CR TECHNOLOGY SYSTEMS

CR POWER

Air insulated MV Metal clad
switchgear 12-24-36-40.5kV

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Catalog: CR Power - MV switchgear
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C.R. TECHNOLOGY SYSTEMS SPA

SUMMARY

GENERAL DESCRIPTION

Medium-Voltage Metal Clad Switchgear, CR Power, is an air insulated (AIS) switchgear, fitted with metallic segregated compartments and withdrawable main components (circuit breaker, voltage transformers, protection relays). It is designed for primary distribution grids and can be supplied as standard or Internal ArcClassified IAC AFLR.
For outdoor use (mines, Oil & Gas) it can be design in special features with a protection degree up to Ingress Protection IP 65 and configuration Duplex, Double Busbars Systems.

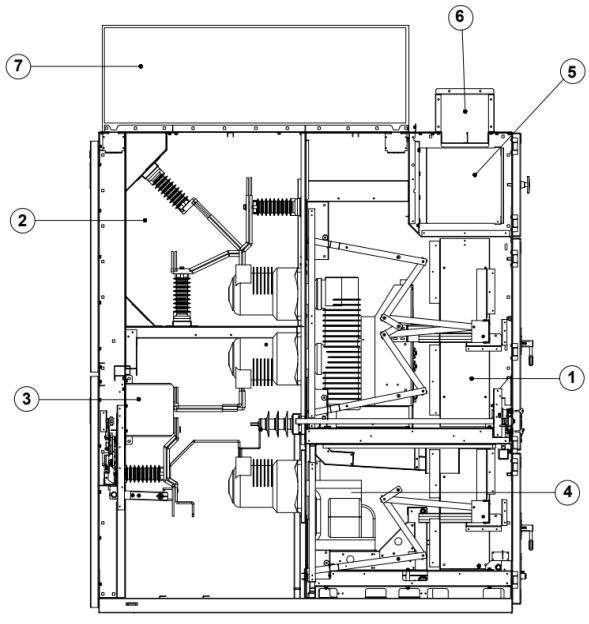
Our range of CR Power includes Normal Clad switchgear 12kV 24kV 36kV 40.5kV.

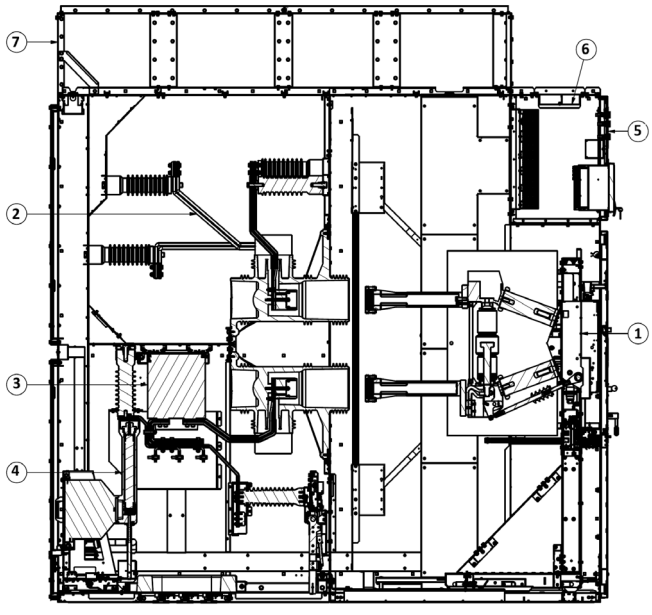
STANDARDS

The switchgear and main apparatuses comply with the following standards:

IEC 60071-2	for the insulation coordination
IEC 60265-1	for the switch disconnectors
IEC 60470	for the contactors
IEC 60529	for the degree of protection
IEC 62271-1	for general purposes
IEC 62271-100	for the circuit-breaker from 1kV to 25kV
IEC 62271-102	for the earthing switch in switchgear from 1kV up to 52kV
IEC 62271-200	for the switchgear from 1kV up to 52kV

MAIN COMPARTMENTS





1 CIRCUIT-BREAKER AND SWITCH CONTROL COMPARTMENT

The circuit breaker compartment, together with the related trolley and accessories for its operations, is equipped with:

- Fixed part of the interrupting device which creates the physical connection with the line unit and the busbar unit.
- Metallic obturators automatically operated by the movement of the circuit-breaker trolley.
- Passage of auxiliary cables.

Control of the earthing switch is carried out through a lever system which operates inside the compartment.

2 MAIN BUSBAR COMPARTMENT

This compartment contains the main busbar system, connected to the fixed contacts of the interrupting device envelopes. This area is protected by removable panels, in order to allow the maintenance and the direct access to the busbar system. The busbar area is extended along the length of the entire switchgear.

3 FEEDER, CURRENT TRANSFORMERS AND EARTHING SWITCH COMPARTMENT

CR POWER switchgear can be wall-standing, since they have full access for maintenance and installation operations. In the 12kV, 24kV and 36kV (ABB version), the cable area is accessible from the front side through a segregation panel that is interlocked with the earthing

switch and can be removed only with the earthing switch closed. In the 36kV and 40.5kV versions, the cable area is accessible from the rear only, by removing the rear closing panel in safety conditions.
The feeder compartment can house the earthing switch and relevant auxiliary contacts, current (CT) and voltage transformers (VT), captor drivers for signaling voltage on cables, voltage indicator, toroidal current transformers on cables, cables terminals, power cable passage opening and earthing switch interlock.
The earthing switch has short-circuit making capacity.
Control of the earthing switch is from the front of the switchgear with manual operation, and optionally, can also be motor operated.

4 WITHDRAWABLE VOLTAGE TRANSFORMER COMPARTMENT

In the general layout, the voltage transformer (VT) compartment consists of an enclosure where a withdrawable truck is inserted, with the transformers on board and the relevant protection fuses. The resin-insulated voltage transformers are used for supplying measurement to protection devices. The main features of the VT compartment are:

- Isolation of the VT's relevant fuses is carried out by an external operating handle.
- When the primary VT is isolated, also the secondary is consequently isolated.
- The truck movement is carried out through a control system managed by the movement of the trolley.
- Metallic obturators are automatically operated by the movement of the trolley.
- Fuses can be replaced by opening the door, after VT are isolated and removed from the compartment.

On request, voltage transformers can be of three types: fixed, insulated, or removable.

5 AUXILIARY COMPARTMENTS

The auxiliary compartment consists of low-voltage and protection instruments. It contains protection relays for the command of the protection system and it receives signals from CT and VT systems.

6 AUXILIARY CIRCUIT WIRING DUCT

The wiring duct for the auxiliary connections between the various units and external apparatus is installed on the top of the unit in the front part above the instrument cubicle. Into the duct there are wiring related to the interpanel wiring.

7 GAS DUCT

CR POWER can be arc-proof and supplied with a duct for the evacuation of the gases produced by the arc itself. The duct is fixed on the top of the auxiliary compartment. In specific plants, the exhaust gases cannot normally be evacuated out of the room and therefore the gas duct must always be closed on both the end-sides and equipped with top chimneys. If there are cases when it is not possible to evacuate gases out of the room, the switchgear can be supplied with outlet gas duct.

GENERAL FEATURES

The characteristics of the switchgear are guaranteed under the following operating conditions:

TEMPERATURE:

Mimimum ambient temperature:
-5°

Maximum ambient temperature:
+40°

AMBIENT HUMIDITY:

Maximum 24h average of relative humidity:
95%

Maximum monthly average of relative humidity:
90%

The normal operating altitude is up to 1.000 m above the sea level.

CR POWER switchgear can be used for particular applications like naval sector, mining, in presence of high-temperatures and application in seismic zones.

PROTECTION DEGREE

The degree of protection of the CR POWER switchgear is conform to the IEC 60529 standards and it is normally supplied with the following degree of protection:

IP3X	for the enclosure (higher degree on request).
IP2X	for internal compartments.

Higher degrees of protection are available on demand.

PAINTING OF EXTERNAL SURFACES

The painting is carried out using epoxy powders, suitable for processes such as washing, degreasing, phosphating, passivation and treatments with demineralized water.
The standard colour for metallic structures and doors is RAL 7035 – light grey (applied to front doors and side panels).Other colours are available upon request.
The minimum painting thickness is 80µm. Higher thickness available on request.

SAFETY EQUIPMENT

CR POWER switchgears can offer a safe performance thanks to:

- The presence of electrical and mechanical interlocks specially designed to prevent any potential error in the maneuver sequence.
- Maneuvers executable only with specific key and levers.
- Electrical and mechanical interlocks installed in order to prevent the access to components in service.
- Availability of remote operations.
- Possibility of equipping the cubicle with sensors for preventive maintenance (temperature probes and electric arc).

SWITCHGEAR CONTROL AND MAINTENANCE

C.R. Technology Systems counts on skilled personnel for preventive and predictive maintenance operations. A proper maintenance limits product deterioration over time, which can cause a loss in terms of quality and improve the safety of the work environment and of the people that operate it. Moreover, maintenance activity has a direct effect on the footprint impact, as the product works longer, and energy losses are avoided.

1. Create a checklist for routine maintenance.
2. Periodically lubricate all moving mechanical parts.
3. Check the condition of the coating and the external casing.
4. Replace the components before their obsolescence.
5. Always follow the manufacturer's instructions, concerning timing and manner.
6. Pay attention to warning signs, even if they don't lead to immediate functional failures.
7. Track and test data to verify the lifespan of the product.
8. Manually operate circuit breakers once a year, in order to keep the contacts clean and help operating mechanisms move freely.
9. Offer training courses to operators.
10. Keep updated on maintenance procedures.

TECHNICAL DATA

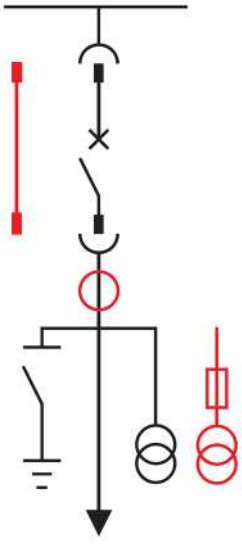
Data Sheet

Related Voltage	**kV**	12	24	36	40.5
Related Voltage insulation (1 min)	**kV**	28	50	70	80
Impulse Test Voltage (BIL)	**kV**	75	125	170	185
Main busbar rated current	**A**	Up to 4.000	Up to 3.600	Up to 3.150	Up to 2.500
Main bars rated current	**A**	1.250 2.000 2.500 3.150 3.600 4.000	1.250 2.000 2.500 3.150	1.250 2.000 2.500 3.150	1.250 2.000 2.500
Short time rated current	**kA (3s)**	Up to 50	Up to 40	Up to 40	Up to 25
Rated frequency	**Hz**	50 - 60	50 - 60	50 - 60	50 - 60
IP Protection Degree		IP3X*	IP3X*	IP3X*	IP3X*
Loss of service continuity LCS		LSC2B	LSC2B	LSC2B	LSC2B
Arc-proof version IAC AFLR	**kA (1s)**	25	25	25	25

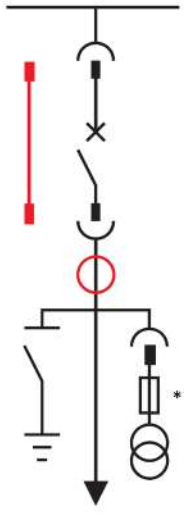
**On request for special applications, up to IP65*

SINGLE LINE DIAGRAMS

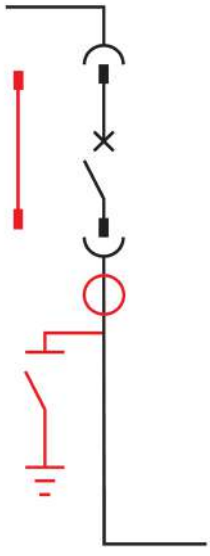
IF(M) Incoming/Outgoing Feeder with Measurements



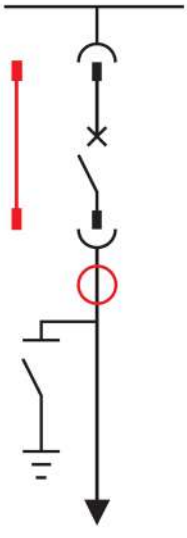
IFM Incoming/Outgoing Feeder with Measurements



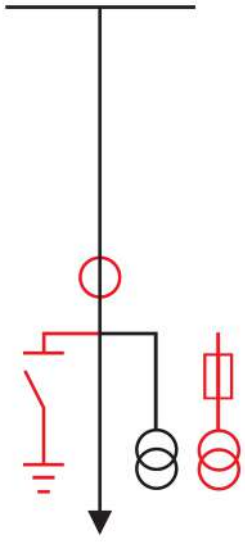
BT Bus-tie



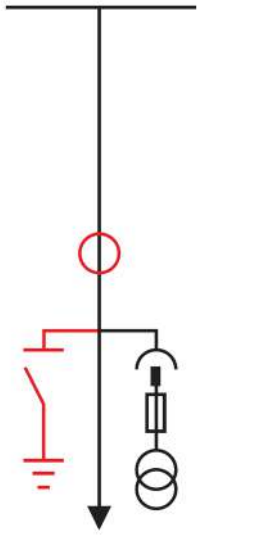
IF Incoming/ Outgoing Feeder



IFD(M) Direct Incoming/ Outgoing Feeder with Measurements



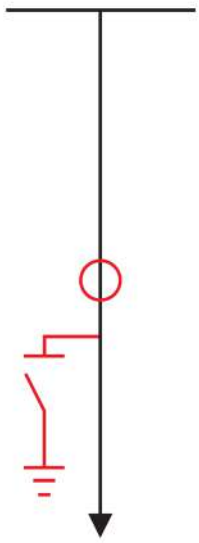
IFDM Direct Incoming/ Outgoing Feeder with Measurements



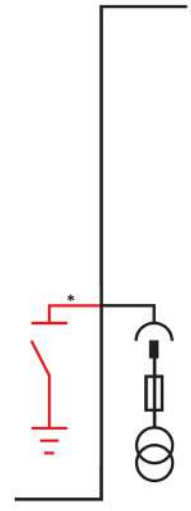
Always present

Optional

IFD Direct Incoming/ Outgoing Feeder

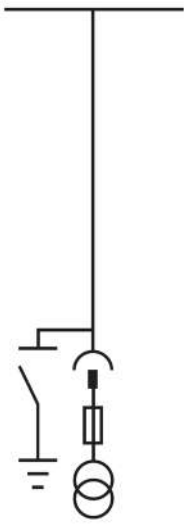


RM Riser with Measurements

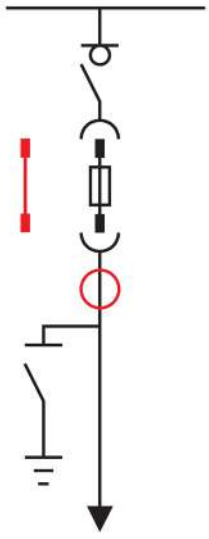


* only available in 40.5kV

M Measurements

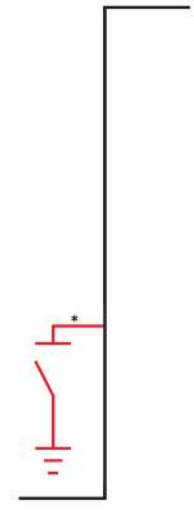


DF Disconnecting Fuse



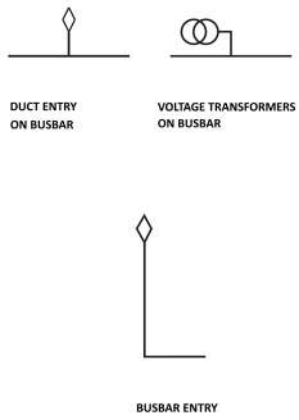
*not available in 40.5kV

R Riser



* only available in 40.5kV

Optional busbar accessories



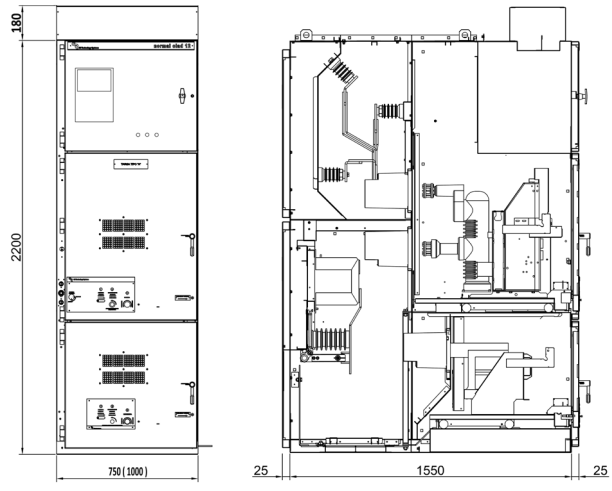
Always present

Optional

SWITCHGEAR LAYOUTS

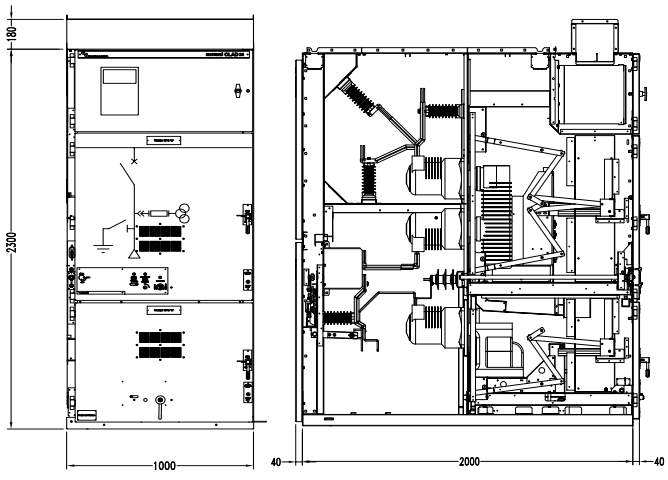
SWITCHGEAR TYPES

CR POWER Normal Clad 12kV



Rated current (A)	A. Length (mm)	B. Depth (mm)	C. Height (mm)	Estimated weight (kg)
630	750	1600	2380	800
1250	750	1600	2380	800
1600	750	1600	2380	850
2000	750	1600	2380	950
2500	1000	1600	2380	1000
3150	1000	1600	2380	1100
3600	1000	1600	2380	1150
4000	1000	1600	2380	1200

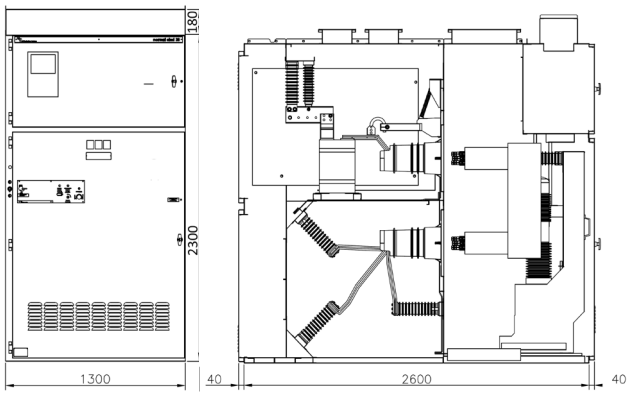
CR POWER Normal Clad 24kV



Rated current (A)	A. Length (mm)	B. Depth (mm)	C. Height (mm)	Estimated weight (kg)
630	1000	2080	2480	1000
1250	1000	2080	2480	1050
1600	1000	2080	2480	1200
2000	1000	2080	2480	1250
2500	1000	2080	2480	1300
3150	1000	2080	2480	1350

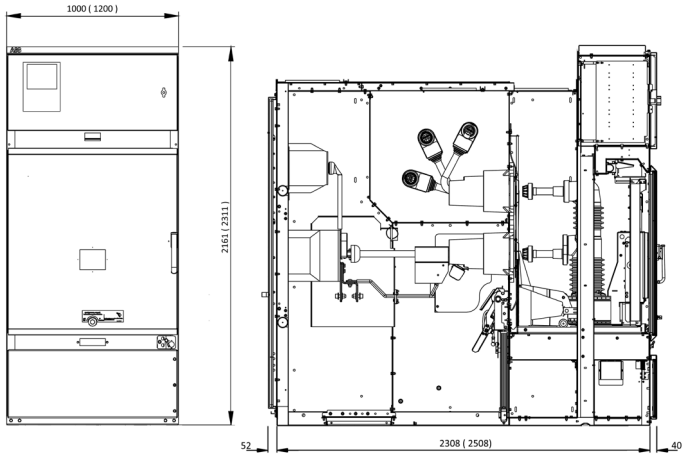
SWITCHGEAR TYPES

CR POWER Normal Clad 36V



Rated current (A)	A. Length (mm)	B. Depth (mm)	C. Height (mm)	Estimated weight (kg)
630	1300	2680	2480	1300
1250	1300	2680	2480	1350
1600	1300	2680	2480	1400
2000	1300	2680	2480	1450
2500	1300	2680	2480	1500
3150	1300	2680	2480	1550

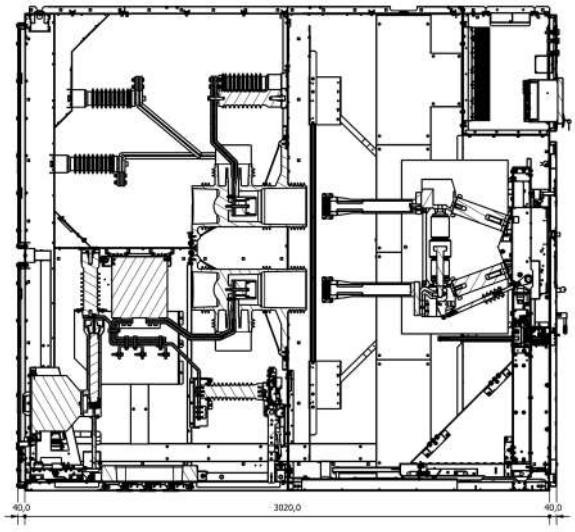
CR POWER 36kV under license of ABB

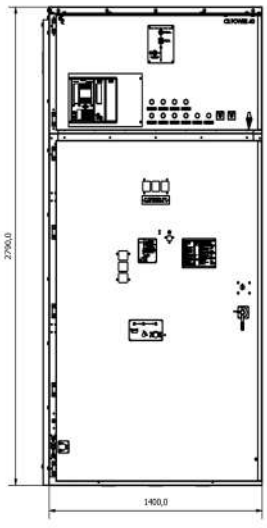


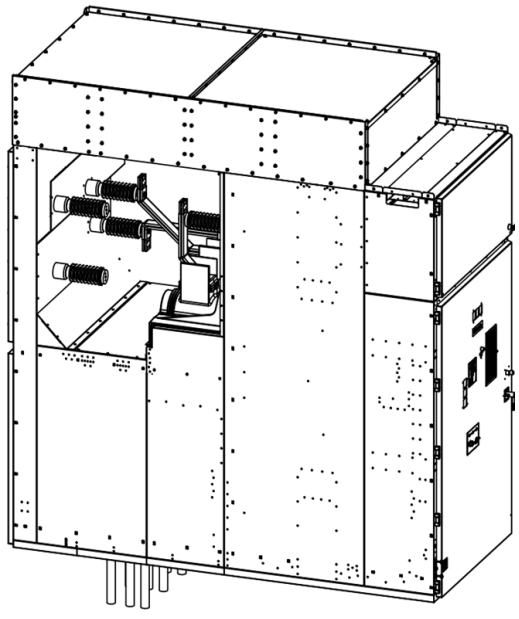
Rated current (A)	A. Length (mm)	C. Depth (mm)	B. Height (mm)
1250	1000 1200	2400 2600	2311
1600	1000 1200	2400 2600	2311
2000	1000 1200	2400 2600	2311
2500	1000 1200	2400 2600	2311
3150	1200	2600	2311

SWITCHGEAR TYPES

CR POWER 40.5kV



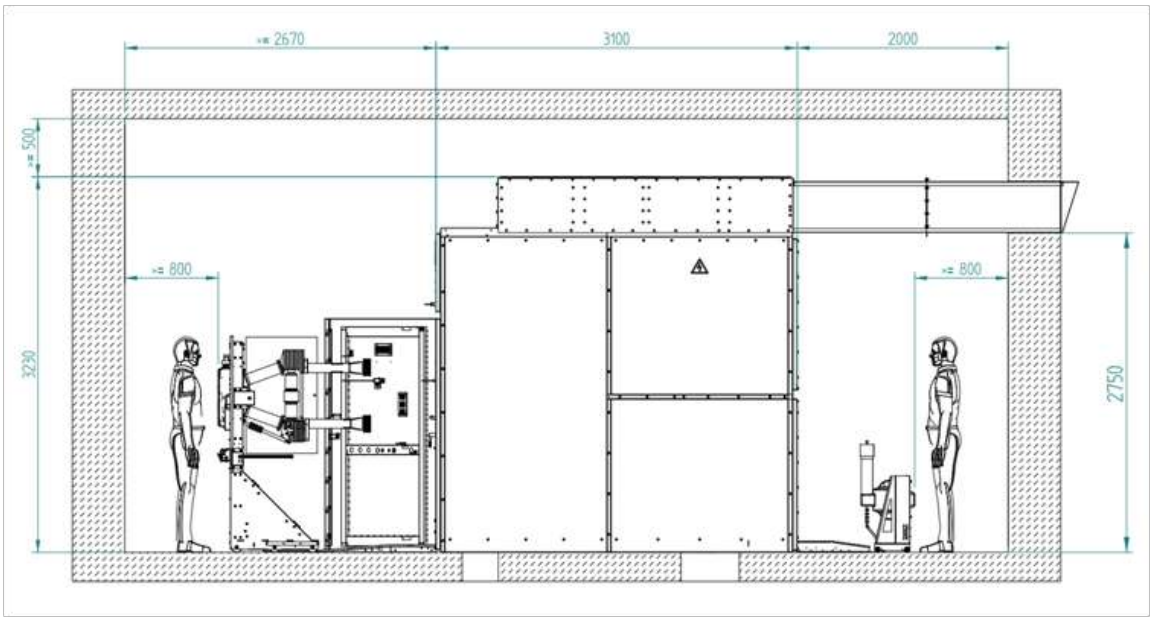




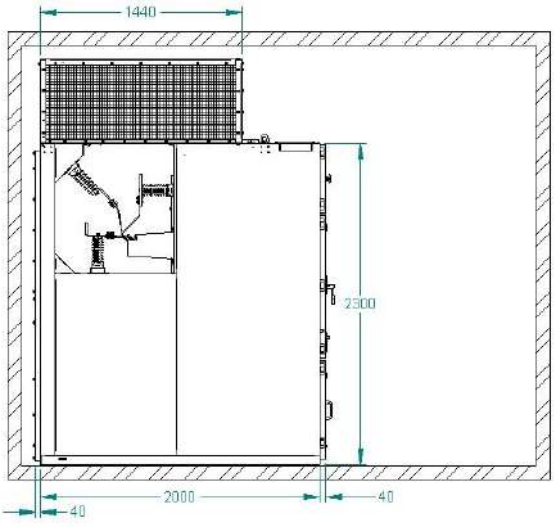
Rated current (A)	A. Length (mm)	C. Depth (mm)	B. Height (mm)	D. Estimated weight (kg)
1600	3100	1400	2790	2830
2500	3100	1400	2790	2830

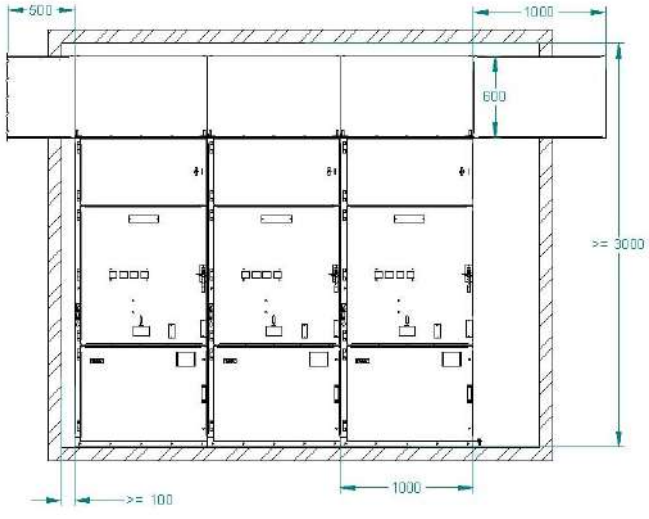
INSTALLATION ROOM

In the picture below there is an example of the CR POWER 36kV and 40.5kV. The side section of the electrical switchgear shows the main compartments, ensuring full front and rear accessibility for operation and maintenance. The design complies with minimum clearance requirements and allows safe, ergonomic access for operators within a controlled environment.

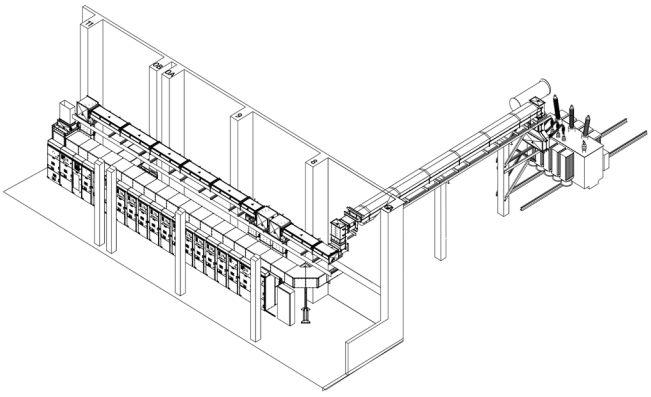


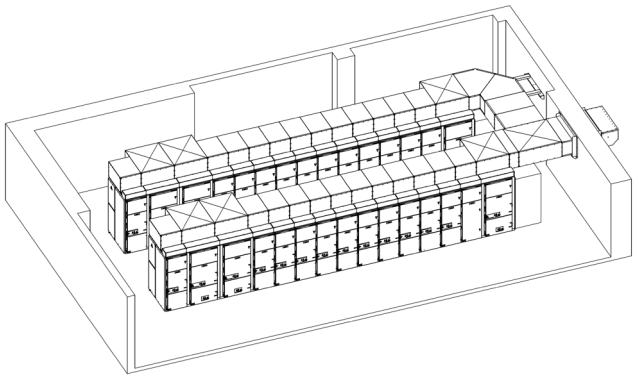
In the picture below, there is an example of front accessibility only, for operation and maintenance.
This configuration is available only for CR POWER 12kV 24kV and 36kV (ABB version).





In the picture below, it is an example of installation room for typicl indoor applications, like electrical systems, or thermal power plants. We can also carry out a reverse engineering work, and design switchgears for the revamping of an old plant, in order to enlarge its life cycle.





SWITCHGEAR CLASS

The various Loss of Continuity Service (LSC) categories, describe the possibility to keep the main circuit in service, or a part of it, in the event of a failure localized in a specific area.

CR POWER is an LSC-2B class, meaning that, the incoming high-voltage connections to the functional unit may be kept energized when any other accessible high-voltage compartment of the same unit is open. Moreover, medium-voltage parts are compartmented using metal partitions (PM class) which are connected to earth and which can be divided as follow:

- busbars;
- withdrawable components;
- MV connections, earthing switch, current sensors, and voltage transformers.

It is thus possible to access to the circuit breaker compartment, while the other compartments and/or functional units remain energized.

MAIN EQUIPMENT

CIRCUIT BREAKER

CR POWER can host SF6 gas-insulated or vacuum insulated circuit breakers for short-circuit interruption and for isolation of the systems connected to the panel. Circuit breakers have different voltage levels (up to 40.5kV), rated current (up to 2500A) and breaking capacity (up to 25kA). C.R. Technology Systems uses mostly circuit breakers of the main brands.
The circuit breaker compartment is equipped with a withdrawable truck where the circuit breaker is mounted. The same truck can also be fitted with phase-to-earth voltage transformers for busbar voltage measurement.

MEASUREMENT TRANSFORMERS AND SENSORS

Current and voltage transformers are insulated with epoxy resin, and they are used for various purposes, including plant protection. These transformers can have one or more cores with performance and precision classes suitable for the functional requirements of the instruments connected to them.
Moreover, voltage transformers can be installed on removable and withdrawable trucks. Current transformers or sensors are used to measure current.

PROTECTION RELAYS & COMMUNICATION PROTOCOLS

The digital protection relay, or numeric relay, uses a microprocessor to analyze power system voltages and currents for the purpose of detecting faults in an electric power system.
Protection relays are used to protect the feeder, transformer, generator, and other equipment. C.R. Technology Systems mostly uses protection relays of the main brands like ABB, Schneider Electric, Hitachi, Siemens, GE.

Digital protection relays have metering and communication protocol ports, allowing them to become an element in the SCADA system. Communication protocol ports may be MODBUS TCP/IP, RS485, IEC 61850 type. Integrating electrical panels within the SCADA system, combined with advanced sensors like our in-house developed wireless, battery-less PR.E.SE., ensures remote monitoring and enables predictive maintenance, significantly enhancing the reliability and efficiency of the entire installation.

DIGITALIZATION AND AUTOMATION SYSTEM

In an increasingly digital and interconnected energy landscape, the integration of intelligent monitoring and automation systems is essential to ensure safety, efficiency, and continuity.
C.R. Technology Systems develops advanced solutions that support the digital transformation of electrical plants, enabling real-time diagnostics, predictive maintenance, and faster fault recovery. By combining cutting-edge sensor technology with smart automation, our systems help reduce downtime, extend equipment lifespan, and optimize overall performance. These innovations are designed to meet the evolving needs of modern energy infrastructures, while remaining adaptable to future developments.
The following technologies represent our commitment to delivering reliable, scalable, and intelligent solutions for today's and tomorrow's power systems.

ARC-FAULT DETERCTORS

The fast detection system uses solely on an arc light signal or on arc light and overcurrent signals occurring simultaneously. In this way, it is possible to limit system faults and to isolate the fault point, thus guaranteeing a higher service continuity and a faster and more efficient system restoration. Combining the arc-sensor with the optional pressure sensor, it is possible to obtain a highly precise and punctual system.
Knowing the trigger point of the arc, the reconstruction process is more effective, and it can ensure the improvement of the plant and its loyalty.

PR.E.SE. SENSORS

PR.E.SE. solution (PRedictive Electrical SEnsors) permits a wireless constant monitoring of temperature of the electrical equipment, based on the RFID technology (Radio Frequency Identification) in UHF band.

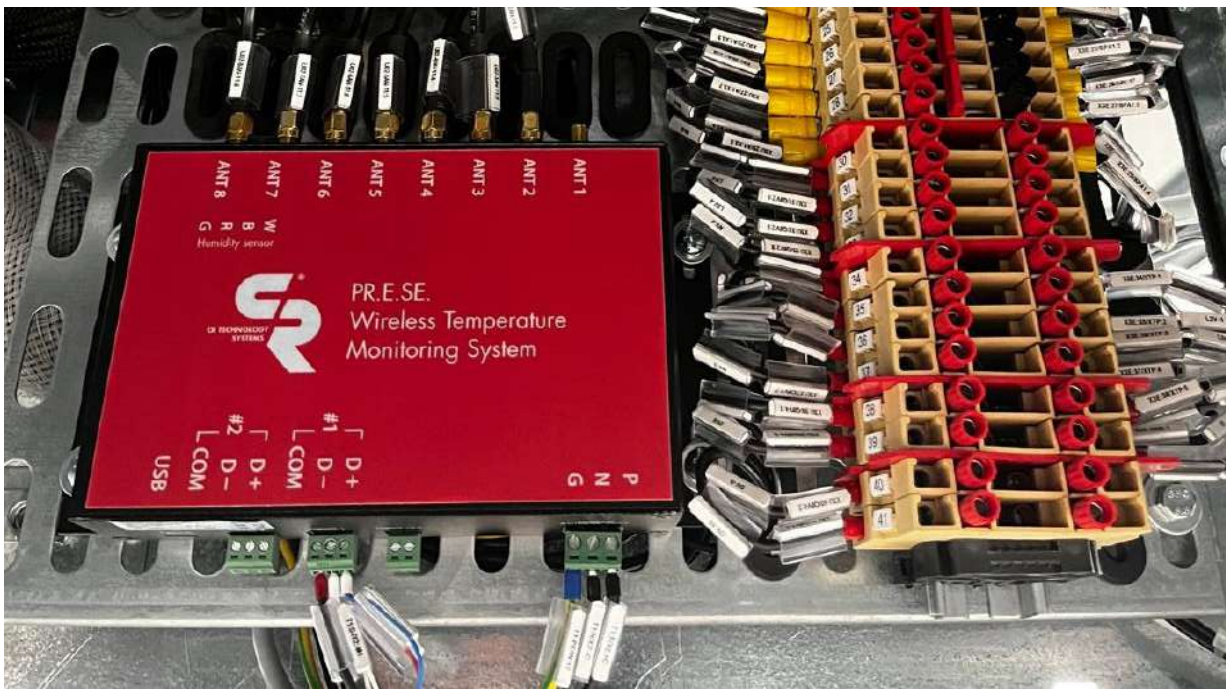
These sensors play an important role in the prevention of the overheating of electrical devices (critical temperature >120°C) due to overload, corrosion, loose connections and difficult environmental conditions and permit predictive maintenance of the electrical insulation.

The sensors allow improving the performance of the system and extending its life cycle. Their technical features have several advantages:

• Adaptable: tags can be applied to any type of surface and environment, and in any weather condition.

• Reliable: tags are battery-less and do not require maintenance after their application.

• Modularity: sensors are equipped with a modular and scalable architecture. A large number of uniquely addressable sensors can be applied.



SURGE ARRESTERS

It is an optional protection device used to safeguard equipment against external agents or lighting overvoltage transients. Surge arresters are typically installed and connected to wires (power phase line, signal line, zero line) and ground line.
In the event of direct or indirect lightning-induced overvoltage transients, it absorbs the surge current and safely discharges it to ground, preventing damage to people or property.

INTERNAL LIGHTING

The switchgear provided by C.R Technology Systems is equipped with a lighting system, which switches on automatically when the low-voltage panel door is opened, in order to facilitate maintenance operations.

SPACE HEATERS

Enclosure Heaters or Switchgear Space Heaters are designed to maintain temperature and minimize moisture inside electrical and mechanical equipment enclosure. They conveniently replace strip heaters or other less efficient heating devices.

MAIN BUSBAR

The main busbar is formed of insulated conductors of copper supported by insulators, which interconnect the loads and the sources of electric power.
On request it is possible to have the following versions of main busbar:

- Silvered copper;
- Tinned copper.

The main busbar system is placed inside the busduct and fixed by insulators, and are insulated through heat shrinkable sheath.
The busbar compartment contains the main busbar system of the power circuit. The main busbars (1) are connected to the fixed contacts of the bushings (2) through the upper branch connections (3).
Access to the busbar compartment from the rear of the unit is possible by first removing the external painted removable panel, followed by the internal removable panel.

TYPE TESTS

Type tests certifications are issued by a certifying authority, internationally recognized. They are carried out in independent, duly accredited test laboratories.
CR POWER certificates contain a record of a series of type tests carried out strictly in accordance with a recognized standard.

Rated Short-Circuit Current Test: Verification of the short-circuit level assigned by the manufacturer, including the review of design data, quality control, and inspection of various power system components in accordance with Clause 4, items e) to p) inclusive, and also item s) of IEC 62271–100:2008. The certification includes the necessary tests to demonstrate compliance as specified in Subclause 6.6 of IEC 62271-1:2017 and in Subclauses 6.6, 6.102 to 6.110, and 6.112 of IEC 62271–100:2008.

Dielectric Tests: Verification of the dielectric performance under short-circuit conditions, in accordance with Clause 4, item b) of IEC 62271–100:2008. The certification includes the required tests to demonstrate compliance with applicable voltage withstand requirements, including impulse, lightning, and switching tests, power frequency voltage tests (wet and dry), and radio interference voltage tests, as specified in Clauses 6.2 and 6.3 of IEC 62271–100:2008 and in accordance with IEC 60060-1:2010.

Temperature Rise Test: Verification of the temperature rise limits and measurement of the resistance of main circuits in a circuit breaker, in accordance with Subclause 4 d) of IEC 62271–100:2008. The certification includes the necessary tests to demonstrate compliance with Subclause 6.5 of IEC 62271-1:2017 and Subclauses 6.4 and 6.5 of IEC 62271–100:2008.

Internal Arc Resistance Test: Verification of personnel safety in the event of an internal arc fault. The applicable standard for switchgear rated from 1 kV up to 52 kV is IEC 62271-200:2011. The test must be performed on the complete equipment in use and carried out in each compartment of the switchgear and feeder containing the main circuits.

Three-Phase Short-Circuit Making Test: Verification of the short-circuit level on the main circuit and grounding circuits. To pass the test, the results for both circuits must match. The test is conducted in accordance with IEC 62271-200:2011 and IEC 62271-102:2003.

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FOCUS ON APPLICATIONS

CR POWER FOR E-HOUSE APPLICATION

CR POWER switchgears are also designed for eHouses, including switchrooms and compact substations.
C.R. Technology Systems studies and mnufactures connectiong-ready MV eHouse solutions.
It is a robust metallic structure, designed with factory-integrated equipment, for the efficient primary grid connection to Photovoltaic Plants, Battery Energy Storage Systems (BESS) and other applications. The eHouse is provided fully assembled, pre-configured, and commissioning-ready, ensuring fast deployment and minimizing installation time and risks.

Advantages:

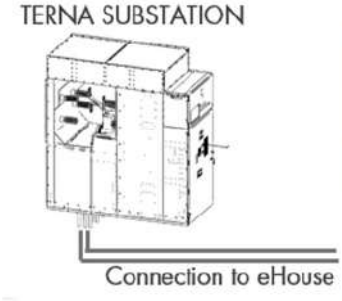
- Size upon request
- Customized internal configurations
- Resistant to elements and hostile environments
- Transportable by sea and land

For this product, please ask for the eHOUSE SWITCHROOM & CONTROL ROOM CATALOGUE.

CR POWER FOR TERNA RENEWABLE PROJECTS

Future Terna connections for new generation plants up to 125MVA for each system will require a 36kV service voltage point of connection.
We are official TERNA (Italian TSO) providers, with our MV Normal Clad switchgear 40.5kV, CR Power 40, currently under certification phase.

We provide switchgears for plug-in solutions, intended for the connection to our prefabricated metallic eHouse, equipped with MV 40.5kV switchgears, in compliance with Terna TSO standards.



CR POWER IP65 FOR MINING APPLICATION (UP TO 40.5kV)

The IP protection rating of the switchgear affects its ability to dissipate heat: The higher the protection rating, the lower the switchgear's capacity to release heat, resulting in increased internal temperatures. For this reason, it is advisable to select a protection rating appropriate to the installation environment. For mining operations and other dusty environments, switchgears with IP65 or IP54 ratings are recommended. An IP6X rating indicates that the device is completely protected against dust ingress, while an IPX5 rating means the switchgear is protected against low-pressure water jets from all directions.

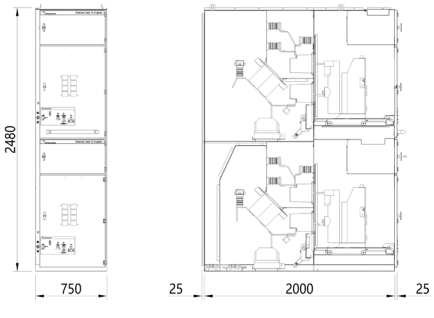
CR POWER DUPLEX

The Duplex switchgear is designed for applications with limited floor space but available vertical room, such as in naval environments.

Each panel includes two vertically stacked, independent and identical units, hosting three separate compartments esch: circuit breakers, busbars, and auxiliary services. Equipped with two circuit breakers per panel, it ensures maximum service continuity, making it ideal for systems that require redundancy, like large vessels where unscheduled maintenance is not an option.

In the central section, the panel includes a compartment for auxiliary instrumentation serving both units.

The switchgear is arc-resistant and includes a dedicated duct system to evacuate gases from internal arc faults. Each upper unit compartment has a top-mounted deflector that opens under pressure, directing gases into the duct.



CR POWER 40.5kV FOR STEELWORKS

The 40.5 kV switchgear is used for steel mill furnaces and is mounted on an anti-vibration base. It features an IP5X protection rating, making it suitable for operation in environments affected by contamination from ferrous dust and corrosive gases. In many high-energy-consuming industries, it is critical to keep all equipment operational. For example, in steel plants, service interruptions are unacceptable, as they can result in losses amounting to millions of euros due to the shutdown of the entire facility.

Thanks to its know-how and many years of experience, C.R. Technology Systems is capable of manufacturing sophisticated and reliable 40.5 kV metal-clad switchgear. This solution requires minimal maintenance and is designed to meet demanding mechanical and electrical performance requirements.

With voltage ratings up to 40.5 kV and load currents up to 4000 A, this switchgear ensures reliable power supply and continuous plant operation.

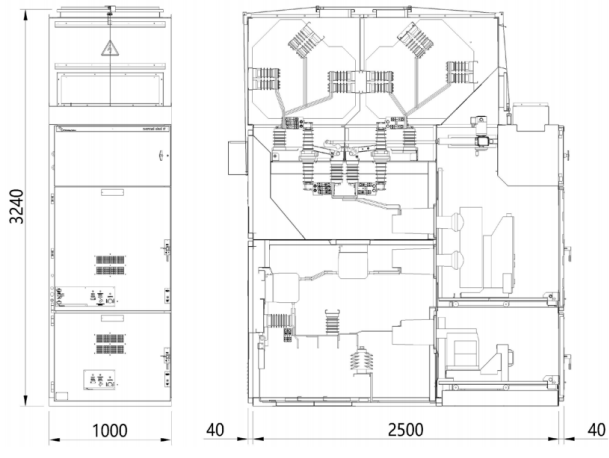
The circuit breaker compartment is designed to accommodate the breaker, contactor, or link, along with the corresponding withdrawable truck and all mechanical components required for extraction. Breaker isolation can be remotely controlled. In case of motorized operation, insertion and withdrawal can also be performed remotely. Moreover, the breaker supports a high number of operations, approximately 120,000 throughout its service life. The switchgear is equipped with auxiliary switches for signaling the "connected position" and the "disconnected/test position."

DOUBLE BUSBAR SWITCHGEAR

The air-insulated switchgear (AIS) with a double busbar system can operate at voltages up to 24kV. It is used in applications where enhanced service continuity is required, such as large substations, electric utility companies, or heavy industries. This type of switchgear is also recommended in the following scenarios:

- Isolation of specific feeder cells from the network
- Load balancing of feeder cells across two busbar systems during normal operating conditions
- Flexibility during inspection and maintenance procedures without load interruption
- Free access to one of the two busbar systems during maintenance operations while the other remains in service
- Maintenance and testing of the circuit breaker without deactivating the feeder cell
- Reduced need for switching components and devices

Each cell consists of four independent compartments: apparatus, duct 1, duct 2, and cables. Metallic segregation is provided between each compartment. Upon request, the double busbar switchgear can be supplied with a duct for evacuating gases generated by internal arc faults.



C.R. TECHNOLOGY SYSTEMS
YOUR PARTNER FOR CONNECTING THE POWER

Worldwide projects

Engineering

Export expertise

Manufacturing

One reliable interlocutor

Connection-ready solutions

Automation system integration

#GreenAttitude

+4.5GW BESS and +4GW PV plants connected to our Switchroom

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