

# SEAE

## MEDIUM VOLTAGE PANEL

3.6/7.2/12/24kV - 400/630/1250A - 12,5/25kA



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3.6/7.2/12/24kV - 400/630/1250A - 12,5/25kA



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## Reliability

- Type testing is complete for all models according to latest standard, IEC62271-200
- Internal arc proofed 21kA / 1s
- Earthing of both the whole switchboard structure and the metal division between the compartments
- Mechanical interlocks which assure the exact operation sequence
- Protection Classes: PI (insulating partition)
- Loss of service continuity classes: LSC2A (LSC1 for bus riser)
- IP3X protection degree on the external housing
- High voltage indication system in each cubicle

## Simplicity

- Simplified switchboard busbar design
- Mimic diagram front of the switchboard by means of simple and functional devices

## Optimize

- Reduced dimensions and weights
- Less space requirement for switchboard installation
- Easy integration in factory-built outdoor substations
- A solution adapted to cable connection
- Modular units containing fixed and withdrawable metal-enclosed switchgear, using vacuum

## Applications

- Secondary electricity distribution networks
- MV/LV distribution transformer substations
- Manufacturing industry
- Shopping malls
- Airports, hospitals, holiday village
- Small size power plants
- Wind Power plants

## KEMA TEST REPORT STANDARD

**DNV·GL**

**KEMA TEST REPORT** **5023-18**

**Object** Main circuit and earthing switch of air-insulated metal-enclosed MV switchgear and controlgear

**Type** SD 6/L (incoming unit) **Serial No.** 30191/2016 (incoming unit)  
SD 6/F (outgoing unit) 09920/2017 (outgoing unit)

24 kV - 630 A - 25 kA - 50 Hz

**Client** Southeast Asia Electrical Trading Co., Ltd.  
115/9A Hamlet 1, Xuan Thoi Son Commune, Hoc Mon District, Ho Chi Minh City, the Socialist Republic of Vietnam

**Manufacturer** Southeast Asia Electrical Trading Co., Ltd.  
115/9A Hamlet 1, Xuan Thoi Son Commune, Hoc Mon District, Ho Chi Minh City, the Socialist Republic of Vietnam<sup>1)</sup>

**Tested by** KEMA Laboratories Prague  
Zkušebníctví, a.s., Podnikatelská 547, Prague 9, the Czech Republic

**Date of tests** 26 January 2018

**Test specification** The tests have been carried out in accordance with client's instructions.

This report applies only to the object tested. The responsibility for conformity of any object having the same type references as that tested rests with the manufacturer.  
<sup>1)</sup> as declared by the manufacturer

This report consists of 32 pages in total.

Zkušebníctví, a.s.  
*P. Jech*  
Robert Jech  
Operational Manager  
KEMA Laboratories Prague, 23 April 2018

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**DNV·GL**

**KEMA TEST REPORT** **5018-18**

**Object** A extendable three-phase air-insulated metal-enclosed MV switchgear and controlgear

**Type** SD 6/L (incoming unit) **Serial No.** 30191/2016 (incoming unit)  
SD 6/F (outgoing unit) 09920/2017 (outgoing unit)

24 kV - 630 A - 25 kA - 50 Hz

**Client** Southeast Asia Electrical Trading Co., Ltd.  
115/9A Hamlet 1, Xuan Thoi Son Commune, Hoc Mon District, Ho Chi Minh City, the Socialist Republic of Vietnam

**Manufacturer** Southeast Asia Electrical Trading Co., Ltd.  
115/9A Hamlet 1, Xuan Thoi Son Commune, Hoc Mon District, Ho Chi Minh City, the Socialist Republic of Vietnam<sup>1)</sup>

**Tested by** KEMA Laboratories Prague  
Zkušebníctví, a.s., Podnikatelská 547, Prague 9, the Czech Republic

**Date of tests** 16 January and 23 January 2018

**Test specification** The tests have been carried out in accordance with client's instructions.

This report applies only to the object tested. The responsibility for conformity of any object having the same type references as that tested rests with the manufacturer.  
<sup>1)</sup> as declared by the manufacturer

This report consists of 22 pages in total.

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**DNV·GL**

**KEMA TEST REPORT** **5019-18**

**Object** A extendable three-phase air-insulated metal-enclosed MV switchgear and controlgear

**Type** SD 6/L (incoming unit) **Serial No.** 30191/2016 (incoming unit)  
SD 6/F (outgoing unit) 09920/2017 (outgoing unit)

24 kV - 630 A - 25 kA - 50 Hz

**Client** Southeast Asia Electrical Trading Co., Ltd.  
115/9A Hamlet 1, Xuan Thoi Son Commune, Hoc Mon District, Ho Chi Minh City, the Socialist Republic of Vietnam

**Manufacturer** Southeast Asia Electrical Trading Co., Ltd.  
115/9A Hamlet 1, Xuan Thoi Son Commune, Hoc Mon District, Ho Chi Minh City, the Socialist Republic of Vietnam<sup>1)</sup>

**Tested by** KEMA Laboratories Prague  
Zkušebníctví, a.s., Podnikatelská 547, Prague 9, the Czech Republic

**Date of tests** 16 January to 18 January 2018

**Test specification** The tests have been carried out in accordance with client's instructions.

This report applies only to the object tested. The responsibility for conformity of any object having the same type references as that tested rests with the manufacturer.  
<sup>1)</sup> as declared by the manufacturer

This report consists of 30 pages in total.

Zkušebníctví, a.s.  
*P. Jech*  
Robert Jech  
Operational Manager  
KEMA Laboratories Prague, 23 April 2018

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# General characteristics

The SF6-insulated M.V. SE switchboards have been studied for M.V. secondary distribution compact stations and they have been designed to provide a wide variety of functions and service as required by modern power distribution system.

The switchboard is realized with standardized typical units. During the design stage of the units we took into consideration the functionality, the simplicity of operation and locking devices and a long period of service without any maintenance.

Each typical unit is divided into two compartments placed one on the top of the other:

- an upper compartment containing the main bus-bars;
- a lower compartment containing various electrical equipment (circuit-breakers, isolators, protections, current transformers, voltage transformers and terminals).

The compartments are segregated from each other with the switch-disconnector metal body which guarantees an IP3X protection degree, and when the door is open and the busbars are in service, the access into the equipment compartment is allowed.

In the superior position (on the busbars compartement) it is possible to locate a LV section for various LV electrical equipments.

The main aspects of SE switchboards are as following:

## A) Maximum safety for personnel thanks to:

- Earthing of both the whole switchboard structure and the metal division between the compartments;
- Mechanical interlocks which assure the exact operation sequence;
- IP3X protection degree on the external housing;

## B) Protection against the spread of fire:

The metal segregation of the compartments and the use of self-extinguishing insulating materials prevent the spreading of fire.

## C) Easy operation:

All the various operations are carried out from the front of the switchboard by means of simple and functional devices, provided with mechanical signals indicating the position of the components.

Clear operation instructions on the front of the switchboard.

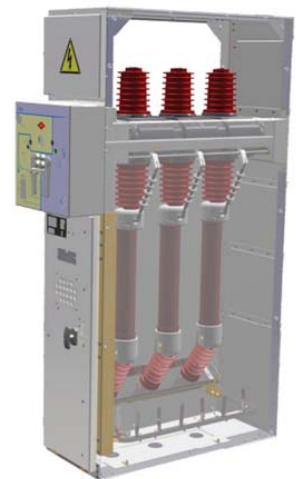
## D) Versatility

All different technical applications.

Esecution width 375-500-750 mm (Internal arc tested on request).

## E) Long functional life throught careful choice of materials:

Standard colour: grey RAL 7035 (other colours on request)



## FEATURES AND APPLICATION RANGES

The ME6 switchboard is made of a modular units (Switchboards) with SD6 Switch-disconnector completely SF6 insulated.

It's possible to use standard cable glands (indoor use). The most important application ranges of the SE switchboards are the following:

- public secondary distribution
- industrial distribution

## SWITCH-DISCONNECTOR FEATURES

The SD6 swicth-disconnector is compact type and low volume of SF6 insulation.

The metallic body makes the segregation between terminal cable box and busbar with high safe degree. Inside there is an earthing switch with making capacity. The operating mechanism is very reliable and it is possible to have hand or motorized system.

## Electrical characteristics

RATED VALUES				
Rated voltage	kV	12	17,5	24
Rated nominal frequency	Hz	50/60	50/60	50/60
Insulation level				
Test voltage 1 min. 50 Hz against earth and between the phases	kV	28	38	50
Test voltage 1 min. 50 Hz between the open contacts of the switch- disconnecter	kV	32	45	60
Impulse withstand voltage against earth and between the phases	kV	75	95	125
Impulse withstand voltage between the open contacts of the switch-disconnector	A	85	110	145
Rated current	A	400/630	400/630	400/630
Bus-bar rated current	A	400/630/800	400/630/800	400/630/800
Rated short-time withstand current (1 sec.)	kA	12,5/25*	12,5/25*	12,5/25*
Rated short-time withstand current (3 sec.)	kA	12,5/21	12,5/21	12,5/21
Rated peak withstand current	kA	31,5-65	31,5-65	31,5-65
Internal arc classification	kA	AF16/1' (**)	AF16/1' (**)	AF16/1' (**)
Loss of service continuity		LSC2A-PI	LSC2A-PI	LSC2A-PI
Protection degree		IP3X	IP3X	IP3X
* 25 kA-2 sec. on request (**) Bigger values on request				

## Normal operating conditions

Ambient air pollution	No significant pollution by dust, smoke, corrosive and / or flammable gases, vapours or salt.
Ambient air temperature	Less than or equal to 40°C Less than or equal to 35°C on average over 24 hours Greater or equal to -5°C
Altitude	Less than or equal to 1000 m
Humidity	Average relative humidity over a 24 hour period, less than or equal to 95% (average relative humidity over a 1 month period, less than or equal to 90%)

## STANDARDS

### TEST REPORTS

SE cubicles have successfully passed all the type tests requested by the international and national Standards (IEC, CEI, Chinese Standard GB 3804-90, GOST Russia) in officially acknowledged testing laboratories. International Standards: IEC 60265, 62271-200, 62271-102, 60694

### OTHER STANDARDS

- Italian CEI EN 62271-200 Standards
- ENEL Homologation to Spec. DY 803/1/2/4
- Italian accident prevention law (D.P.R. 547)

### QUALITY SYSTEM

The designing and manufacturing system is carried out with a rigid application of the Company Quality System, certified by CSQ (EQNET Member), in compliance with ISO 9001-2000 Standards

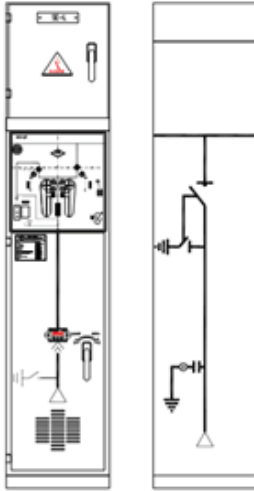
### ENVIROMENT

The Quality System is integrated with an Enviromental policy that is of primary importance for our company. Enviromental Management Systems is certified by CSQ (EQNET member) in compliance with ISO 14001-2004 standard.

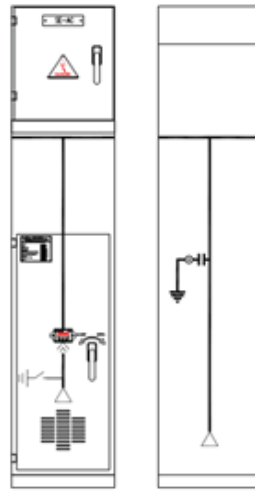
Due to the continuous development of Standards as well as of materials, the characteristics and dimensions indicated in this catalogue must be regarded as binding only on our confirmation.

# STANDARD TYPES

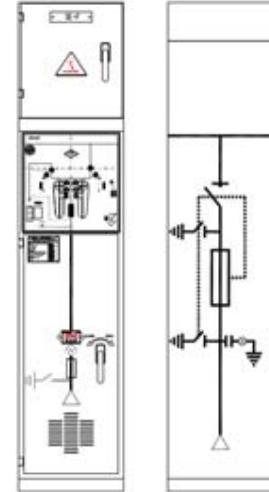
INCOMING/OUTGOING  
UNIT SE-L



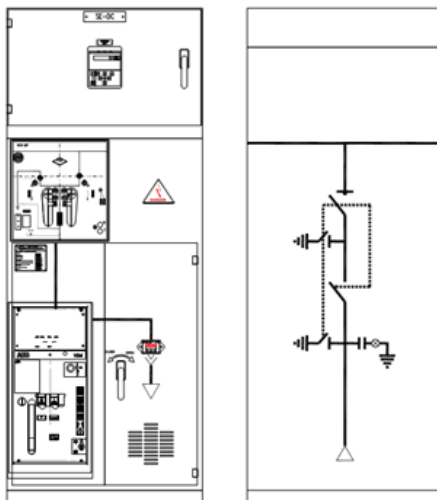
INCOMING AND BUS RISER  
UNIT SE-AC



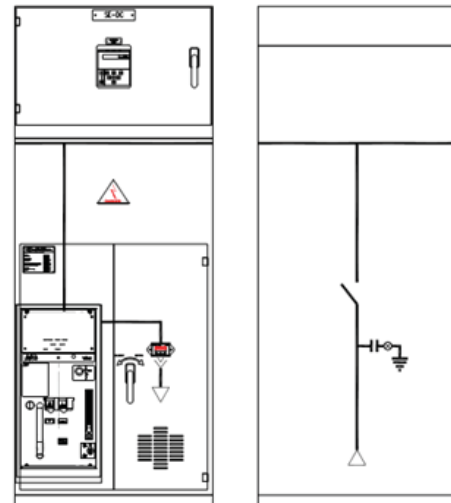
TRANSFORMER PROTECTION  
UNIT SE-F



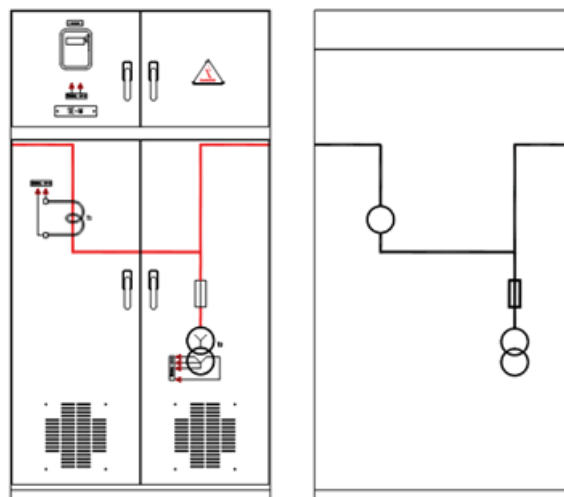
GENERAL PROTECTION UNIT SE-DC  
WITH SF6/VACUUM CIRCUIT-BREAKER



GENERAL PROTECTION UNIT SE-C  
WITH VACUUM CIRCUIT-BREAKER



MEASUREMENT UNIT SE-M





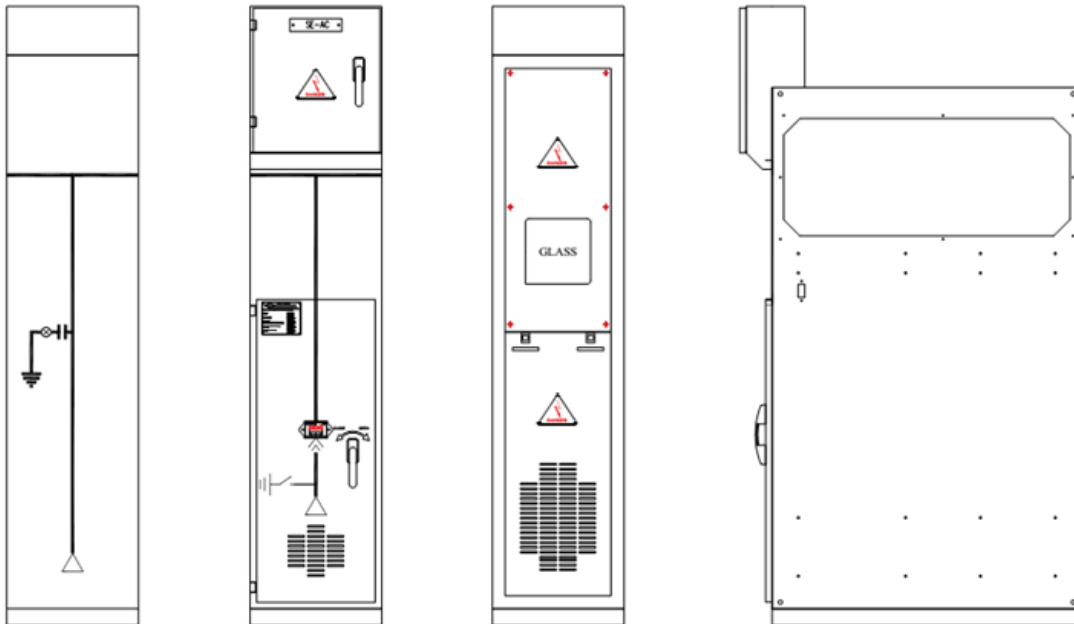
**Base unit components**

Dimensions (mm): W=375 x H=1700 x D=870  
Weight :140 Kg

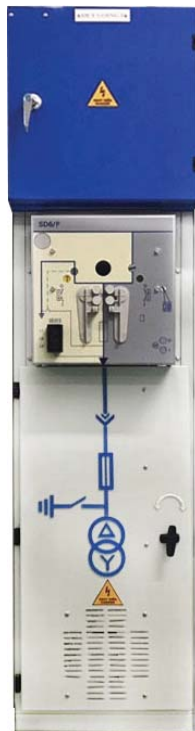
- Main busbars
- Earthing bar
- Cable gland support
- Reference plate
- Capacitor dividers and lamp

**Optional components**

- Capacitor dividers and lamps
- LA



# SE-L INCOMING / OUTGOING UNIT



## Base unit components

Dimensions (mm):

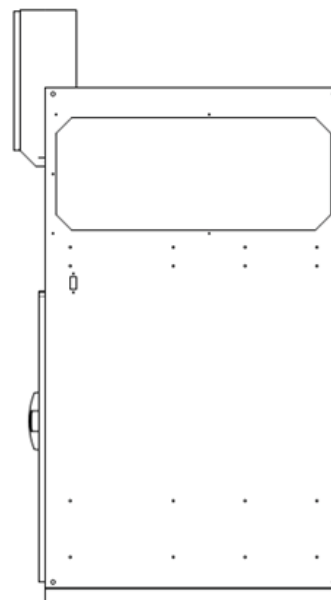
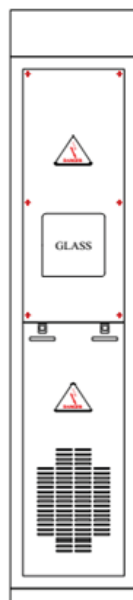
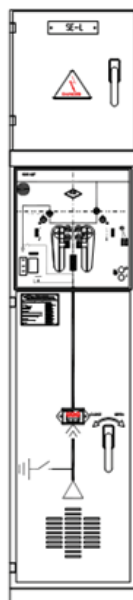
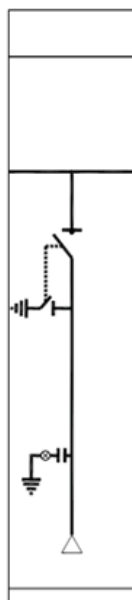
W=405/500x H=1750 x D=950

Weight : 190/210 Kg

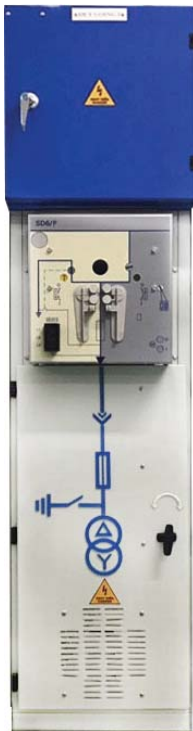
- Main busbars
- Earthing bar
- Inspection window
- Safety interlocks
- Switch Disconnecter
- Earthing switch
- Cable gland support
- Synoptic diagram
- Reference plate for operation steps

## Optional components

- Key interlocks SE/L e/o ST (extraction to be defined)
- Capacitor dividers and lamps
- Auxiliary contacts on SE/L and/or ST
- Space heater
- Internal lighting for unit
- Instrument box







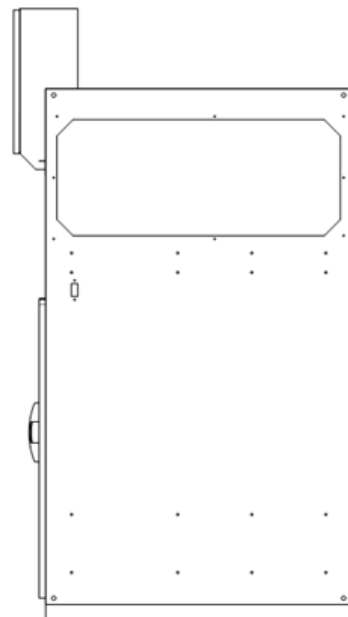
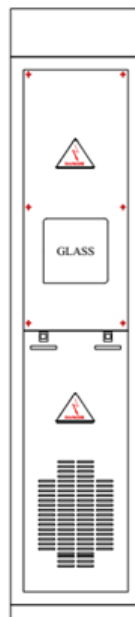
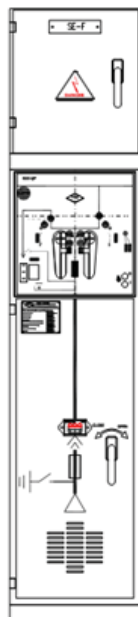
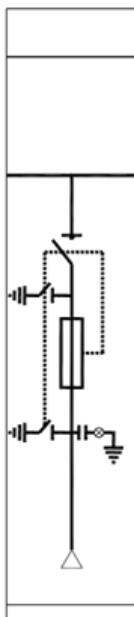
**Base unit components**

Dimensions (mm):  
 W=405/500 x H=1750 x D=950  
 Weight : 230/245 Kg

- Main busbars
- Earthing bar
- Inspection window
- Safety interlocks
- Switch Disconnecter
- Earthing switch
- Synoptic diagram

**Optional components**

- Key interlocks SE/F e/o ST (extraction to be defined)
- Capacitor dividers and lamps
- Auxiliary contacts on SD6/F and/or ST
- Space heater
- Internal lighting for unit
- MV fuses
- Opening coil (220 Vac-110/48/24 Vdc).



**SE-DC****GENERAL PROTECTION UNIT WITH DS + CB SF6/VACUUM CIRCUIT - BREAKER****Base unit components**

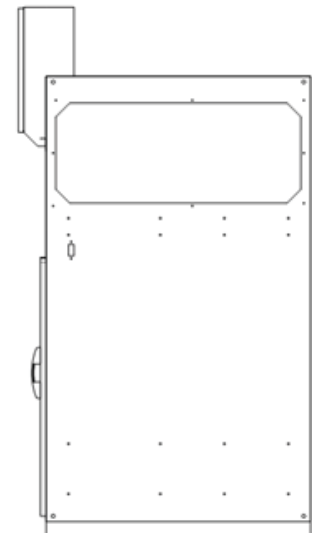
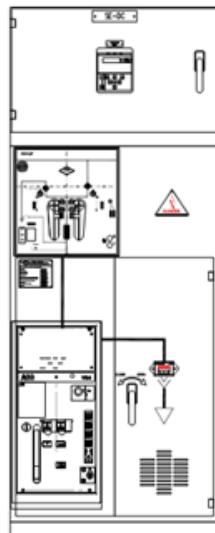
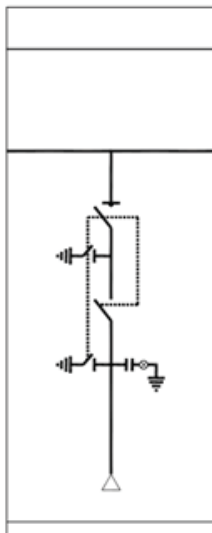
Dimensions (mm): W=750 x H=1750 x D=950

Weight: 310 Kg - CB, CT's, and LV box not included

- Main busbars
- Earthing bar
- Inspection window
- Safety interlocks
- Disconnector with key interlock
- Earthing switch
- Cable gland support
- Synoptic diagram
- Reference plate for operation steps

**Optional components**

- Key interlocks SE/D e/o ST (extraction to be defined)
- Capacitor dividers and lamps
- Auxiliary contacts on SE/D and/or ST
- Space heater
- Internal lighting for unit
- Instrument box
- Current/voltage transformers
- Fixed Vacuum or SF6 circuit breaker and accessories
- Motor charge , closing coil for CB/ VCB.





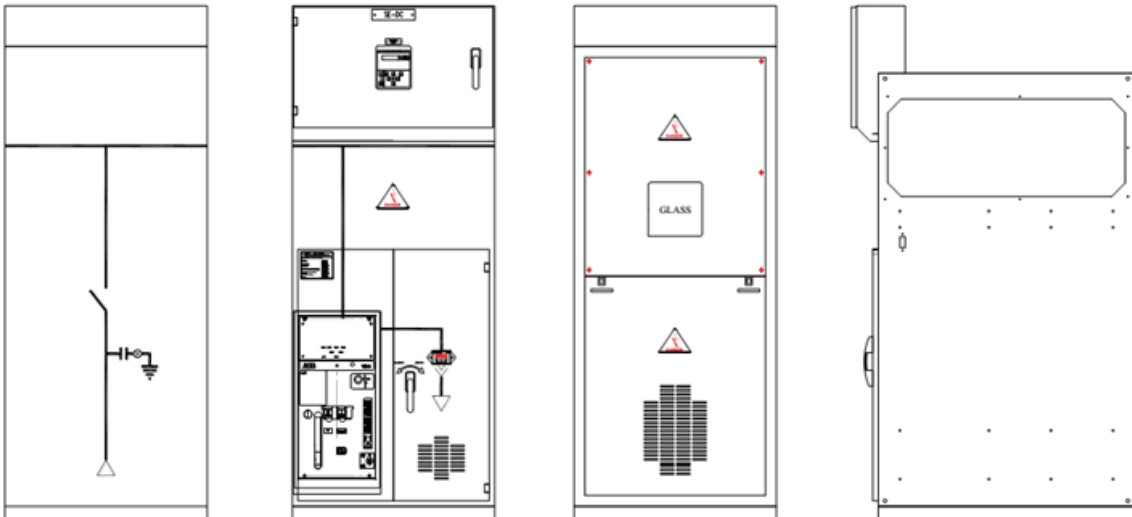
### Base unit components

Dimensions (mm) : W=750 x H=1750 x D=950  
 Weight : 310 Kg - CB, CT's, and LV box not included

- Main busbars
- Earthing bar
- Inspection window
- Safety interlocks
- Disconnecter with key interlock
- Earthing switch
- Cable gland support
- Synoptic diagram
- Reference plate for operation steps

### Base unit components

- Capacitor dividers and lamps
- Space heater
- Internal lighting for unit
- Instrument box
- Current/voltage transformers
- Fixed Vacuum or SF6 circuit breaker and accessories
- Motor charge , closing coil for CB/ VCB.



# SE-M

## MEASUREMENT UNIT



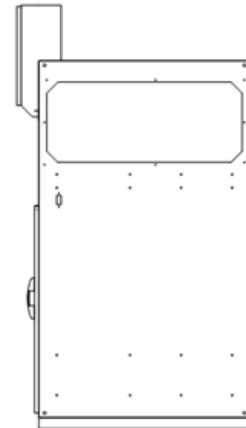
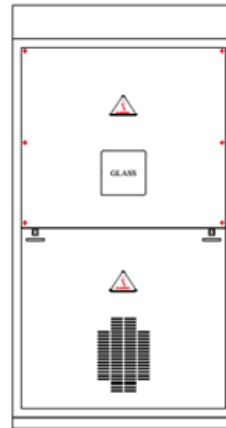
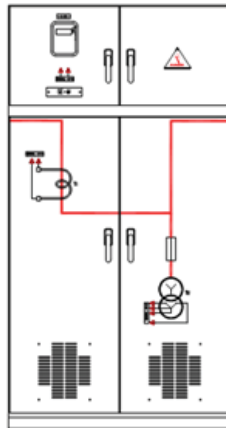
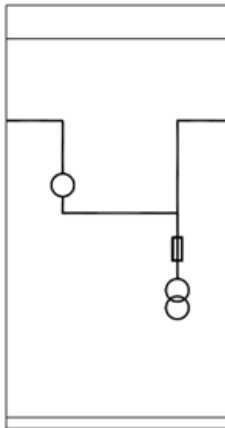
### Base unit components

Dimensions (mm) : W=1000 x H=1750 x D=950  
Weight : 145 Kg - CT's and VT's not included

- Main busbars
- Earthing bar
- Inspection window
- Synoptic diagram
- Measurement Voltage transformer.
- Measurement Current transformer.
- KWH

### Base unit components

- Instrument box
- Capacitor dividers and lamps
- Voltage transformers
- Current transformers

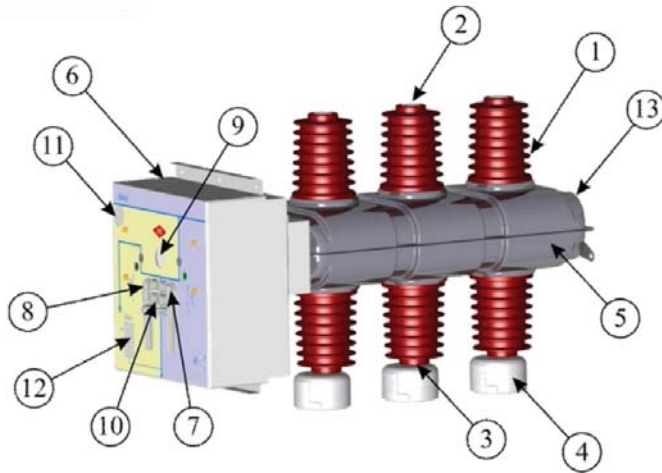


FUSES TABLE FOR PROTECTION TRANSFORMER

Service voltage (kV)	Transformer rating (kVA)																
	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500
	Rated thermal current / of the fuse (A)																
3	25	40	40	63	63	100	100	100	100	100	160						
5	16	25	25	40	40	63	63	100	100	100	100	100	160				
6	16	25	25	40	40	40	63	63	100	100	100	100	100	160			
10	10	16	16	25	25	25	40	40	63	63	63	100	100	100	100	160	
12	6	16	16	16	25	25	40	40	40	63	63	100	100	100	100	160	160
15	6	10	16	16	25	25	25	40	40	40	63	63	100	100	100	100	
17.5	6	6	10	16	16	25	25	25	40	40	63	63	63	100	100	100	100
20	6	6	10	16	16	16	25	25	40	40	40	63	63	63	100	100	100
24	6	6	6	10	16	16	16	25	25	40	40	40	63	63	100	100	100
30	6	6	6	6	10	16	16	16	25	25	40	40	40				
36	6	6	6	6	10	10	16	16	25	25	25	40	40				



## SWITCH - DISCONNECTOR

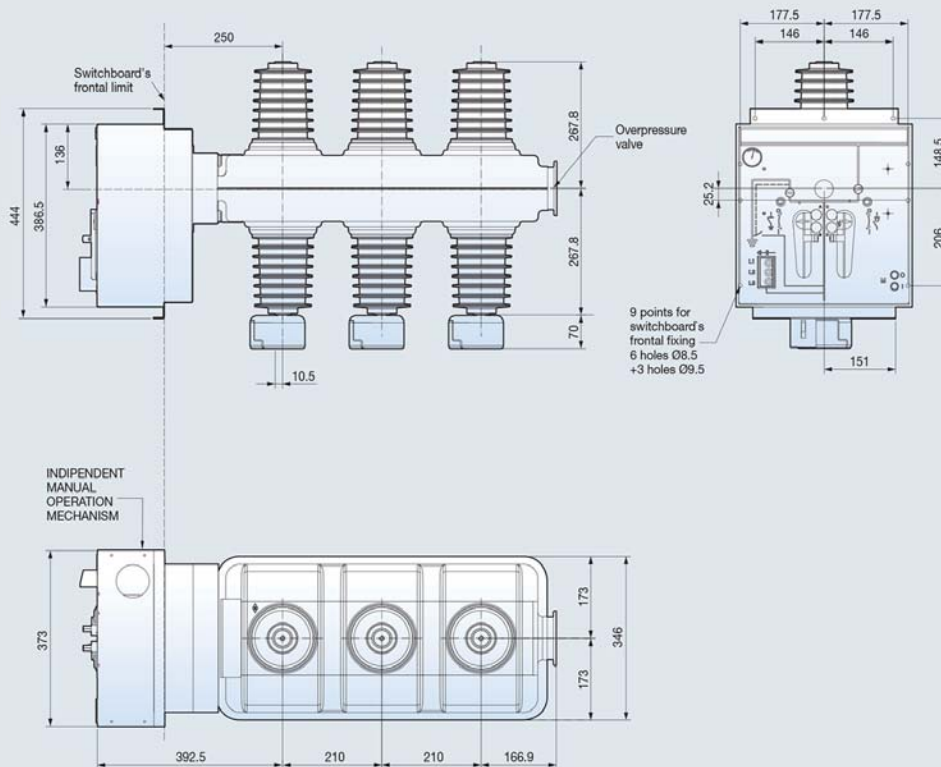


- 1 Insulator
- 2 Upper terminal
- 3 Lower terminal
- 4 Electrical field adapter only for 24kV
- 5 Stainless steel body
- 6 Operating mechanisms box
- 7 Switch-disconnector operating seat
- 8 Earthing-switch operating seat
- 9 Inspection window
- 10 Key interlock
- 11 Manometer
- 12 Voltage signalling lamps
- 13 Safety valve

### CHARACTERISTICS OF COMPONENTS

SF6 disconnecting unit is equipped with switch- disconnecter and earthing switch fitted with separated and interlocked operating mechanism.

*Optional : Schneider ...*



RATED VALUES				
Rated nominal voltage	[kV]	12	17,5	24
Rated nominal frequency	[Hz]	50/60	50/60	50/60
Test voltage 1 min. 50 Hz against earth and between the phases	[kV]	28	38	50
Test voltage 1 min. 50 Hz between the switch-disconnector opened contacts	[kV]	32	45	60
Impulse withstand voltage against earth and between the phases	[kV]	75	95	125
Impulse withstand voltage between the switch-disconnector opened contacts	[kV]	85	110	145
Rated nominal current	[A]	400/630/800	400/630/800	400/630/800
Rated breaking capacity mainly active load	[A]	400/630	400/630	400/630
Rated breaking capacity no-load transformer	[A]	6,3	6,3	6,3
Rated breaking capacity no-load overhead lines	[A]	10	10	10
Rated breaking capacity no-load cables	[A]	16	16	16
Rated short-time withstand current (1 sec.)	[kA]	12,5-25*	12,5-25*	12,5-25*
Rated short-time withstand current (3 sec.)	[kA]	12,5-21	12,5-21	12,5-21
Making capacity (on switch-disconnector and upstream earthing switch)	[kA]	31,5-65	31,5-65	31,5-65
Rated short-time withstand current 1 sec (downstream earthing switch)	[kA]	31,5-65	31,5-65	31,5-55
IEC standard test cycle		E1-E3	E1-E3	E1-E3
Endurance operation test (cycles)		5000	5000	5000

\*25 kA-2 sec. A richiesta

\*25 kA-2 sec.on request

## SWITCH-DISCONNECTOR EQUIPPED WITH FUSES

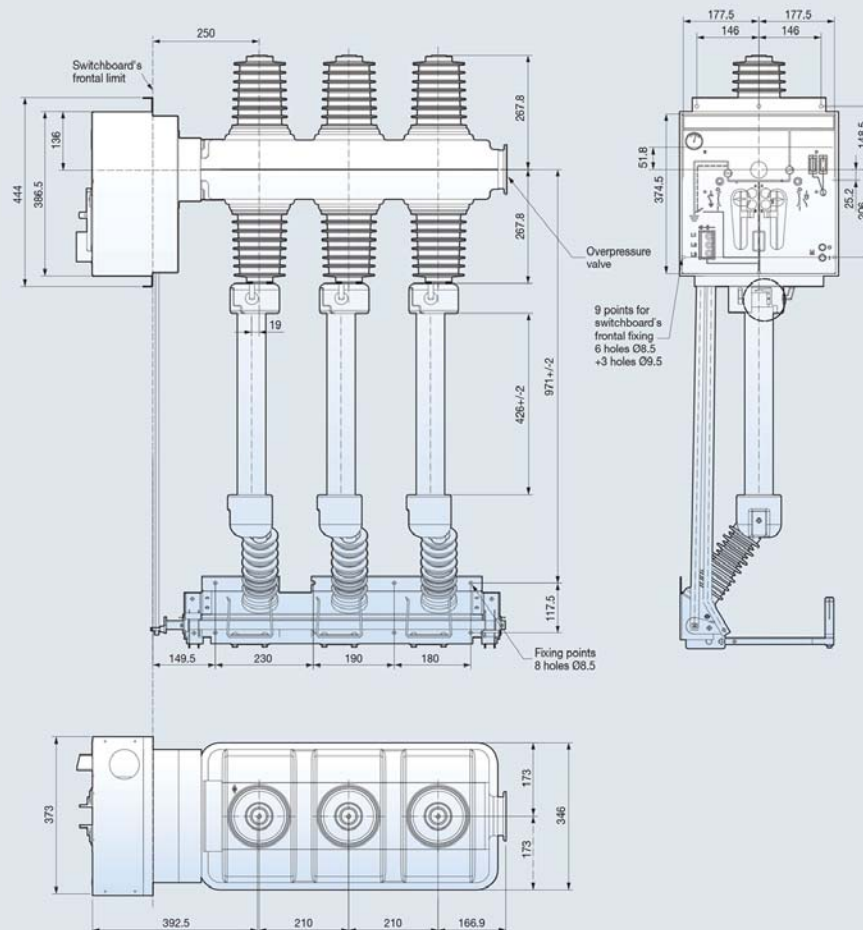


### CHARACTERISTICS OF COMPONENTS

Structurally, SE/F is similar to SE/L switch-disconnector but it is equipped with fuse-holder and downstream fuses air insulated earthing switch and release system activated by fuse striker and shunt-trip coil (optional).

SE/F is equipped with switch-disconnector and earthing switch fitted with separated and interlocked operating mechanism.

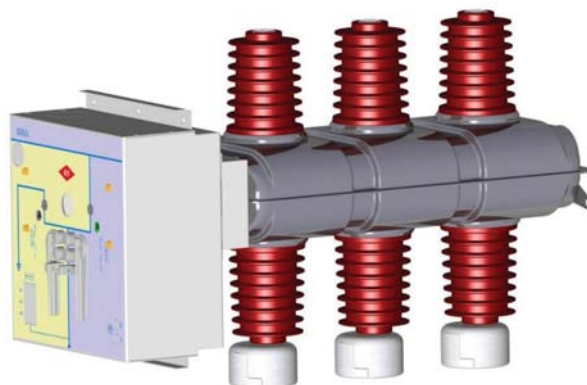
*Optional : Schneider ...*



RATED VALUES				
Rated nominal voltage	[kV]	12	17,5	24
Rated nominal frequency	[Hz]	50/60	50/60	50/60
Test voltage 1 min. 50 Hz against earth and between the phases	[kV]	28	38	50
Test voltage 1 min. 50 Hz between the switch-disconnector opened contacts	[kV]	32	45	60
Impulse withstand voltage against earth and between the phases	[kV]	75	95	125
Impulse withstand voltage between the switch-disconnector opened contacts	[kV]	85	110	145
Rated nominal current	[A]	400/630	400/630	400/630
Rated breaking capacity mainly active load	[A]	400/630	400/630	400/630
Rated breaking capacity no-load transformer	[A]	6,3	6,3	6,3
Rated breaking capacity no-load overhead lines	[A]	10	10	10
Rated breaking capacity no-load cables	[A]	16	16	16
Rated short-time withstand current (1 sec.)	[kA]	12,5-25*	12,5-25*	12,5-25*
Rated short-time withstand current (3 sec.)	[kA]	12,5-21	12,5-21	12,5-21
Making capacity (on switch-disconnector and upstream earthing switch)	[kA]	31,5-65	31,5-65	31,5-55
Rated short-time withstand current 1 sec (downstream earthing switch)	[kA]	3,15	3,15	3,15
IEC standard test cycle		E1-E3	E1-E3	E1-E3
Endurance operation test (cycles)		5000	5000	5000

\*25 kA-2 sec. A richiesta

\*25 kA-2 sec.on request



### CHARACTERISTICS OF COMPONENTS

Structurally, the disconnecter type D6 is similar to the SE/L switch-disconnector with the changes as below listed.

Elimination of the arc-breaking contacts.

Elimination of the blowing device.

The disconnecter is equipped, both for closing and opening operations, with a manual operating mechanism. Operation can be fitted with a keylock, padlock facility and auxiliary contacts. The disconnecter can be coupled with an earthing switch type "ES" (when it is used with a circuit breaker).

### TECHNICAL FEATURES

RATED VALUES				
Test voltage 1 min. 50 Hz against earth and between the phases	[kV]	28	38	50
Test voltage 1 min. 50 Hz between the open contacts of the switch-disconnector	[kV]	32	45	60
Impulse withstand voltage against earth and between the phases	[kV]	75	95	125
Impulse withstand voltage between the open contacts of the switch-disconnector	[kV]	85	110	145
Rated nominal current	[A]	400/630/800	400/630/800	400/630/800
Bus-bar rated current	[A]	400/630/800	400/630/800	400/630/800
Rated short-time withstand current (1 sec.)	[kA]	12,5-25*	12,5-25*	12,5-25*
Rated short-time withstand current (3 sec.)	[kA]	12,5-21	12,5-21	12,5-21
Rated peak withstand current	[kA]	31,5-65	31,5-65	31,5-65
Endurance operation test (cycles)		5000	5000	5000
*25 kA-2 sec. A richiesta				
*25 kA-2 sec.on request				





## General Presentation

SF6 Circuit Breaker is an essential component of an indoor metal-enclosed device intended for the MV section of HV/MV substations and high power MV/MV substations.

\* SF6 Circuit Breaker offers you:

- pre-engineered and adaptable solutions tailored to your specific requirements
- significantly reduced maintenance
- local support centres throughout the world

\* SF Circuit Breaker gives you the advantages of:

- continuity of service for your networks;
- enhanced safety for your staff and operations
- optimised investment throughout the life of your installation
- the possibility of integrating your medium voltage switchboard in a monitoring and control system

## Scope of application

SF circuit breakers are 3-pole MV circuit breakers for indoor installation.

They are mainly used for switching and protection of networks up to 40.5 kV in primary and secondary power distribution.

The autocompression breaking technique used in these circuit breakers means that making or breaking all types of capacitive or inductive currents can be achieved without dangerous overvoltages for the switchgear connected to the network.

The SF circuit breaker is therefore well suited to operating capacitor banks



SF1 circuit breakers with a B1 side operating mechanism



SFset circuit breakers with a B1 side operating mechanism

## Description of the device

The basic withdrawable version of the SF circuit breaker comprises:

- 3 main independent poles, that are mechanically linked and each comprising a "sealed pressure system" type insulating enclosure. The sealed enclosure is filled with low pressure SF6 gas
- a stored energy operating mechanism of manual RI type (that can be electrically operated as an option)

This gives the device an opening and closing speed that is independent of the operator, for both electrical and manual orders.

When equipped with an electrical operating mechanism, the circuit breaker can be remotely controlled and it is possible to carry out reclosing cycles.

- a front panel housing the manual operating mechanism and status indicators
- upstream and downstream terminals for the power circuit connection
- a terminal block for connection of external auxiliary circuits.

According to its characteristics, the SF circuit breaker is available either in frontal version or in lateral version.

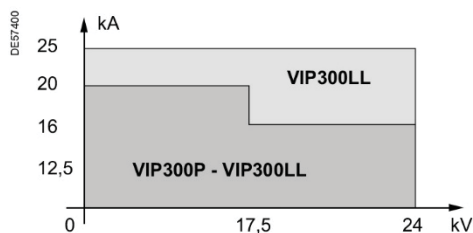
### Each device can be optionally equipped with:

- an electrical operating mechanism
- a support frame fitted with rollers and floor securing brackets for a fixed installation
- locking of the circuit breaker in the open position by a keylock installed on the control panel
- a pressure switch for the high performance versions
- a Harting 42-pin type LV connector.

### The SFset includes an independent protection chain

The SFset is provided with a fully autonomous integrated protection chain (with a VIP type control unit) operating without an auxiliary power source.

The VIP protection unit exists in two models: VIP300P and VIP300LL.

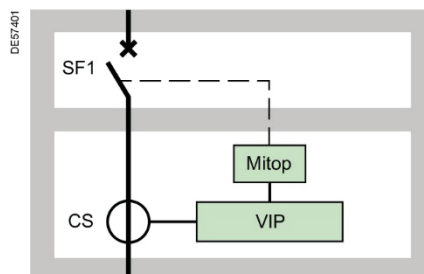


Depending on the model, the unit provides protection against phase over-currents and earthing faults.

VIP protection units are associated with functional current sensors.

Two interchangeable sensors, CSa and CSb, are sufficient to cover all requirements from 10 to 1250 A.

SFset is delivered equipped and cabled with its protection chain, this simplifies panel builders' installation work.



SFset schematic diagram

**SF1**

PE56503



**Electrical characteristics according to IEC 62271-100**

Rated voltage	Ur	kV 50/60 Hz	12	17.5	24	36									
Insulation voltage															
- power frequency withstand	Ud	kV 50 Hz 1min	28	38	50	70									
- lightning impulse withstand	Up	kV peak	75	95	125	170									
Rated current	Ir	A	400	-	-	■	-	■	-	■	-	■	-	■	
			630	■	■	■	■	■	■	■	■	■	■	■	
			1250	-	■	■	■	■	■	■	■	■	■	■	
Short circuit current	Isc	kA	25	12.5	20	25	12.5	16	20	25	12.5	16	20	25	
Short time withstand current	I <sub>k</sub> /t <sub>k</sub>	kA/3 s	25	12.5	20	25	12.5	16	20	25	12.5	16	20	25	
Short-circuit making current	Ip	kA peak	50 Hz	62.5	31.3	50	62.5	31.3	40	50	62.5	31.3	40	50	62.5
			60 Hz	65	32.5	52	65	32.5	41.6	52	65	32.5	41.6	52	65
Rated switching sequence	O-3 min-CO-3 min-CO		■	■			■				■				
	O-0.3 s-CO-3 min-CO		■	■			■				■				
	O-0.3 s-CO-15 s-CO		■	■			■				■				
Phase to phase	mm	220	-	■	■	■	■	-	-	-	-	-	-	-	
		250	■	■	■	■	■	■	■	■	-	-	-	-	
		280	-	-	-	-	■	■	■	■	-	-	-	-	
		350	-	-	-	-	-	-	-	-	■	-	■	■	
		380	-	-	-	-	-	-	-	-	-	■	■	■	■
Operating mechanism	A1 lateral (*)		-	■	■	■	■	■	■	■	■	-	■	■	
	B1 lateral (*)		-	■	■	■	■	■	■	■	■	-	■	■	
	C1 frontal (*)		-	■	■	■	■	■	■	■	■	-	■	■	
	For SM6 switchgear		■	-	■	-	■	■	■	-	■	■	■	■	
Operating times	Opening (ms)		< 50												
	Breaking (ms)		< 60												
	Closing (ms)		< 65												
Service temperature	T	°C	- 5 to + 40 (**)												
Mechanical endurance	Class		M2												
	Number of switching operations		10,000												
Electrical endurance	Class		E2												
Capacitive current breaking capacity	Class		C2												

(\*) See chapter "Dimensions"

(\*\*) For a temperature lower than -5 °C, please consult us

■ Available  
- Not available

**Specific applications**

**Switching and protection of capacitor banks**

SF range circuit breakers are particularly well suited to switching and protection of capacitor banks; they are classed C2 according to standard IEC 62271-100. Tests carried out according to the standard for breaking at 400 A with making and breaking cycles in case of a capacitor bank with a making current of 20 kA.

## General characteristics

### SF1 and SF set Fixed version

#### SFset



#### Electrical characteristics according to IEC 62271-100

Rated voltage	Ur	kV 50/60 Hz	12	17.5	24						
Insulation voltage											
- power frequency withstand	Ud	kV 50 Hz 1min	28	38	50						
- lightning impulse withstand	Up	kV peak	75	95	125						
Rated current	Ir	A	400	630	1250	■	■	■	■	■	■
Short circuit current	Isc	kA	25	12.5	20	25	12.5	16	20	25	
Short time withstand current	I <sub>k</sub> /t <sub>k</sub>	kA/3 s	25	12.5	20	25	12.5	16	20	25	
Short-circuit making current	I <sub>p</sub>	kA peak	50 Hz	62.5	31.3	50	62.5	31.3	40	50	62.5
		60 Hz	65	32.5	52	65	32.5	41.6	52	65	
Rated switching sequence		O-3 min-CO-3 min-CO	■	■	■	■	■	■	■	■	■
		O-0.3 s-CO-3 min-CO	■	■	■	■	■	■	■	■	■
		O-0.3 s-CO-15 s-CO	■	■	■	■	■	■	■	■	■
Phase to phase		mm	220	250	280	350	380				
			-	■	■	■	■	-	-	-	-
			■	■	■	■	■	■	■	■	■
			-	-	-	-	-	■	■	■	■
			-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-
Operating mechanism		A1 lateral (*)	-	■	■	■	■	■	■	■	■
		B1 lateral (*)	-	■	■	■	■	■	■	■	■
		C1 frontal (*)	-	■	■	■	■	■	■	■	■
		For SM6 switchgear	■	-	■	-	■	■	■	■	-
Operating times		Opening (ms)									< 50
		Breaking (ms)									< 60
		Closing (ms)									< 65
Service temperature	T	°C									- 5 to + 40 (**)
Mechanical endurance		Class									M2
		Number of switching operations									10,000
Electrical endurance		Class									E2
Capacitive current breaking capacity		Class									C2

(\*) See chapter "Dimensions"

(\*\*) For a temperature lower than -5 °C, please consult us

■ Available  
- Not available

#### Specific applications

##### Switching and protection of capacitor banks

SF range circuit breakers are particularly well suited to switching and protection of capacitor banks; they are classed C2 according to standard IEC 62271-100. Tests carried out according to the standard for breaking at 400 A with making and breaking cycles in case of a capacitor bank with a making current of 20 kA.





PE6604  
SFset with a VIP protection unit installed on the front panel

### The SFset circuit breaker has an integrated and independent protection system

The SFset circuit breaker comprises an SF1 into which is integrated a protection system comprising:

- a set of current sensors installed on the lower current terminals of the pole units.
- Two interchangeable sensors, CSa and CSb, sufficient to cover all requirements from 10 A to 1250 A.
- a VIP type protection relay mounted on the control unit.
- a "Mitop" low consumption, release unit installed on the switching device.
- The unit is fully independent and functions without an auxiliary power supply.

#### Operating principle

The protection system is supplied power by sensors which supply:

- the "current" information, processed by the protection unit
- the electrical power required for the whole protection system to operate ; VIP unit and Mitop release.

All settings are visible and accessible from the front of the device.



PE5772  
VIP300LL protection unit

### VIP300P and VIP300LL independent protection unit

The VIP300 unit is intended to be installed on distribution networks. It can be used to protect an MV/LV transformer, to protect the head of an industrial installation, but also to protect a branch.

The VIP300 provides protection against phase-to-phase faults and against earthing faults. The choice of trip curves and the large number of settings enable it to be used

in a large number of discrimination arrangements.

The VIP300 is an independent unit supplied power from the current sensors; it does not require an auxiliary power supply. It activates a Mitop release unit.

The VIP300 exists in 2 models:

- VIP300P: phase protection
- VIP300LL: phase and earthing protection.

#### Phase protection (VIP300P, VIP300LL)

Phase protection has two independently adjustable thresholds:

- the lower threshold can be chosen to be either definite time or inverse definite time. It can be executed according to the RI curve.
- the upper threshold is inverse definite time.

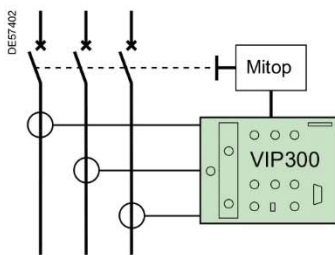
The definite time curves are in conformity with standard IEC 60255-3.

They are either of type inverse (SI), very inverse (VI) and extremely inverse (EI).

#### Earthing protection (VIP300LL)

Earthing full protection functions with the measurement of residual current: this is carried out based on the sum of secondary currents in the sensors.

As for phase protection, earthing protection has two independently adjustable thresholds.



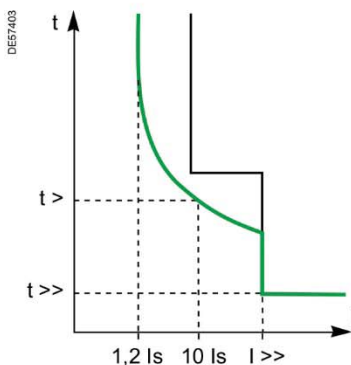
DI57402  
Simplified connection arrangement

#### Indication

Two indicators show the origin of the release (phase or earth).

They stay in position after breaking the release unit power supply.

Two LED indicator lights (phase and earth) show that the lower threshold has been exceeded and that the time delay has been started.



DI57403  
Phase and earthing protection curve



## Protection, monitoring and control

Current sensors and test unit for VIP300

SF1 and SF set Fixed version

PE55773



Cs type current sensors

### CSa and CSb current sensors for the VIP300

In order to achieve the specified performance levels, the VIP300 protection unit must be used with the specified sensors. The combination of the unit/sensor is essential in order to comply with characteristics and in particular with:

- operation throughout the whole range
- response time
- accuracy
- short circuit thermal withstand.

Two interchangeable sensors, CSa and CSb, suffice to cover all requirements from 10 A to 1250 A.

Sensor selection	Service current (Is)
CSa	10 A to 200 A
CSb	63 A to 1250 A

PE56614



VAP6 test unit

### VAP6 test unit

VIP type protection units have a "test", socket to connect a VAP6 test unit.

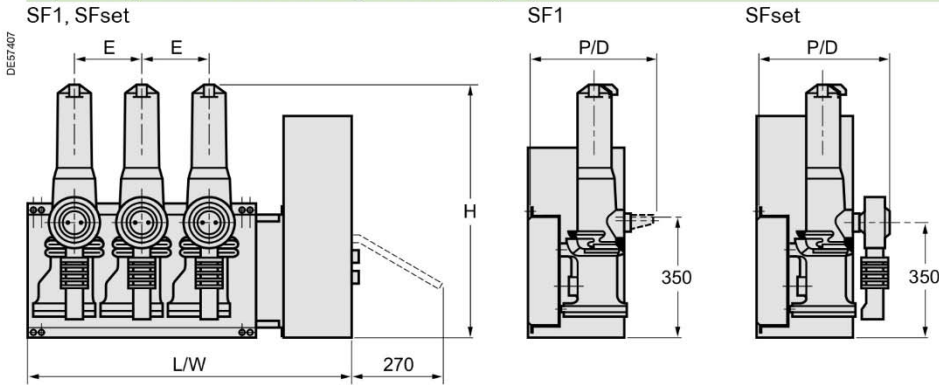
This portable unit with its own power supply enables the correct functioning of the protection unit to be checked.

# Dimensions

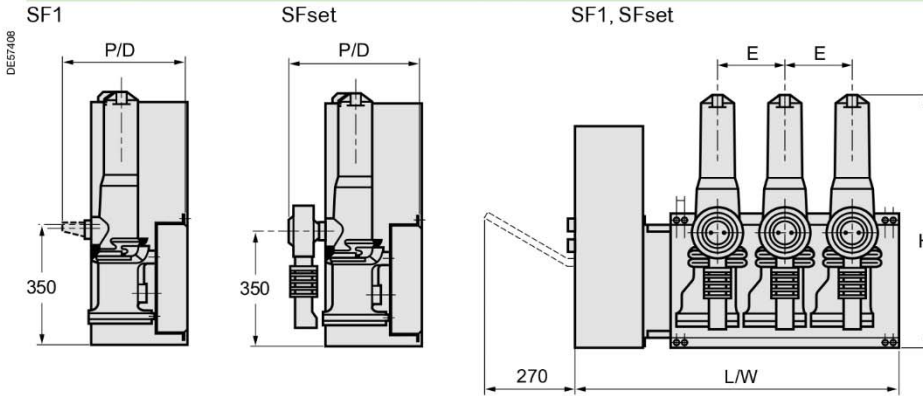
## SF1 and SF set Fixed version

### Basic fixed unit

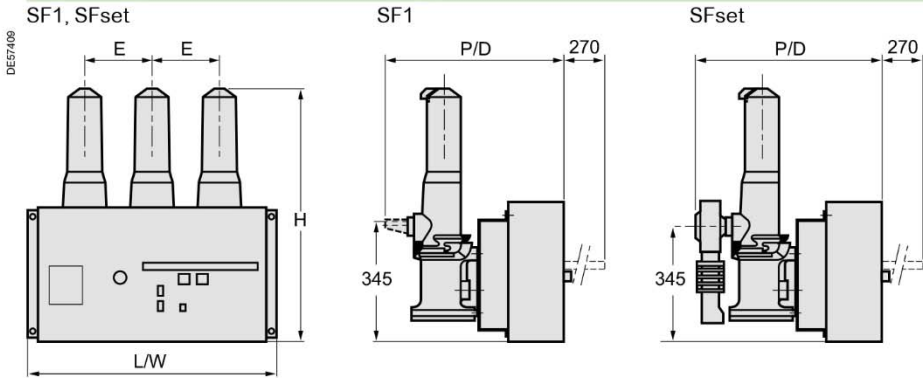
#### Operating mechanism on the right hand side (A1)



#### Operating mechanism on the left hand side (B1)



#### Operating mechanism on the front (C1)



### Dimensions and weights

Rated voltage (kV)	SF1					SFset				
	Dimensions (mm)				Weight (kg)	Dimensions (mm)				Weight (kg)
H	W	D	E	H		W	D	E		
<b>Operating mechanism on the right or left</b>										
17.5	750	993	290	220	78	750	993	420	220	88
24	750	1143	290	280	80	750	1143	420	280	90
36	750	1560	365	380	88					
<b>Operating mechanism on the front</b>										
17.5	745	766	490	220	78	745	766	620	220	88
24	745	886	490	280	80	745	886	620	280	90
36	745	927	559	350	85					
36	745	1260	565	380	88					

For SF circuit breakers with SM6, consult us.

## Dimensions

### SF1 and SF set Fixed version

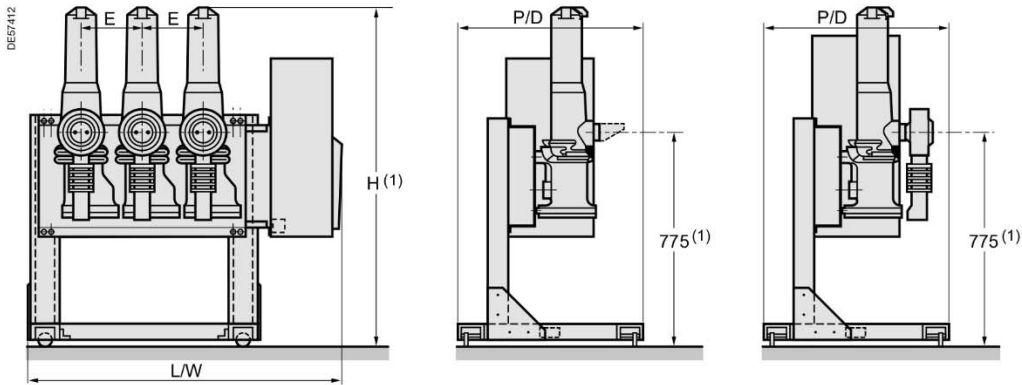
#### Fixed unit with support frame

##### Operating mechanism on the right hand side (A1)

SF1, SFset

SF1

SFset

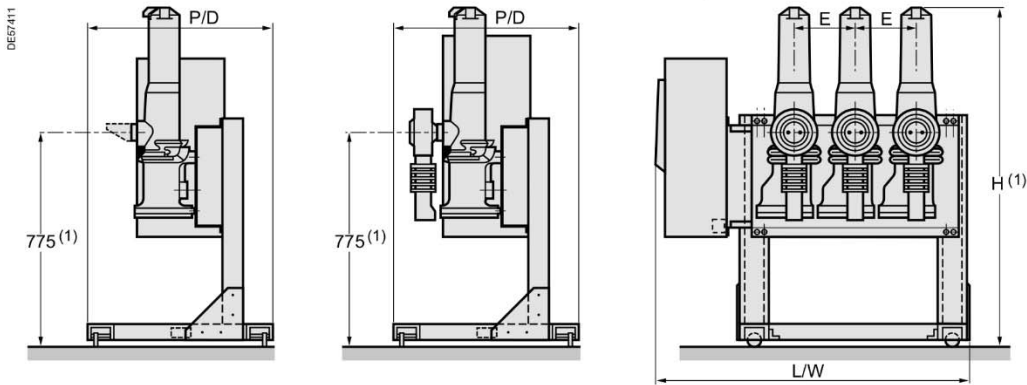


##### Operating mechanism on the left hand side (B1)

SF1

SFset

SF1, SFset

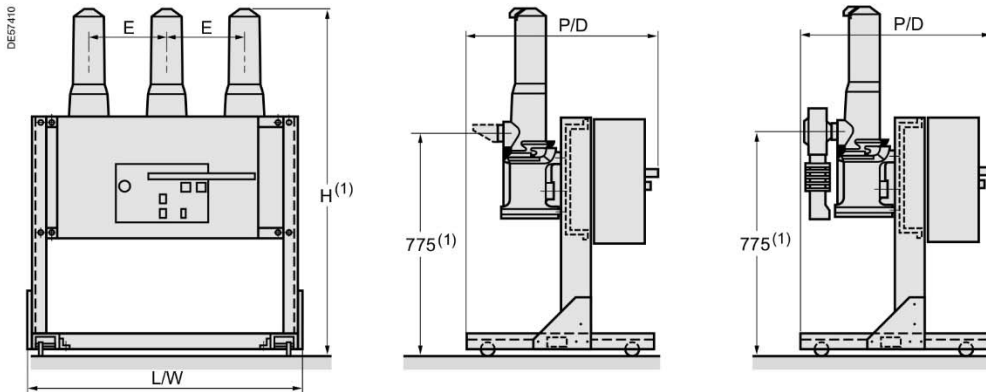


##### Operating mechanism on the front (C1)

SF1, SFset

SF1

SFset



#### Dimensions and weights

Rated voltage (kV)	SF1					SFset				
	Dimensions (mm)				Weight (kg)	Dimensions (mm)				Weight (kg)
H	W	D	E	H		W	D	E		
<b>Operating mechanism on the right or left hand side</b>										
17.5	1175	1065	600	220	103	1175	1065	600	220	103
24	1175	1215	600	280	105	1175	1215	600	280	105
36	1175	632	600	380	113					
<b>Operating mechanism on the front</b>										
17.5	1175	853	600	220	103	1175	853	649	220	103
24	1175	973	600	280	105	1175	973	649	280	105
36	1175	1347	600	380	113					

(1) Additional holes, provided on the fixed support frame allow the device to be positioned 215 mm lower.

# Dimensions

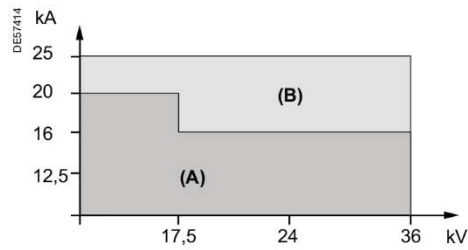
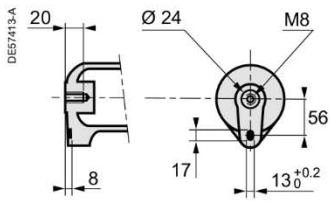
## SF1 and SF set Fixed version

### Connection

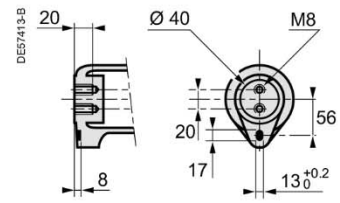
#### Top

**Ir ≤ 630 A**

SF1, SFset (A)

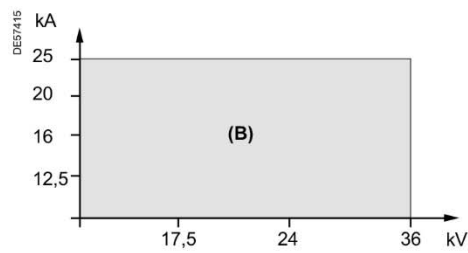
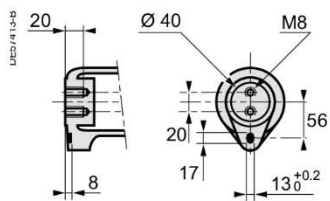


SF1, SFset (B)



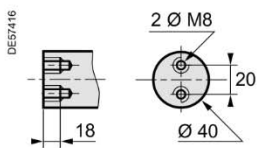
**Ir = 1250 A**

SF1, SFset (B)

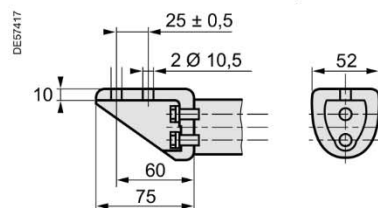


#### Bottom

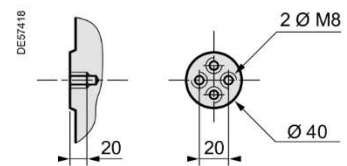
SF1, insulation ≤ 125 kV impulse



SF1, insulation ≤ 170 kV impulse



SFset



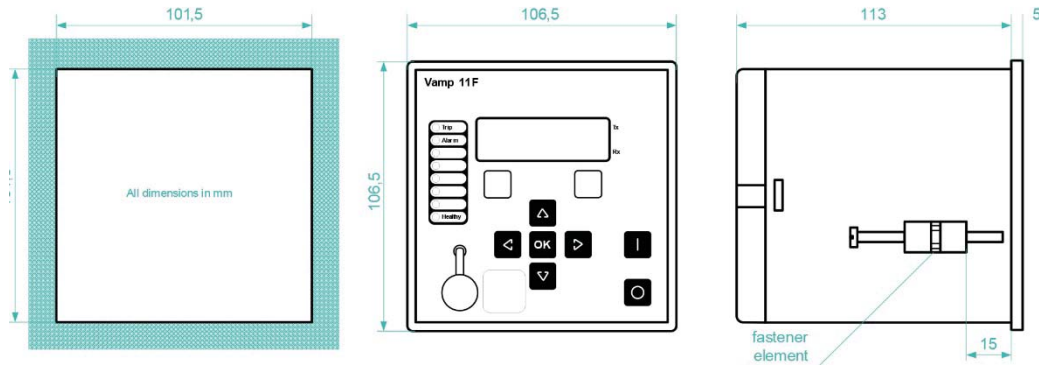
**Note:** recommended connection screw M8 class 8.8.  
Tightening torque: 28 Nm with contact washer.

## VAMP 11F

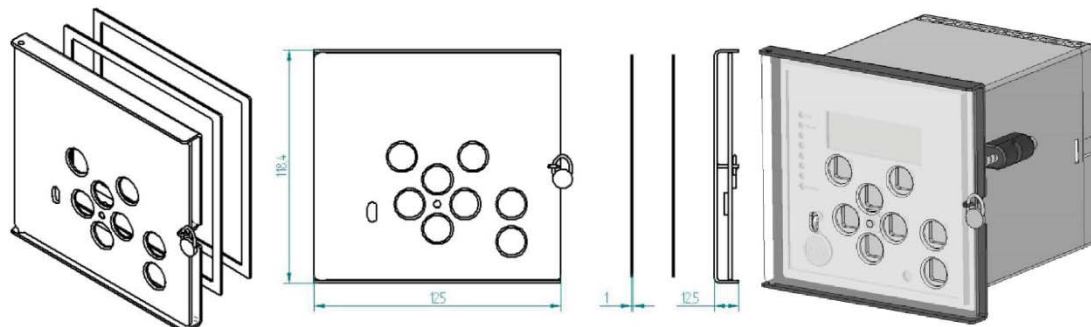
### Universal Overcurrent Protection Relay

Individual relays are normally supplied with an outline diagram showing the dimensions. This information can also be found in the product publication.

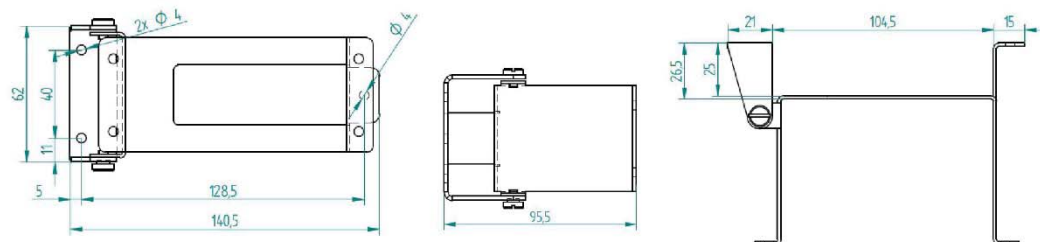
The relays are designed for indoor use only and can be flush or wall mounted



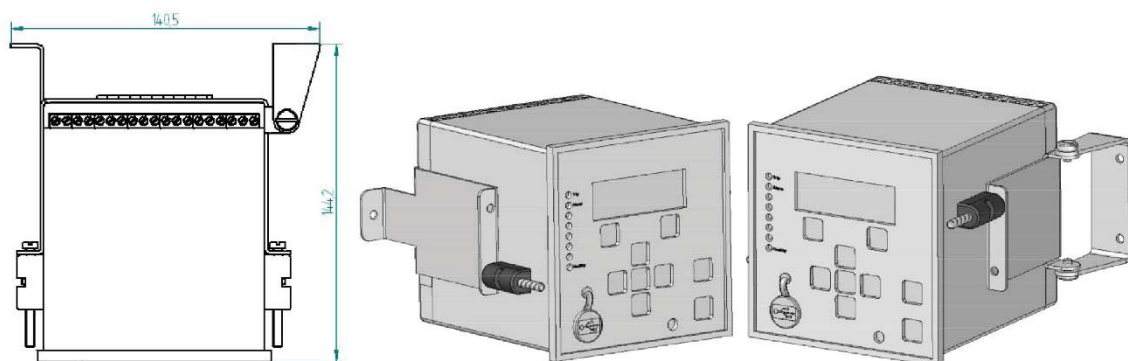
V11F Dimensions



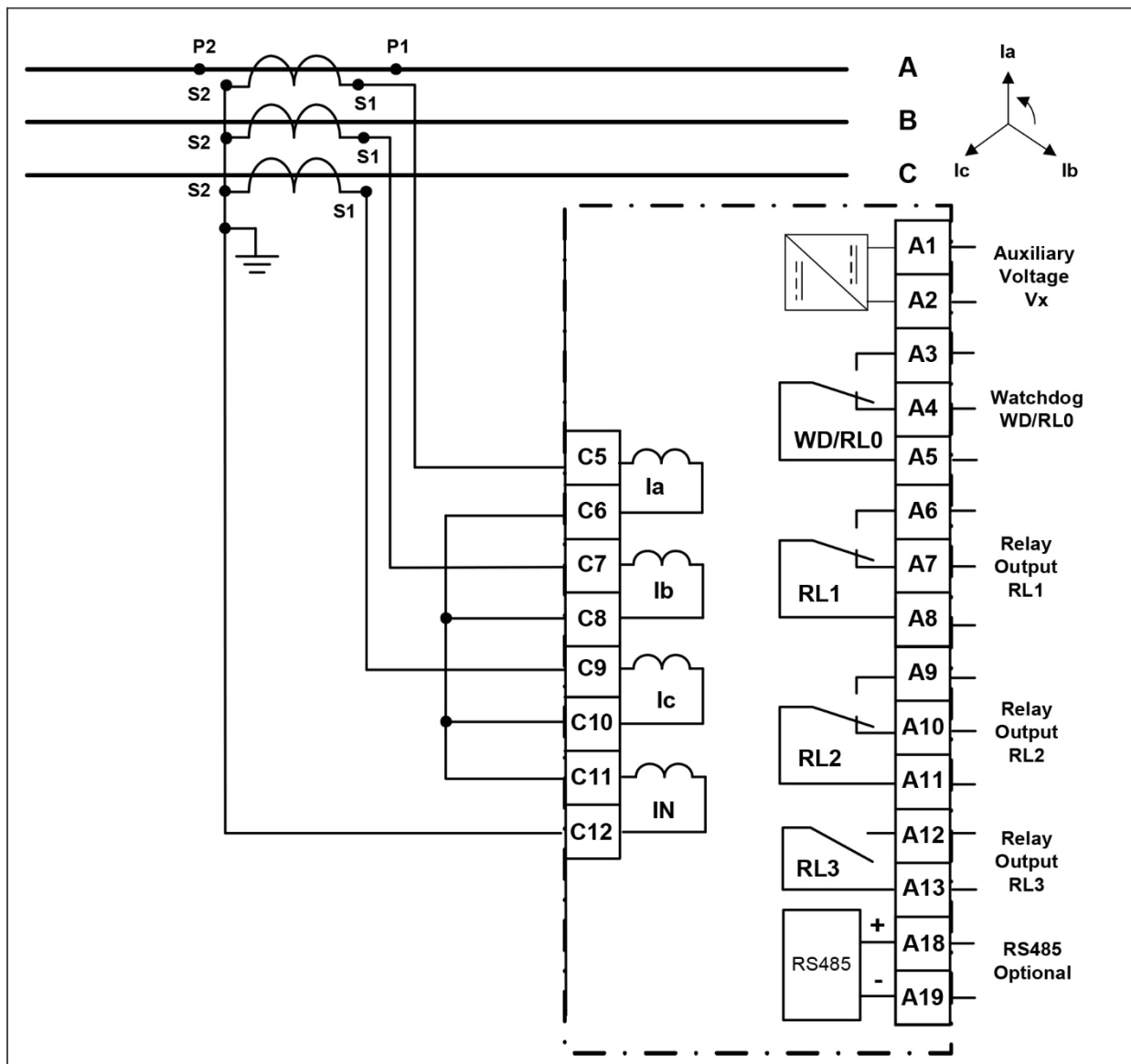
Front panel cover



V11F Wall Mounting Case Adaptor Dimensions



Wall Mounting Case Adaptor with fastener element



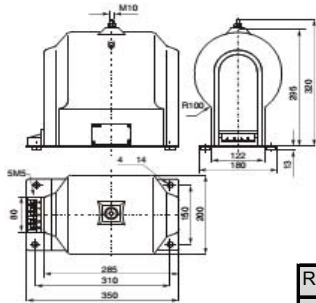
**Model L**

List of functions available in L model:

IEEE/ANSI Code	IEC Symbol	Function name
50BF	I<, IN<	Circuit breaker failure
50/51	I>, I>>, I>>>	Three-phase non directional overcurrent 3 independent thresholds (20 groups of IDMT curves)
		Cold Load Pick-Up
50N/51N	IN>, IN>>	Phase-earth non directional overcurrent 2 independent thresholds (20 groups of IDMT curves)
86		Output relay latching

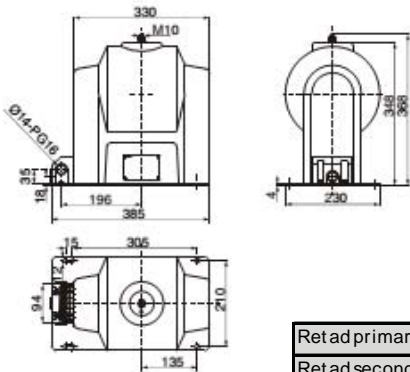


## INDOOR, EPOXY CASTING TYPE, 1 PHASE MEDIUM VOLTAGE MEASURING POTENTIAL TRANSFORMERS



Description	Unit	Data		
PT type		PT22 – 1ZH11	PT22 – 1ZH12	PT22 – 1ZH1P
Connection diagram		H.1	H.3	H.5
Standard		TCVN 6097-1995; IEC 186; IEC60044-2		
Rated voltage/ Power frequency withstand voltage/ Impulse withstand voltage [1.2/50s]	kV	24/50/95 (PT22-1ZH1..) 24/50/125 (PT22-1ZH11..)		
Number of phase		1		
Rated frequency	Hz	50		
Rated voltage factor		1.9 x Un (8h)		
Number of bushing		1		
Burden – Measuring accuracy class		25VA-0.5; 30VA-0.5; 50VA-0.5; 75VA-0.5		
Burden – Protection accuracy class		75VA/3P; 200VA/3P; 200VA/6P		
Number of primary inputs for rated voltage		1 or 2		
Service type		Indoor		
Creepage distance	mm/kV	16		
Outer dimensions	mm	See drawing		
Weight	kg	35		

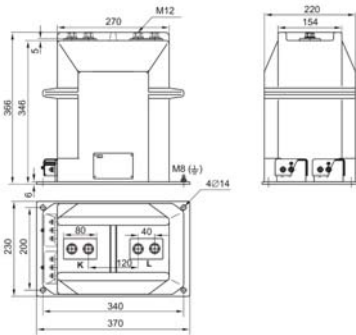
Rated primary voltage (V)	20000 : 3	22000 : 3	22900 : 3	24000 : 3
Rated secondary voltage 2 ratios (V)	(15000-22000) : 3 [Ph <sub>u</sub> t <sub>aj</sub> / Burden : 30/50VA or 50/75VA]			
Rated secondary voltage	Measuring winding	100 : 3 ; 110 : 3 ; 190 : 3 ; 100:110 : 120 : 190		
	Protective winding	100:3 ; 110:3 ; 190:3		



Description	Unit	Data	
PT type		PT22 – 1ZH11	PT22 – 1ZH12P
Connection diagram		H.1	H.5
Standard		TCVN 6097-1995; IEC 186; IEC60044-2	
Rated voltage/ Power frequency withstand voltage/ Impulse withstand voltage [1.2/50s]	kV	24/50/95 (PT22-1ZH1..) 24/50/125 (PT22-1ZH11..)	
Number of phase		1	
Rated frequency	Hz	50	
Rated voltage factor		1.9 x Un (8h)	
Number of bushing		1	
Burden – Measuring accuracy class		100VA	
Burden – Protection accuracy class		100VA/3P; 200VA/3P; 200VA/6P	
Number of primary inputs for rated voltage		1	
Service type		Indoor	
Creepage distance	mm/kV	16	
Outer dimensions	mm	See drawing	
Weight	kg	50	

Rated primary voltage (V)	20000 : 3	22000 : 3	22900 : 3	24000 : 3
Rated secondary voltage	Measuring winding	100 : 3 ; 110 : 3 ; 190 : 3 ; 100:110 : 120 : 190		
	Protective winding	100:3 ; 110:3 ; 190:3		

# INDOOR, EPOXY CASTING TYPE, 1 PHASE MEDIUM VOLTAGE CURRENT TRANSFORMERS



Description	Unit	Data	
PT type		CT22-2C11B CT22-2C51B	CT22-2C112B CT22-2C512B
Connection diagram		H.3	H.4
Standard		TCVN 5928-1995; IEC 185; IEC60044-1	
Rated voltage/ Power frequency withstand voltage/ Impulse withstand voltage [ 1.2/50s]	kV	24/50/95 24/50/125	
Rated frequency	Hz	50	
Rated thermal current factor		1.2	
Number of cores		2	
Burden – Accuracy class		15VA or 30VA – 0.5/5P10	
Service type		Indoor	
Creepage distance	mm/kV	16	
Outer dimensions	mm	See drawing	
Weight	kg	40	

Rated primary current 1 ratio	5	10	15	20	25	30	40	50	60	75	100	150	200	250	300	400	500	600	800
Rated primary current 2 ratio	5	10	15	20	20	25	30	50	75	75	100	150	200	250	300	400	400		
	10	20	30	30	40	50	60	100	100	150	200	300	400	500	600	600	800		
Rated secondary current	1A or 5A																		



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