Masterclad section.

Test jumper
The test jumper is used to extend the length of the test cabinet's cable when needed.

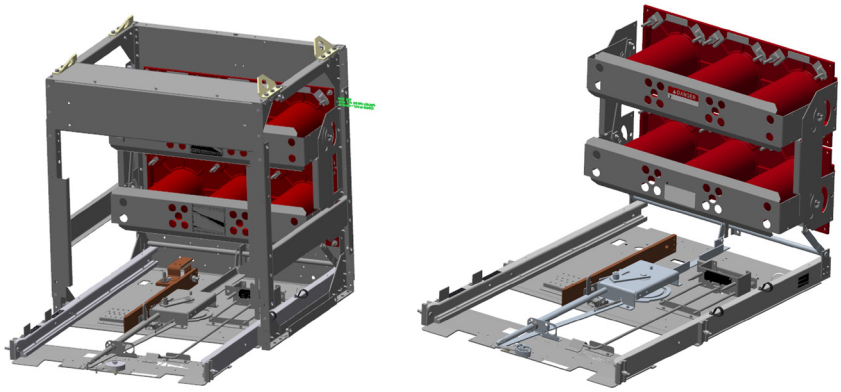
Breaker Lift Truck
Breaker Lift Truck is required for Two High breaker lineups and Type 3R structures. A Breaker Lift Truck is required for indoor equipment elevated above floor level. (Ex: Housekeeping pad) Lift Trucks provided with adapters used to remove VT, CPT, and Fuse Trucks from the cell.

Ground and test units
A Ground and test unit allows the customer to ground the load side bus of a feeder breaker compartment.

This is done for preventive maintenance to protect against back-feed from downstream sources. Typically used during maintenance process to protect against back-feed from downstream sources.

Semi-assembled and OEM components are available for flexibility

Multiple configurations allow partners to build with proven Masterclad reliability.Options range from unwired, fully assembled equipment to core components.



Masterclad Type VR Circuit Breaker

This VR circuit breaker with type RI advanced design motorcharged stored energy mechanism is a model of reliability with simplicity and virtually maintenance free. With an operating life exceeding the ANSI test requirements, the RI mechanism with synchronizing crossbar is electrically and mechanically trip-free. An integral handle (non-removable) is provided for manual charging.

The vacuum interrupters of the VR circuit breaker are mounted in high-strength, molded glass-reinforced polyester insulation/support housings. The molded housings position the bus runbacks for precise alignment. The completed pole units are bolted directly to the breaker truck. The inherent rigidity and mechanical strength of this circuit breaker design complement the operating mechanism, resulting in high endurance and reliability.

The VR breaker is a horizontal drawout type designed to provide long life, reduced maintenance, and ease of handling. The breaker truck has wheels for easy movement into a lower cell (indoor switchgear) without use of any lifting device. A lifting truck is provided for installation of a breaker into an upper cell.

Masterclad Type VR Circuit Breaker

Auxiliary switch actuator
This operates the MOC auxiliary switch when the circuit breaker is in the test/ disconnect or connected position and the test positions (unless otherwise specified).

Breaker removal latch cam
This prevents removal of the circuit breaker from the cell until the pull handle at bottom front of the circuit breaker is pulled by the operator.

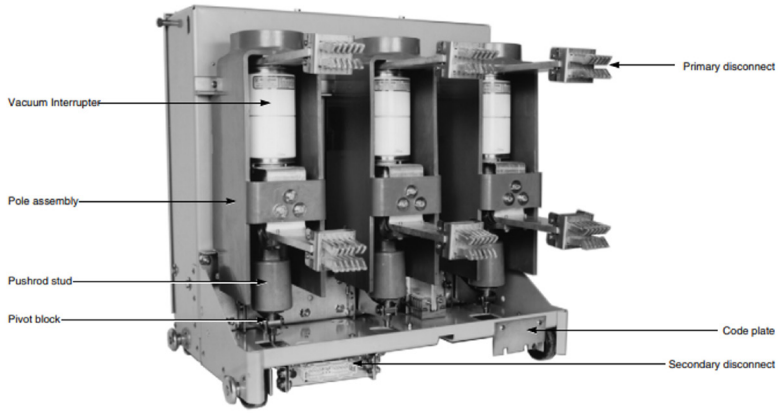
Breaker code block
This prevents insertion of a breaker with lower or higher rating, (either MVA or continuous ampacity), than the compartment is designed to accept.

Operation counter
Standard on all breakers, this is used to count the operations of the breaker.

Front of breaker



Rear of breaker



Additional information

5/15 kV Breaker Brochure

27 kV Breaker Brochure

For further information about Square D Masterclad switchgear with vacuum circuit breakers, contact your nearby Schneider Electric sales office.

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