

Medium Voltage Switchgear



Switchgear

We develop flexible and sustainable solutions. Our teams work worldwide, offering a comprehensive service.

Brief description

The Switchgear area develops solutions for safe distribution of electric power at medium voltage, operating in primary and secondary distribution and providing MV / LV Transformer stations. We offer a comprehensive portfolio that includes design, manufacturing, testing and supply.

Switchgear has an industrial presence in Portugal, Spain, India, Czechia, and Argentina, with its own sales teams and the support of a network of agents, distributors, and partners.

Offer portfolio

- **Primary distribution:** medium voltage withdrawable switchgear solutions (up to 36 kV; 4000 A; 50 kA).

For critical applications, we have a range of primary distribution solutions suitable for the customer's most demanding needs. These include air-insulated switchgear equipped with withdrawable circuit breakers and outdoor solutions.

- **Secondary distribution:** AIS and GIS solutions for modular (up to 36 kV; 1250 A; 20 kA) and compact (up to 36 kV; 630 A; 20 kA) frames.

We keep in mind future trends, including the products without any F-gas as well as the demand for efficient and modular solutions, providing secondary distribution assets for any location and environmental conditions, such as gas-insulated (RMU) or air-insulated cubicles with several available features.

- **Transformation stations:** turnkey solutions for energy distribution (up to 36 kV; 2500 kVA).

Currently used in the field of renewable energy, transformation stations incorporate most of the assets developed by Efacec, allowing quick commissioning as well as easy integration in either an urban or rural environment. These solutions have evolved in keeping with the smart concept.

QES certifications

Argentina

ISO 9001:2015 (Quality)

Czech Republic

ISO 9001:2015 (Quality)

ISO 14001: 2015 (Environment)

ISO 45001: 2018 (Safety)

India

ISO 9001:2015 (Quality)

ISO 14001: 2015 (Environment)

ISO 45001: 2018 (Safety)

Portugal

ISO 9001:2015 (Quality)

ISO 14001: 2015 (Environment)

ISO 45001: 2018 (Safety)

Spain

ISO 9001:2015 (Quality)

QES certifications

Colombia: RETIE Certifications

Main geographies

Portugal, Spain, France, Italy, Czechia, Argentina, Morocco, Algeria, Saudi Arabia, Qatar, UAE, Australia



Solutions & Service

Overview

Efacec has the expertise of more than 70 years developing, producing, installing, rehabilitating and maintaining medium and high voltage installations.

All technical means available leverage the capacity of Efacec, associated to highly qualified and specialised teams in this type of installations. Customers are provided with highly reliable and available systems resulting on economic profits and a more competitive business.

Remodelling/Rehabilitation

High voltage

- Reconditioning of HV circuit-breakers and sectionalizers;
- Adapting/remodelling of high voltage installations, with the replacement of:
 - Conductive parts of sectionalizers;
 - Old sectionaliser commands by up-to-date electrical commands;
 - Earth sectionalizers;
 - Re-electrification of the circuit breaker commands;
 - Mobile parts of extractable parts with circuit breakers and last generation transformers.

Medium voltage

- Replacement of end-of-life circuit breakers by today's technology circuit-breakers (air cut, DIVAC circuit-breaker) by adapting them to Efacec panels and others;
- Development of adapting cells between different cells;
- Remodelling command and protection systems;
- Deployment of safety systems using lock and/or padlock;
- Installation of internal arc detection.

Commissioning

- Assembly of circuit-breakers, sectionaliser and HV draw-out units;
- Tuning, tests and commissioning;
- Assembly of medium voltage equipment;
- Protection relays setting and testing;
- Site acceptance tests and commissioning.

Maintenance

Efacec has the proprietary know-how of multiple Efacec and third-party equipment and systems, covering a high level of technical areas and is entitled to supply a complete service, including total or part of overall maintenance contracts of medium and high voltage, at the power production centres, transport, distribution and industry.

After-sales service

The know-how and the experience of more than 60 years of field activity enable us to play a leader role in domestic market and be a reference in the international market, supplying a very qualified service to our clients.

We develop systems of power management and power efficiency, focusing on how to use power by the clients, improving quality and reducing costs.



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Switchgear Area

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Withdrawable Metal-clad Switchgear

Primary Distribution

Overview

The QBN7 is a Medium Voltage Air Insulated Switchgear, constructed on a modular design with metallic partitions, making it easy to extend with more feeders.

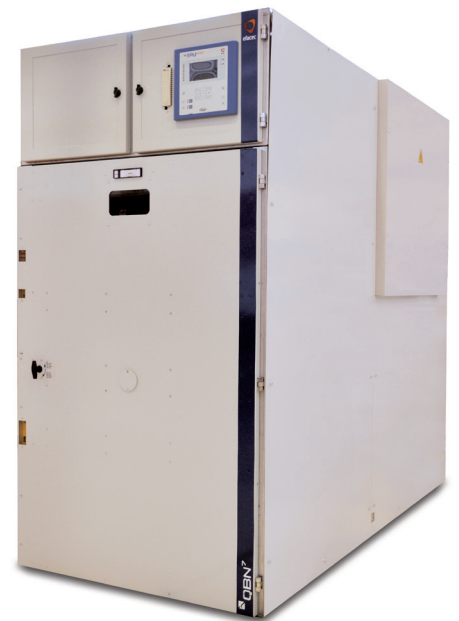
The installation area required is quite small, but without compromising the operational safety or easy access for maintenance.

The standard operation of the equipment is exclusively carried-out from the front and the need to access it from the rear is limited to the connection of the MV cables.

The construction of QBN7 switchgear is internal arc resistant in accordance with IEC 62271-200, PM type, A FLR accessibility, for the protection of personnel and other equipment.

The cubicles are fitted with DIVAC withdrawable vacuum circuit breakers, with high electrical and mechanical performance in accordance with IEC 62271-100, E3 and M2 classes.

Always in the forefront of the most demanding performances, the QBN7 range has already reached 31.5 kA.



Characteristics

- Modular construction
- Extendable
- Small installation area
- Operational simplicity
- Exclusively operated from the front
- Internal arc resistant
- Equipped with a vacuum circuit breaker with high electric and mechanical life (E3 and M2 classes)
- Reliable and requires little maintenance
- Insertion/extraction of the circuit breaker with the compartment door closed
- Several optional equipment as specified by the customer

Electrical characteristics

Rated voltage	36 kV		
Insulation level	170 kV		
Lightning impulse	70 kV / 1 min		
Power frequency			
Frequency	50 Hz / 60 Hz		
Rated busbar current	630 up to 3150 A		
Rated tee-off current	630 up to 3150 A		
Peak current	40 kAp	63 kAp	80 kAp
Rated short-time current	16 kA / 3 s	25 kA / 3 s	31.5 kA / 3 s

Mechanical characteristics

Protection degree (IEC 60529)	IP3X (IP41 upon request)		
Standard color	RAL 7035		

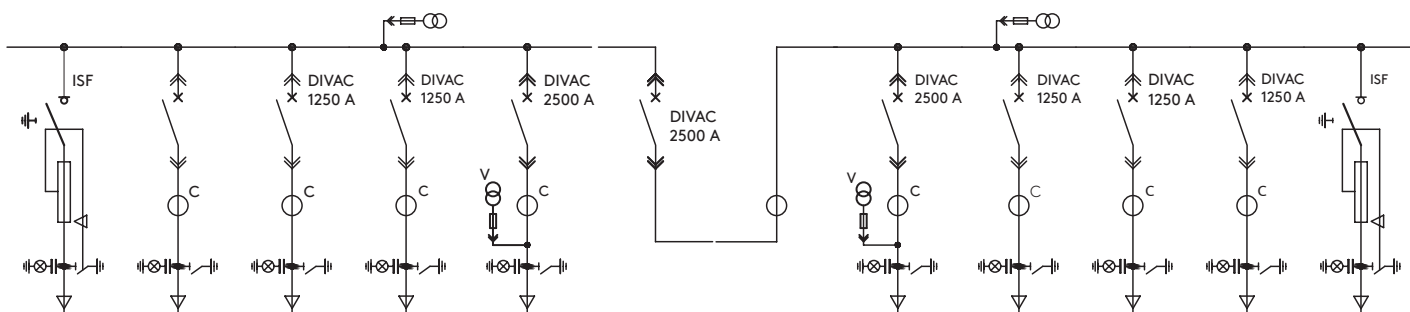
Normal service conditions

Ambient temperature	Basic: - 5 °C / + 40 °C Option: - 10 °C / + 55 °C		
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Dimensions mm

Height	2250		
Depth	2570		
Width			
Tee-off current up to 1250 A	1000		
Tee-off current up to 2500 A	1300		

Standard features



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CS243I/410F1

Withdrawable Metal-clad Switchgear Primary Distribution

Overview

The Normacel range includes Medium Voltage Switchgear with air-insulation and modular construction that is metal-clad and easily extendable.

The installation area required is quite small, without compromising operational simplicity and accessibility for maintenance.

The construction of Normacel switchgear is internal arc resistant in accordance with IEC 62271-200, PM type, A FLR accessibility, for the protection of personnel and other equipment.

Cubicles are equipped with DIVAC-type withdrawable vacuum circuit breakers, with high electrical and mechanical performance in accordance with IEC 62271-200, E3 and M2 classes.

With this product range, development is carried out to keep with the customer's specific needs for each application.



Characteristics

- Modular construction
- Extendable
- Small installation area
- Operational simplicity
- Exclusively operated from the front
- Internal arc resistant
- Equipped with a vacuum circuit breaker with high electric and mechanical life (E3 and M2 classes)
- Reliable and requires little maintenance
- Insertion/extraction of the circuit breaker with the compartment door closed
- Several optional equipment as specified by the customer

Electrical characteristics

Rated voltage	12 kV	17.5 kV	24 kV
Insulation level			
Impulse (1.2 / 50 ms)	75 kVp (95 kVp)	95 kVp	125 kV
Power frequency (50 Hz / 1 min)	28 kV	38 kV	50 kV
Frequency	50 Hz / 60 Hz		
Rated current	630 up to 4000 A		
Peak current	up to 125 kAp	up to 100 kAp	up to 63 kAp
Rated short-time current	up to 50 kA / 3 s	up to 40 kA / 3 s	up to 25 kA / 3 s

Mechanical characteristics

Protection degree (IEC 60529)	IP3X or IP41
Standard color	RAL 7035

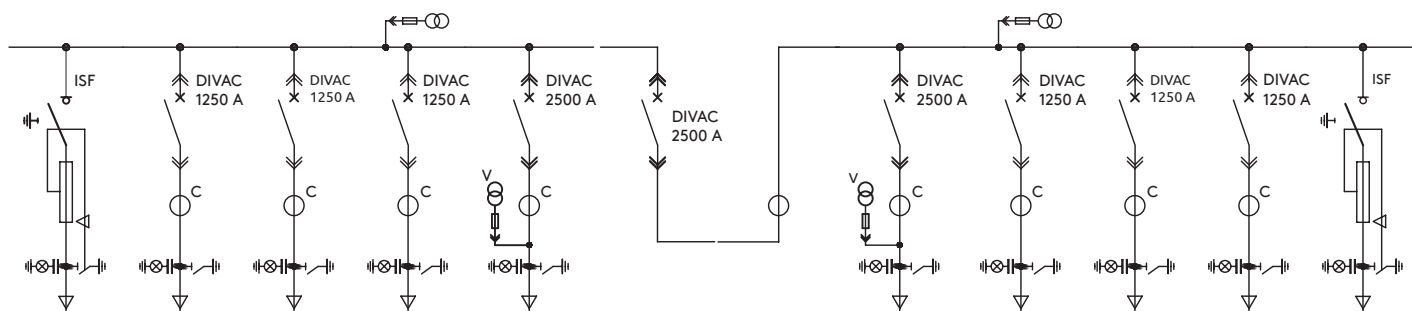
Normal service conditions

Ambient temperature	Basic: - 5 °C / + 40 °C Option: - 10 °C / + 55 °C
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Dimensions mm

Height			
< 1250 A	2120	2120	2350
> 1600 A	2250	2250	2350
Depth	1560	1560	1650
Width			
< 1250 A; < 25 kA	600	700	800
< 1250 A; < 50 kA	N/A	750	N/A
2500 A	750	850	900
3150 A / 4000 A	N/A	1000	1200

Composition



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CS2431/410F1

Medium Voltage Circuit Breakers

Primary Distribution

Overview

Fifty years of technological development have allowed Efacec Switchgear to present this equipment. Divac is a three-pole indoor circuit breaker with vacuum technology. This solution, among many other applications, is used by our Primary Distribution product ranges, such as the Normacel and QBN7 solutions.

With reduced dimensions, the Divac achieves excellent electrical and mechanical performances, requiring low energy to perform closing and opening operations.



Characteristics

- Safe and reliable
- Compact design
- Ideal for all medium voltage applications
- Excellent dielectric properties
- Excellent arc extinguishing properties
- Easy to install
- Easy switching operation
- High electric and mechanical life
- Maintenance free
- Several options available

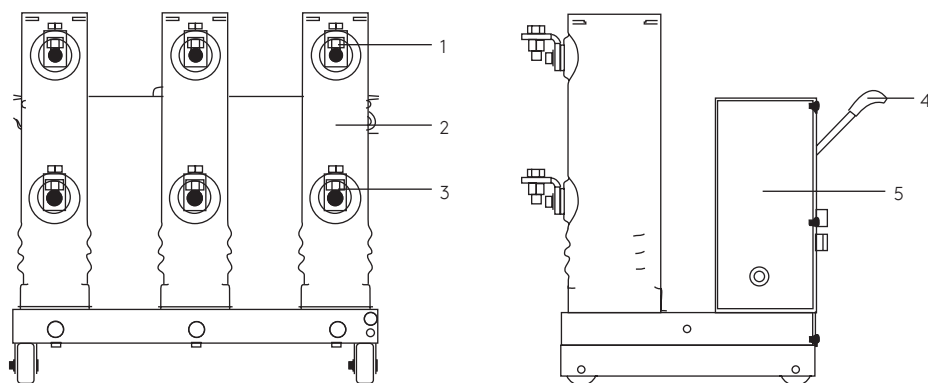
Electrical characteristics

Rated voltage	12kV	17.5kV	24kV	36 kV
Rated short-time current	50kA/3s	40kA/3s	25kA/3s	31.5 kA/3s
Rated current	3150A		2500A	
Rated operating sequence	O-0.3s-CO-15s-CO			
Spring reset time	<15 s			

Mechanical characteristics

Standard colour	RAL 7035			
Applicable standards	IEC 62271-100 IEC 62271-1 IEC 60056 ANSI IEEE C37.09 GOST			

Standard features



Description:

1. High current tap
2. Pole with vacuum bulb
3. Low current tap
4. Reset lever
5. Control mechanism

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Modular Switchgear Secondary Distribution

Overview

Air-insulated modular switchgear suitable for medium voltage networks as well as industries and other applications, allowing for high adaptability and customisable configuration based on project requirements. Cubicles are entirely manufactured in steel sheet, comprising modular units equipped with several features such as the inclusion of switches, circuit breakers and several other options.

This product is available up to 36 kV covering a wide range of solutions to suit various world markets in the field of distribution of electrical energy. As well as providing multiple solutions, it has features that allow for an easy expansion of previously installed MV switchgear.



Electrical characteristics

Rated voltage	12 kV	17.5 kV	24 kV	36 kV
Insulation level	28 / 75 kV	38 / 95 kV	50 / 125 kV	70 / 170 kV
Rated current	630 / 1250 A			
Short-time withstand current	16 kA / 3 s; 20 kA / 1 s			

Dimensions mm

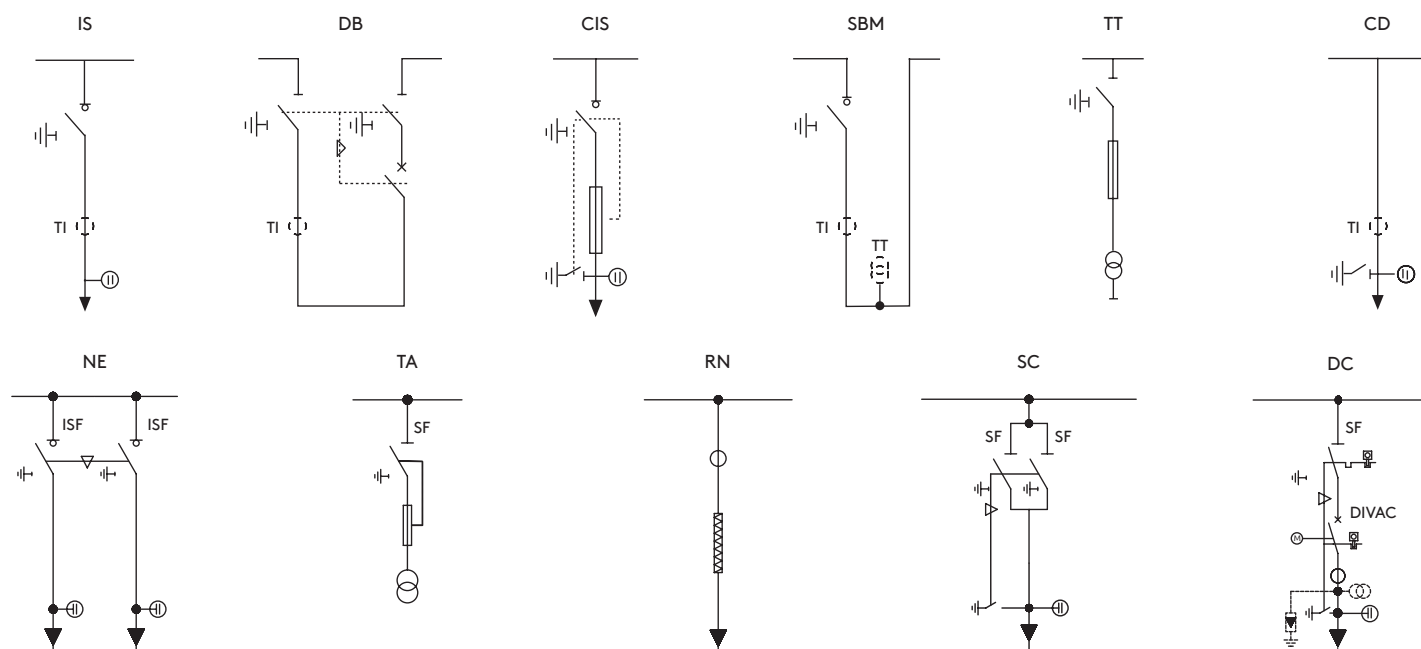
Height	1575	2010
Depth	860	1155
Width	375 / 500 / 750 / 1000	600 / 1200

Note: Dimensions are for reference purposes only.

Characteristics

- Air-insulated modular switchgear
- Equipped with an SF₆ load break switch
- Protection by fuses or circuit breaker
- Modular construction
- Easy to install and expand
- Developed in accordance with International Standard IEC 62271-200
- Internal arc resistant
- High electric and mechanical life (E3 and M2 classes)
- Thermal imaging is available (optional)

Standard features



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Compact & Modular Switchgear Secondary Distribution

Overview

This solution has modular and compact cubicles with full SF₆ insulation for medium voltage networks up to 36 kV. It is a modular solution for easy installation due to its dimensions and weight.

Operational safety is ensured by tests carried out in conformity with the most demanding standards, including the construction and weather resistance of the solutions. This solution allows for numerous configurations as well as the incorporation of several options to keep with the demands of the customer.

The reduced dimensions allow for installation in compact substations. Available with up to 5 functions in a single stainless steel hermetically isolated tank, which ensures the protection of its active components against harsh environments.

It is available in a compact version that minimises on-site work and a modular version that maximises different function settings.



Electrical characteristics

Rated voltage	12 kV	17.5 kV	24 kV	36 kV
Insulation level				
Impulse (1.2 / 50 ms)	75 kVp	95 kVp	125 kVp	170 kVp
Power frequency (50 Hz / 1 min)	28 kV	38 kV	50 kV	70 kV
Rated current	up to 630 A			
Short-time withstand current	16 kA / 3 s; 20 kA / 1 s			
Temperature	-25 °C / + 40 °C (others, upon request)			

Dimensions mm

Height	1275	1728
Depth	727	900
Width	375 / 450 / 750	450 / 1000

Mechanical characteristics

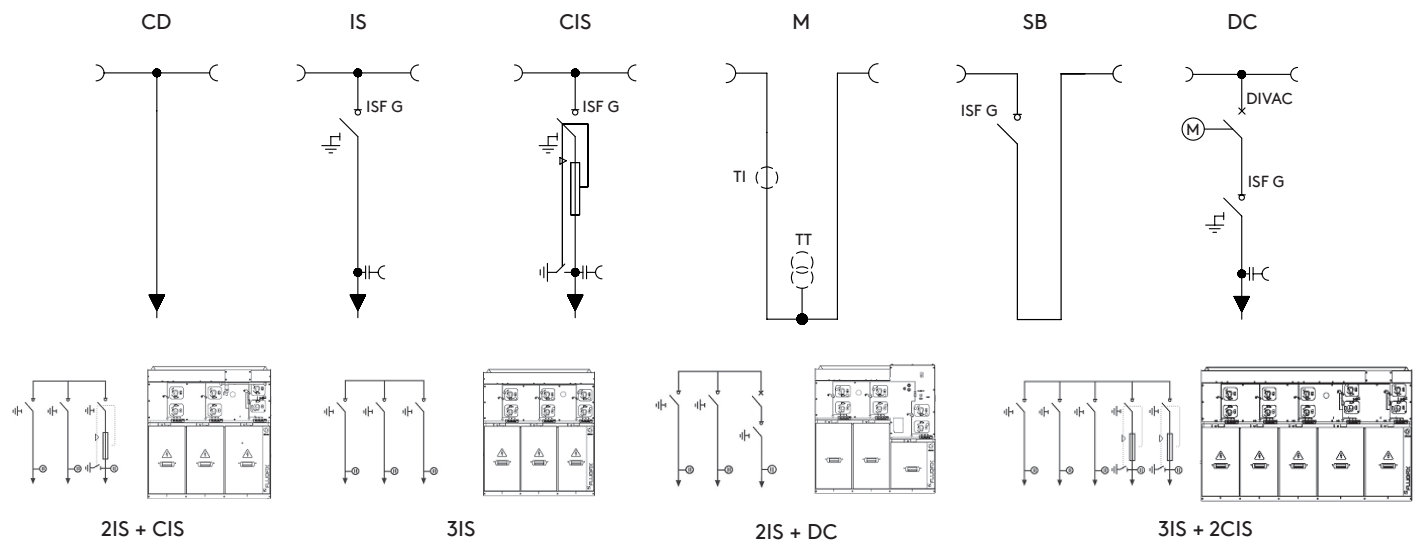
Protection degrees	IP67 (for the medium voltage compartment)
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Note: Dimensions are for reference purposes only.

Characteristics

- Compact switchgear with SF₆ insulation
- Equipped with an SF₆ load break switch
- Equipped with a vacuum circuit breaker
- Developed in accordance with International Standard IEC 62271-200
- Unaffected by weather conditions
- Compact or modular version
- Internal arc resistant
- High electric and mechanical life (E3 and M2 classes)
- Stainless steel tank

Standard features



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Outdoor Pole-mounted Recloser Secondary Distribution

Overview

Revac was designed to integrate an automated power distribution system. Reliability on distribution network is enhanced when integrating this equipment. Failures can be detected and isolated by the device and the network can be reconfigured from the control centre or based on distributed intelligence. This type of technology enables to increase the service quality and to reduce the cost associated to outages and line-crew dispatch.

Revac has three poles, each one with the corresponding vacuum interrupter in an epoxy casing. Each pole has its own actuator mechanically connected by an axis that assures the synchronisation between them. A lever outside the equipment enables to trip manually.

Revac circuit breakers, developed to operate outdoors (pole mounted), were designed to face all environment conditions, easily assembled and easy to use.



Technical data				
Rated voltage	12 kV	17.5 kV	27 kV	36 kV
Rated current	630 A			
Frequency	50 / 60 Hz			
Short-time short-circuit current	12.5 kA (3s)			
Impulse insulation level (1.2 / 50 μs)	75 kV	95 kV	125 kV	150 kV
Short-circuit making current	31.5 kAp			
Breaking capacity	12.5 kA			
Auxiliary voltage supply	48 Vcc / 110 Vca / 220 Vca			
Applicable standards	IEC 62271-111 / IEEE C37.60 / IEC 62271-1			
Weight (kg)	145		160	
Dimensions (mm)				
Width	735		750	
Height	784		850	
Depth	885		885	

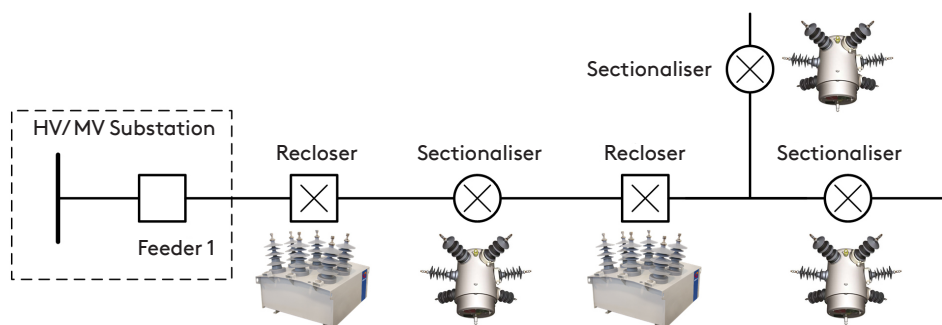
Characteristics

- Flexible
- Reliable
- Remotely controlled
- Long service life (10 000 mechanical manoeuvres)
- Ideal for adverse environmental conditions
- Compact equipment design
- Simple and flexible installation
- Adapted to any type of pole assemblies
- Few mechanical parts, minimal maintenance
- Prepared for smart automation of distribution networks

Controller

The Revac is equipped with a RCU 220E controller that targets protection and control of distribution assets together with conventional RTU-functionality.

The RCU 220 provides not only reclosing function but also feeder isolation and restoration algorithms for loop/ring configurations. The automatic loop restoration control function has the advantage of not requiring communication capabilities to isolate faulty sections and restore power to unaffected segments.



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CS2431/1410F1

Outdoor Pole-mounted Load Break Switch

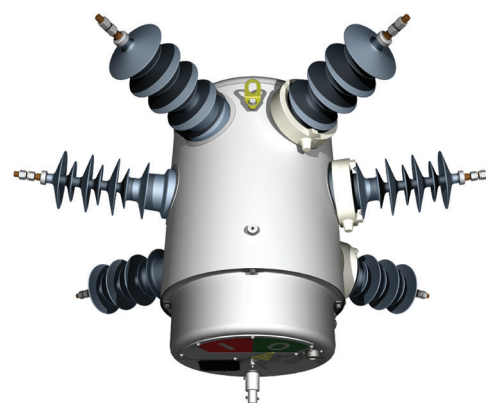
Secondary Distribution

Overview

Iats is an SF₆ load break switch for pole-mounting. All live parts are protected against environmental hazards inside an SF₆-filled compartment. The switch is sealed for life in a stainless steel tank.

Iats was designed to be used outdoors, in power distribution facilities, under the most extreme conditions. This equipment is particularly suitable for industrial (dust, sand), tropical, arid and saline environments. It can be used at altitudes above 1000 m of altitude.

Iats is assembled and tested according to standard IEC 60265. The increasing demands regarding people and equipment protection are taken into consideration by Efacec switchgear area during the development and design of this equipment.



Electrical characteristics

Rated voltage	12 kV	17.5 kV	24 kV	36 kV
Level of insulation				
Lightning impulse (wave 1,2 / 50 ms)	75 kVp	95 kVp	125 kVp	170 kVp
Power frequency (50 Hz / 1 min)	28 Kv	38 Kv	50 Kv	70 Kv
Rated current	400 A or 630 A			
Short-time short-circuit current	12.5 kA / 3 s; 16 kA / 3 s			
Short circuit making current	31.5 / 40 kA			
Breaking current: mainly active load	630 A			
Breaking current: closed loop	630 A			
Breaking current: cable charging	25 A			
Ambient temperature	- 25 °C / + 40 °C (others, upon request)			
Mechanical endurance	2.000 operations			

Mechanical characteristics

Protection degrees (IEC 60529 y EN 50102)	IP54 (mechanism compartments) IP67 (MV compartments)
Standards	IEC60265 HN 64 S46

Characteristics

- Reliable
- Compact and light
- Suitable for all kinds of poles
- Ideal for extreme weather conditions
- Not hazardous to the environment
- Easy to install
- Easy to operate
- Remote control and monitoring via radio
- Simple and safe (mechanical and electric) interlocks
- High electric and mechanical life
- Maintenance free
- Several options available

Controller

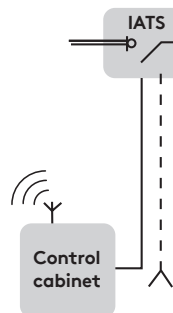


Command centre

- SCADA
- Microprocessor
- Control unit
- Computers
- Radio
- Modem
- Antenna

Control cabinet

- Local pushbuttons
- Local/remote
- Battery and battery charger
- Heat resistant
- Microprocessor
- Remote control unit
- Signal inputs / outputs
- Radio
- Modem
- Antenna
- Fault detection relay

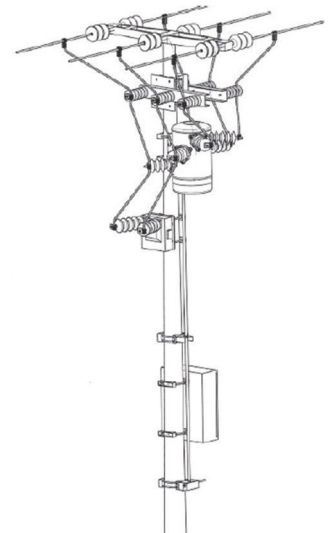


SF₆ load break switch

- Motor
- Transformers
- SF₆ low pressure alarm

Mechanical actuator

- Switching lever
- Interlocks



Example of IATS



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Transformation Stations

Overview

Pucbet is a compact substation designed for outdoor installation. In order to meet the specific needs of each project and each customer, several configurations of PUCBET are available in several models of existing concrete buildings.

The several available concrete buildings allow for various equipment combinations. It is possible to install dry or oil-immersed power transformers / converters and also to install medium voltage equipment, either air-insulated or full SF₆-insulated equipment.

Pucbet is a precast building with dimensions that make it possible to implement any medium voltage electrical arrangement, perfectly adapting to the various uses and needs of the customer in scope of both public and private distribution.

The high reliability and resistance of this equipment is ensured by the quality of the reinforced concrete, which provides a resistance higher than 300 kg/cm² and full impermeability. It should be stressed the importance of the concrete shell's very high mechanical resistance, since the sites where this type of equipment is installed are, most of the times, accessible to the public and not fenced.



Electrical characteristics

Medium voltage	up to 36 kV – 50 Hz	
Low voltage	up to 1000 V	
Normafix	Check respective specifications	
Fluofix	Check respective specifications	
Transformer	Rated voltage up to 36 kV	Power up to 1600 kVA*1

Mechanical characteristics

Standard colours*2	Wall frames/ironwork : RAL 1015					
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Dimensions mm

Model	PBT-3500	PBT-4500	PBT-5500	PBT-6500	PBT-7500	PBT-8500
Depth	2520	2520	2520	2520	2520	2520
Width	3500	4500	5500	6500	7500	8500
Height	2600	2600	2600	2600	2600	2600

Mass _T

Weight (without transformer)	14	18	20	23	27	30
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*1 Further options upon request

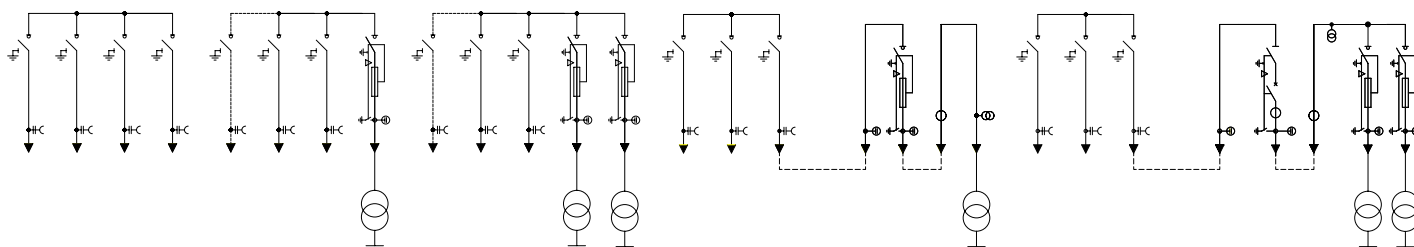
*2 Others upon request

- Buildings with different width upon request
- The presented solutions are subject to possible changes

Characteristics

- Follows all applicable standards and regulations, ensuring a full operational safety
- Manufactured in highly resistant and fully impermeable reinforced concrete
- Allows for the use of any type of cladding and outer coating
- Ventilation windows and grids in painted and galvanised steel
- Resistant to the most extreme weather conditions and tested for seismic environments
- Simple to integrate in rural and urban environments
- Great flexibility in the use of inner space
- Adapted to several kinds of equipment (public and private)
- Easy to transport and assemble
- Low construction cost
- Short delivery times
- Turnkey solution
- Power converters (inverters) for renewable energies

Standard features



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Transformation Stations

Overview

Pucmet is a compact substation designed for outdoor installation. Its small dimensions allow for optimal transport costs as well as the required installation space.

Made in welded construction, this building has the following compartments that are fully segregated:

- Compartment for medium voltage cubicles, prepared for Efacec Switchgear's Normafix and Fluofix equipment
- Compartment for distribution transformers
- Compartment for the low voltage distribution board



Electrical characteristics

Medium voltage	up to 36 kV	
Low voltage	up to 1000 V	
Normafix	Check respective specifications	
Fluofix	Check respective specifications	
Transformer	Rated voltage up to 36 kV	Power up to 1600 kVA
Earth circuit	Earth protection circuit – 20x1 copper tape with 20 mm ² section Earth service circuit – insulated copper tape with 35 mm ² section	

Mechanical characteristics

Protection degree (IEC 60529 & EN 50102)	All compartments (MV, LV and Transf.) possess IP 35D	
Standard colour *1	RAL 7032	

Dimensions mm

Model	PUC 3F 630	PUC 4F 1000	PUC 5RC 630	PUC 3F 1000 (36)	PUC 4F 1000 (36)	PUC 5F 1000 (36)
Depth	1600	2250	2250	2250	2250	2250
Width	3350	3350	2850	3350	5000	5600
Height	1930	2040	1930	2335	2335	2335

Mass _T

Weight (without transformer)	1240	1710	1555	2015	2880	3305
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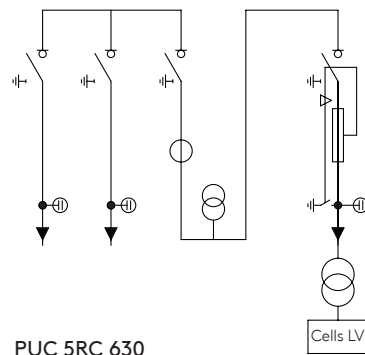
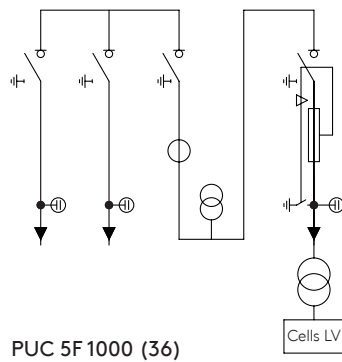
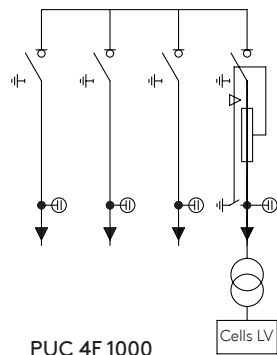
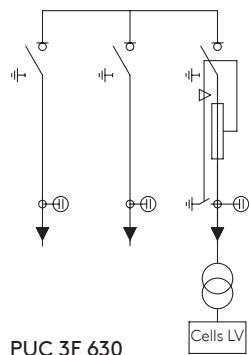
*1 Others upon request

- Buildings with different dimensions upon request
- Solution of larger power upon request
- The presented solutions are subject to possible changes

Characteristics

- Certified by KEMA
- Fully tested in the factory
- Completely manufactured in stainless steel (optionally in zincor)
- Resistant to extreme environments – protected against corrosion
- Special anti-condensation ventilation system
- Simple to integrate in rural and urban environments
- High flexibility in the distribution of inner space
- Adapted to several types of equipment (public and private)
- Easy to transport (20 or 40-feet containers) and assemble
- Small installation area
- Low maintenance
- Anti-vandal protection
- Low construction cost
- Short delivery times
- Turnkey solution

Standard features



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