

SMART CLAD

Air-insulated MV switchgear



Introduction

Introduction to SMART CLAD

SMART CLAD panels are designed for the operation and protection of electric distribution circuits up to 36 kV, having as main equipment a vacuum circuit breaker mounted on a removable cart.

Its components are housed in compartments separated by metal partitions (through multi-cubicle type modular construction), according to national and international standards, and can be installed in indoor and outdoor environments.

SMART CLAD panels are designed to ensure rigidity and absorption capacity of mechanical vibrations when subjected to internal arc. The criteria of our customers are observed in order to improve system reliability, safety and maintenance of operation.

Characteristics:

- Rated voltage up to 36 kV
- Suitable for use in indoor and outdoor applications
- Operator and public safety guarantee due to its high internal arc rating
- Extensibility for both sides of the panel
- A large number of possible configurations due to the functions available
- Extensive range of extra equipment: protection relays, VTs, CTs, surge arresters, etc.
- Virtually nonexistent maintenance
- Earthing switch for short-circuit opening
- Interlocks ensure safe and reliable operations



SMART CLAD in São Paulo, Brazil

Application

SMART CLAD panels are used in a variety of applications: from electricity distribution companies to petrochemical, mining, steel, chemical, cement and other industries.

As per the IEC 62271-200 standard, SMART CLAD panels are classified as the following:

- Category of service availability (continuity of service when opening an accessible compartment): LSC2B for both 17.5 kV and 36 kV
- Separation class: PM
- Internal arc:
40kA - 0.5s - 17.5kA
25kA - 0.5s - 38kV
- Accessibility:
BF-ALR - 17.5 kV
BFLR - 36 kV

High level of security

- Internal arc resistance complying the five criteria of the IEC 62271-200/2003 standard
- Compartments with maximum safety: PM type (metallic partitions) for totally safe maintenance work
- High level of safety in operation, through functional interlocks that prevent carrying out undue operations.
- Locking of the grounding pin with circuit breaker inserted.
- Locking of the low voltage connection of the automatic circuit breaker, to prevent the compartment door from closing with the connection disconnected.
- Insertion and removal of the switching instrument with door closed, making the operation safer.
- Internal access only with circuit breaker in test position or removed.



The SMART CLAD panel is equipped with a high security locking system.



Metallic partitions (PM) between compartments for safe maintenance work.

Standards

The manufacturing project of the SMART CLAD type metal-enclosed switchgear has been type tested in accordance with the following standards and obtained approval through test certificates carried out in internationally accredited laboratories.

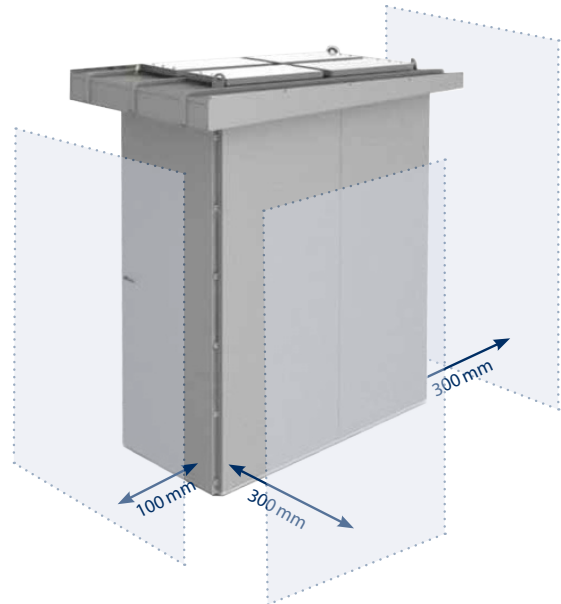
- IEC 62271-1 - HV switchgear and control gear: common specifications
- IEC 62271-100/2003 - High-voltage alternating current circuit breaker.
- IEC 62271-102 Alternating current disconnectors and earthing switches
- IEC 62271-200/2003 - A.C. metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV.
- ANSI/IEC 60529 - Degrees of Protection Provided by Enclosures

Introduction

Internal arc classification - BF ALR

SMART CLAD units are rated at BF ALR (17.5 kV) and AFLR (36 kV). This classification offers a level of protection tested for people who have to intervene in the area under normal operating conditions.

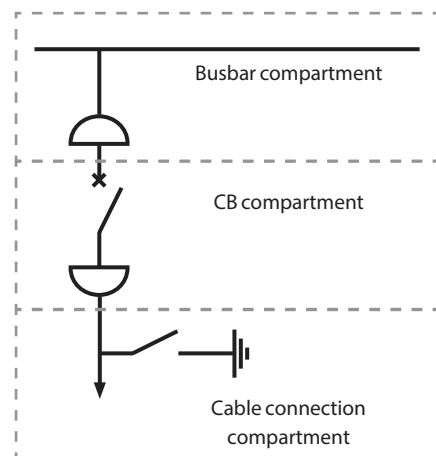
- Class A: Restricted to authorized personnel. Tested at 300 mm.
- Class B: Unrestricted accessibility, including general staff. Tested at 100 mm.



Continuity of service LSC2B

SMART CLAD switchgear incorporate, optionally, another disconnection and separation point between the connection device and the cables, insulating the busbar compartment from the functional unit. This feature allows safe revision and maintenance of the unit and maintaining the continuity of the service in the rest of the installation.

- High mechanical strength.
- Main busbars arranged so that they can withstand high short-circuit currents.
- Easy access to the internal components.
- Easy commissioning through subsequent accesses.



The maintenance of the circuit breaker can be carried out when the busbar and the incoming cable are energized.

Other advantages

- Possibility of expansion on both sides of the cubicle.
- Low maintenance.
- Environmentally friendly. Environmentally friendly materials are used for the manufacture of the air-insulated system, which are, for the most part, recyclable.



Low maintenance



Environmentally friendly

SMART CLAD range

Installation and operating conditions

SMART CLAD switchgear have been designed to withstand the following installation conditions (internal use) as established by the IEC 62271-1 Ed. 2.2 standard.

- Relative humidity of the air: below 95%
- Temperature: -5 °C to 40 °C.
- Altitude below or equal to 1000 m *.
- Indoor installation - IP4X
- Outdoor installation - IP54

*The correction factor must be taken into account for altitudes above 1000 m in accordance with the provisions of the IEC 62271-1 standard.



SMART CLAD
Indoor installation



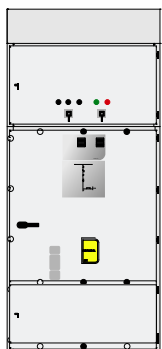
SMART CLADex
Outdoor installation



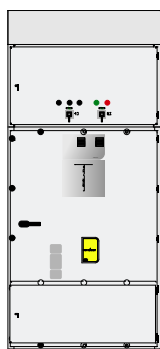
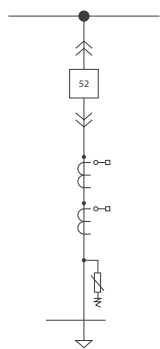
SMART CLADex unit

SMART CLAD range

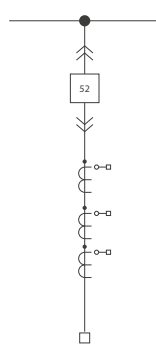
Available functions



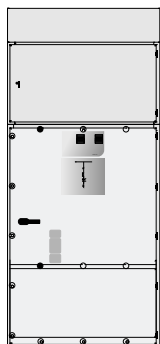
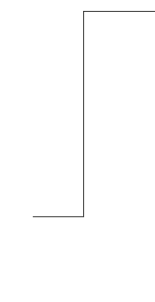
Feeder functions



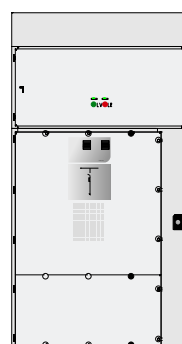
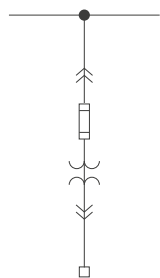
Switching function



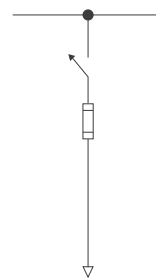
Bus coupler function



Transition with measurement function



Disconnecter function

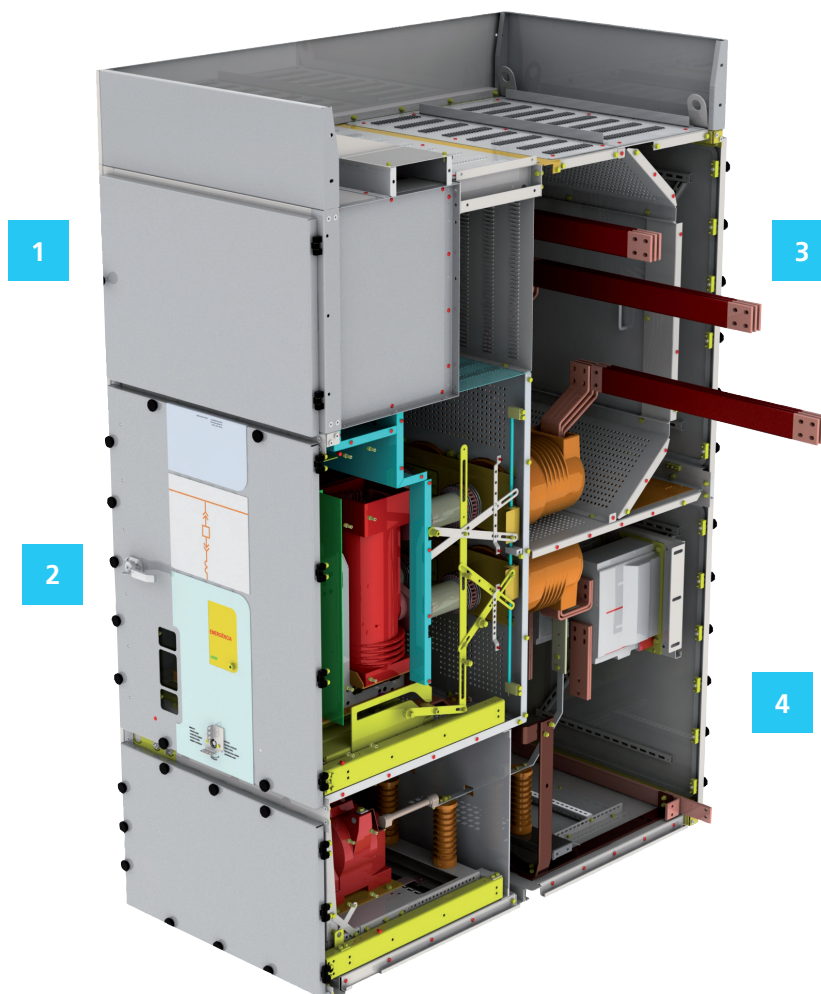


Switchgear compartments

In accordance with national and international standards, SMART CLAD switchgear are made up of up to five compartments:

1. Low voltage compartment.
2. Circuit breaker compartment.
3. Busbar compartment.
4. Cable compartment.

The divisions between the compartments are metallic, including the divisions of the busbar compartment which is not connected to the adjacent switchgear, to ensure a greater degree of safety in the event of a fault.



SMART CLAD range

Metallic panel structure

- The structural part is made of carbon steel plate having as powder paint surface treatment, and galvanized parts.
- Anti-corrosion protection of the paint system according to the highest criteria, guaranteeing a life of more than 10 years.
- The panels are designed and dimensioned to ensure rigidity and absorption capacity of the mechanical vibrations to which they will be subjected during transportation and when energized.
- Ease of access to internal components, with front and back access doors.
- Modular construction of multi-compartment type (with metal separations between compartments).
- All metal parts are connected to each other and connected to the main ground circuit.
- General compartment of segregated bars with metal separations and electrically insulated supports, increasing the reliability of the equipment.
- The cable connection compartment allows easy access for installation and maintenance with the use of a tool.

Voltage transformers

They reduce the voltage values of the point of the network where they are connected, to proportional and manageable values; at the same time as separating the metering instruments, counters, relays, etc., of the medium voltage circuit.

Possibility of using signalling contacts positioned in the lower part of the panel, in the removable drawer. The access is made with the extraction tool and follows the procedure as per IEC 62271-200.

Busbars

The busbars are manufactured, following the standards laid down by DIN standard 43671, in electrolytic copper, compatible with the nominal current of the project and suitable to withstand the dynamic and thermal efforts derived from the maximum short-circuit current specified.



In addition, removable covers or articulated and screwed doors can be added to each of the switchgear, allowing easy access to the installation for its maintenance and inspection.

General busbar insulated with degree of protection IP2X in the internal compartments and IP4x for the enclosure. Possibility of use of thermovision equipment, maintaining the degree of protection of the compartment.

Protection, control and measurement

Possibility of integration of protection, control and measurement equipment from the main suppliers, to address the customer's needs.

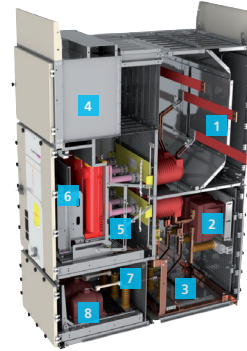
Earthing switch

Earthing switch tested according to standards for opening in short-circuit. This increases the operating safety level for the user

Incoming / Feeder

1. Busbar compartment
2. Current transformer
3. Cable output compartment
4. LV compartment
5. Circuit breaker compartment
6. Circuit breaker
7. Lower compartment
8. Power transformers
9. Earthing switch (optional)

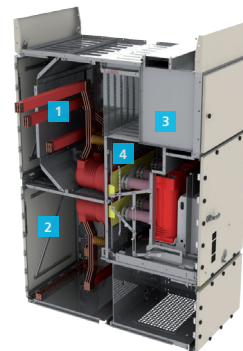
There are also other optional items available, such as surge arresters, toroidal CTs or capacitive insulators.



Coupling

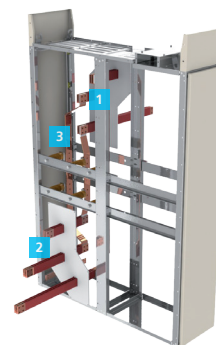
1. Busbar compartment
2. Cable output compartment
3. LV compartment
4. Circuit breaker compartment

There are also other optional items available, such as surge arresters, toroidal CTs or capacitive insulators.



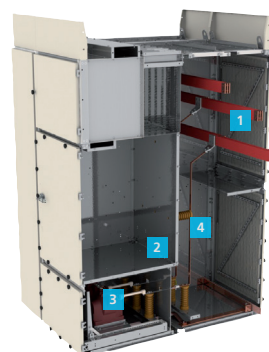
Busbar coupling

1. Upper general busbar
2. Lower general busbar
3. Transition busbars



VT Section

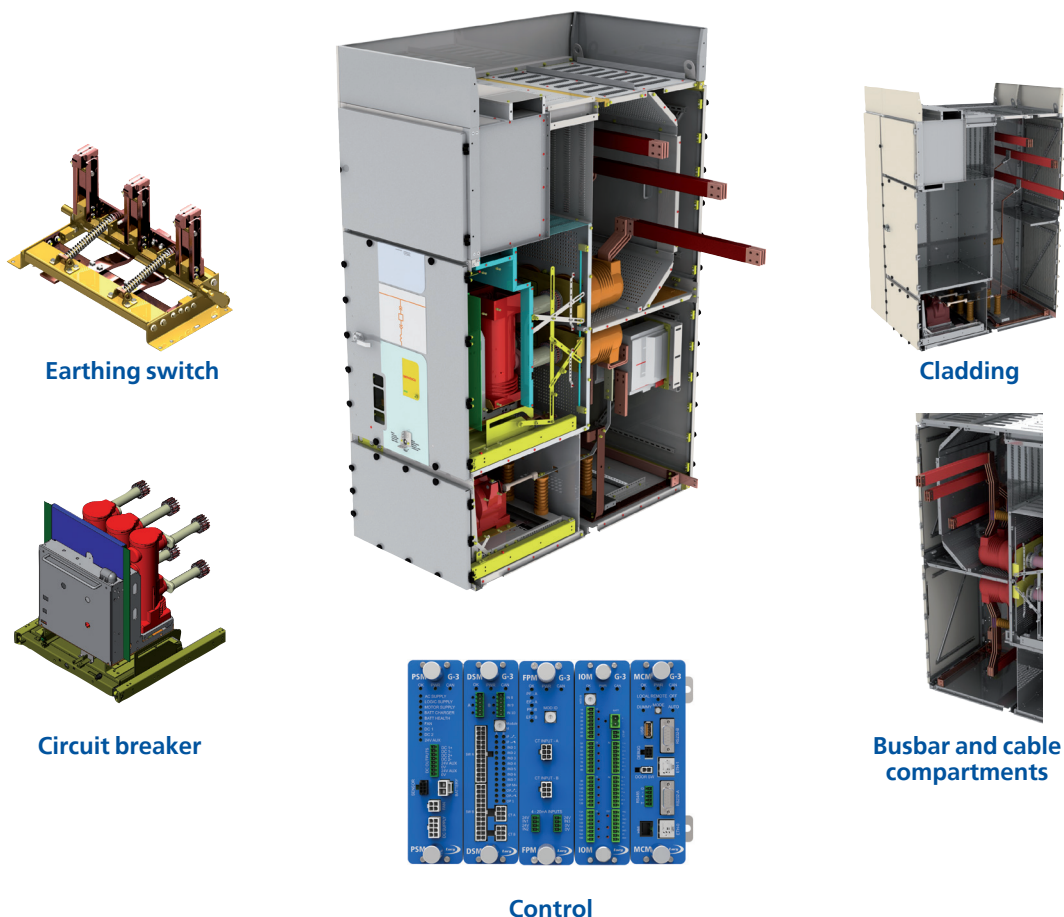
1. Upper general busbar
2. Interconnection with voltage transformers
3. Voltage Transformers
4. Transition busbars



Product characteristics

Main equipment

In addition to having standardized configurations for the different type panels, Lucy Electric's engineering is able to adapt SMART CLAD panels to any special requirements made by the customer, thanks to the powerful 3D drawing computer tools.



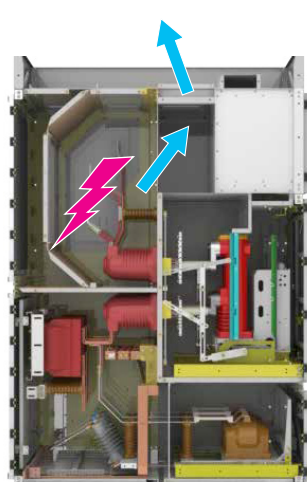
Optional equipment

- Extraction / insertion crank: Allows the extraction / insertion operation of the switch only with the cubicle door closed.
- Protective shields: device used to prevent accidental touches in energized areas, thus ensuring greater safety during panel maintenance.
- Capacitive insulator: device used to detect the presence of voltage on the bus.
- Toroidal CTs.
- Surge arresters.
- Measuring transformers
- Temperature sensor
- Internal arc sensor
- Circuit breaker motorized extraction system

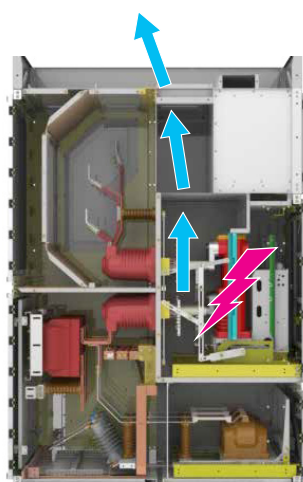
Internal arc protection

According to Annex A of IEC 62271, five criteria are defined for the approval of cells in the case of an internal arc.

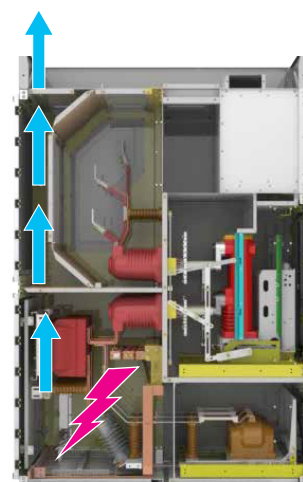
Based on studies and internal arc tests performed, SMART CLAD panels behave as follows:



Arc in the busbar compartment



Arc in the circuit breaker compartment



Arc in the cable connection compartment

Smart-grid ready: Gemini 3 RTU integration

The Gemini 3 has a modular design such that it can be configured from a simple monitoring only device to a fully functional automated switch controller. It has the ability to transition from a basic to an advanced RTU by plugging in additional modules. These modules are rugged, making the device field serviceable and future proof.

Key features of Gemini 3

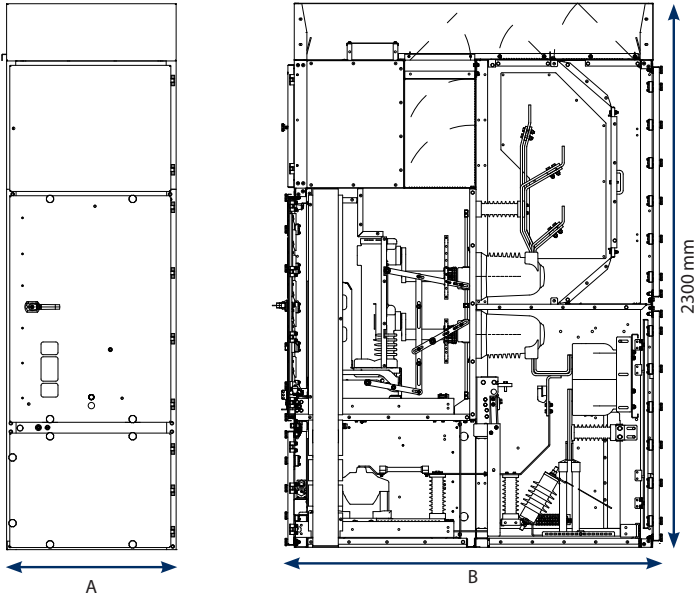
- Embedded auto change over and auto sectionalising functions
- Real time network condition monitoring of voltage, current, power, power factor and frequency
- Flexible communication through radio, RS232, RS485, packet data network, GSM, GPRS, PSTN, ethernet TCP / IP and optical fibre.
- Advanced battery pack to operate under mains AC input failure
- Fully tested to ENATS (Energy Network Association Technical Standards), EMC and environmental standards

Benefits of Automation

- Reduced time in diagnosing system anomalies as well as locating and isolating faulty sections of the network
- Faster response time and quick network reconfiguration
- Optimisation of asset management through the implementation of customised automation schemes
- Reduced operational cost associated with routine network switching
- Increased operator safety

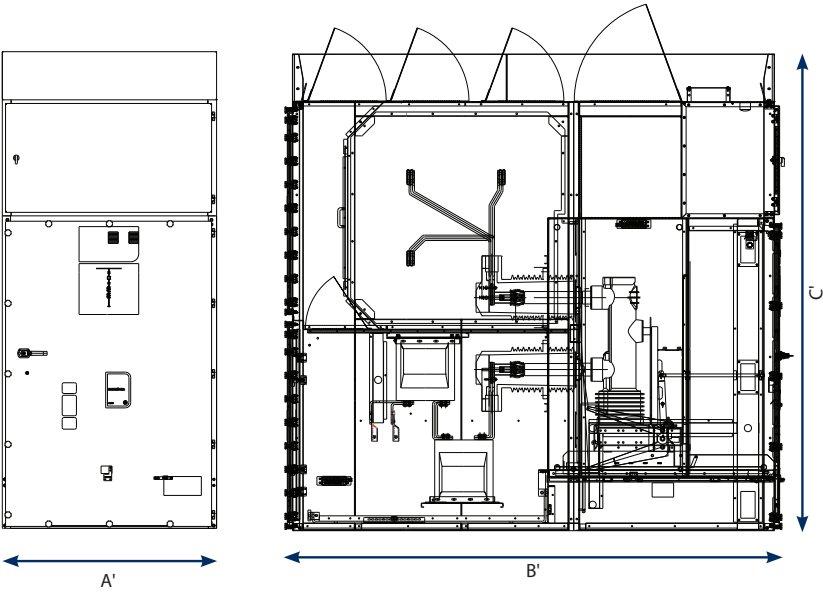
Dimensions

SMART CLAD 17.5 kV



Legend	Installation	Model	Dimensions
A	Indoor	1250 A	800 mm
		>1250 A	900 mm
	Outdoor	1250 A	900 mm
		>1250 A	1000 mm
B	Indoor	1700 mm	
	Outdoor	1800 mm	

SMART CLAD 36 kV



Legend	Installation	Model	Dimensions
A'	Indoor	1250 A	1200 mm
		>1250 A	1400 mm
	Outdoor	1250 A	1300 mm
		1250 A	1500 mm
B'	Indoor	Without earth switch	2700 mm
		With earth switch	3000 mm
	Outdoor	Without earth switch	2800 mm
		With earth switch	3100 mm
C'	Indoor	2700 mm	
	Outdoor	2900 mm	

Electrical characteristics

Panel

Rated voltage		17,5	36/38
Rated power frequency withstand voltage			
Directly earthed	kV	38	70
Across disconnecter	kV	45	80
Rated lightning impulse withstand voltage			
Directly earthed	kVp	95	170
Across disconnecter	kVp	110	195
Frequency	Hz	50/60	
Short circuit breaking capacity	kA	25/31,5/40	25
Rated short time withstand current	kA 3s	25/31,5/40	25
Rated peak withstand current	kAp	65/82/105	65
Rated current			
In the busbar compartment, with natural ventilation	A	Up to 2500	Up to 2000
Circuit breaker function, with natural ventilation	A	Up to 2500	Up to 2000
Sectionalizer	A	630	
Internal arc (IAC)			
Internal arc classification		BF-ALR	BFLR
Breaking capacity	kA/0.5 s	40	25
Ingress protection class			
Indoor		IP 4X	IP 4X
Outdoor		IP 54	IP 54
Between compartments		IP 2X	
Weight	kg	900	1500
Loss of continuity of service		LSC2B	
Separation class		PM	

Circuit Breaker

The circuit breakers have been tested in accordance with the IEC 62271-100 standard. Circuit breakers with the same characteristics are interchangeable. The circuit breaker optionally has interlocks to unload the spring, MOC and TOC..

Type of circuit breaker		HVF 315	HVF 316	HVF 614	HVF 714
Rated voltage	kV	17,5		24 / 25,8	36
Frequency	Hz	50/60			
Rated current	A	1250 2000	1250 2000 2500 3150	630 1250 2000	1250 2000 2500
Rated short time withstand current	kA / 3s	31,5	40	25	25
Rated peak withstand current	kA	82	104	65	65

Disclaimer

Lucy Electric has a policy of continuous research and development and accordingly reserves the right to change the design and specification of its products without prior notice.

Lucy Electric worldwide offices

Lucy Electric Ltd.

Howland Road, Thame, Oxfordshire,
OX9 3UJ, United Kingdom
Tel: +44 1844 267 267 General
Tel: +44 1844 267 222 Sales
Fax: +44 1844 267 223
Email: salesuk@lucyelectric.com

Lucy Middle East FZE.

PO Box 17335, Jebel Ali, Dubai,
United Arab Emirates
Tel: +97 148 129 999
Fax: +97 148 129 900
Email: salesme@lucyelectric.com

Lucy Electric (Thailand) Ltd.

388 Exchange Tower, 37th Flr Unit 3702,
Sukhumvit Road, Klongtoey Sub district,
Klongtoey District, Bangkok,
10110, Thailand
Tel: +66 (02) 663 4290
Fax: +66 (02) 663 4293
Email: salesth@lucyelectric.com

Lucy Switchgear Arabia Co. Ltd.

Novotel Business Centre,
P.O. Box 35340, Dammam 31488,
Saudi Arabia
Tel: +966 138 147 910
Fax: +966 138 147 914
Email: salessa@lucyelectric.com

Lucy Electric (South Africa).

Unit 12 & 13, Block C,
Honeydew Business Park,
1503 Citrus Street, Laser Park,
Honeydew, 2170, South Africa
Tel: +27 11 025 7490
Fax: +27 11 794 3277
Email: salesza@lucyelectric.com

Postal Address:
P.O. Box 1078, Honeydew, 2040

Lucy Asia Pacific Sdn Bhd.

L17-05-06, PJX-HM Shah Tower,
No16A Jalan Persiaran Barat,
46050 Petaling Jaya, Selangor, Malaysia
Tel: +603 74910700
Fax: +603 79316923
Email: salesmy@lucyelectric.com

Lucy Electric (Beijing) Co. Ltd.

卢西电器（北京）有限公司
北京市朝阳区东三环北路霞光里
18号佳程广场A座1122室
邮编: 100027
电话: +86 1059 231 176
传真: +86 1059 231 177
电子邮件: salescn@lucyelectric.com

Lucy Electric India Private Ltd

F-10, MIDC, Ambad
Nasik 422010
India
Tel: +91 253 2381603
Fax: +91 253 2381247
Email: leindia@lucyelectric.com

Lucy Equipamentos Elétricos Ltda.

Av. das Araucárias 2558
Thomaz Coelho,
CEP 83707-067, Araucária - PR -, Brazil
Tel: +55 (41) 2106 2801
Email: salesbrazil@lucyelectric.com

engineering intelligent solutions
www.lucyelectric.com