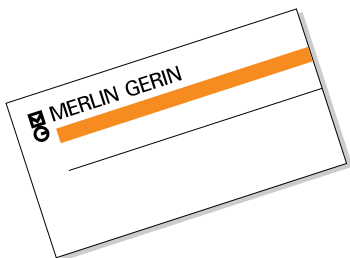


Circuit breakers

SF

1 to 40.5 kV

SF6 switchgear



GROUPE SCHNEIDER

SF circuit breakers 1 to 40.5 kV

contents

	page
SF6 gas	
the universal technology for medium voltage	2
the switchgear manufacturers' gas	3
breaking technique	
auto-compression technique	4
operating	5
general	
a high-performance and reliable range	6
certified quality: ISO 9001	7
electrical characteristics	8
description	
SF1 circuit breaker	10
SFset circuit breaker	11
SF2, ISF2, circuit breaker	12
auxiliaries	13
operating mechanisms and diagrams	
SF1/SFset circuit breaker	14
SF2 circuit breaker	16
protection and control/monitoring	
protection units	18
VIP13 protection unit	20
VIP17 protection unit	21
VIP200/VIP201 control units	22
time/current curves	25
dimensions	
SF1, SFset	28
SF2, ISF2	30
identification of units	
examples of rating plates, inspection sheet	31
order information	32

SF6 gas

the universal technology for medium voltage



mastering difficult currents

The absence of overvoltages is one of the numerous advantages of the SF6 breaking technique, eliminating the need for arresting devices to reduce switching surges.

Short-circuit currents

The short duration of the arc in the breaking chamber and the rapid recovery of the SF6 dielectric properties enable SF6 switchgear to break fault currents up to 50 kA rms.

Capacitive currents

SF6 switchgear does not provoke multiple restrikes. Capacitive currents (lines, unloaded cables, capacitor banks) can therefore be interrupted without creating overvoltages that could damage equipment connected to the network.

Low inductive currents

Using the SF6 breaking technique, the chopping current, resulting from the instability of the arc at low currents, is reduced to a very low level. The corresponding overvoltage is therefore considerably reduced to a level that cannot damage equipment.

Numerous tests carried out in national and international laboratories have shown that multiple restrikes (opening) or prestrikes (closing) do not occur with SF6 switchgear.

SF6 switchgear ensures surge-free breaking, eliminating successive dielectric breakdowns and the need for surge-arresting devices.

the experience of a major manufacturer

Given its pioneer work in the puffer-type SF6 technique, Merlin Gerin naturally played a decisive role in developing further applications of the technique.

Merlin Gerin is today one of the foremost manufacturers of SF6 switchgear, with:

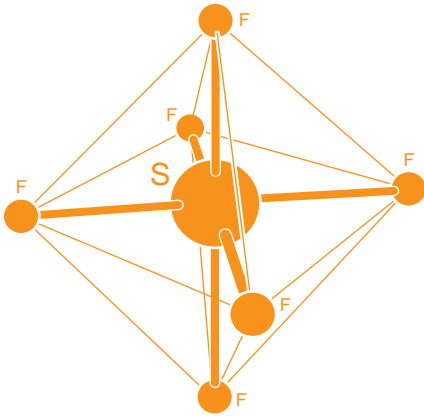
- more than twenty years of industrial experience using SF6 techniques,
- more than 500 000 switchgear units installed around the world,

It has developed a wide range of high-performance and reliable units, operating faultlessly on all five continents.

The company continuously innovates to improve performance levels. In 1989, it introduced a product based on a new concept, the SFset circuit breaker with integrated protection functions.

SF6 switchgear is thus capable of meeting the most demanding requirements of public and industrial distribution networks worldwide, up to 40.5 kV.

the switchgear manufacturers' gas



a widely available gas

Like all gases in current use, SF₆ is available in all countries of the world. SF₆ is non-toxic.

a non-inflammable gas

SF₆ is an inert gas and does not sustain combustion.

a very stable gas

The high stability of SF₆ gas is due to the 6 covalent bonds of its molecule.

an insulating gas

The dielectric strength of SF₆ is superior to that of most known media, reaching 5 times that of air at a pressure of a few tenths of MPa.

a breaking gas

SF₆ is "the" breaking gas offering a number of advantages:

- **high capacity for carrying the heat produced by the arc.** The arc is rapidly cooled by convection during arcing;
- **high radial thermal conduction and high electron capturing capacity;** when the current passes through zero:
 - the SF₆ permits rapid heat exchange from the centre of the arc towards the exterior,
 - the fluorine atoms, which are highly electro-negative, act as veritable "traps" for electrons; since it is the electrons which are mainly responsible for electric conduction in the gas, the gap between the contacts recovers its initial dielectric strength through this electron capture phenomenon at current zero.

anticipated service life: more than 30 years

The breaking system is designed to operate without maintenance for many years with in particular:

- no need for any SF₆ refilling throughout the service life of the unit, thanks to SF₆ gas recombination after breaking,
- no continuous pressure monitoring.

insensitivity to the environment

In addition to the active parts (for breaking), the sealed enclosure contains the essential mechanical parts (for mechanical transmission).

The result is a fully insulated system. Furthermore, the long creepage distances of the insulated enclosures contribute to high insensitivity to the outside environment.

sealed pressure system

All Merlin Gerin switchgear is of the sealed pressure system type in accordance with the IEC 56 definition (appendix EE).

Enclosures are filled to a low relative pressure of 0.05 to 0.35 MPa (0.5 to 3.5 bars).

The seal and the for-life lubrication of the rotary seals is provided by an oil film. In the MV circuit breaker field, for example, on more than 20 000 SF₆ switchgear units installed by the French electrical utility (EDF), the annual fault rate related to seal problems is less than 0.05 %.

endurance

The mechanical and electrical endurance of Merlin Gerin SF₆ switchgear is far above that recommended by the IEC.

This equipment meets the needs of power networks, even those operating under the most severe conditions.

very low maintenance

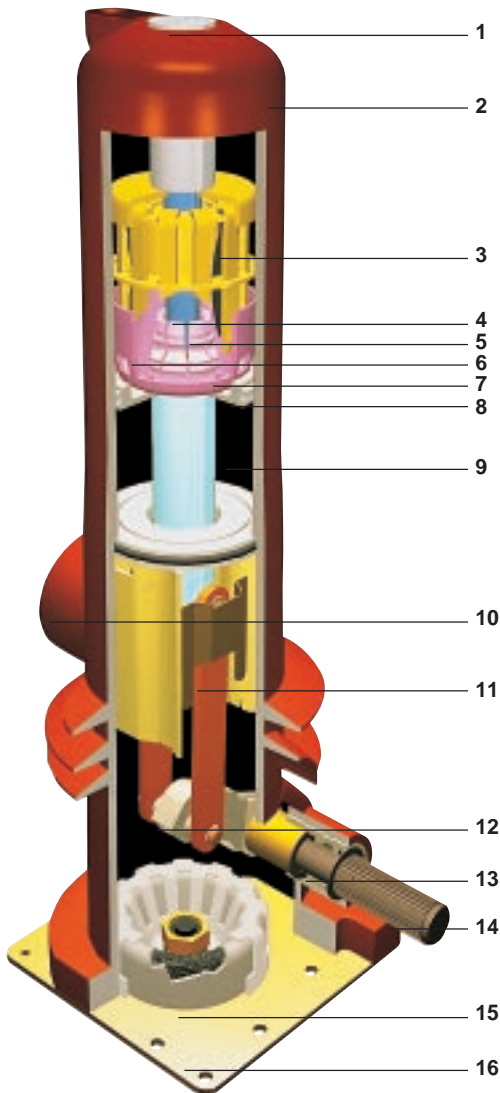
The electrical contacts, housed in a sealed-for-life enclosure, require no special maintenance.

The operating mechanism requires only minimum maintenance at intervals depending on the conditions of use.

Under normal operating conditions, no preventive maintenance is required before 10 000 operations or 10 years of service.

breaking technique

auto-compression technique



- 1 Upper current terminal.
- 2 Insulating enclosure.
- 3 Fixed main contact.
- 4 Fixed arcing contact.
- 5 Moving arcing contact.
- 6 Insulating nozzle.
- 7 Moving main contact.
- 8 Moving piston.
- 9 Pressure chamber.
- 10 Lower current terminal.
- 11 Connecting rod.
- 12 Crank.
- 13 Sealing system.
- 14 Shaft.
- 15 Molecular sieve.
- 16 Bottom cover.

pole-unit description

The SF pole unit consists of:

- **a main circuit** with:
 - upper current terminal (1),
 - fixed main contact with self-wiping blades (3),
 - moving main contact (7),
 - lower current terminal (10);
- **a breaking circuit** with:
 - fixed arcing contact (4),
 - moving arcing contact (5);
- **an auto-compression system** with:
 - pressure chamber (9),
 - moving piston (8),
 - insulating nozzle (6);
- **a transmission mechanism** with:
 - shaft (14),
 - crank (12),
 - connecting rod (11);
- **a sealing system** (13) of the "sealed pressure system" type according to the definition in IEC 56 appendix EE;
- **an insulating enclosure** (2) containing all the active components, including:
 - SF6 at low relative internal pressure,
 - molecular sieve (15),
 - bottom cover (16).

principle

Simplicity

The movement of the arcing contacts compresses a small volume of gas behind a piston. The compressed gas is trapped and cannot escape between the arcing contacts until they begin to separate.

This pre-compression stage produces an instantaneous difference in pressure making it possible to inject the gas by forced convection.

Efficiency

Injection of a small quantity of gas between the contacts suffices to "smother" the arc by electron capture. This technique breaks low currents and short-circuit currents with equal effectiveness.

Clogging effect

During breaking of heavy currents, the cross-section of the arc is equal to that of the inside of the injection nozzle at full breaking capacity, which considerably reduces the flow of the injected gas. That is the clogging effect.

The phenomenon has two beneficial results:

- storage, before the current passes through zero, of almost all the compressed gas;
- limiting of the arcing energy by the braking of the moving parts, thus limiting the length of the arc.

Moreover, during breaking of low currents, the mass flowrate is reduced and breaking is surge-free.

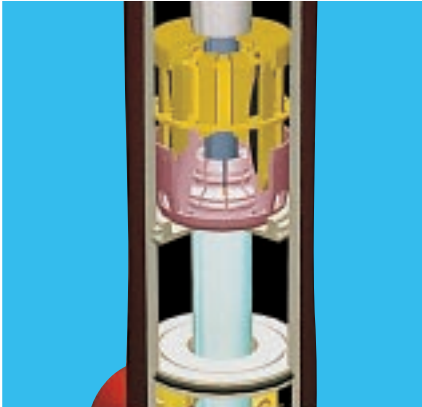


fig. 1

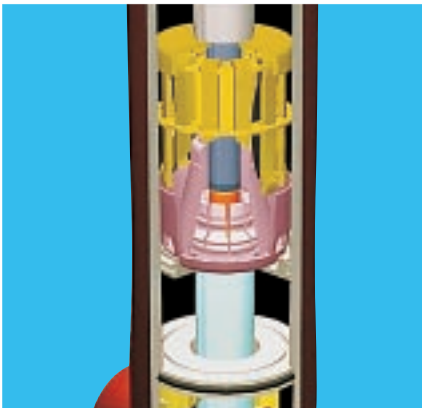


fig. 2

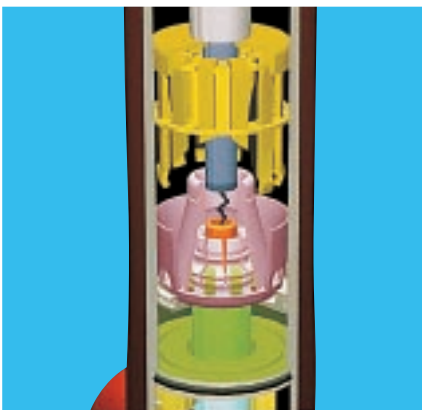


fig. 3



fig. 4

operation

SF6 circuit breakers use the SF6 auto-compression technique.

The main contacts and the arcing contacts are initially closed (fig. 1).

Pre-compression (fig. 2)

When the contacts begin to open, the piston slightly compresses the SF6 gas in the pressure chamber.

The arcing period (fig. 3)

The arc then forms between the arcing contacts. The piston continues its downward movement. A small quantity of gas, directed by the insulating nozzle, is injected onto the arc.

For the breaking of low currents, the arc is cooled by forced convection.

However, for high currents, thermal expansion transfers the hot gases toward the cold parts of the pole unit.

Due to the dielectric properties of SF6, the gap between the two arcing contacts is sufficient at the first current zero to definitively interrupt the current.

Sweeping overstroke (fig. 4)

The moving parts finish their travel and the injection of cold gas continues until the contacts are completely open.

general

a high-performance and reliable range



wide choice

Progress and innovation in SF6 technology has led to a number of important **breakthroughs** in the field of MV switchgear.

The high performance levels and the reliability of Merlin Gerin circuit breakers are largely a result of the remarkable properties of SF6 gas.

The many ways of implementing SF6 technology have led to a wide range of switchgear units.

flexible installation

Small in size, SF6 switchgear is available in a number of versions:

- basic **fixed** units;
- fixed units on **support frames**;
- **withdrawable** units (please consult us). Most can be equipped with either front or side operating mechanisms.

intelligent and autonomous

SF1 and SF2 circuit breakers

SF1 and SF2 circuit breakers are used with the standard protection units (**Sepam, Statimax**).

SFset circuit breakers

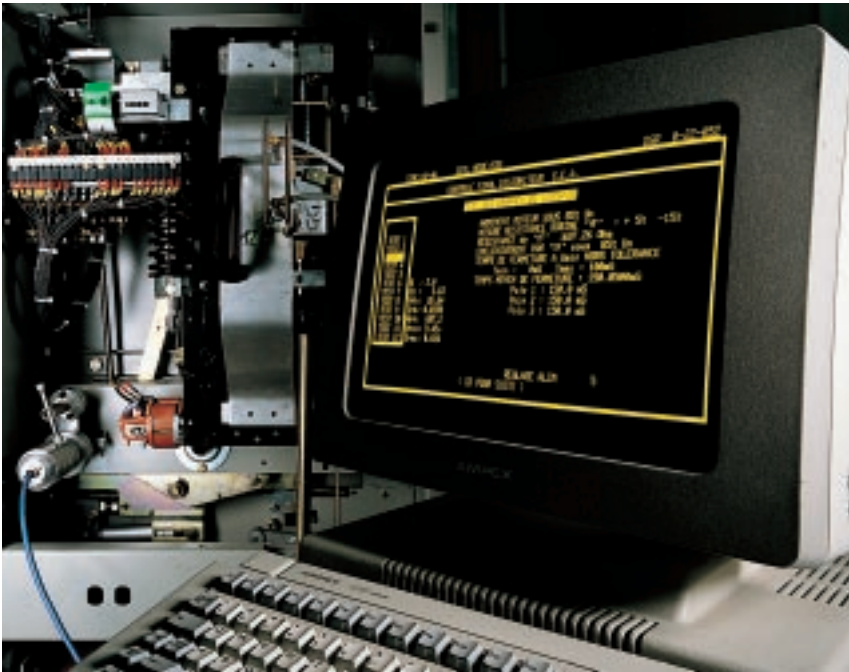
SFset circuit breakers integrate, in a single unit, the different functions customarily found in separate compartments.

They are equipped with a fully **autonomous protection system**, operating **without any auxiliary source** and including:

- a **set of current sensors** installed on the lower terminal of the pole unit;
- a **VIP electronic protection unit**;
- a **low-consumption Mitop** release.

The various types of units available make it possible to implement **multifunction protection** systems.

certified quality: ISO 9001



a major advantage

In each of its sites, Merlin Gerin has set up a functional organisation vested with the responsibility of verifying quality levels and ensuring correct implementation of standards.

Company procedures are:

- uniform throughout all departments;
- recognised by numerous customers and inspection organisations such as the French Electrical Authority, Framatome, SSIA (French Military Procurement Surveillance), General Electric, etc.

Furthermore, it is the rigorous application of procedures that has enabled certification by an independent organisation, the French Association for Quality Assurance (AFAQ).

The quality system of the MV department has been certified for conformity with the ISO 9001 quality assurance standard.



severe and systematic inspections

During production, each circuit breaker undergoes **routine testing** to ensure quality and conformity. The following points are checked:

- pole-unit seals;
- mechanical operation of the unit and any associated locking systems;
- simultaneous closing of contacts;
- insulation level at industrial frequency;
- resistance of the main circuit;
- insulation level of auxiliary circuits;
- electrical resistance of the auxiliary circuits;
- operating speed;
- operating cycle;
- operating times.

Results are indicated on the **test certificate** for each unit.

general (cont.)**electrical characteristics**

type		SF1 circuit breaker										
CEI 56, VDE 0670, BS 5311, UTE C 64-100/101												
rated voltage (kV 50/60 Hz)		17.5				24					36	
insulation level	kV rms 50 Hz-1 min	38				50					70	
	kV impulse 1.2/50 μ s	95				125					170	
rated current I_a (A)	400	■	■			■	■				■	
	630	■	■	■		■	■	■	■	■	■	■
	1250	■	■	■		■		■	■		■	■
	2500											
	3150											
breaking capacity I_{sc} (kA rms)	at (kV) :	≤ 17,5	12.5	20	25							
	24					12.5	16	20	25			
	36									12.5	20	25
	40,5											
making capacity (kA peak)		31.5	50	63		31.5	40	50	63	31.5	50	63
short-time withstand current (kA rms-3s)		12.5	20	25		12.5	16	20	25	12.5	20	25
capacitor breaking capacity (A)	for I_a (A) :	400	280	280	280	280	280	280	280	280	280	280
	630	440	440	440		440	440	440		440	440	440
	1250	875	875	875		875	875	875		875	875	875
	2500											
	3150											
rated operation sequence	O-3 min-CO-3 min-CO	■				■				■		
	O-0.3 s-CO-15 s-CO	■				■				■		
	O-0.3 s-CO-3 min-CO	■				■				■		
approximate operating times (ms)	opening	50				50				50		
	breaking	65				65				65		
	closing	70				70				70		
ANSI C37.04-C37.06-C37.09												
rated maximum voltage	kV, 60 Hz	15.5 ⁽²⁾				25.8 ^{(1) (2)}				38 ⁽⁴⁾		
rated voltage range	K factor	1				1				1		
rated insulation level	kV, rms. 60 Hz-1 mn	50				60				80		
	kV, impulse 1,2/50 μ s	110				150				150		
rated continuous current A	600	■				■						
	1200	■				■				■		
	2000											
	3000											
rated short-circuit current (at rated max kV)	kA, rms.	25				25				25		
rated maximum symmetrical interrupting capability and rated short-time current	kA, rms	25				25				25		
closing and latching capability (2.7 K times rated short-circuit current)	kA, crest	68				68				68		
rated interrupting time	cycles 60 Hz	5				5				5		
rating operation sequence	CO-15 s-CO	■				■				■		

(1) Please consult us.

(2) These values are valid for outdoor installations.

(3) Above 24 kV, the SFset is equipped with conventional current transformers.

(4) Indoor installations.

(5) Interphase barriers.

(6) Only in fix installations.



SFset circuit breaker with integrated protection unit

SF2 circuit breaker

ISF2 switch

SFset circuit breaker with integrated protection unit								SF2 circuit breaker							ISF2 switch		
17.5		24		36 ⁽³⁾		24		36		40.5		24		40.5			
38		50		70		50		70		85		50		85			
95		125		170		125		170		185		125		185 ⁽⁵⁾			
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
								■	■	■	■	■	■	■	■		
															■ ⁽⁶⁾		
															■		
12.5	20	25						12.5	25	31.5	40						
			12.5	16	20	25		12.5				25	31.5	40			
															31.5		
															25		
31.5	50	63	31.5	40	50	63	31.5	31.5	63	79	100	63	79	100	79		
12.5	20	25	12.5	16	20	25	12.5	12.5	25	31.5	40	25	31.5	40	31.5		
280	280	280	280	280	280	280	280			280	280		280	280			
440	440	440	440	440	440	440	440			440	440		440	440			
875	875	875	875	875	875	875	875			875	875		875	875			
								1750	1750	1750	1750	1750	1750	1750			
												2200	2200	2200			
■			■				■	■				■	■		■		
■			■				■	■				■	■		■		
■			■				■	■				■	■		■		
50			50				50	50				50			50		
65			65				65	65				65			65		
70			70				70	70				70			70		
								25.8 ⁽¹⁾⁽²⁾				38 ⁽¹⁾⁽²⁾					
								1				1					
								60				80		80			
								150				200		150			
												■	■	■			
												■	■	■			
												■	■	■			
								25				25	31.5	40 ⁽¹⁾			
								25				25	31.5	40 ⁽¹⁾			
								68				68	85	108			
								5				5	5	5			
								■				■	■	■			

description

SF1 circuit breaker



Basic fixed SF1.

application

The **SF1** is a 3-pole MV circuit breaker for indoor installation.

It is used primarily for switching and protection of **1 to 36 kV public, industrial and commercial distribution networks**.

All standard protection units (**Sepam, Statimax**) may be used with the SF1 circuit breaker.

Note that it may also be equipped with an integrated protection system to form a fully autonomous circuit breaker (see the SFset).

technology

The SF1 implements the **auto-compression technique using SF6** gas as the current interruption and insulation medium.

The SF1 is available in three versions:

- **basic fixed unit;**
- **fixed unit with a support frame;**
- **withdrawable unit** (please consult us).

Each version can be equipped with an operating mechanism installed on the right side, left side or in front.

The basic fixed unit comprises:

- **three independent main poles** that are mechanically connected; each comprises:
 - **an insulating enclosure** of the "sealed pressure system" type (in compliance with IEC 56, 1987 edition, appendix EE) forming a hermetic assembly filled with SF6 at a low relative pressure (0.05 MPa, i.e. 0.5 bars or 0.2 MPa depending on system characteristics);
 - **active parts** housed in the insulating enclosure;
- **an RI-type stored-energy** operating mechanism (see the "operating mechanism" section);
- **a front panel** with all the controls and indicators;
- **upstream and downstream terminals** for connection of the power circuits.

The fixed unit with a support frame comprises:

- **the basic fixed unit** described above;
- **a support frame** fitted with:
 - rollers for handling and installation;
 - lugs for securing to the floor.

options⁽¹⁾

For each version, options include:

- **an electrical RI operating mechanism;**
- **a device for locking** the circuit breaker in the open position (via a keylock);
- **a keylock** for the locking option;
- **a pressure switch for each pole**, equipped with an NO contact for continuous monitoring of the SF6 (please consult us);

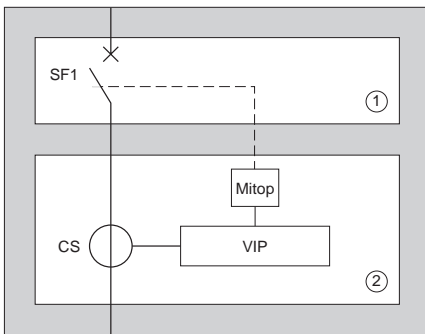
⁽¹⁾ The "operating mechanism" section describes other specific auxiliaries.

SFset circuit breaker



Basic fixed SFset.

Schematic diagram of the SFset



application

The SFset is a 3-poles MV circuit breaker for indoor installation. It is used primarily for switching and protection of **1 to 36 kV public, industrial and commercial distribution** networks.

The SFset is equipped with an **integrated protection** system that is fully autonomous (with VIP type protection unit), operating **without an auxiliary power supply** (see the "protection and control/monitoring" section).

technology

The SFset implements the **auto-compression technique using SF6** gas as the current interruption and insulation medium.

The SFset is available in two versions:

- **basic fixed unit;**
- **fixed unit with a support frame.**

Each version can be equipped with an operating mechanism installed on the right side, left side or in front.

The basic fixed unit comprises:

- **an SF1 circuit breaker;**
- **an autonomous protection system** comprising:

- 2 or 3 functional current sensors** ⁽²⁾ installed on the lower current terminals of the pole units;
- a VIP electronic protection unit** installed on the operating mechanism enclosure,
- a "Mitop" low-consumption opening release** installed on the circuit breaker.

The fixed unit with a support frame comprises:

- **the basic fixed unit** described above;
- **a support frame** fitted with:
 - rollers for handling and installation,
 - lugs for securing to the floor.

options⁽¹⁾

For each version, options include:

- **a device for locking** the circuit breaker in the open position (via a keylock);
- **a keylock** for the locking option;
- **a pressure switch for each pole**, equipped with an NO contact for continuous monitoring of the SF6 (please consult us).

(1) The "operating mechanism" section describes other specific auxiliaries.

(2) For voltages 24 kV, units are fitted with conventional current transformers (please consult us).

description (cont.)

SF2, ISF2 circuit breaker



Fixed SF2 with support frame.

application

The **SF2** is a 3-pole MV circuit breaker for indoor installation.

It is used primarily for switching and protection of **24 to 38 kV public and industrial distribution networks**.

All standard protection units (**Sepam, Statimax**) may be used with the SF2 (please consult us).

special application

ISF2 is a 3-pole indoor switch-circuit breaker. Designed to withstand high operating rates, it is especially suitable for the control of electric furnaces. It can switch 50.000 times with a maintenance program to be defined in accordance with operating conditions.

technology

The SF2 implements the **auto-compression technique using SF6** gas as the current interruption and insulation medium.

The SF2 is available in three versions:

- **basic fixed unit;**
- **fixed unit with a support frame;**
- **withdrawable unit** (please consult us).

The basic fixed unit comprises:

- **three independent main poles** that are mechanically connected. Each comprises:
 - **an insulating enclosure** of the "sealed pressure system" type (in compliance with IEC 56, 1987 edition, appendix EE) forming a hermetic assembly filled with SF6 at a low relative pressure (0.35 MPa, i.e. 3.5 bars);
 - **active parts** housed in the insulating enclosure;
- **an GMh-type stored-energy** operating mechanism (see the "operating mechanism" section);
- **a front panel** with all the controls and indicators;
- **upstream and downstream terminals** for connection of the power circuits.

The fixed unit with a support frame

comprises:

- **the basic fixed unit** described above;
- **a support frame** fitted with:
 - rollers for handling and installation,
 - lugs for securing to the floor.

options ⁽¹⁾

For the basic fixed unit or the fixed unit with support frame, options include:

- **a device for locking** the circuit breaker in the open position (via a keylock);
- **a keylock** for the locking option;
- **a pressure switch for each pole**, for continuous monitoring of the SF6.

¹⁾ The "operating mechanism" section describes other specific auxiliaries.

auxiliaries



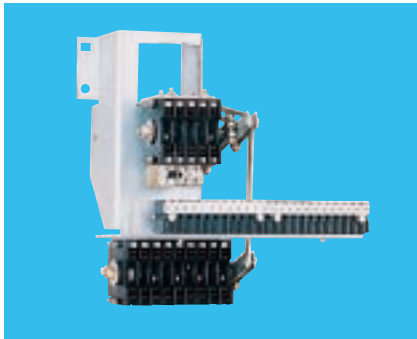
Single shunt opening release for SF1, SFset and SF2.



Auxiliary contact block for SF1, SFset and SF2.



Double shunt opening release for SF1, SFset and SF2.



Auxiliary contact block for SF2.



Undervoltage opening release for SF1, SFset and SF2.



"End of charging" and "Operating mechanism charged" auxiliary contact block for SF1, SFset and SF2.



"Mitop" opening release for SF2.

operating mechanisms and diagrams

SF1 and SFset circuit breakers



Electrical RI operating mechanism.

SF1 and SFset circuit breakers are actuated by an **RI operating** mechanism that ensures operating speeds (opening and closing) independent of operator action.

When equipped with an electrical operating mechanism, the circuit breaker can take on remote control functions and implement reclosing cycles.

manual RI operating mechanism

The **basic version** of the circuit breaker comes with a **manual RI** operating mechanism comprising:

- a **stored-energy mechanism** (spring type) that stores the energy required to close and open the contacts;
- a **spring charging system** using a built-in lever;
- a **mechanical "opening/closing"** actuated by two pushbuttons on the front panel;
- an **electrical "opening"** system including an opening release⁽²⁾;
- an **"operating mechanism charged" indication contact**;
- an **"end of charging" contact**;
- a **block with auxiliary contacts**⁽³⁾;
- a black/white mechanical "open/closed" **position indicator**;
- a **terminal block** for connection of external auxiliary circuits;
- a **cover to protect** the operating mechanism.

electrical RI operating mechanism

The **electrical RI** operating mechanism, available on request, is made up of the manual RI operating mechanism with the following equipment added in the factory:

- an **electrical "closing" system** with a closing release and an anti-pumping relay;
- an **electrical spring charging device** (motor-driven) that automatically recharges the mechanism as soon as the contacts are closed;
- an **operations counter**.

options ⁽¹⁾

The following options are available for the **manual RI** operating mechanism:

- an **electrical "closing" system** including a closing release;
- an **operations counter**;
- the **common auxiliaries** (see below).

The following **common auxiliaries** are available for both the manual and electrical RI operating mechanism:

- an **additional opening release**⁽²⁾ (see combination possibilities below);
- for the **undervoltage** release:
 - a **mechanical time** delay for opening, adjustable from 0 to 3 seconds,
 - a **mechanism enabling** the closing of the circuit breaker in the event of a circuit breaker supplied by a "downstream" voltage,
 - a **momentary contact** to indicate tripping by the "Mitop" release;
 - a **green/red** mechanical position indicator (instead of black/white).

Auxiliaries: combination possibilities⁽⁴⁾

RI operating mechanism and auxiliary contacts			electrical spring charging	closing release	opening releases		under-voltage	overcurrent		Mitop	available contacts ⁽³⁾					
					shunt single	double		single	double		NC	NO	CHG			
power supply	voltage	AC (V)	50 Hz	48 - 110 - 220 - 230												
			60 Hz	120 - 240												
		DC (V)	24 - 48 - 110 - 125 - 220													
	current	AC (A)						2 à 5	2 à 5							
consumption		AC (VA)	390	180	180	2 x 180		120	120							
		DC (W)	390	65	65	2 x 65	160	15	15							
combinable auxiliary types and quantities ⁽⁴⁾ for SF1 and SFset			■ 1	■ 1	■ 1					■ 1	5	4	1			
	or		■ 1	■ 1		■ 1				■ 1	5	3	1			
	or		■ 1	■ 1			■ 1			■ 1	5	5	1			
	or		■ 1	■ 1				■ 1		■ 1	5	4	1			
	or		■ 1	■ 1					■ 1		5	4	1			
additional combination possibilities for SF1			■ 1	■ 1	■ 1						5	4	1			
	or		■ 1	■ 1	■ 1			■ 1			5	4	1			
	or		■ 1	■ 1		■ 1			■ 1		5	4	1			
	or		■ 1	■ 1		■ 1	■ 1				5	3	1			
	or		■ 1	■ 1		■ 1		■ 1			5	4	1			
	or		■ 1	■ 1				■ 1			5	5	1			
	or		■ 1	■ 1			■ 1				5	5	1			
	or		■ 1	■ 1					■ 1		5	5	1			
rated current (A)											10					
breaking	AC 220V (cos φ ≥ 0,3)										1					
capacity (A)	DC 110/220V (L/R ≤ 0,02 s)										0.3					

(1) The "description" section provides further information.

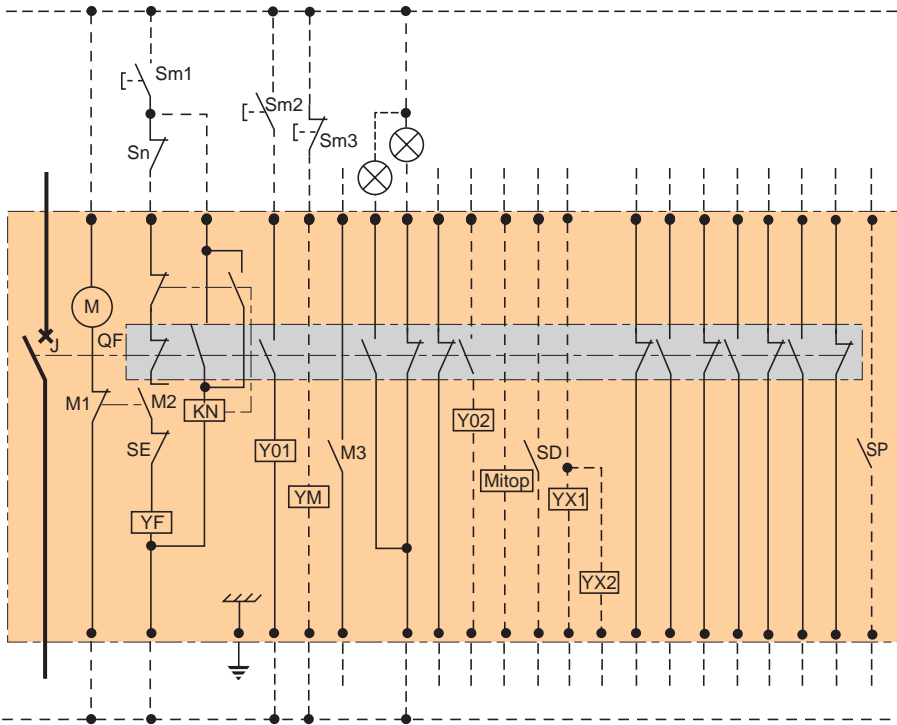
(2) Single or double shunt release, undervoltage release, or Mitop release (requiring no auxiliary source, necessary for SFset).

(3) The number of available contacts depends on the options selected.

(4) Maximum quantities with the electrical RI operating mechanism.

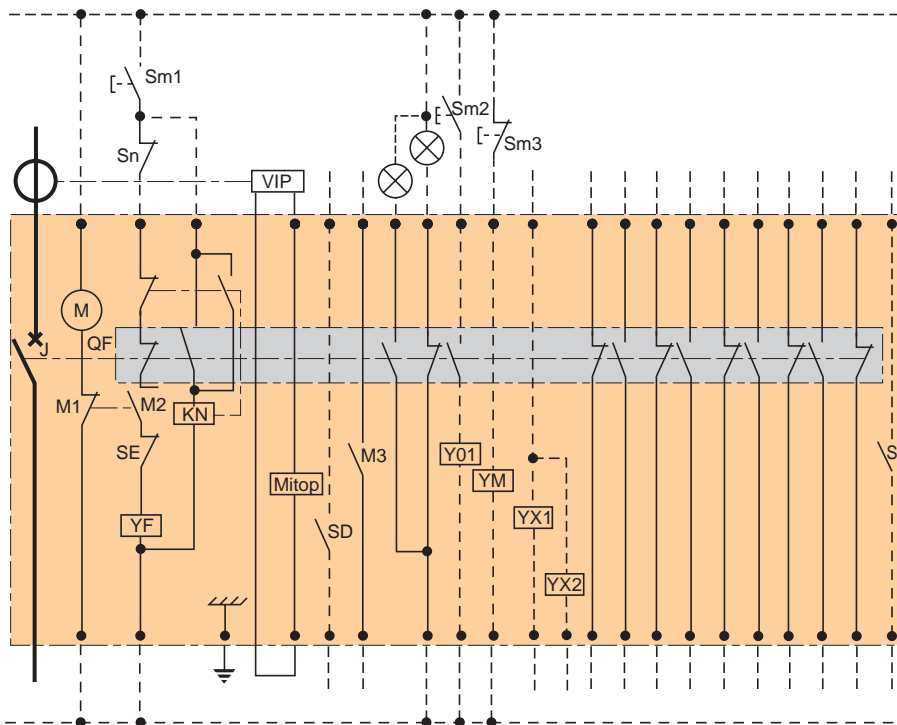
auxiliary wiring diagram

RI operating mechanism for SF1⁽¹⁾



J	Circuit breaker.
KN	Anti-pumping relay.
M	Spring charging motor.
M1-M2	End-of-charging contacts.
M3	"Operating mechanism charged" indication contact.
QF	Circuit breaker auxiliary contacts.
SD	Fault (Mitop) trip indication momentary contact.
SE	Trip indication maintained contact.
Sm1	Closing pushbutton (outside).
Sm2	Opening pushbutton for shunt release (outside).
Sm3	Opening pushbutton for undervoltage release (outside).
Sn	Closing disable contact (outside).
SP	Pressure-switch contact (please consult us).
YF	Closing release.
Y01-Y02	Shunt opening releases.
YM	Undervoltage opening release.
Mitop	Mitop opening release (autonomous).
YX1-YX2	Overcurrent opening releases.

RI operating mechanism for SFset⁽¹⁾

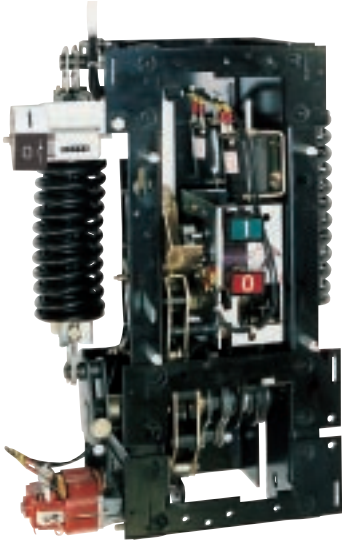


J	Circuit breaker.
KN	Anti-pumping relay.
M	Spring charging motor.
M1-M2	End-of-charging contacts.
M3	"Operating mechanism charged" contact.
QF	Circuit breaker auxiliary contacts.
SD	Fault (Mitop) trip indication momentary contact.
SE	Trip indication maintained contact.
Sm1	Closing pushbutton (outside).
Sm2	Opening pushbutton for shunt release (outside).
Sm3	Opening pushbutton for undervoltage release (outside).
Sn	Closing disable contact (outside).
SP	Pressure-switch contact (please consult us).
YF	Closing release.
Y01	Shunt opening releases.
YM	Undervoltage opening release.
Mitop	Mitop opening release.
YX1-YX2	Overcurrent opening releases.

(1) Dotted lines represent optional equipment.

operating mechanisms and diagrams (cont.)

SF2 circuit breakers



Electrical GMh operating mechanism (cover removed).

SF2 circuit breakers are actuated by a **GMh operating mechanism** that ensures operating speeds (opening and closing) independent of operator action.

It can take on remote control functions and implement reclosing cycles.

GMh operating mechanism

Every SF2 circuit breaker comes with a **manual** and **electrical** GMh operating mechanism.

The **manual operating mechanism** comprises:

- a **stored-energy mechanism** (spring type) that stores the energy required to close and open the contacts;
- a **spring charging system** using a removable lever;
- a **mechanical "opening/closing" system** actuated by two pushbuttons on the front panel;
- an **electrical "opening" system** including an opening release⁽²⁾;
- an **"operating mechanism charged" indication contact**;
- an **"end of charging" contact**;
- a **block with auxiliary contacts** ⁽³⁾;
- a **black/white mechanical "open/closed" position indicator**;
- a **terminal block** for connection of external auxiliary circuits;
- a **cover** to protect the operating mechanism.

The **electrical GMh** operating mechanism is made up of the manual GMh operating mechanism plus:

- an **electrical spring** charging device (motor-driven) that automatically recharges the mechanism as soon as the contacts are closed;
- an **electrical "closing" system** with a closing release and an anti-pumping relay;
- an **operations counter**.

options⁽¹⁾

The following options are available for the GMh operating mechanism:

- an **additional opening release**⁽²⁾ (see combination possibilities below);
- **for the undervoltage** release:
 - a **mechanical opening** time delay, adjustable from 0 to 3 seconds,
 - a **mechanism enabling** the closing of the circuit breaker in the event of a circuit breaker supplied by a "downstream" voltage,
 - a **green/red** mechanical position indicator (instead of black/white).

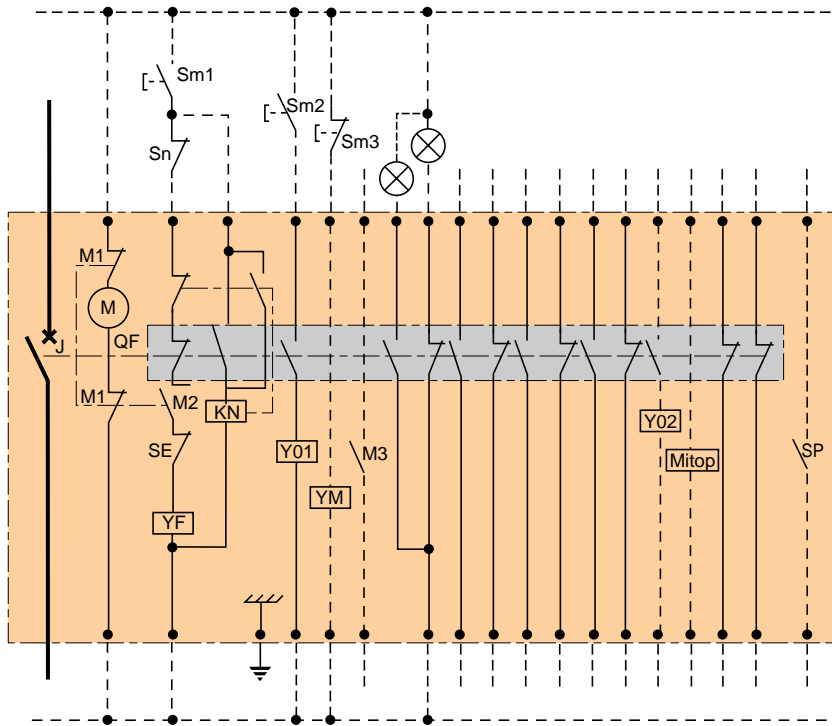
Auxiliaries: combination possibilities⁽⁴⁾

GMh operating mechanism and auxiliary contacts		electrical spring charging	closing release	opening release		under-voltage	Mitop	available contacts ⁽³⁾		
				shunt single	double			NC	NO	CHG
power supply	voltage	AC (V)	110 - 127 - 220 - 230							
		DC (V)	24 - 48 - 110 - 125 - 220							
consumption		AC (VA)	700	120	120	2 x 120	75			
		DC (W)	570	70	70	2 x 70	15			
combinable auxiliary types and quantities ⁽⁴⁾		■ 1	■ 1	■ 1		■ 1		5	4	1
	or	■ 1	■ 1	■ 1				5	4	1
	or	■ 1	■ 1	■ 1			■ 1	5	4	1
	or	■ 1	■ 1	■ 2				5	3	1
	or	■ 1	■ 1		■ 1	■ 1		5	3	1
	or	■ 1	■ 1		■ 1			5	3	1
	or	■ 1	■ 1			■ 1	■ 1	5	5	1
	or	■ 1	■ 1		■ 1		■ 1	5	3	1
or	■ 1	■ 1				■ 1	5	5	1	
rated current (A)								10		
breaking capacity (A)	AC 220V (pf ≥ 0.3)						10			
	DC 110/220V (L/R ≤ 0.01 s)							3		

(1) The "description" section provides further information.
 (2) Single or double shunt release, undervoltage release, or Mitop release (requiring no auxiliary source, for Statimax system).
 (3) The number of available contacts depends on the options selected.
 (4) Maximum quantities with the electrical GMh operating mechanism.

auxiliary wiring diagram

GMh operating mechanism for SF2⁽¹⁾



J	Circuit breaker
KN	Anti-pumping relay
M	Spring charging motor
M1-M2	End-of-charging contacts
M3	"Operating mechanism charged" indication contact
QF	Circuit breaker auxiliary contacts
SE	Maintained trip indication contact
Sm1	Closing pushbutton (outside)
Sm2	Opening pushbutton for shunt release (outside)
Sm3	Opening pushbutton for undervoltage release (outside)
Sn	Closing disable contact (outside)
SP	Pressure-switch contact
YF	Closing release
Y01-Y02	Shunt opening releases
YM	Undervoltage opening release
Mitop	Mitop opening release (autonomous)

(1) Dotted lines represent optional equipment.

SF circuit breakers, 1 to 40.5 kV protection and control/monotoring

Protection units



VIP protection unit installed on the front panel.



CS-type current sensors.



VAP5 test unit.

for SF1 and SF2

All standard protection units (**Sepam**, **Statimax**) may be used with the SF1 and SF2.
For further information, please consult us.

for SFset

The SFset is made up of a SF1 circuit breaker with an added integrated protection system that comprises:

- a **VIP protection unit** mounted on the operating mechanism enclosure ;
- a **set of current sensors** installed on the lower current terminals of the pole units ;
- a **low-consumption Mitop** release, installed on the operating mechanism.

The protection system is fully autonomous and operates **without an auxiliary source**.
VIP protection units are available in three models :

- **VIP13**, with an adjustable threshold ;
- **VIP17**, with an adjustable threshold,
- **VIP200 and VIP201**, offering microprocessor-based universal protection. Depending on the model, **overcurrent** and **zero-sequence** protection functions are provided.

The various units offer **wide trip-current** setting ranges and are very **stable** over time.

Operation

Sensors supply the protection system with:

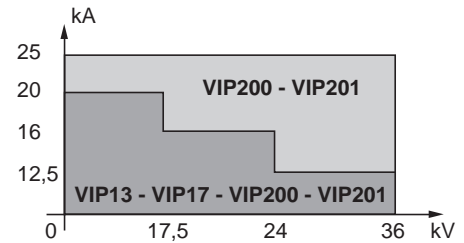
- “ **current** ” information, used by the protection system ;

- **the electrical power** required for the operation of the protection system (VIP unit and “ Mitop ”release).

All settings are visible and accessible from the front of the circuit breaker.

Possible combinations

The VIP unit must be selected taking into account the network characteristics indicated in the table below.



Current sensors

The VIP protection units are used in conjunction with functional current sensors. Two interchangeable sensors, **Csa** and **Csb**, cover all needs ranging from 10 to 1250A.

The table below indicates the current sensor to be used, depending on the current setting **Is** required on the protection unit.

Sensor selection

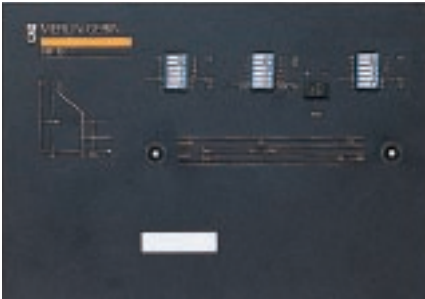
protection unit	sensor type	protection unit current setting I_s : sensor applicability ⁽¹⁾ (for each protection unit rating I_{nc}) (A)
VIP13 VIP17	CSa	10 100 INC = 20
	CSb	62 630 INC = 125
VIP200, VIP201	CSa	20 100 INC = 20 40 100 200 INC = 40
	CSb	125 200 630 INC = 125 250 630 1250 INC = 250

test units

All VIP protection units are equipped with a **test socket** for connection of the VAP5-VAP6 test unit (optional).

The portables and autonomous VAP5-VAP6 units check operation of the protection system.

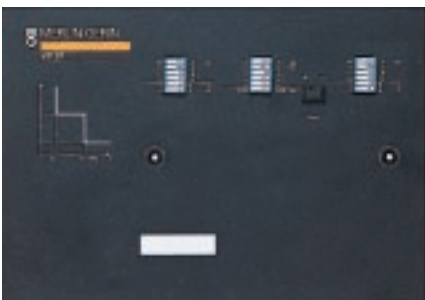
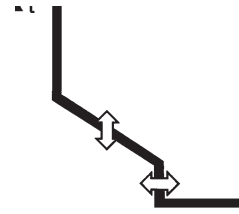
(1) The coloured bars represent the recommended values, while the shaded bars represent the absolute limits of the values that may be used.
(2) Please consult us.



VIP 13 protection unit

The VIP13 offers the following **protection** functions:

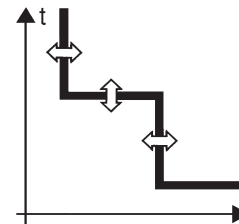
- **overload protection**, with a fixed threshold and an adjustable time delay;
- **short-circuit protection**, with an adjustable threshold and instantaneous tripping;
- **inverse-time** tripping.



VIP17 protection unit

The VIP17 offers the following **protection** functions:

- **overload protection**, with an adjustable threshold and an adjustable time delay;
- **short-circuit protection**, with an adjustable threshold and instantaneous tripping;



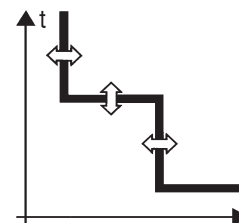
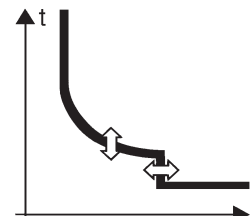
VIP200 protection unit

The VIP200 offers the following **protection** functions:

- **overload protection**, with an adjustable (definite time) or fixed (inverse time) threshold and delayable tripping;
- **short-circuit protection**, with an adjustable threshold and instantaneous tripping;
- **zero-sequence protection**, with two adjustable thresholds and delayable tripping;
- **inverse-time** curves (4 curves) or definite-time curves that may be selected on the front panel.

The VIP 200 can also be used for local **control/monitoring** functions:

- tripping indication via a mechanical indicator (magnetic latching);
- reset of the mechanical indicator;
- self-monitoring with LED indications.



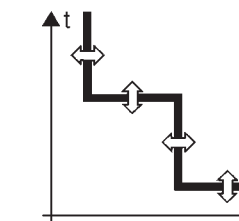
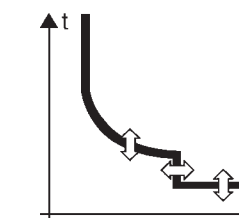
VIP201 protection unit

The VIP201 offers the following **protection** functions:

- **overload protection**, with an adjustable (definite time) or fixed (inverse-time) threshold and delayable tripping;
- **short-circuit protection**, with an adjustable threshold and delayable tripping;
- **zero-sequence protection**, with two adjustable thresholds and delayable tripping;
- **inverse-time** curves (4 curves) or definite-time curves that may be selected on the front panel.

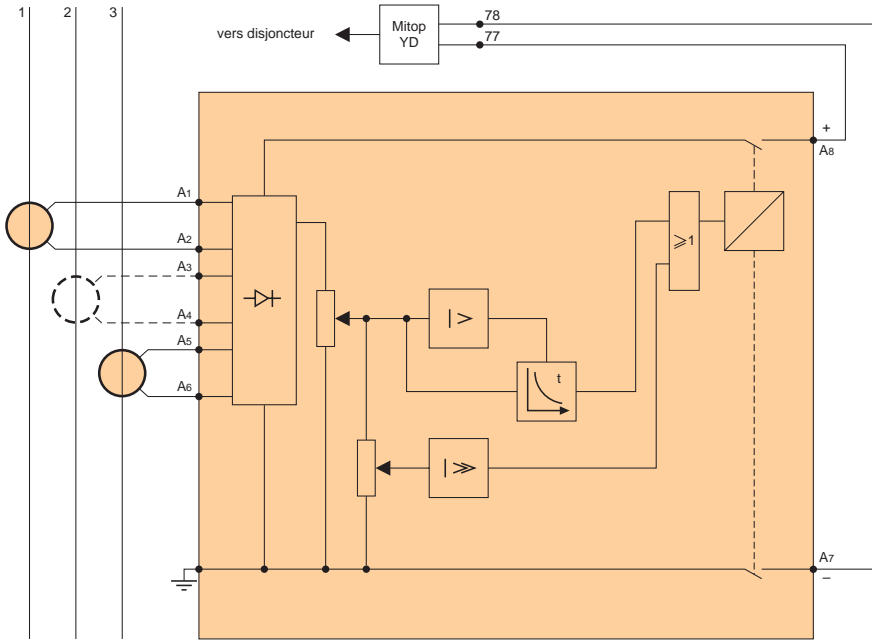
The VIP201 can also be used for local **control/monitoring** functions:

- tripping indication via three mechanical indicators (magnetic latching);
- reset of the mechanical indicator;
- ammeter with digital display.

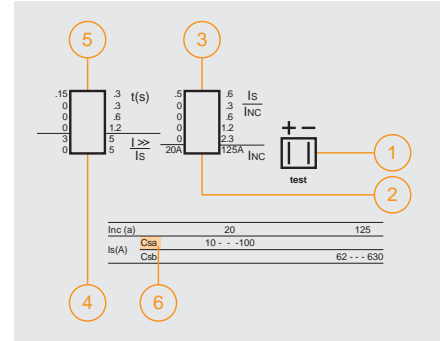


SF circuit breakers, 1 to 40.5 kV protection and control/monotoring (cont.)

VIP13 Protection unit

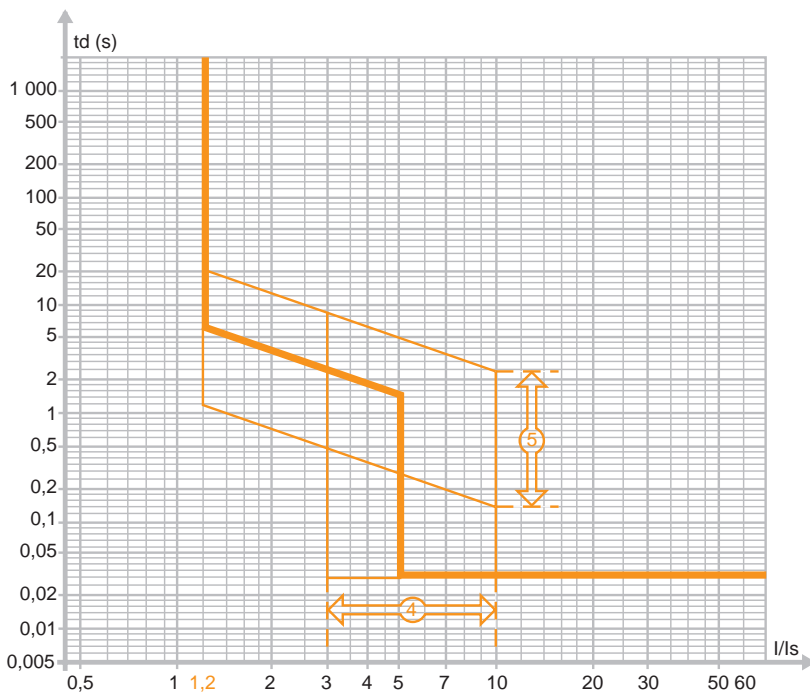


Front-plate



- 1 Test socket (for VAP5-VAP6 tst unit)
- 2 Indication of Inc.
- 3 Is/Inc setting (32 possibilities from 0.5 to 5).
- 4 High threshold setting (4 possibilities for $I >> / I_s$ from 3 to 10).
- 5 Time delay at 10 Is on the inverse time curve (16 possibilities from 0.15 to 2.4 s).
- 6 Table indicating the correspondence between the characteristic values related to the sensor.

VIP13 time/current curve



characteristics

IS setting range	10 to 630 A
low setting ($\pm 10\%$)	fixed: $1,2 \times I_s$
threshold time delay at 10 Is	0,15 to 2,4
high setting	3 à 10 Is
threshold tripping time	fixed: 30 ms for $I > 20 I_s$
thermal continuous	6 x INC
withstand 1 s	20 kA rms
peak withstand capacity	50 kA peak

Definitions

- I** current in the phase.
- Inc** protection unit current setting.
- Is** protection unit current setting.
- I>>** high threshold current setting.
- Td** tripping time (value read on the curve for a given setting).

total circuit breaker opening time:
 $td + 32 \text{ ms}$.

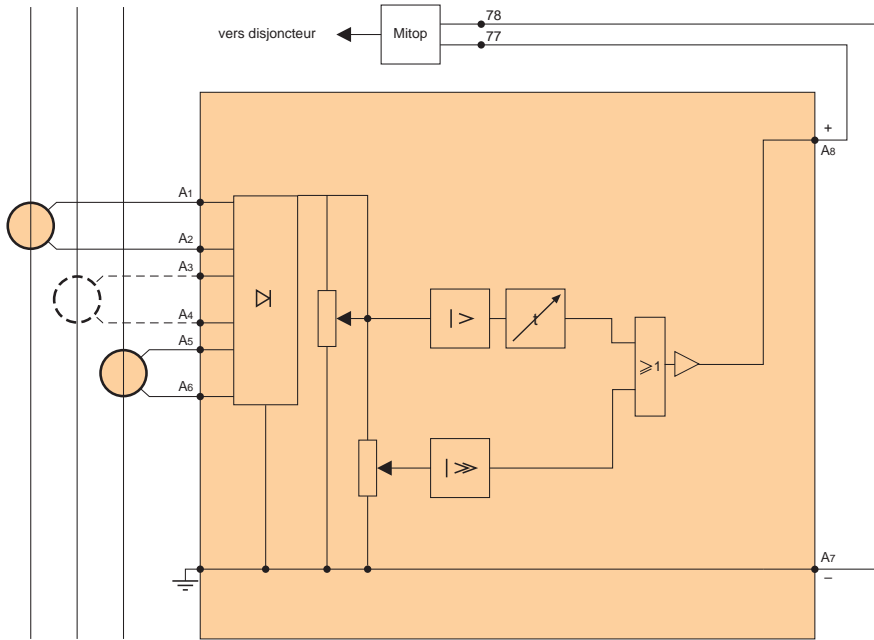
VIP13 setting example

Consider an installation with a phase current **I of 18 A**, requiring:

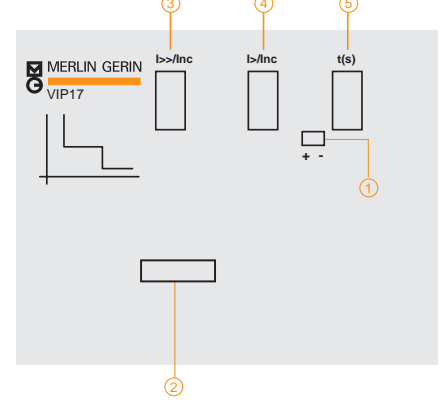
- for the fixed **low trip threshold**: a time delay of **1.25s** at **1.2 Is**;
- for the **high trip threshold** setting: **180 A**

step	parameters	valeurs à afficher	resulting curve
sensor selection	for $I = 18 \text{ A}$, choose sensor CSa , with INC = 20 to set $I_s = 18 \text{ A}$, calculate $I_s / INC = 18 / 20 = 0,9$	INC = 20 for setting (2) Is/INC = 0,9 for setting (3)	
"phase" protection			
low setting threshold	fixed at 1,2 Is , i.e. $1,2 \times 18 = 21,6 \text{ A}$	n.a.	
curve	always inverse time	n.a.	
time delay	on the curve to a "1,25 s delay at 1,2 Is", read td value = to 10 Is , i.e. 0,15 s	0,15 s for setting (5)	
high setting threshold	calculate $I >> / I_s = 180 / 18 = 10$	I>>/Is = 10 for setting (4)	

VIP17 Protection unit

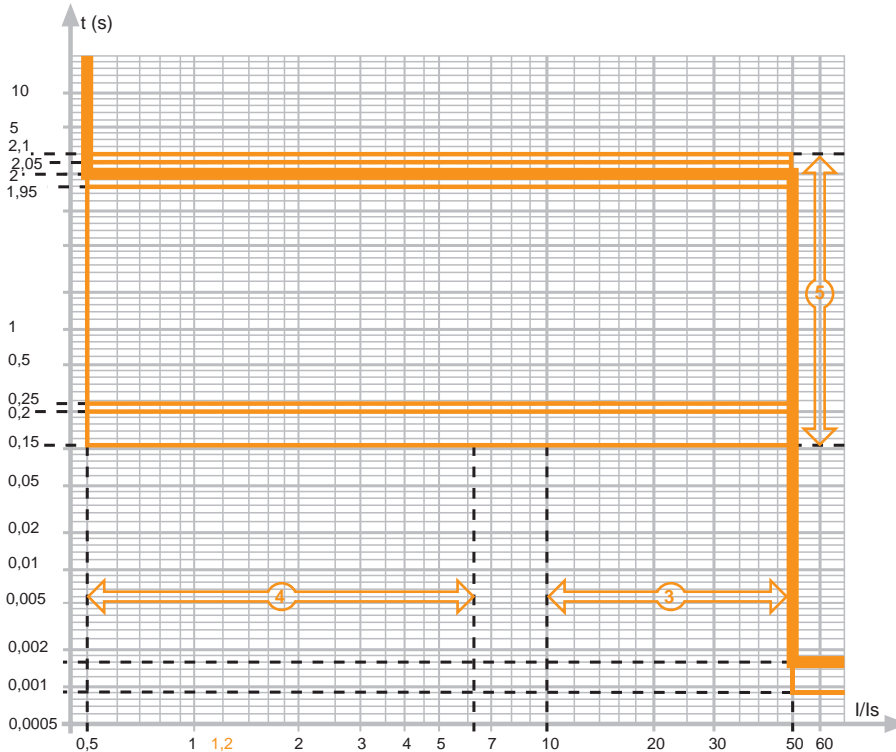


Front-plate



- 1 Test socket (for VAP5-VAP6 test unit).
- 2 Indication of Inc.
- 3 High setting $I>/Inc$ (10 to 50 by steps of 2).
- 4 Low setting $I>>/Inc$ (0.5 to 6.25 by steps of 0.25).
- 5 Time delay setting t (0.15 to 2.1 sec by steps of 0.05).

VIP17 time/current curve



characteristics

Is setting range		
low	setting $\pm 5\%$	0,5 to 6,25 Inc
threshold	time delay	constant time 0,15
	$\pm 5\%$ or ± 20 ms	to 2,1 sec
high	setting $\pm 5\%$	10 to 50 Inc
threshold	tripping time	fixed 40 ms
thermal	continuous	6 Inc
withstand	1s	20 KA
peak withstand capacity		50 KA peak

définitions

- I current in the phase
- Inc protection unit current rating
- $I>$ low threshold current setting
- $I>>$ high threshold current setting
- td tripping time
- total circuit breaker opening time :**
 $td + 32$ ms.

VIP17 setting example

Consider an installation:

- low threshold: $I>=15A$.
- time delay: $td = 350$ ms.
- high threshold: $I>>= 240A$.

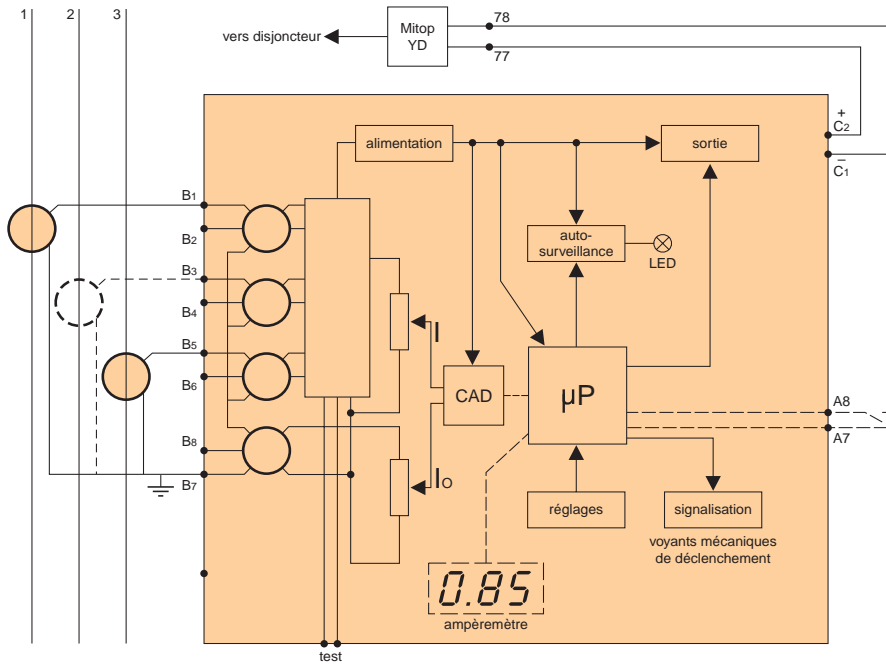
step	parameters	settings	resulting curve
sensor selection	for $I>= 15$ A, choose a sensor CSa ($Inc = 20$ A)	$INC = 20$ A for setting 2	

"phase" protection

low threshold setting	$>= 15$ A	$I>/Inc = 15/20 = 0,75$ write 0,75 in zone 4
time delay	$td = 350$ ms	t (s) = 0,35 write 0,35 s in zone 5
high threshold setting	$I>>= 240$ A	$I>>/Inc = 240/20 = 12$ write 12 in zone 3

SF circuit breakers, 1 to 40.5 kV protection and control/monitoring (cont.)

VIP200 and VIP 201 control units



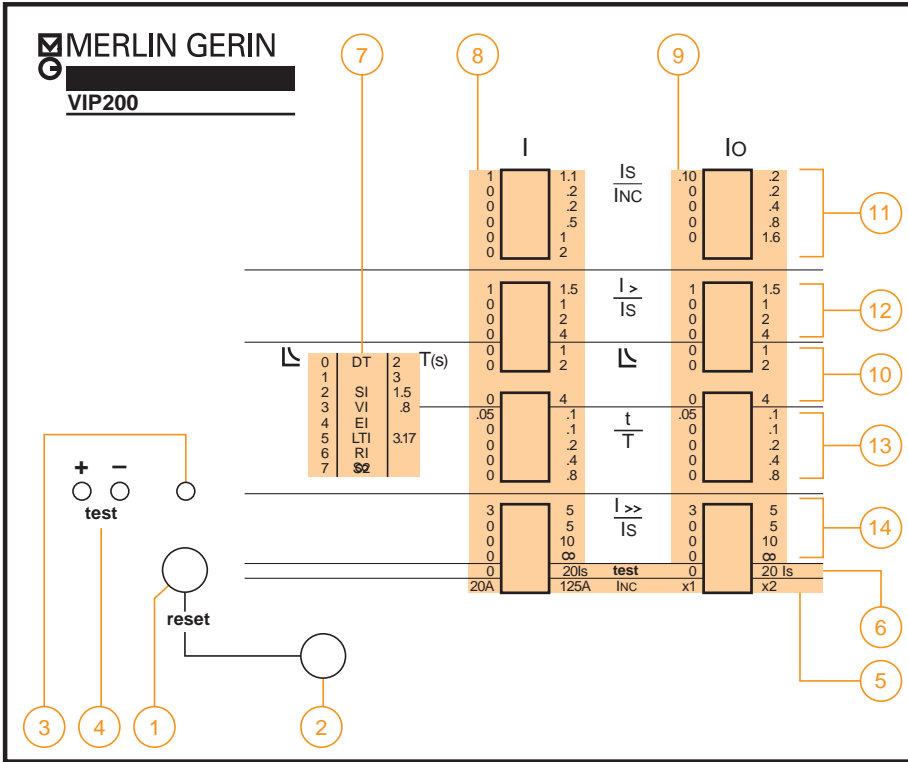
définitions

- I** current flowing in the phases.
 - Io** zero-sequence fault current.
 - InC** protection unit current rating.
 - Is** protection unit current setting
 - I>** low threshold current setting
 - I>>** high threshold current setting
 - Ios** zero-sequence protection current setting.
 - td** tripping time (value read on the curve for given settings).
 - T** base time corresponding to a phase current of 10 Is.
- Time/current curves**
- DT** Definite Time curve
 - SI** Standard Inverse time curve
 - VI** Very Inverse time curve
 - EI** Extremely Inverse time curve
 - LTI** not used
 - RI** Dependent time curve
 - S2** not used
 - ∞** low threshold disable (for "phase" or "zero-sequence" protection).

characteristics (as per standards IEC 255 and IEC 68)

thresholds		
accuracy of:	Is setting	±5 %
	low threshold setting (DT curve)	±5 %
	low threshold time delay	±5 % (or ±30 ms)
	high threshold setting	±5 %
	high threshold delay	VIP200: 25 ms, -0 +15 ms VIP201: 25 ms to 1.575 s, ±5 % (or -0 +15 ms)
maximum drift for:	temperature from 0 to 50 °C	no significant drift
	temperature from -25 to 70 °C	±3 %
	frequency from 45 to 65 Hz	no significant drift
dropout percentage		95 % ±3 %
times:	memory	10 ms
	fault duration without tripping	10 ms
	resetting	50 ms
minimum zero-sequence trip threshold ⁽¹⁾		10 % of InC
input current		
frequency		50 - 60 Hz
short time withstand capacity	continuous	6 InC
	1 s	25 kA rms
peak withstand capacity		50 kA peak
environment		
insulation level	50 Hz-1min	2 kV rms (IEC 255-4)
	impulse wave 1,2/50 µs	5 kV choc (IEC 255-4)
high frequency disturbances	1MHz damped oscillating wave	2,5 kV (IEC 255-4 classe III)
	electrical fast transients (5 ns)	4 kV (IEC 801-4 classe III)
	electrostatic discharge	15 kV (IEC 801)
	radiation	10 V/m (IEC 801-3 classe III)
mechanical endurance of circuit-breaker		10 000 operations (CO)
mechanical vibrations		IEC 255-21-1 classe I
shock and bumps	in service	5 g
	out of service	15 g (IEC 255-21-2 classe I)
degree of protection (relay front plate)		IP 51
temperature range: operation		-25 to +70 °C (IEC 68-2-1 et 68-2-2)
	storage	-40 to +85 °C (IEC 68-2-1 et 68-2-2)

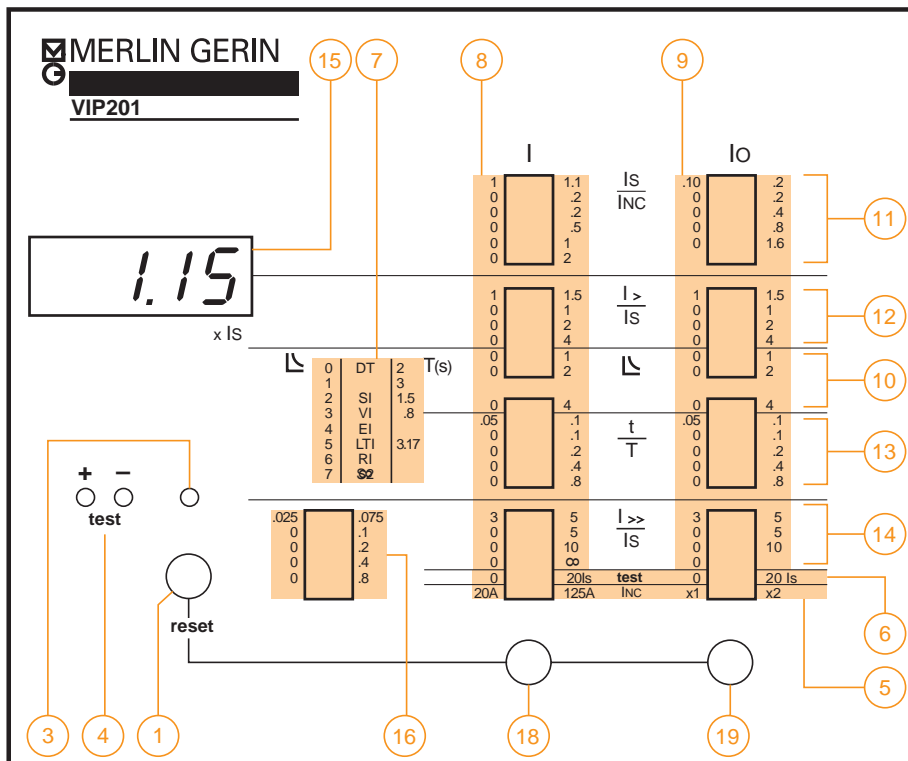
(1) This protection is operational only if the zero-sequence current is greater than InC when the fault occurs.



VIP200 front-plate

The front-plate of the VIP200 includes the following elements:

- 1 indicator "reset" button
- 3 Self-monitoring LED:
 - LED off ; normal VIP operation (hot standby);
 - LED on (not flashing): internal fault;
 - LED flashing : time delay operating or test initiated via the "Reset" button.
- 4 Test socket (for VAP5-VAP6 unit)
- 5 Inc indication:
 - Inc = 20 A set 20A x 1;
 - Inc = 40 A set 20 A x 2 ;
 - Inc = 125 A set 125 A x 1;
 - Inc = 250 A set 125 A x 2;
- 6 Used when testing with VAP5-VAP6 test unit.
- 7 Time/current curves (available curves with indication of time base to be used for time delay settings).
- 8 "Phase" protection (I).
- 9 "Zero-sequence" protection (Io):
 - 10 Choice of type of curve;
 - 11 Choice of Is and Io;
 - 12 Low threshold current setting I/Is and Io/Is, for definite time DT curve only;
 - 13 Low threshold time delay setting;
 - 14 High threshold current settings.



VIP201 front-plate

The front-plate of the VIP201 includes the same elements as the VIP200 front-plate, with in addition:

- 15 Digital ammeter (displays the value of the current flowing in the phase with the highest load as a percentage of Is).
- 16 High threshold time delay
For all current values, the high accuracy of these time delay settings makes it possible to obtain discrimination in stages of 0.2 s (settings from 0.025 s to 1.575 s in steps of 0.05s).

Indications

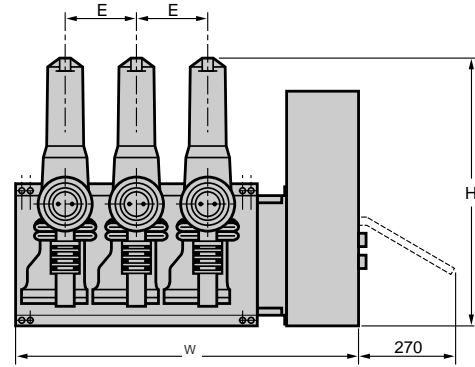
- 18 "phase fault" trip ;
 - 19 "zero-sequence fault" trip ;
- These indicators, with magnetic latching, maintain fault trip indications even after the circuit breaker has opened. The power required for resetting the indicators is supplied either by an internal capacitor (12 hours autonomy) or by connecting the VAP5-VAP6 test unit.

dimensions

SF1, SFset

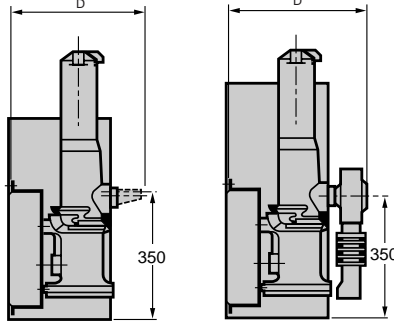
Basic fixed unit

operating mechanism on the right SF1 and SFset

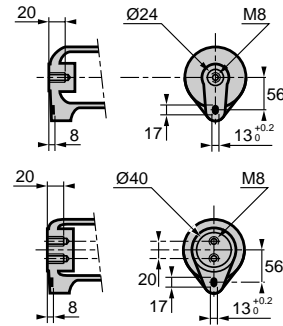


SF1

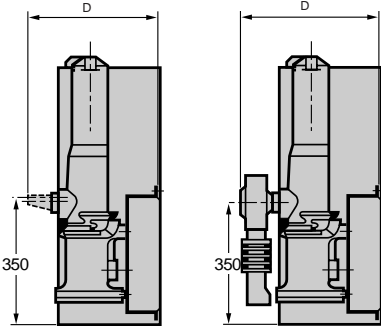
SFset



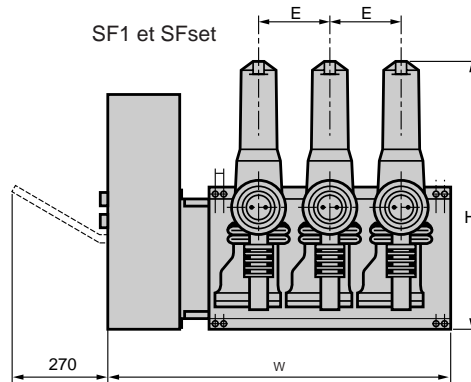
Upper connection (all versions, all types of operating mechanisms)
SF1 and SFset



operating mechanism on the left
SF1 SFset

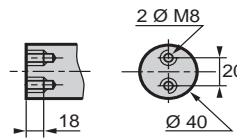


SF1 et SFset

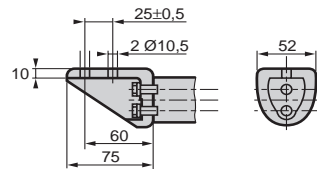


Lower connection

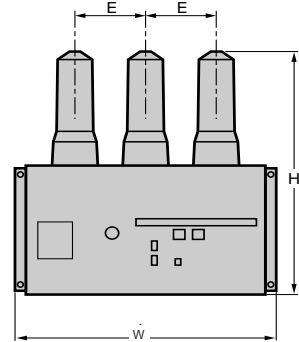
SF1, insulation ≤ 125 kV impulse



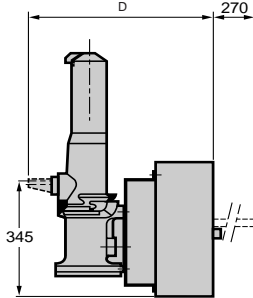
SF1, insulation ≤ 170 kV impulse



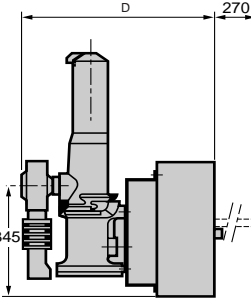
operating mechanism in front
SF1 and SFset



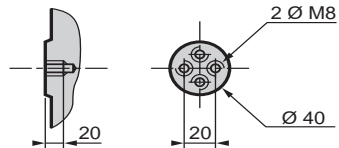
SFset



SF1



SFset



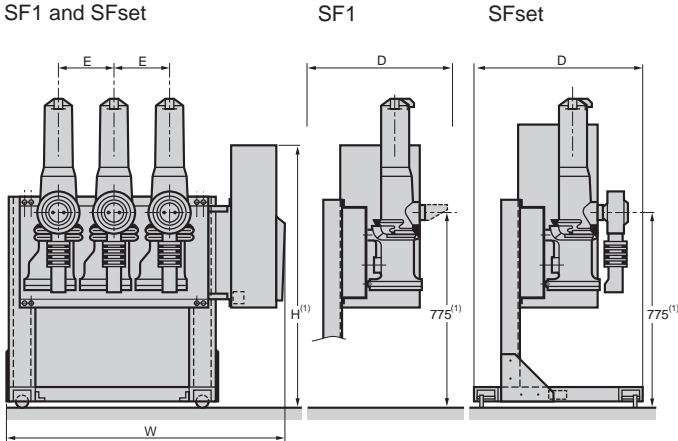
Dimensions and weights

rated current (A)	dimensions (mm)				weight (Kg)	rated voltage kV
	H	W	D	E		
SF1						
operating mechanism on the right or on the left						
630,	750	993	290	220	78	17,5
1250 ⁽²⁾	750	1143	290	280	80	24
	750	1560	365	380	88	36
operating mechanism in the front						
630,	745	766	490	220	78	17,5
1250 ⁽²⁾	745	886	490	280	80	24
	745	927	559	350	85	36
	745	1260	565	380	88	36
SFset						
operating mechanism on the right or on the left						
630,	750	993	420	220	88	17,5
1250 ⁽²⁾	750	1143	420	280	90	24
operating mechanism in the front						
630,	745	766	620	220	88	17,5
1250 ⁽²⁾	745	886	620	280	90	24

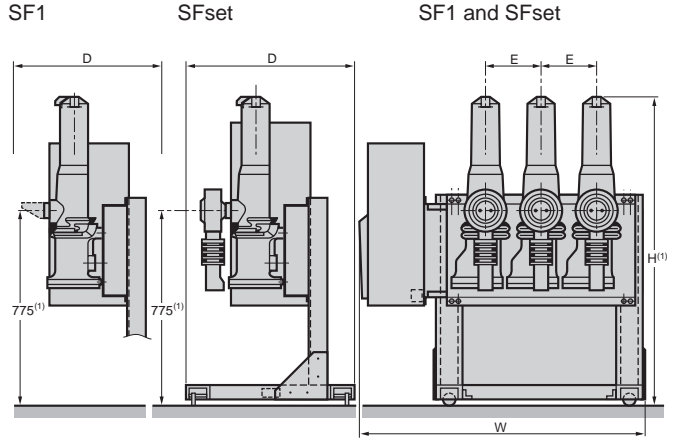
(2) When there are several lines of values for a given rated current, each line corresponds to a different insulation level.

Fixed unit with support frame

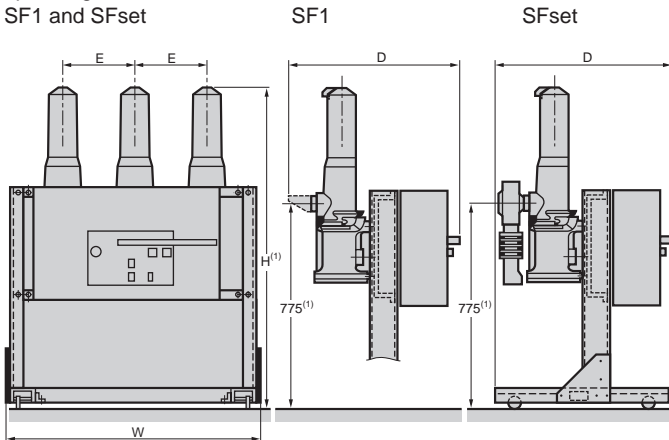
operating mechanism on the right
SF1 and SFset



operating mechanism on the left
SF1 SFset



operating mechanism in front
SF1 and SFset



Dimensions and weights

rated current (A)	dimensions (mm)				weights (Kg)	rated voltage kV
	H	W	D	E		
SF1						
operating mechanism on the right or on the left						
630,	1175	1065	600	220	103	17,5
1250 ⁽¹⁾⁽²⁾	1175	1215	600	280	105	24
	1175	632	600	380	113	36
operating mechanism in the front						
630,	1175	853	600	220	103	17,5
1250 ⁽¹⁾⁽²⁾	1175	973	600	280	105	24
	1175	1347	600	380	113	36
SFset						
operating mechanism on the right or on the left						
630,	1175	1065	600	220	103	17,5
1250 ⁽¹⁾⁽²⁾	1175	1215	600	280	105	24
operating mechanism in the front						
630,	1175	853	649	220	103	17,5
1250 ⁽¹⁾⁽²⁾	1175	973	649	280	105	24

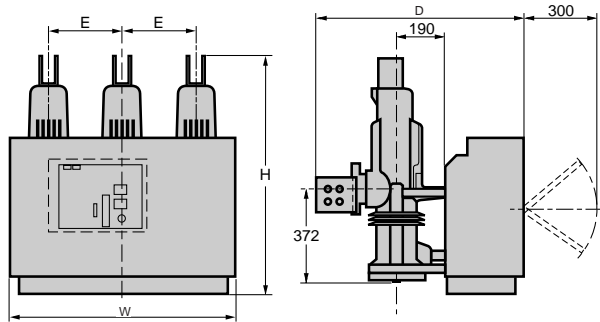
(1) Additional holes are provided on the frame for positioning the unit 215 mm lower.

(2) When there are several lines of values for a given rated current, each line corresponds to a different insulation level.

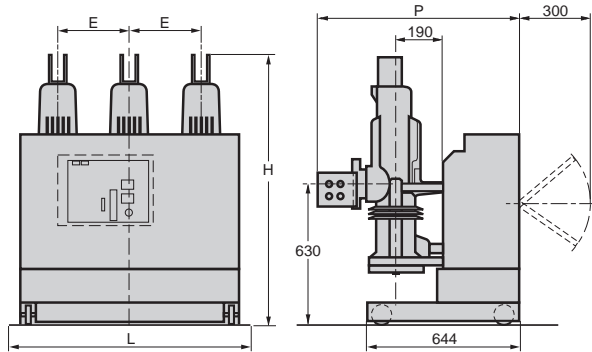
dimensions (cont.)

SF2 - ISF2

Basic fixed unit SF2



Fixed unit with support frame SF2 - ISF2



SF2 dimensions and weights

rated current (A)	dimensions (mm)				weight (kg)	rated voltage (kV)
	H	W	D	E		
basic fixed unit						
630, 1250	825	910	750	300	159	24
	825	1110	750	400	212	36
	825	1224	750	457	242	40,5
2500, 3150	942	910	777	300	174	24
	942	1110	777	400	227	36
	942	1224	777	457	242	40,5
fixed unit with support frame						
630, 1250	1030	910	750	300	179	24
	1030	1110	750	400	239	36
	1030	1224	750	457	272	40,5
2500, 3150	1147	910	777	300	194	24
	1147	1110	777	400	254	36
	1147	1224	777	457	272	40,5

(1) This connection terminal is specific to the ANSI standard 2000 A current rating.

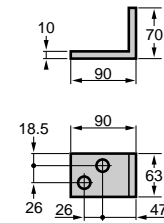
ISF2 dimensions and weights

rated current (A)	dimensions (mm)				weight (kg)	rated voltage (Kv)
	H	W	D	E		
fixed unit with frame						
3150 A	1147	910	777	300	194	24
2500 A	1147	910	777	300	194	40,5 (2)

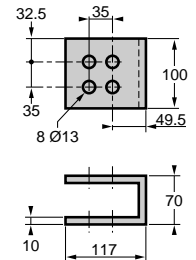
(2) With interphases barriers.

Connection SF2

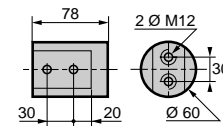
630, 1250 A



2500, 3150 A

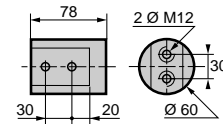


2000 A⁽¹⁾

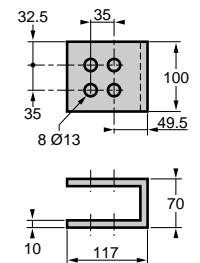


Connection ISF2

2500 A



3150 A



identification of units

examples of rating plates

units complying with IEC standards

Circuit breaker, electrical operating mechanism and auxiliaries

MERLIN GERIN

IEC 56

n° _____

U _____ kV Uw _____ kV

Isc _____ kA sec In _____ A

Seq _____ f Hz

tension de fermeture - closing voltage
Einschaltspannung - tension de cierre
tensione di chiusura _____

tension d'ouverture - opening voltage
Ausschaltspannung - tension de apertura
tensione di apertura _____

tension du moteur - motor voltage
Motorenspannung - tension del motor
tensione del motore _____

schema - diagram
Schaltbild - esquema
schema _____

⚠ SF6 : P = _____ bars

units complying with ANSI standards

Circuit breaker

MERLIN GERIN

n° _____

Rated frequency _____ Hz

Rated cont.current _____ A

Rated max.voltage _____ kV

Range factor k _____

BIL _____ kV

Rated SC current _____ kA

Rated interr.time _____ Cycles

Operating pressure _____ b

Weight _____

Instruction book _____

Std. duty cycle _____

Electrical operating mechanism and auxiliaries

MERLIN GERIN

n° _____

Closing control voltage -----V

Tripping control voltage-----V

Closing current -----A

Tripping current-----A

Wiring diagram -----

inspection sheet

units complying with IEC and ANSI standards

All devices

MERLIN GERIN

département DOMT.F

garantie qualité

le _____

par _____

General information

quantity

Person ordering
 Order number
 User
 Name of project
 Operating manuals french english

Network characteristics

Service voltage V
 Frequency Hz
 Insulation level kV rms 1 min
 kV impulse 1.2/50 μ s

Unit characteristics

Rated current A
 Breaking capacity kA rms
 Short-time withstand current kA rms s
 Standards IEC ANSI
 Circuit-breaker model SF quantity

Version basic fixed unit
 fixed unit with support frame

Installation indoor
 special panel
 outdoor

Operating sequence standard (O - 3 min - CO - 3 min - CO)
 rapid 1 (O - 0,3s - CO - 3 min - CO)
 rapid 2 (O - 0,3s - CO - 15 s - CO)

Protection unit

For SFset unit type VIP
 sensor type quantity⁽¹⁾
 For SF1 et SF2 please consult us

Auxiliaries and accessories

Operating mechanism manual
 manual and electric
 spring charging motor V,
 closing release V,

Opening release shunt single V,
 quantity
 double V,

undervoltage V,
 mechanical time delay yes
 no

close enabling yes
 mechanism no

overcurrent single A
 quantity
 double A

Mitop (necessary for Fluarc SFset) :
 without momentary contact ⁽²⁾
 with momentary contact ⁽²⁾

Additional auxiliaries pressure switch

Accessories "green-red" mechanical indicators
 operation counter (for manual RI operating mechanism)
 locking device: without locks
 with locks

VAP5 test unit quantity

.....

Selection of additional auxiliaries and accessories depends on the type of switchgear. Consult the options proposed in the "description" and "operating mechanism and diagrams" sections.

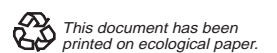
(1) If the selected protection unit includes zero-sequence protection (VIP200 and VIP201), 3 sensors are required.

(2) Momentary contact to indicate tripping by the "Mitop release.

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As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.



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