NORMAFIX

Modular Distribution Switchgear

Air-insulated

efacec

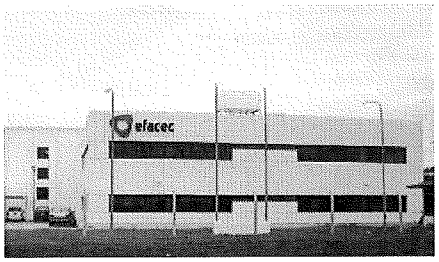
Efacec Switchgear

Efacec Switchgear is a Business Unit part of the Efacec Group, leader in Portugal and a worldwide reference in the development of solutions for Generation, Transmission, Distribution and Use of Electrical Power in High and Medium Voltage.
It has highly experienced teams dedicated to the development of high and medium voltage switchgear by using advanced 3D modeling software and virtual simulation of the equipment's behavior under real conditions and operating limits. It implemented a thorough quality system focused on the continuous improvement of manufacturing processes and equipments. In order to meet the highest standards of industrial manufacturing, Efacec Switchgear presents:

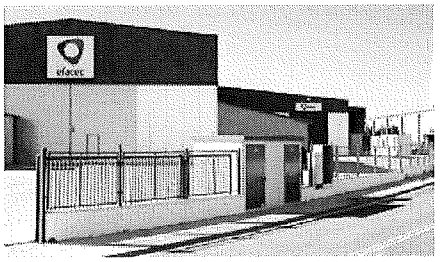
- Flexible production lines, integrated with advanced technology, in order to increase efficiency and ensure high quality standards;
- Internal laboratory for development tests and type tests;
- Rigorous planning, production and logistical processes, in order to improve response capability;
- Flexibility in adapting our product ranges to the most varied and demanding market needs;
- Equipment certified in independent international laboratories.

We are audited and certified by the most exacting quality standards and management: ISO 9001; ISO 14001; OHSAS 18001 and also certified according to the benchmark for Research, Development and Innovation NP 4457: 2007.

With a wide and complete portfolio of High and Medium Voltage products, Efacec Switchgear is recognized for its expertise in terms of flexible and custom-made solutions and products, and the ability to understand the customer's needs and offer appropriate solutions for each project.

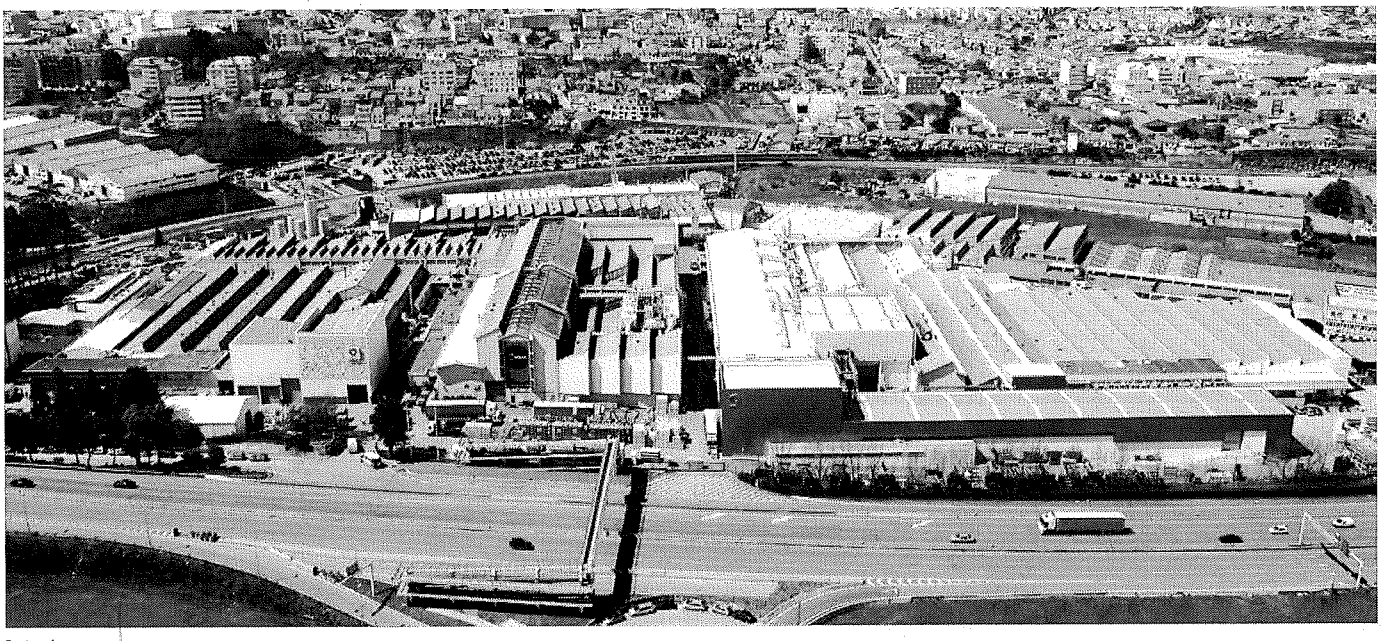


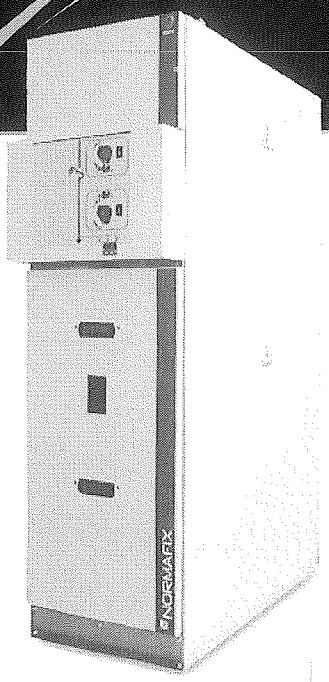
Argentina



Spain

India


Portugal



Description

The **Normafix** unit is part of a range of indoor, air-insulated modular cells for use in Secondary Distribution ranging from power generation (wind, photovoltaic, among others) to electric power distribution for several industries and applications.

Typical applications include:

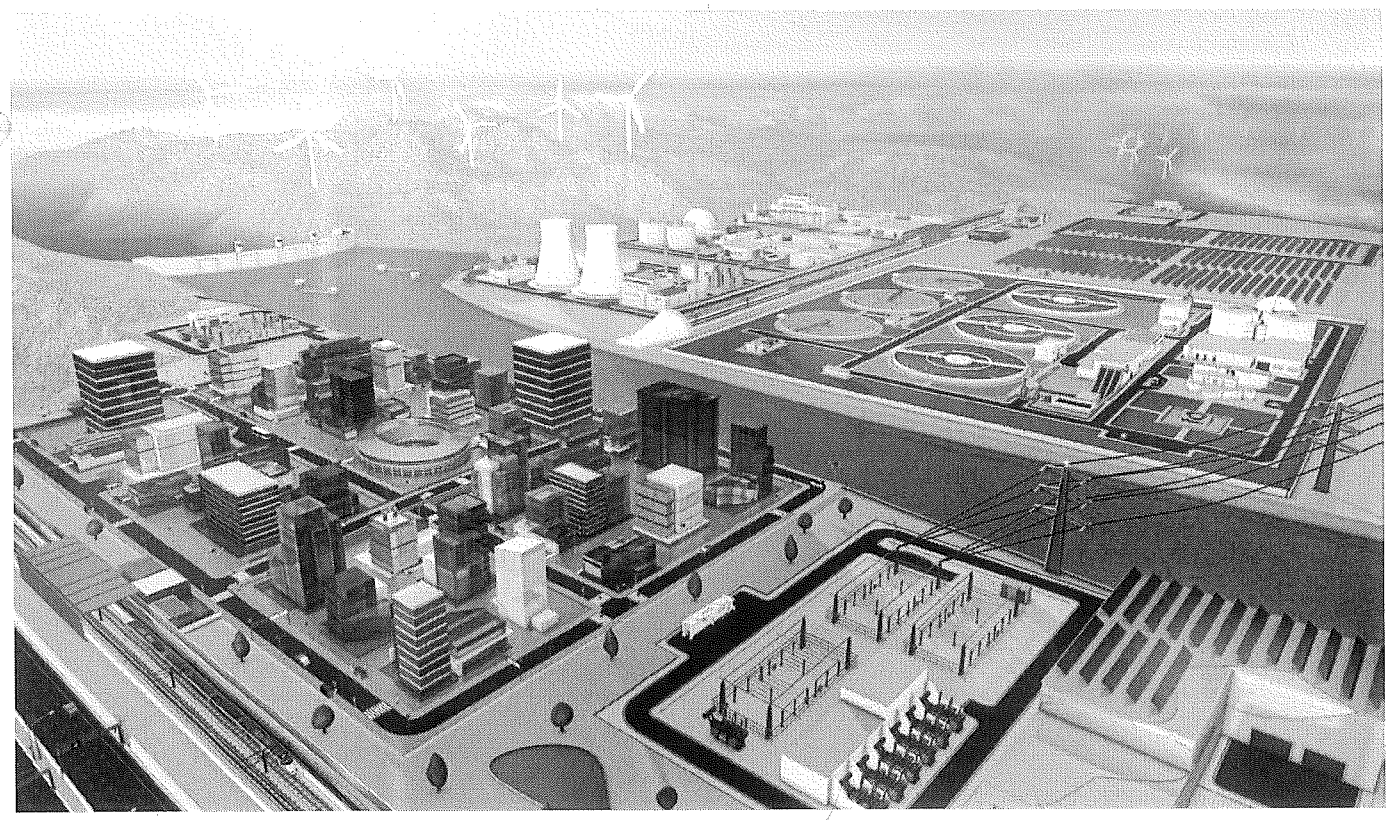
- Transformer stations;
- Sectioning Station;
- Public and private power distribution stations.

Its construction is structured into modular units and equipped with several functions, such as the inclusion of switches and circuit breakers, enabling the integration of several solutions.

NORMAFIX

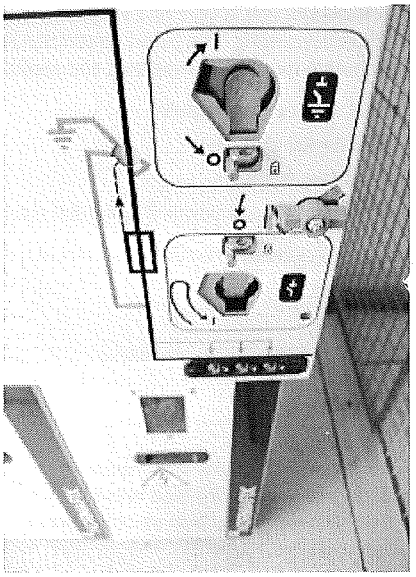
Design features

- Air-insulated modular switchgear;
- Equipped with an SF6 load break switch;
- Equipped with a vacuum 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).



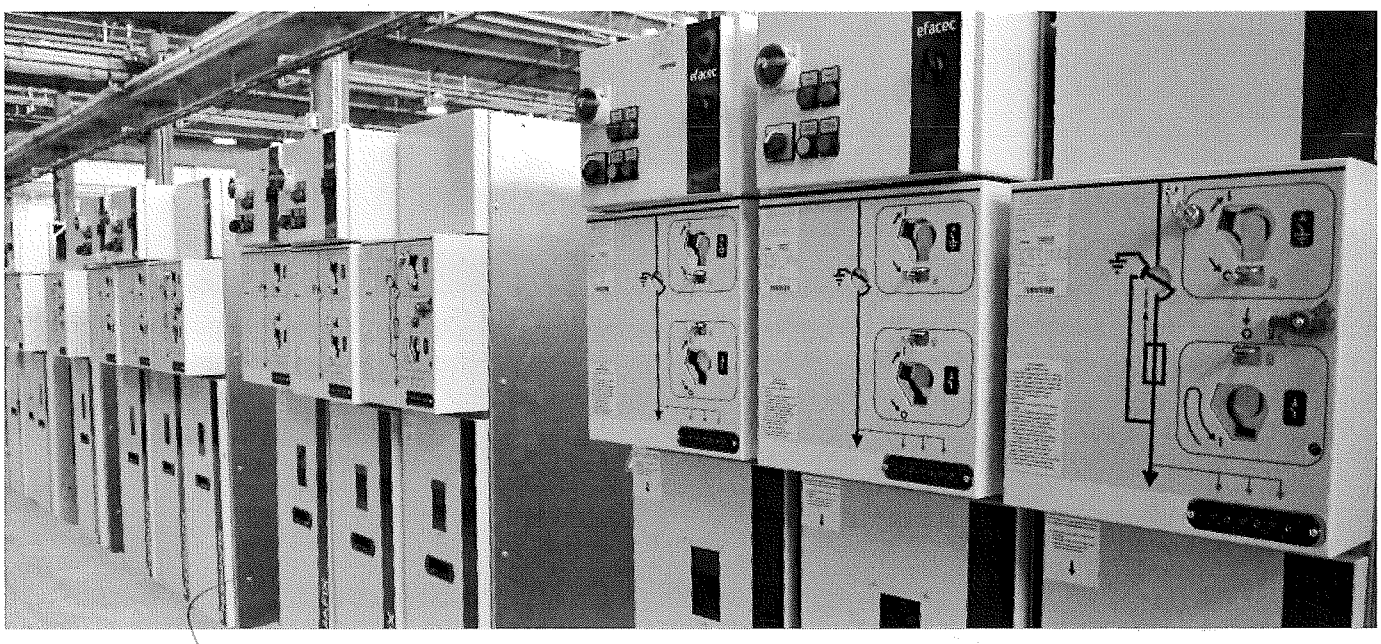
Characteristics

Normafix cells are entirely manufactured in steel sheet, equipped with structural reinforcements to withstand the internal arc, including protective devices against overpressure, enabling hot gas and fume exhaust, protecting persons and goods. Its modular construction, besides being highly resistant and reliable, is also ergonomic and provides safe access to the control and signaling area located at the front.



General technical characteristics

Characteristics				
Rated voltage	12 kV	17.5 kV	24 kV	36 kV
Insulation level				
Power frequency (50 Hz - 1 min)	28 kV	38 kV	50 kV	70 kV
Lightning impulse (1,2 / 50 µs)	75 kV	95 kV	125 kV	170 kV
Rated current				
Busbar	630/1250 A	630/1250 A	630/1250 A	630/1250 A
Incoming / Outgoing	400/630 A	400/630 A	400/630 A	400/630 A
Protection by fuses	200 A	200 A	200 A	200 A
Protection by circuit breakers	630/1250 A	630/1250 A	630/1250 A	630/1250 A
Short-circuit current	20 kA (3s) 25 kA (1s)	16 kA (3s) 20 kA (3s)	16 kA (3s) 20 kA (3s)	16 kA (3s) 20 kA (1s)
Short-circuit making current	50 kA 62,5 kA	40 kA 50 kA	40 kA 50 kA	40 kA 50 kA
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Internal arc (IAC A-FL)	16 kA (1s)	16 kA (1s)	16 kA (1s)	16 kA (1s)
Ambient temperature	-5 to 40 °C	-5 to 40 °C	-5 to 40 °C	-5 to 40 °C
Rated filling pressure (20°)	0,3 bar rel	0,3 bar rel	0,3 bar rel	0,3 bar rel
Loss of service continuity category	LSC 2A (according to CEI 62271-200)			
Separation class	PI (according to CEI 62271-200)			
Degree of protection (CEI 60529 and EN 50102)	IP2XC (control mechanism compartment) IP3X (cable and busbar compartment) IK07			
Standard color	RAL 7035			



Units up to 24 kV

Dimensions mm								
Model	IS	CIS	DC	CD	M	SBM	TT	DB
Width	375	375	750/1000	375	750	750	500	750
Height (**)	1575	1575	1575	1575	1575	1575	1575	1575
Depth (*)	860 (+110)	860 (+110)	860 (+110)	860 (+110)	860 (+30)	860 (+110)	860 (+110)	860 (+110)
Mass kg								
Weight	100	110	355/410	80	175	200	150	460

* Depth of 860 mm for the base cell, adding 110 mm to the control mechanism.
** Height of 1575 mm for the base cell, adding 400 mm to the top compartment.

Units up to 36 kV

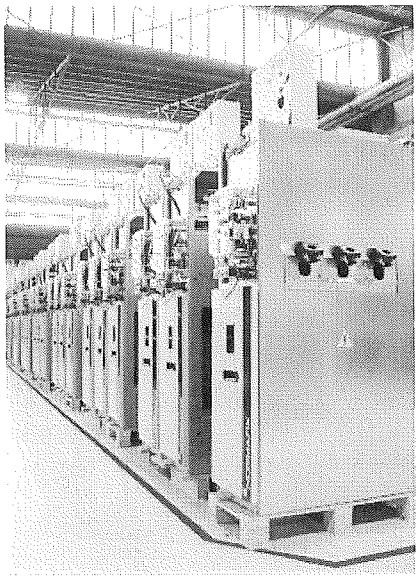
Dimensions mm								
Model	IS	CIS	DC	CD	M	SBM	TT	DB
Width	600	600	1200	600	1200	1200	600	1200
Height (**)	2010	2010	2010	2010	2010	2010	2010	2010
Depth (*)	1155 (+110)	1155 (+110)	1155 (+110)	1155 (+110)	1155 (+30)	1155 (+110)	1155 (+110)	1155 (+110)
Masse kg								
Weight	275	300	900	245	470	560	420	1000

* Depth of 1155 mm for the base cell, adding 135 mm to the control mechanism.
** Height of 2010 mm for the base cell, adding 400 mm to the top compartment.

ISF Switch-disconnector

ISF is a switch-disconnector with 3 positions (closed, open, ground), with a simple and compact design and with a small number of moving parts, granting it high reliability. This SF6-insulated equipment includes in the same unit the three functions for switching, load break and ground connection with breaking and making capacity.

On the other hand, the natural interlocking between line and ground positions increases safety, preventing any wrong operations.



SF disconnector

For load breaking, a 3-position SF6 disconnector is used (closed, open, ground). Its casing is entirely similar to the ISF switch-disconnector, equipped with a dependent, double switching, SF6-insulated operating mechanism.

SF6-insulated ISF switches and SF disconnectors used in **Normafix** cells are airtight and "sealed for life", in conformity with standard CEI 62271.

The airtightness of this equipment is ensured by routine tests and its useful life, which can reach 30 years for this kind of equipment.

Divac circuit breaker

Divac circuit breakers are for indoor use, comprised by three poles equipped with vacuum technology, intended for use in fixed installations or integrated into switchboards.

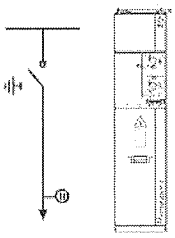
Its operating vacuum principle, together with a simple and sturdy construction, grants it high reliability.

Functions

IS

Switch-disconnector (IS)

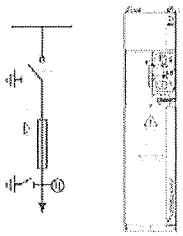
Incoming/outgoing cubicle equipped with ISF switch-disconnector (CI1 control).



CIS

Transformer Protection (CIS)

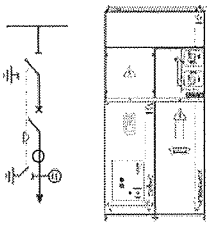
Cubicle for transformer protection by fuses, equipped with ISF switch-disconnector (CI2 control)



DC

Cable Protection Cubicle (DC)

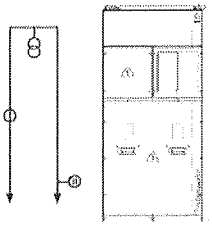
Cable Protection cubicle equipped with a DIVAC-type vacuum breaker.



M

Cubicle intended for voltage and current measurement (optionally, with voltage presence signaling).
Several versions are available:

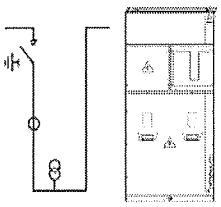
- Side input and output
- Cable input and output
- Cable input and side output



SBM

Measuring and Load Breaking Cubicle (SBM)

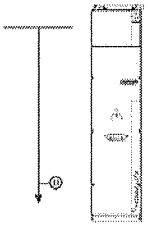
Cubicle intended for busbar load breaking and voltage and/or current measurement (optionally, with voltage presence indicator). Versions are available with busbar output to the right or left.



CD

Direct Incoming (CD)

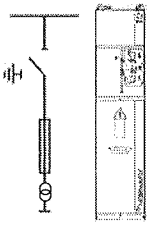
Unit that enables the direct input or output of cables. (optionally, with voltage presence indicator or ground disconnector).



TT

Voltage Transformer (TT)

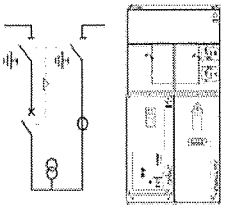
Cubicle for voltage measuring with voltage transformer protection by fuses.



DB

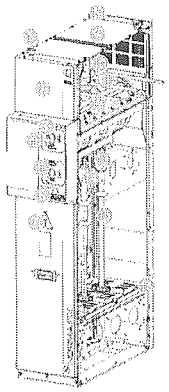
Busbar Protection (DB)

Cubicle for busbar protection, with Divac circuit breaker, and current and/or voltage measurement (optionally, with voltage presence indicator). Versions are available with circuit breaker to the right or left.

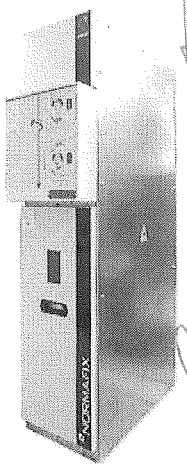


Overview of modular units

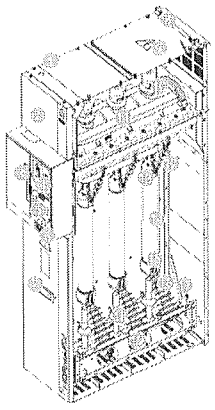
IS



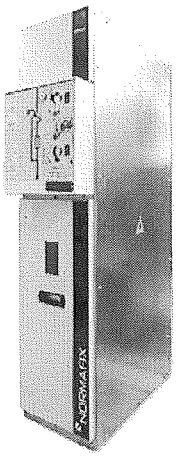
1. Accessories for lifting the cubicle
2. Low voltage compartment
3. Earthing switch command
4. Switch status indicator
5. Switch-disconnector command
6. Voltage presence indicator
7. Door for accessing the MV cable compartment
8. Ground circuit
9. Door for accessing the busbar
10. Busbar deflector cover
11. Busbar
12. ISF switch disconnector
13. Connectors for MV cables
14. Capacitive insulator for support
15. MV cables
16. Cables fastening



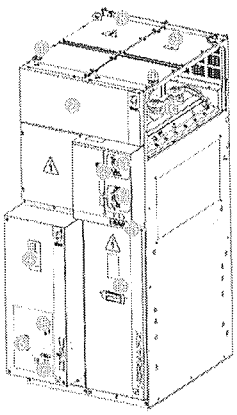
CIS



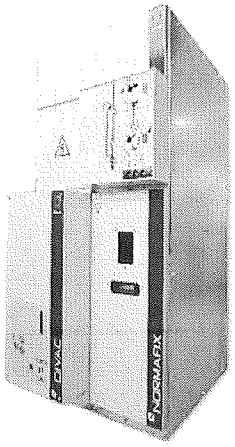
1. Accessories for lifting the cubicle
2. Low voltage compartment
3. Switch status indicator
4. Earthing switch command
5. Switch command
6. Voltage presence indicator
7. Door for accessing the MV cable compartment
8. Ground circuit
9. Door for accessing the busbar
10. Busbar deflector cover
11. ISF switch disconnector
12. Fuse protection trigger system
13. Upper fuse support
14. MV fuses
15. Lower fuse support
16. Capacitive insulator for support
17. Extra earthing switch
18. MV cables
19. Cables fastening



DC

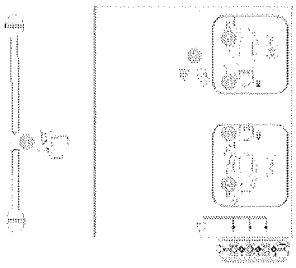


1. Accessories for lifting the cubicle
2. Low voltage compartment
3. Switch status indicator
4. Self-powered protection relay
5. Slot to place the lever (charge circuit breaker springs)
6. Button control panels for opening and closing the circuit breaker
7. Switch status indicator
8. Earthing switch
9. Busbar access panel
10. SF switch
11. Earthing switch command
12. Switch command
13. Voltage presence indicator
14. Door for accessing the MV cable compartment



Operation mechanisms overview

CI1, CS1 e CST Operating Mechanism (Switches and Earthing switches)



- Lever for the manual operation of the switch or earthing switch
- Switch and Earthing switch status indicator

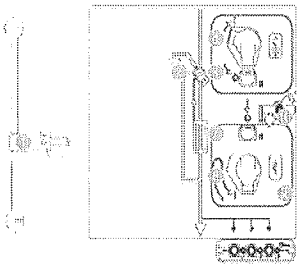
Earthing switch Operating Mechanism:

- Slot to place the Earthing switch interlocking pin
- Slot to place the Earthing switch operating lever

Switch (or Disconnector) Operating Mechanism:

- Slot to place the Switch interlocking pin
- Slot to place the switch operating lever

CI2 Operating Mechanism (Switches and Earthing switches)



- Lever for the manual operation of the switch or earthing switch
- Switch and Earthing switch status indicator

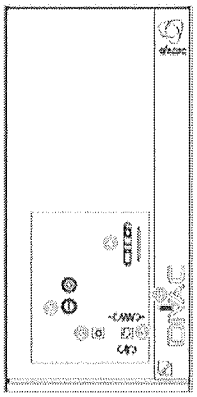
Earthing switch Operating Mechanism:

- Slot to place the Earthing switch interlocking pin
- Slot to place the Earthing switch operating lever

Switch CI2 Operating Mechanism (only for CIS cubicles):

- Slot to place the Switch interlocking pin
- Slot to place the switch operating lever
- Blown fuse indicator
- Button control for manually opening the Switch

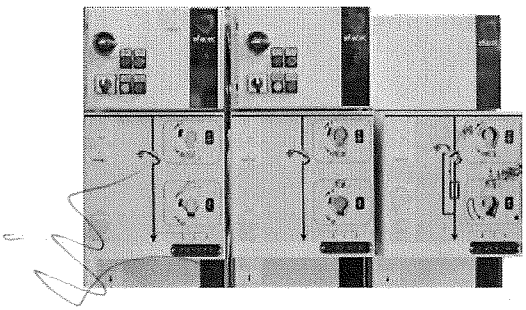
Divac circuit breaker Operating Mechanism



- Lever to recharge the spring system of the Circuit Breaker;
- Button control panels for opening and closing the circuit breaker
- Circuit Breaker status indicator
- Slot to place the lever for recharging the springs
- Switch counter
- Spring system status indicator

Operation principle and application examples

Type	Operation principle	Application examples
CI1(M)	"Tumbler" type operating mechanism. Opening and closing operations are manually or electrically performed through a high speed motor system, separate from the operator's action. (Recharging time <= 2 s at Un)	Used on IS cubicles, with the function arrival/departure it enables to insert or remove a portion of the service networking. The CI1 (M) command allows the remote control of the ISF Switch-Disconnector.
CI2(M)	"Tumbler" type operating mechanism equipped with stored-energy spring system exclusively for opening. The closing operation is made manually or electrically by the worker and then followed by a recharge operation of the mechanism. This enables to perform opening operations in a short time (<100 ms) by the action of a push button, electromagnet or striker fuse.	Used on CIS cells, with a transformer's protection function using fuses fitted with an ISF Switch-Disconnector. Switch tripping is made by means of one or more Fuses. Switch tripping is made by transformers protection relays. The CI2 command allows the remote control of the ISF Switch-Disconnector.
CS1	Double function operating mechanism with dependent operation for the SF switch and independent operations for the cable Earthing switch (DC panels).	It enables the simultaneous control of two SF switches (DB cubicles).
CST	Earthing switch operating mechanism. Closing and opening operations are independent from the operator's action.	It enables the control of the earthing switch operating mechanism of CD cubicles.
CDV(M)	The three poles activity command is a stored-energy spring system type. The opening and closing of the circuit breaker are held by their stored energy in springs, and it is mechanically connected to the maneuver shaft and to the movable contact of the vacuum ampoules. It is available in manual or motorized version.	It enables the control and maneuver of the DIVAC breaker.



Tumbler mechanism operation principle

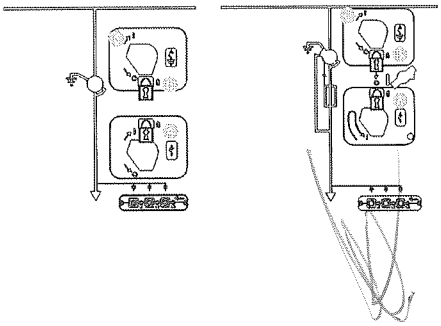
The lever maneuver charges a spring beyond a balanced position. In this position the spring is released abruptly, distending independently from the operator.

Interlock by locks/padlocks

Interlocks padlock

This type of locking consists in the use of padlocks and wedges to prevent the lever from entering the maneuver shafts of the earthing switches and disconnectors. Each wedge includes at least three padlocks:

- Switch opened
- Earthing switch opened
- Earthing switch closed

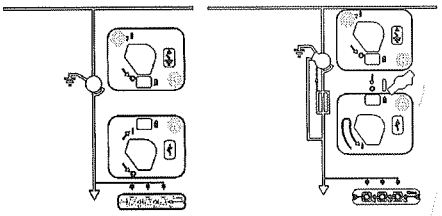


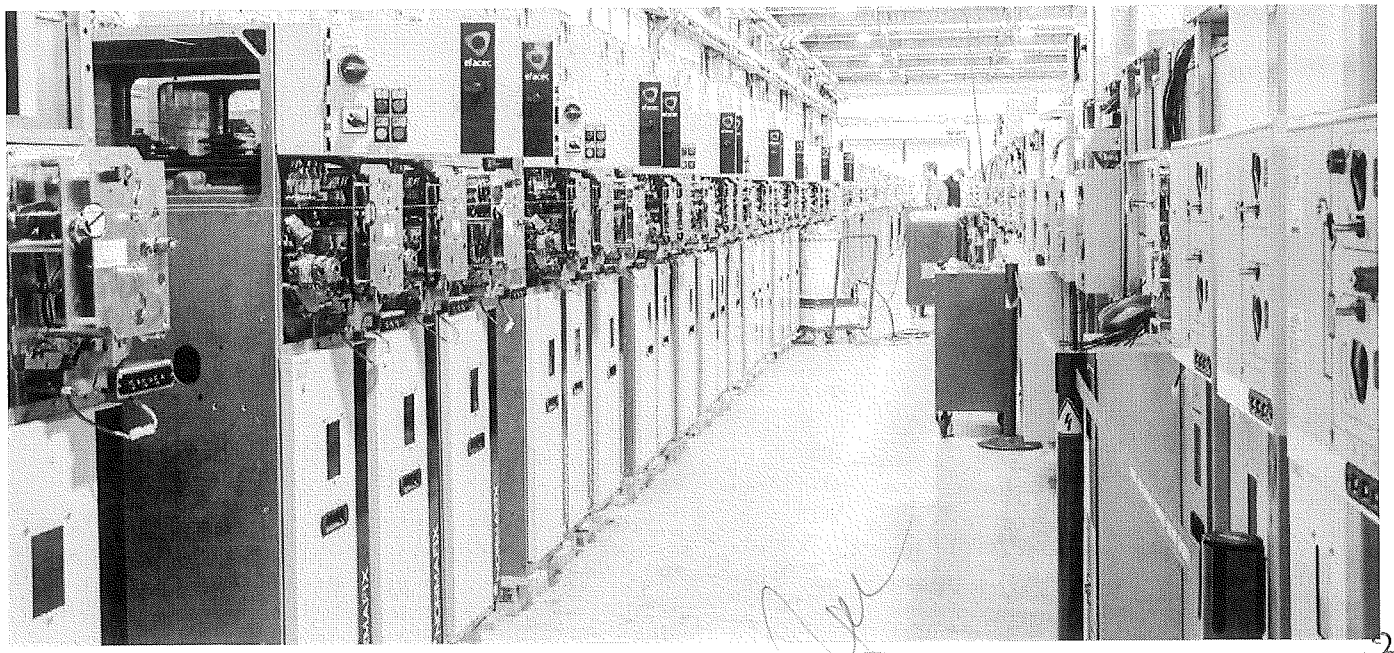
Interlocks lock

This type of locking consists in the use of locks. Each lock has a key that can only be removed in the jammed position.

Three placements are possible in the control panel to assemble the locks. Each lock corresponds to the following jams:

- Switch opened
- Earthing Switch opened
- Earthing Switch closed

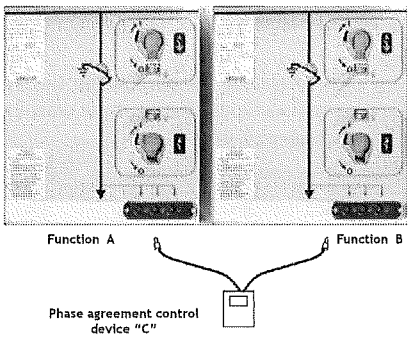




Voltage presence control

Normafix cubicles include L1, L2, L3 voltage presence indicators mounted on the control panel. They also have easily accessible testing points in order to check the phase agreement of mobile equipment.

As the figure shows, after supplying power to the cables of the "A" cell, the L1, L2, L3 voltage presence indicators, mounted on the control panel must be on. The same applies to the "B" cell, after connecting the respective power supply cables.



Phase agreement control in "Incoming" cubicles

To check the phase agreement, use the movable control device "C" for that purpose:
- Insert the "C" male plug into the L3 device's test socket of Function A;
- Insert the "C" male plug into the L3 device's test socket of Function B.

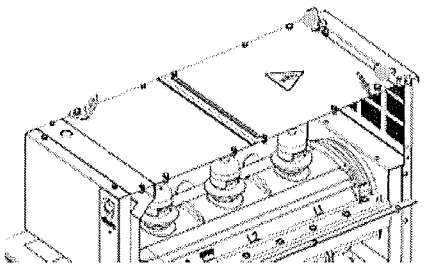
If there is phase agreement:
- The lights of the L3 control devices of Functions A and B are lit.
- The light of movable device "C" is off.

If there is no phase agreement:
- The lights of the L3 control devices of Functions A and B have reduced luminosity.
- The light of movable device "C" is lit.

This procedure repeats for phases L1 and L2.

Connecting to the electrical earth circuit

All **NORMAFIX** components (busbar, cable connections, fuses, etc.) are interconnected and earth-connected through a common copper circuit.



Connection points of the earth-connected common copper circuit

Fuse rating definition

Fuses used in CIS cubicles, for transformer protection, must be selected according to the following table:

Primary Voltage of the Transformer (kV)	Power Transformer (kVA) 100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	Rated Current IN (**)
10/11	16 A	16 A	20 A	25 A	31.5 A	40 A	50 A	63 A	80 A	100 A	125 A	160 A	160 A	250 A	
13,8	10 A	16 A	16 A	20 A	25 A	31.5 A	40 A	50 A	63 A	80 A	100 A	125 A	(*)	(*)	
15	10 A	10 A	16 A	16 A	20 A	25 A	31.5 A	40 A	50 A	63 A	80 A	100 A	125 A	(*)	
20	10 A	10 A	16 A	16 A	16 A	20 A	25 A	31.5 A	40 A	50 A	63 A	80 A	100 A	(*)	
24/25	10 A	10 A	10 A	16 A	16 A	20 A	25 A	31.5 A	40 A	50 A	63 A	80 A	(*)	(*)	
30	10 A	10 A	10 A	10 A	10 A	16 A	16 A	20 A	25 A	31.5A	40 A	50 A	(*)	(*)	

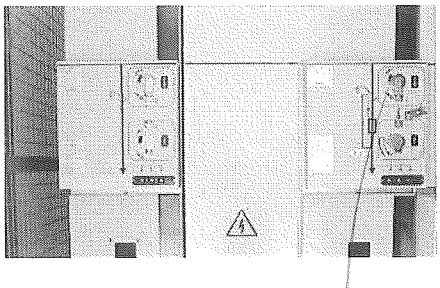
(*) The fuse must consider power losses set limits (shown in the documentation about fuses).
(**) For (IN at: -5°C ≤T ≤+40°C) and for power transformers > 1000 kVA, the maximum operating overcurrent is 1.2 x IS.

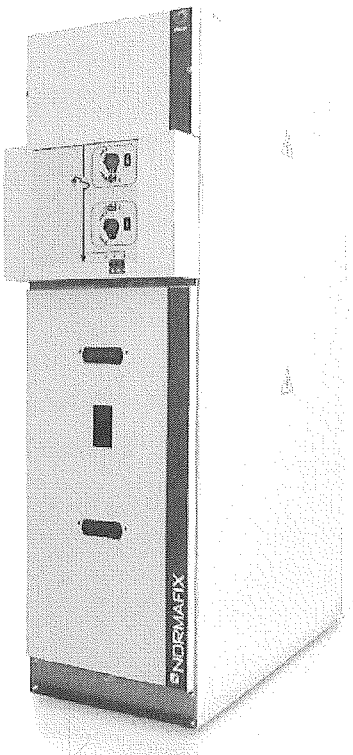
Maintenance

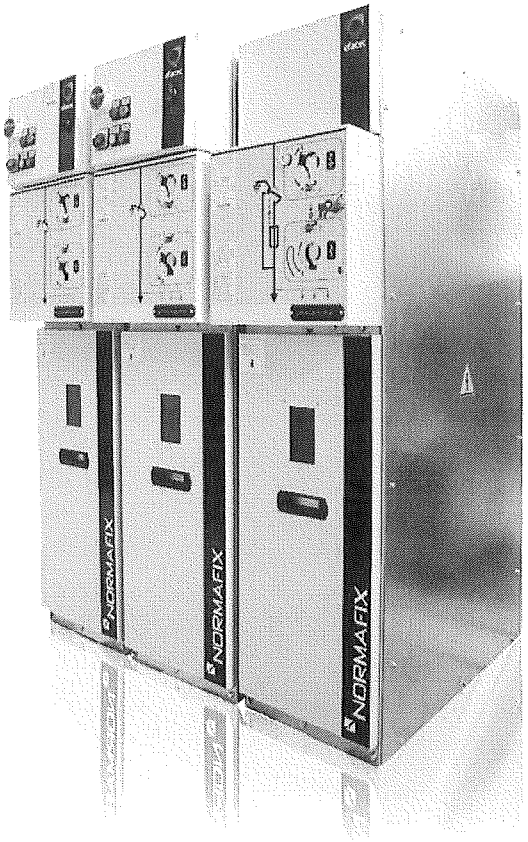
NORMAFIX cubicles do not need maintenance.

However, after being out of operation for a long period of time or when there is an interruption of service, it is recommended to carry out some operations:

- Visual inspection to confirm the good condition of the equipment;
- Clean the dust or dirt that may appear in insulating parts (insulators, switches, transformers, etc.) with a dry cloth. Never use solvents;
- Verify the correct operation of the mechanisms and interlocks;
- Verify the correct placement of the cable connectors;
- Make sure connections are fastened;
- Apply a very thin layer of industrial pH neutral vaseline (Mobil Special with MOS2) in the male contacts of the earthing switch and in the electrical contacts, after cleaning the previous lubricant by using a cloth with petroleum or another chlorine-free solvent.







Headquarters

Efacec Energia, Máquinas e Equipamentos
Switchgear Business Unit

Apart. 1018
4466-952 S. Mamede de Infesta
Portugal
Phone: + 351 229 562 000
Fax: + 351 229 562 961
Email: efacecamt@mail.efacec.pt

Visite o nosso site Web

Through continuous development, specifications

mod. GS178114014

www.efacec.com/switchgear