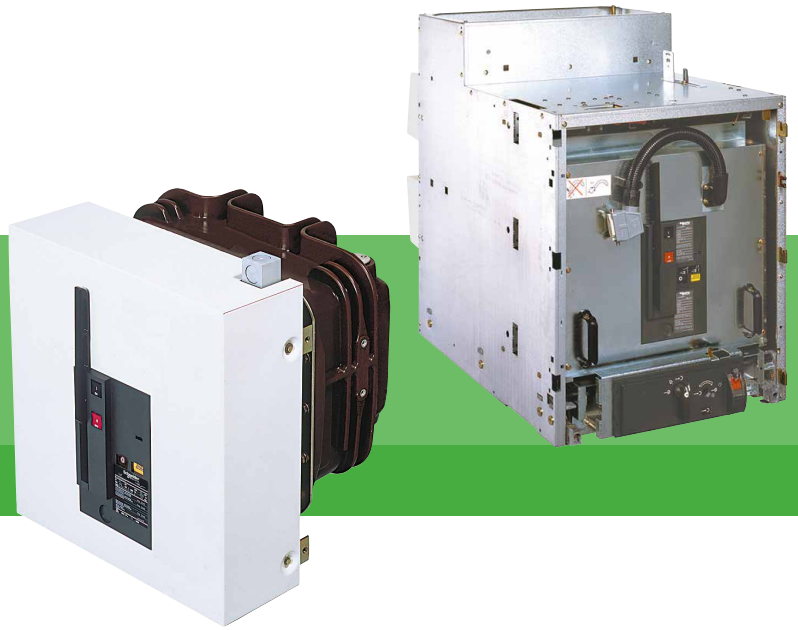


2018 Catalog



# LF

SF6 Circuit breaker up to 17.5 kV

Medium Voltage Distribution

# Your requirements

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Continuity  
of service



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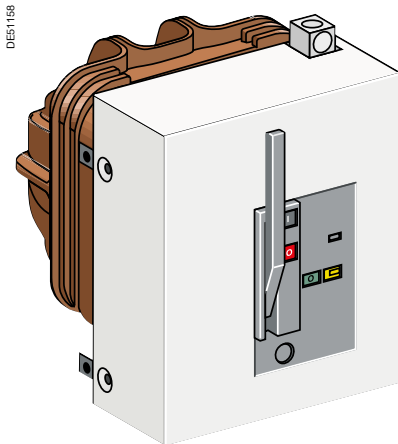
Proven  
technology



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Ease  
of installation





For over 45 years, Schneider Electric, leverages its experience to develop SF6 circuit breakers and thus holds a unique know-how in various applications.

- Low level of SF6 pressure
- A safety membrane which, in very rare cases of an internal arc, will open in order to let the gas flow to the back of the circuit breaker
- Keeping at 0 bar of SF6:
  - The nominal performance
  - The capacity to break once at least 80 % of the full breaking capacity
  - The capacity to withstand at least 80 % of the insulating level
- Breaking all types of current without overvoltages

- Long experience of Schneider in manufacturing MV circuit breakers in SF6 technology
- 100,000 LF Circuit Breakers installed with over 20 years of experience

- Compact dimensions
- Cassette version : retrofit and new panels integration



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# General Presentation

# Content

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# The advantages of proven technology

Schneider Electric has developed a wide range of high performance and reliable devices operating faultlessly on all 5 continents.

Continuously increasing its performance, the company maintains a very high level of innovation in its offer.

## Key Benefits

- Compact and simple design
- No overvoltage during breaking
- Comprehensive range
- Soft breaking without chopping currents
- Continuous monitoring of the gas pressure inside poles

## Certification

The quality system for the design and production of LF range is certified in conformity with ISO 9001: 2008 quality assurance standard requirements.

The environmental management system adopted by Schneider Electric production sites for the production of LF range has been assessed and judged to be in conformity with requirements in standard ISO 14001.



## Safety

The breaking medium is sulfur hexafluoride (SF6) used at low pressure.

The insulating enclosure containing the circuit breaker pole(s) is equipped with a safety membrane.

In addition, the rated characteristics, breaking the rated current under the rated voltage, are generally maintained at zero relative bars of SF6.

## Reliability

The motor-charged spring stored energy operating mechanism is a key factor of device reliability: Schneider Electric cumulates 45 years' experience with this type of mechanism, 1,200,000 of which are already in operation.

Schneider Electric's mastery of design and the testing of sealed systems guarantees sustained device performance for at least 30 years.

## Increased endurance

The mechanical and electrical endurance of Schneider Electric SF6 breaking devices are in conformity with the most demanding specifications recommended by the IEC.

These devices therefore meet requirements for even the most exposed of networks.

## Environmentally-friendly

Schneider Electric devices have been designed to ensure protection of the environment:

- the materials used, both insulating and conductive, are identified and easy to separate and recycle,
- the SF6 gas is under control from production through to the circuit-breaker's end of life. In particular it can be recovered at the end of the circuit-breaker's life and re-used after treatment in line with the new European directive,
- an end of life manual for the product details procedures for dismantling and recycling components.

## Quality Assurance

During production, each circuit breaker undergoes systematic routine tests in order to check quality and conformity:

- pole sealing check
- checking the correct mechanical operation of the device, plus its associated locking mechanisms
- checking simultaneous closing of contacts
- checking power frequency insulation level
- checking main circuit resistance
- checking auxiliary circuit insulation
- checking switching speeds
- checking the switching cycle
- measuring the switching times.

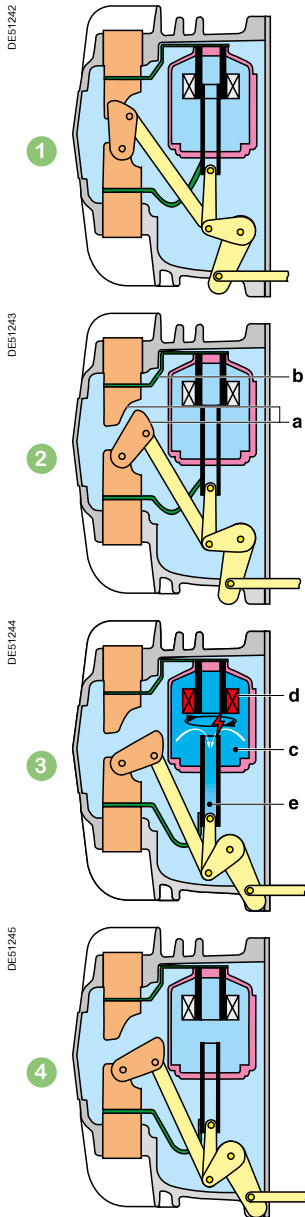
The results are recorded on the test certificate for each device which is initiated by the quality control department.



# Breaking principle

## Breaking principle: self expansion

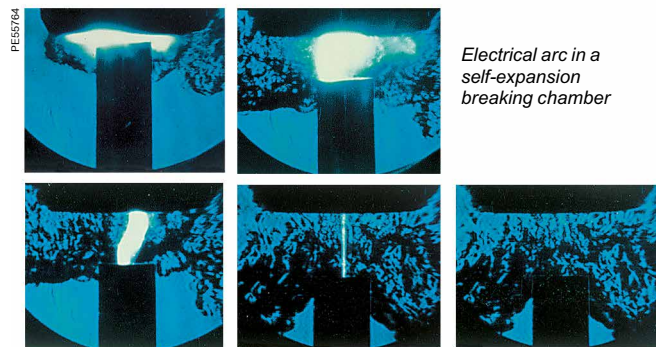
LF circuit breakers use the SF6 gas self expansion technique. This technique is the result of many years' experience in SF6 technology and major research work. It combines the effect of thermal expansion with a rotating arc to create arc blowing and quenching conditions. The result is reduced control energy requirements and arcing contact erosion; this increases mechanical and electrical endurance. The operating sequence of a self-expansion breaking chamber, whose moving part is driven by the mechanical operating mechanism, is as follows:



1 The circuit breaker is closed

2 On opening of the main contacts (a) the current is shunted into the breaking circuit (b)

3 ■ On separation of the arcing contacts, an electrical arc appears in the expansion volume (c).



■ The arc rotates under the effect of the magnetic field created by the coil (d) through which flows the current to be broken:  
 □ the overpressure created by the temperature build-up of the gas in the expansion volume (c) causes a gaseous flow blowing the arc inside the tubular arcing contact (e)  
 □ resulting in arc quenching when the current passes through the zero point

4 The circuit breaker is open

# Scope of application and some references

Our LF Circuit Breaker adapts  
to all electrical power distribution  
requirements up to 17.5 kV.

## Applications

LF circuit breakers are three-pole indoor MV circuit breakers.

They are mainly used for operation and protection of public, industrial and tertiary distribution networks from 7.2 to 17.5 kV.

Through their anti-seismic qualification, they are particularly well suited to nuclear or thermal power production installations and applications in heavy industries such as the petrochemical industry.

Through their compact dimensions and harmonized range, LF circuit breakers are positioned very favorably on the retrofit market.

LF Circuit breaker is a component integrated in MV switchgear used in power distribution to protect and control cables, transformer and MV substations, motors, capacitors banks, etc.

SF6 Self expansion breaking technique use in LF circuit breaker makes all current types, capacitive and inductive, without generating operating overvoltage that could damage the installation.

Therefore, it is greatly appropriate for the retrofit and upgrading of old installations.

A two thresholds pressure switch in standard to monitor the gas pressure (0.1 MPa, 0,05 MPa / 1 bar, 0,5 bar).

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

- LF 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

## LF Circuit breaker is present in all power distribution markets

### Energy

- Electric power stations (thermal, nuclear)
- Auxiliary substations
- Source substations

### Industry

- Oil & gas
- Chemical industry
- Paper mills
- Metallurgy
- Car industry
- Mining
- Cement plants...

### Infrastructure

- Airports
- Ports
- Hospitals
- Water treatment...

### Marine and Navy applications

- Cruisers
- Container ships
- Tankers
- Offshore platforms, fixed and mobile
- LNG (Liquid Natural Gas)
- Navy...



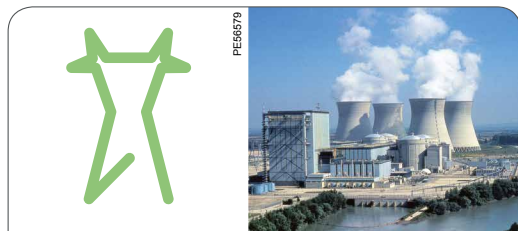
## Marine

Jan de Nul	Belgium (MCset)
Zhen Hua Port Machinery	China (MCset)
FREMM	France (MCset)
Conti Rederei	Germany (MCset)
MSC	Italy (MCset)
M.O.L.	Japan (MCset)
STX Shipyard	Korea (MCset)
CPOC	Malaya (MCset)
Subsea	Norway (MCset)
Sovcomflot	Russia (MCset)
TMT	Taiwan (MCset)
British Gas	United Kingdom (MCset)
Norwegian Cruise Lines	USA (MCset)



## Industry

Algérienne des eaux	Algeria (MCset)
Water treatment, Degremont	Argentina (MCset)
Alcoa Aluminium	Australia (MCset)
Croesus Mining	Australia (MCset)
Rollestone Coal Pty LTD	Australia (MCset)
Ciment Karadag	Azerbaijan (MCset)
Volvo	Belgium (MCset)
Cement Lafarge	Equator - Turkey (MCset)
Cement Lafarge	France (MCset)
Ford	Germany (MCset)
Irak Traitement des eaux	Irak
Arab Union Contracting Company	Libya (MCset)
Arcelor	Luxemburg (MCset)
Opel	Russia (MCset)
Ciment Bastas	Turkey (MCset)



## Power generation

Sonelgaz	Algeria (MCset)
Moranbah Generation Facility	Australia (MCset)
China Nuclear Power programmes	China (MCset)
CEA Cadarache	France (MCset)
Enertherm	France (MCset)
Wind Turbines	France (MCset)
La Termica	Italy (MCset)
Al Fanar Electrical System	KSA (MCset)
Skagerak Nett AS	Norway (MCset)
EVN thermal power station	Vietnam (MCset)



## Oil and Gas

Girassol Mpg-Elf	Angola (MCset)
ONAL	Gabon (MCset)
Alya Co	Kazakhstan (MCset)
Tengiz Chevroil JV	Kazakhstan (MCset)
Occidental Mukhaizna LLC	Oman (MCset)
Qatar Petroleum	Qatar (MCset)
Repsol, Santander	Spain (MCset)
Syrian Gas Company	Syria (MCset)
Turkmengaz	Turkmenistan (MCset)
Abu Dhabi Oil Refining Company	United Arab Emirates (MCset)
Yemen LNG Company	Yemen (MCset)
Yemgas – Technip	Yemen (MCset)



## Infrastructure

Italian Railways	Italy (MCset)
Alicante airport	Spain (MCset)
Port of Laem Chabang	Thailand (MCset)

# Operating conditions & Standards

PE50251



## Operating conditions

Normal operating conditions, according to the IEC International Standards listed below, for indoor switchgear.

- Ambient air temperature:
  - less than or equal to 40°C
  - less than or equal to 35°C on average over 24 hours
  - greater than or equal to - 25 °C
- Altitude:
  - less than or equal to 1000 m;
  - above 1000 m, a derating coefficient is applied (please consult us)
- Atmosphere:  
no dust, smoke or corrosive or inflammable gas and vapor, or salt
- Humidity:
  - average relative humidity over a 24 hour period  $\leq 95\%$
  - average relative humidity over a 1 month period  $\leq 90\%$
  - average vapor pressure over a 24 hour period  $\leq 2.2$  kPa
  - average vapor pressure over a 1 month period  $\leq 1.8$  kPa

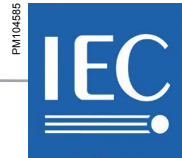
## Storage conditions

In order to retain all of the functional unit's qualities when stored for prolonged periods, we recommend that the equipment is stored in its original packaging, in dry conditions, and sheltered from the sun and rain at a temperature ranging from - 40°C up to + 70°C

## Standards

The LF range meets the following international standards:

- IEC 62271-100: High-voltage switchgear and controlgear - Alternating current circuit-breakers
- IEC 62271-1: High-voltage switchgear and controlgear: common specifications
- GOST conformity: R52565 - 2006

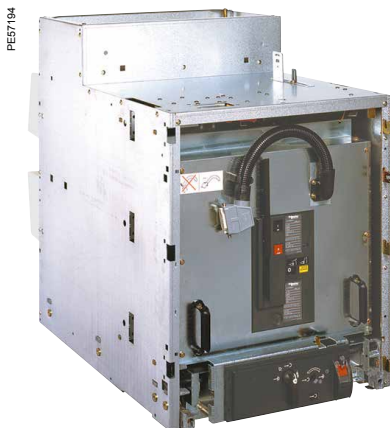


One range of comprehensive and proven three-pole circuit breaker units for indoor installation using SF6 technology.

Both compact and dependable, it is ideally suited to the most demanding applications.

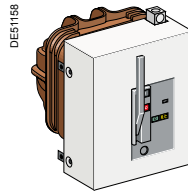


**LF circuit breakers fixed version**  
from 7.2 kV to 17.5 kV

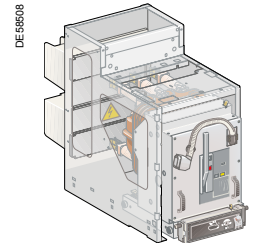


**LF circuit breakers withdrawable version**  
from 7.2 kV to 17.5 kV

## LF range circuit breakers LF1-LF2-LF3

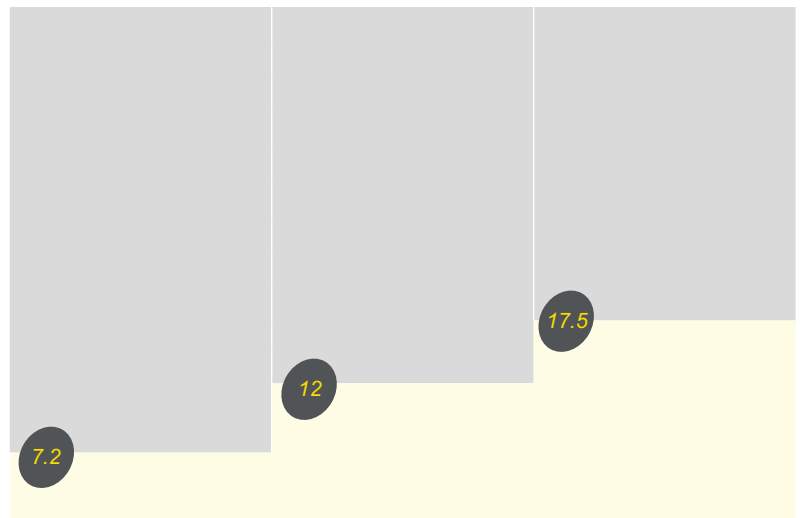


Fixed



Withdrawable

Rated voltage  $U_r$  (kV, 50/60 Hz)



Rated short-circuit breaking current ( $I_{sc}$ )

from 25 to 50 kA

from 25 to 40 kA

Rated current ( $I_r$ )

from 630 to 3150 A

# LF circuit breakers fixed version

# Contents

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PE57191



LF1 - LF2 - LF3 circuit breakers

PE57192



LF1 - LF2 - LF3 circuit breakers installed on a support frame

## Description of the device

### The LF circuit breaker comprises a basic fixed version:

- 3 poles integrated in a "sealed pressure system" type insulating enclosure. The sealed assembly is filled with SF6 gas at low relative pressure (0.15 MPa/1.5 bars) and equipped with a pressure switch
- an RI stored energy electrical operating mechanism. This gives the device an opening and closing speed that is independent of the operator, for both electrical and manual orders. It enables reclosing cycles to be carried out
- 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.

### Each device can also be fitted with the following options:

- a seismic version is available, allowing to withstand the specific parameters of earthquakes and marine applications
- a supporting frame equipped with rollers and ground fixing brackets for fixed installation
- circuit breaker locking in the open position by a keylock installed on the front plate of the operating mechanism
- a 42-pin Harting type LV connector.



Electrical characteristics according to IEC 62271-100				LF1				LF2				
Rated voltage	Ur	kV 50/60 Hz		7.2	12			7.2	12	17.5		
Insulation voltage												
- power frequency withstand	Ud	kV 50 Hz 1min (*)		20	28			20	28	38		
- lightning impulse withstand	Up	kV peak		60	75			60	75	95		
Rated current	Ir	A	630	■	■	■	■	■	■	■	■	■
			1250	■	■	■	■	■	■	■	■	■
			2000	-	-	-	-	-	-	-	-	-
Short circuit current	Isc	kA		25	31.5	25	31.5	40	50	40	25	31.5
Short time withstand current	Ik/tk	kA/3 s		25	31.5	25	31.5	40	50	40	25	31.5
Short-circuit making current	Ip	kA peak	50 Hz	63	79	63	79	100	125	100	63	79
			60 Hz	65	82	65	82	104	130	104	65	82
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			■	■	■	■	■	■	■	■	■
Operating times	Opening ms			< 54				< 54				
	Breaking ms			< 70				< 70				
	Closing ms			< 72				< 72				
Service temperature	T	°C		-25 to +40				-25 to +40				
Mechanical endurance	Class			M2				M2				
	Number of switching operations			10 000				10 000				
Electrical endurance	Class			E2				E2				
Capacitive current breaking capacity	Class			C2				C2				

(\*) Ud 42 kV 50 Hz, 1 min available in standard

■ Available  
- Not available

Electrical characteristics according to IEC 62271-100				LF3										
Rated voltage	Ur	kV 50/60 Hz		7.2				12				17.5		
Insulation voltage														
- power frequency withstand	Ud	kV 50 Hz 1min (*)		20				28				38		
- lightning impulse withstand	Up	kV peak		60				75				95		
Rated current	Ir	A	630	-	-	-	-	-	-	-	-	-	-	-
			1250	-	-	-	-	-	-	-	■	-	-	■
			2000	-	-	-	-	-	-	-	-	-	-	-
			2500	■	■	■	■	■	■	■	■	■	■	■
			3150	■	■	■	■	■	■	■	■	■	■	■
Short circuit current	Isc	kA		25	31.5	40	50	25	31.5	40	50	25	31.5	40
Short time withstand current	Ik/tk	kA/3 s		25	31.5	40	50	25	31.5	40	50	25	31.5	40
Short-circuit making current	Ip	kA peak	50 Hz	63	79	100	125	63	79	100	125	63	79	100
			60 Hz	65	82	104	130	65	82	104	130	65	82	104
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			■	■	■	■	■	■	■	■	■	■	-
Operating times	Opening ms			< 54										
	Breaking ms			< 70										
	Closing ms			< 72										
Service temperature	T	°C		-25 to +40										
Mechanical endurance	Class			M2										
	Number of switching operations			10000										
Electrical endurance	Class			E2										
Capacitive current breaking capacity	Class			C2										

(\*) Ud 42 kV 50 Hz, 1 min available in standard

■ Available  
- Not available

## Specific applications

### Protection of generators and power station auxiliaries

All circuit breakers in the LF range break short circuit currents with an asymmetry of at least 30%.

In cases where the network constant L/R is greater than 45 ms, the asymmetry to be broken is higher; this is often the case of circuit breakers protecting nuclear or thermal power station auxiliaries or circuit breakers that are close to generator sets or large transformers.

Specific tests have been carried out:

Circuit breakers	kV	kA	Asymmetry
LF2	7.2	43.5	50%
LF3	7.2	43.5	50%
	12	40	50%
	17.5	25	100%

### Switching and protection of capacitor banks

LF 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.

PIE57164



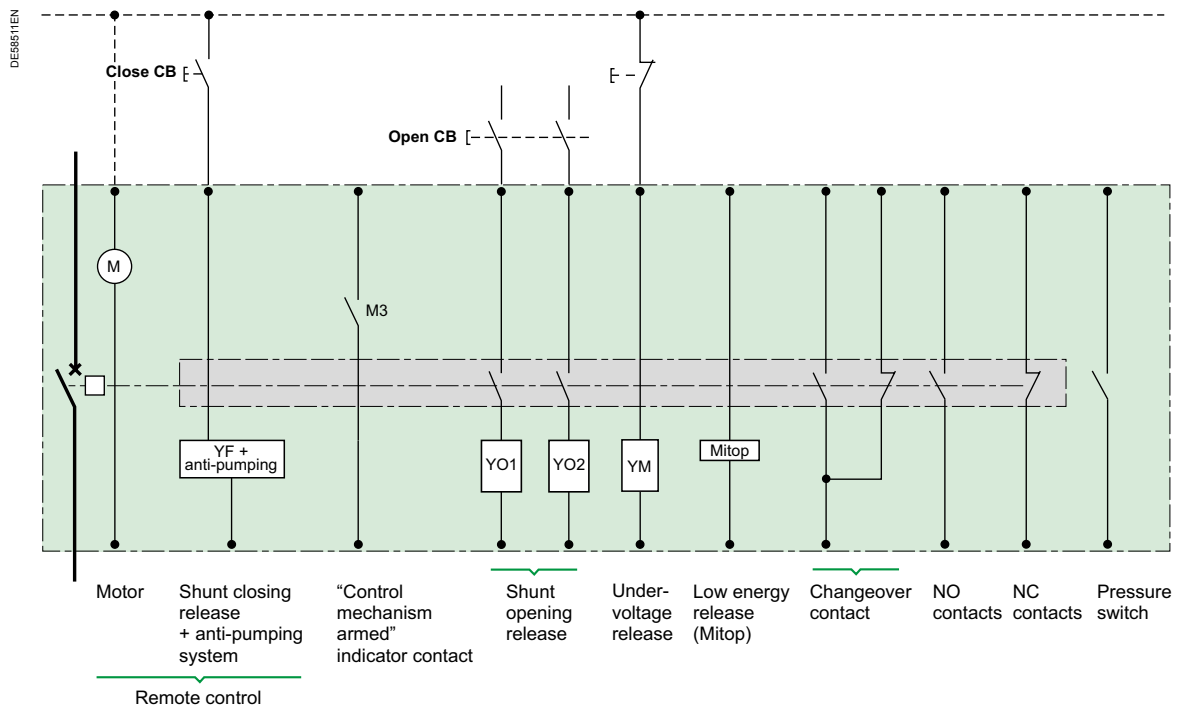
### Operation of the RI stored energy operating mechanism

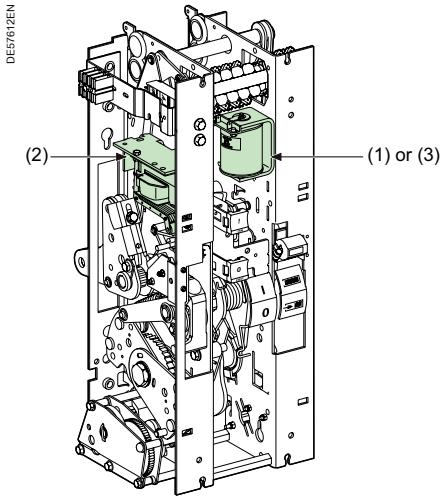
This mechanism guarantees the device an opening and closing speed unaffected by the operator, for both electric and manual orders.

It carries out the O and CO cycles and is automatically recharged by a gear motor after closing. It consists of:

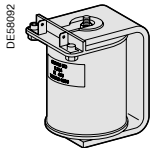
- the stored energy operating mechanism which stores in springs the energy required to open and close the device
- a gear motor electrical charging device with manual charging by lever (useful on loss of auxiliary supply)
- manual order devices by push buttons on the front panel of the device (red and black)
- an electrical remote closing device containing a release with an antipumping relay
- an electrical opening device containing one or more releases, for example:
  - shunt trip devices
  - Mitop, a low consumption release, used only with the self protection relay.
- an operation counter
- a position indication device by mechanical indicator (black and white) and a module of 14 auxiliary contacts whose availability varies according to the diagram used
- a device for indicating "charged" operating mechanism status by mechanical indicator and electrical contact
- A two thresholds pressure switch allows to monitor the gas pressure (0.1 MPa, 0,05 MPa / 1 bar, 0,5 bar, relative pressure)

### Wiring diagram

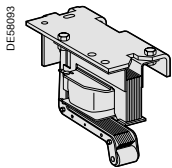




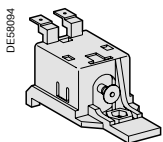
Operating mechanism



Shunt opening release (1)



Undervoltage release (2)



Low energy release (3)

### Composition

The opening circuit can be produced using the following components:

- shunt opening release (on energizing) (YO1)
- second shunt opening release (on energizing) (YO2)
- undervoltage release (YM)
- low energy release (Mitop).

*Note: see the table of the releases' combinations "Order form" page.*

### Shunt opening release (YO1 and YO2)

Energizing this unit causes instant opening of the circuit breaker.

#### Characteristics

Power supply	See "Order form" page	
Threshold	V AC	0.85 to 1.1 Ur
	V DC	0.7 to 1.1 Ur
Consumption	V AC	160 VA
	V DC	50 W

As an option, the tripping circuit monitoring (supervision) enables to ensure that the Circuit breaker is ready to open.

### Undervoltage release (YM)

This release unit causes the systematic opening of the circuit breaker when its supply voltage drops below a value less than 35% of the rated voltage, even if this drop is slow and gradual. It can open the circuit breaker between 35% and 70% of its rated voltage. If the release unit is not supplied power, manual or electrical closing of the circuit breaker is impossible. Closing of the circuit breaker is compulsory when the supply voltage of the release unit reaches 85% of its rated voltage.

#### Characteristics

Power supply	See "Order form" page		
Threshold	Opening	0.35 to 0.7 Ur	
	Closing	0.85 Ur	
Consumption	Triggering	V AC	400 VA
		V DC	100 W
	Latched	V AC	100 VA
		V DC	10 W

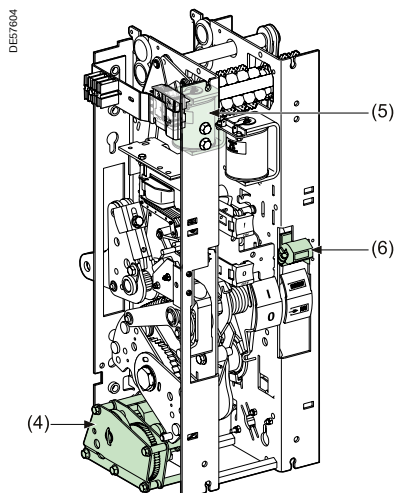
### Low energy release (Mitop)

This specific release unit comprises a low consumption unit and is specifically used with self-powered relays. The Circuit-breaker's opening time must be adjusted with the relay to a minimum value of 45ms.

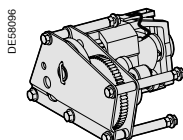
#### Characteristics

Power supply	Direct current
Threshold	0.6 A < I < 3 A

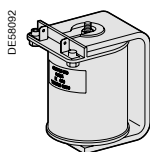
Any tripping due to the Mitop release unit is momentarily indicated by an SDE type changeover contact.



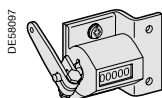
Operating mechanism



Electrical motor with gearing (4)



Shunt closing release (5)



Operation counter (6)

### Function

Remote control enables the remote opening and closing of the circuit breaker.

### Composition

The remote control mechanism comprises:

- an electrical motor with gearing
- a shunt closing release (YF) combined with an anti-pumping device
- an operation counter.

### Electrical motor with gearing (M)

The electrical motor arms and re-arms the stored energy unit as soon as the circuit breaker is closed. This allows the instant closing of the device after opening.

The arming lever is only used as a back-up operating mechanism in the case of any auxiliary power supply.

The M3 contact indicates the end of arming operations.

#### Characteristics

Power supply	See "Order form" page	
Threshold	V AC/V DC	0.85 to 1.1 Ur
Consumption	V AC	380 VA
	V DC	380 W

### Shunt closing release (YF)

This allows the remote closing of the circuit breaker when the operating mechanism is armed.

#### Characteristics

Power supply	See "Order form" page	
Threshold	V AC	0.85 to 1.1 Ur
	V DC	0.85 to 1.1 Ur
Consumption	V AC	160 VA
	V DC	50 W

The anti-pumping relay enables the guaranteeing of opening priority in the case of a permanent closing order. This therefore avoids the device being caught in a uncontrolled opening-closing loop.

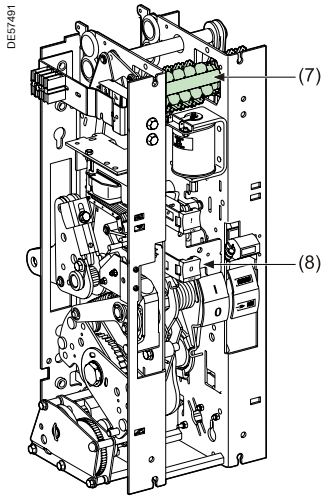
### Operation counter

The operation counter is visible on the front panel.

It displays the number of switching cycles (CO) that the device has carried out.

# Description of functions

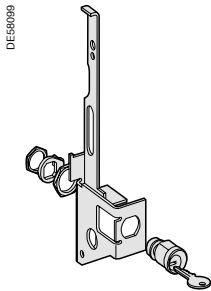
## Indication and locking/interlocking



Operating mechanism



Auxiliary contacts (7)



Keylocking kit (8)

### “Open/closed” auxiliary contacts

The number of contacts available depends on the options chosen on the operating mechanism.

In the basic configuration, the circuit breaker’s operating mechanism comprises a total of:

- 6 normally closed contacts (NC)
- 7 normally open contacts (NO)
- 1 changeover contact (CHG).

The usage procedure for auxiliary contacts is given in the following table:

Options		
	NC contact	NO contact
Remote control	1	1
Shunt opening release (each one) YO1/YO2	0	1
Undervoltage release YM	0	0
Low energy release (Mitop)	0	0

In order to know the final number of available contacts, you must deduct the total number of contacts included in the circuit breaker (6 NC + 7 NO + 1 CHG), the number of contacts used given in the table above.

E.g.: a circuit breaker equipped with a remote control and a shunt trip unit has the following available contacts:

6 NC + 5 NO + 1 CHG.

With a undervoltage release instead of the shunt trip, this circuit breaker would have the following available contacts:

6 NC + 6 NO + 1 CHG.

Shunt opening release combination			
1st release 2nd release	Shunt opening release YO1	Undervoltage release YM	Mitop
Without	6NC + 5NO + 1CHG	6NC + 6NO + 1CHG	6NC + 6NO + 1CHG
Shunt opening release YO2	6NC + 4NO + 1CHG		
Undervoltage release YM	6NC + 5NO + 1CHG		
Mitop	6NC + 5NO + 1CHG	6NC + 6NO + 1CHG	

### Locking the circuit breaker in the “open” position

This key-operated device allows the circuit breaker to be locked in the “open” position.

The circuit breaker is locked in the open position by blocking the opening push button in the “engaged” position.

Locking is achieved using a Profalux or Ronis captive key type keylock.

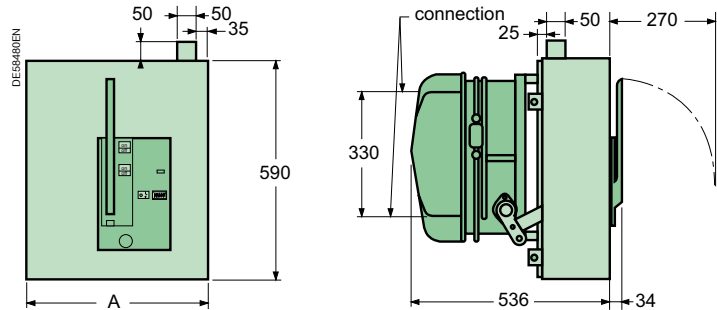
# Dimensions

## LF1, LF2, LF3 circuit breakers

### Device

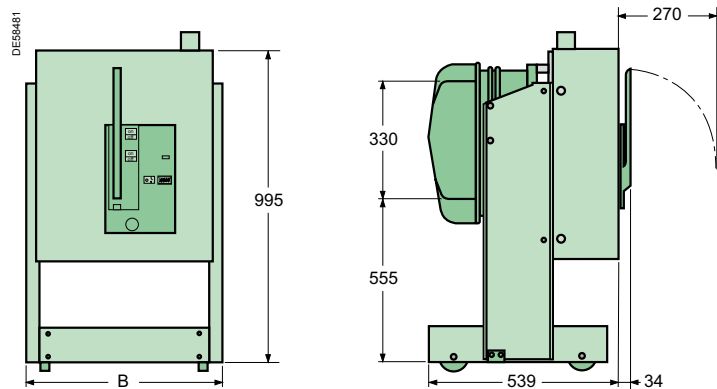
#### Fixed version

	LF1	LF2	LF3
A	493	554	728
Weight (kg) *	115	134	197



#### Fixed version with support frame (to be ordered separately)

	LF1	LF2	LF3
B	542	602	776
Weight (kg) *	135	154	217



\*Maximum values, depending on ratings and options

### Connections

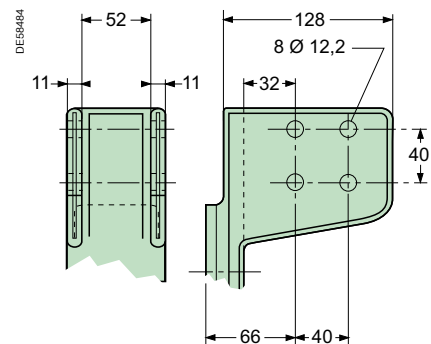
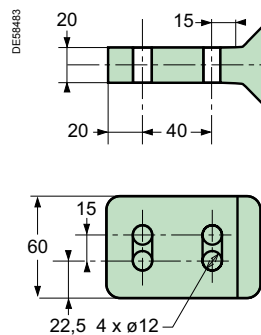
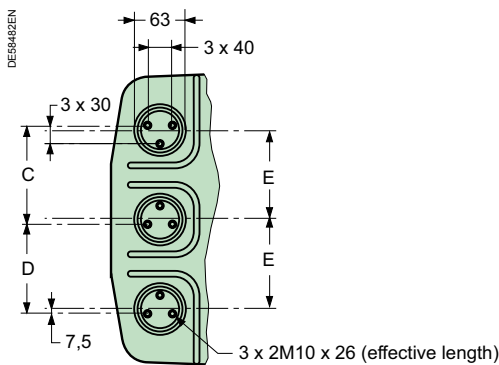
#### Direct to the device

- LF1
- LF2 < 2000 A < 95 kV impulse
- LF3 < 2500 A and < 95 kV impulse

#### Connection on pads

- LF2:
  - 2000 A
  - 1250 A/95 kV impulse
  - 630 A/95 kV impulse
- LF3: 1250 A/95 kV impulse

- LF3:
  - 2500 A/95 kV impulse
  - 3150 A/95 kV impulse



	LF1	LF2	LF3
C	160	180	240
D	145	165	225
E	145	165	225

#### Note:

- recommended connection screw M10 class 8.8.
- Tightening torque: 50 Nm with contact washer.
- connectors delivered mounted on the device
- for more details refer to the dimensional drawings

# LF circuit breakers withdrawable version



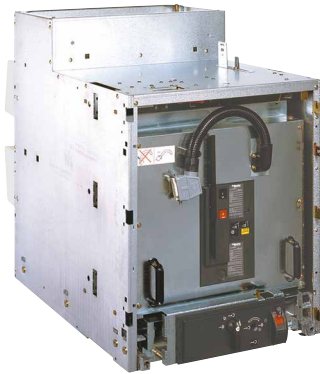
# Contents

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PE57194



*LF withdrawable circuit breaker  
and MC cassette*

## Description of the device

### The basic withdrawable version of the LF circuit breaker comprises:

- the circuit breaker unit with its operating mechanism:
  - 3 poles integrated in a “sealed pressure system” type insulating enclosure. The sealed assembly is filled with SF6 gas at low relative pressure (0.15 MPa/1.5 bars) and equipped with a pressure switch
  - an RI stored energy electrical operating mechanism. This gives the device an opening and closing speed that is independent of the operator, for both electrical and manual orders. It enables reclosing cycles to be carried out
  - a front panel housing the manual operating mechanism and status indicators.
- the components enabling it to be withdrawable:
  - the circuit breaker is equipped with racking arms and contact fingers and mounted on a racking in/out drive device with a threaded shaft activated by a handle, including all of the safety interlock systems.
  - a Harting type male LV connector allows connection of the external auxiliary circuits

### Each device can optionally be fitted with:

- locking of the circuit breaker in the following positions:
    - racked out, by a key lock installed on the drive device for disconnecting truck
  - the basic MC cassette, comprising:
    - a metal structure and two guide rails
    - fixed connection fingers insulated by bushings
    - metal shutters to insulate from the HV part
    - safety interlocking systems
    - a female Harting type LV connector.
  - MC cassette options:
    - circuit breaker racked-in or out position indicator contacts
    - a circuit breaker operating mechanism spring discharge system
    - a circuit breaker racked-in blocking mechanism
    - an extraction tool
    - an equipped door
    - a foolproof device for the circuit breaker rating
    - an earthing switch operating mechanism
- (see chapter 5 in catalogue “MV switchboards components” ref. AMTED305019EN).

Electrical characteristics according to IEC 62271-100			Circuit breaker LF1 / Cassette MC1				
Rated voltage	Ur	kV 50/60 Hz	7.2		12		
Insulation voltage							
- power frequency withstand	Ud	kV 50 Hz 1min (*)	20		28		
- lightning impulse withstand	Up	kV peak	60		75		
Rated current	Ir	A	630	■	■	■	■
			1250	■	■	■	■
Short circuit current	Isc	kA	25	31.5	25	31.5	
Short time withstand current	Ik/tk	kA/3 s, kA/1 s	25	31.5	25	31.5	
Short-circuit making current	Ip	kA peak	50 Hz	63	79	63	79
			60 Hz	65	82	65	82
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	■	■	■	■	
Operating times		Opening ms	< 54				
		Breaking ms	< 70				
		Closing ms	< 72				
Service temperature	T	°C	-25 to +40				
Mechanical endurance		Class	M2				
		Number of switching operations	10000				
Electrical endurance		Class	E2				
Capacitive current breaking capacity		Class	C2				

(\*) Ud 42 kV 50 Hz, 1 min available in standard

## Specific applications

### Protection of generators and power station auxiliaries

All circuit breakers in the LF range break short circuit currents with an asymmetry of at least 30%.

In cases where the network constant L/R is greater than 45 ms, the asymmetry to be broken is higher; this is often the case of circuit breakers protecting nuclear or thermal power station auxiliaries or circuit breakers that are close to generator sets or large transformers.

Specific tests have been carried out:

Circuit breakers	kV	kA	Asymmetry
LF2	7.2	43.5	50%
LF3	7.2	43.5	50%
	12	40	50%
	17.5	25	100%

### Switching and protection of capacitor banks

LF 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.

Electrical characteristics according to IEC 62271-100				Circuit breaker LF2 / Cassette MC2										
Rated voltage	Ur	kV 50/60 Hz		7.2				12				17.5		
Insulation voltage														
- power frequency withstand	Ud	kV 50 Hz 1min (*)		20				28				38		
- lightning impulse withstand	Up	kV peak		60				75				95		
Rated current	Ir	A	630	-	-	■	■ (**)	-	-	■	■	■		
			1250	■	■	■	■ (**)	-	-	■	■	■		
			1600	■	■	■	■ (**)	■	■	■	■	■		
Short circuit current	Isc	kA	25	31.5	40	50	25	31.5	40	25	31.5			
Short time withstand current	I <sub>k</sub> /t <sub>k</sub>	kA/3 s, kA/1 s	25	31.5	40	50 (**)	25	31.5	40	25	31.5			
Short-circuit making current	I <sub>p</sub>	kA peak	50 Hz	63	79	100	125	63	79	100	63	79		
			60 Hz	65	82	104	130	65	82	104	65	82		
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		■	■	■	■	■	■	■	■	■			
Operating times	Opening ms		< 54											
	Breaking ms		< 70											
	Closing ms		< 72											
Service temperature	T	°C	-25 to +40											
Mechanical endurance	Class		M2											
	Number of switching operations		10 000											
Electrical endurance	Class		E2											
Capacitive current breaking capacity	Class		C2											

(\*) Ud 42 kV 50 Hz, 1 min available in standard  
(\*\*) Rated short-circuit breaking duration (t<sub>k</sub>): 1 s

■ Available  
- Not available

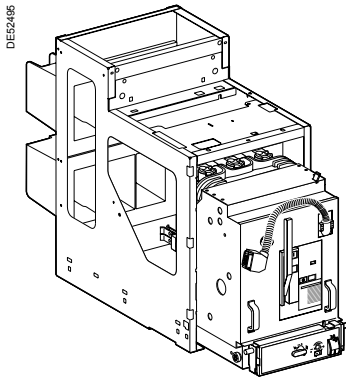
Electrical characteristics according to IEC 62271-100				Circuit breaker LF3 / Cassette MC3											
Rated voltage	Ur	kV 50/60 Hz		7.2				12				17.5			
Insulation voltage															
- power frequency withstand	Ud	kV 50 Hz 1min (*)		20				28				38			
- lightning impulse withstand	Up	kV peak		60				75				95			
Rated current	Ir	A	630	-	-	-	-	-	-	-	-	-	-		
			1250	-	-	-	-	-	-	-	■ (**)	-	-		■
			1600	-	-	-	-	-	-	-	-	-	-		-
			2500	■	■	■	■	■	■	■	■	■	■		■
			3150	■	■	■	■	■	■	■	■	■	■		■
Short circuit current	Isc	kA	25	31.5	40	50	25	31.5	40	50	25	31.5		40	
Short time withstand current	I <sub>k</sub> /t <sub>k</sub>	kA/3 s, kA/1 s	25	31.5	40	50	25	31.5	40	50	25	31.5		40	
Short-circuit making current	I <sub>p</sub>	kA peak	50 Hz	63	79	100	125	63	79	100	125	63	79		100
			60 Hz	65	82	104	130	65	82	104	130	65	82		104
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		■	■	■	■	■	■	■	■	■	■		-	
Operating times	Opening ms		< 54												
	Breaking ms		< 70												
	Closing ms		< 72												
Service temperature	T	°C	-25 to +40												
Mechanical endurance	Class		M2												
	Number of switching operations		10 000												
Electrical endurance	Class		E2												
Capacitive current breaking capacity	Class		C2												

(\*) Ud 42 kV 50 Hz, 1 min available in standard  
(\*\*) Rated short-circuit breaking duration (t<sub>k</sub>): 1 s

■ Available  
- Not available

# Description of functions

## Racking in



### Assembly components

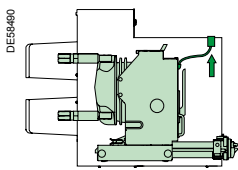
The "racking-in/out" function is achieved by:

- the withdrawable circuit breaker with its LV connector (mobile part)
- the cassette with its bushings (fixed part).

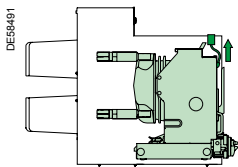
### Circuit breaker operation

The withdrawable circuit breaker can be placed in 3 stable positions:

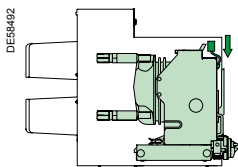
- service position: circuit breaker racked in and locked in position; LV plugs connected
- test position: circuit breaker racked out and locked in position; LV plug connected
- disconnected position: circuit breaker extracted and locked in this position, LV plug disconnected.



Operation position



Test position



Disconnected position

### Circuit breaker safety functions

A drive system using a threaded shaft gives easier racking and unracking.

#### Test position contact

This is activated when the circuit breaker is in the "test" or "service" position.

**Earthing** is achieved throughout the operation via the racking carriage casters. An additional earthing system can be supplied as an option.

#### Interlocking mechanisms

In conformity with IEC standards 62271-100 and 62271-200, the following interlocks are available:

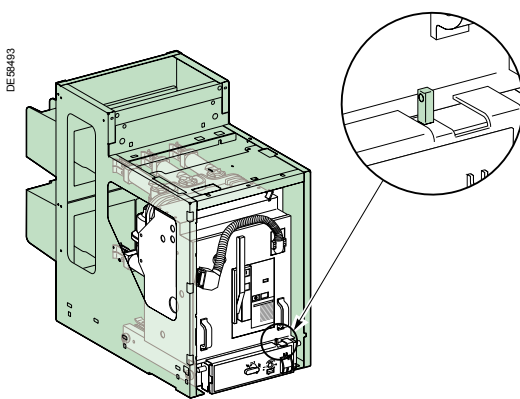
- impossibility of racking in or out is the circuit breaker is not in the "open" position
- impossible to rack in the circuit breaker when the LV plug is not connected
- impossible to disconnect the LV plug if the circuit breaker is not racked-out.

#### Cubicle door interlocking mechanism (MC cassette door only)

The carriage is equipped with a device that enables interlocking between the racking out of the circuit breaker and the cubicle door:

- possible to rack in the circuit breaker only if the door is closed
- possible to open the door only if the circuit breaker is racked out.

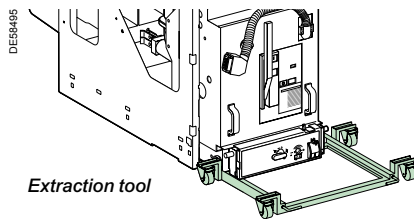
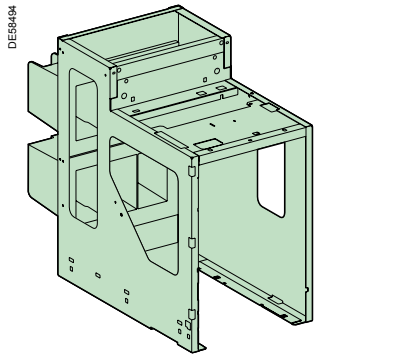
This device must be disabled if the interlocking function is not present.



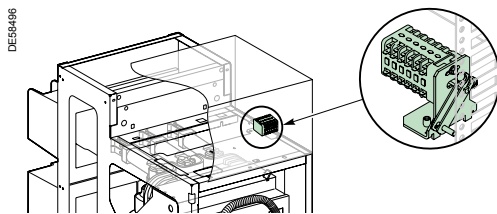
Interlocking door-cubicle

# Description of functions

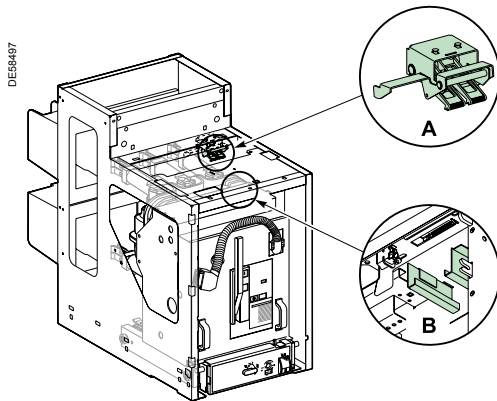
## Racking in (cont.)



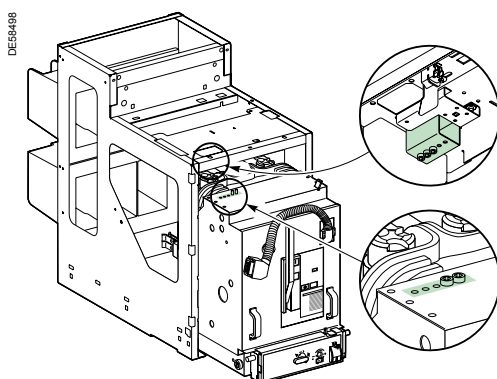
Extraction tool



Drawn in/out contacts



(A) 50 kA fixing latch  
(B) circuit breaker operating mechanism spring discharge system



Cassette/circuit breaker foolproofing device

### MC cassette safety functions

The MC cassette is designed to receive the LF circuit breaker and comprises the following components ensuring safety when racking-in (*see details in the Installation Guide ref. 07897536EN*).

#### Metal structure with two guide rails

The rails guide the LF circuit breaker during racking-in/out operations.

#### Fixed connection fingers insulated by bushings

The three ends of the circuit breaker, fitted with racking clusters, provide the contact with these three fingers.

#### Metal shutters to insulate from the MV part

Three shutters mounted on the structure stop access to the racking fingers when the circuit breaker is extracted (protection index: IP2X).

#### Safety interlocking systems

When carrying out maintenance operations, it is possible to:

- padlock the shutters in the closed position
- unlock the access mechanism to the fixed contacts.

#### Anti-drop function

This function ensures operator safety during circuit breaker extraction.

### Compulsory MC cassette accessories

#### Female Harting low voltage connector

A connector with a cable can either be delivered with the circuit breaker or separately.

#### Panel with circuit breaker operation pictograms

A self-adhesive panel shows racking-in and out operations for the circuit breaker. This is systematically delivered when the circuit breaker is ordered either with the cassette or as a separate order.

#### Racking handle

The handle is used for circuit breaker racking-in/out operations and for earthing switch opening and closing operations.

#### Extraction tool

A standard tool allows the breaking device to be extracted from each cassette version, whatever the installation height, up to 800 mm from the ground.

- A simplified extraction tool can be manufactured locally according to the installation height.

#### 50 kA fixing latch

This upper lock enabling the circuit breaker to be held in the cassette in the case of a fault, is compulsory for LF2/LF3 circuit breakers with 40 and 50 kA withstand.

### MC cassette options

#### Circuit breaker racked-in or racked-out position indicator contacts

12 contacts (6 NO + 6 NC)

#### Circuit breaker operating mechanism spring discharge system

Circuit breaker operating mechanism springs are automatically discharged when it is extracted from the cubicle. This function avoids any risk of unwanted circuit breaker closing.

#### Mechanical circuit breaker racked-in lock

This option is included when the earthing switch is installed. However, it can be delivered separately if the earthing circuit breaker is not required: it takes the space and volume of the earthing switch operating mechanism.

#### Equipped MV access door

Possibility of delivering a fully equipped, available with or without the manual circuit breaker closing mechanism.

#### Foolproofing device

This enables foolproofing of the circuit breaker rating relative to the cassette rating. This system is mounted on the cassette side. The corresponding combining of the right circuit breaker rating must be carried out by the panel builder.

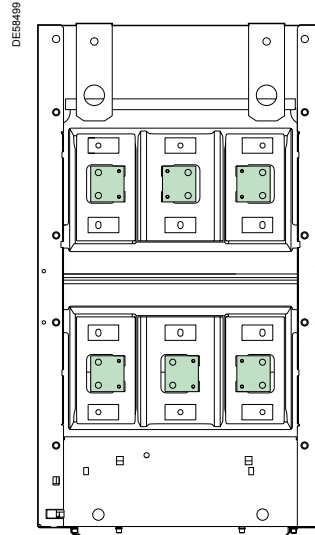
#### Earthing switch operating mechanism

This can be mounted under the cassette, for suitable interlocking between the circuit breaker and the earthing switch.

(*see details in the «installation guide» 07897490EN*)

### MV connection

The customer connection is easily made at the rear of the cassette on the connection terminals integrated in the bushings (see drilling details in the "Installation Guide" ref. 07897536EN).



### LV connection

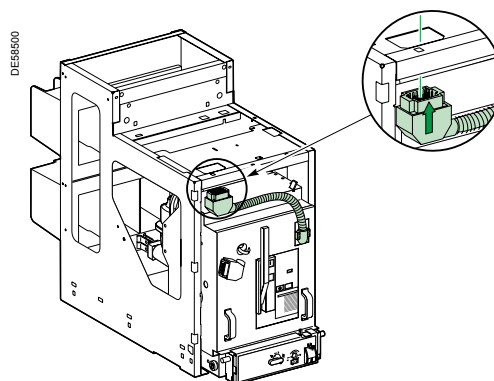
With the withdrawable circuit breaker, the LV cabling has an LV connector with:

- a mobile part (male Harting connector) at the end of a flexible cable, fully connected to the operating mechanism terminal by a sleeve
- a fixed part (female Harting connector) compatible with the male part mounted at the top, inside the cassette.

Interlocking function

In conformity with IEC standard 62271-200, an interlocking function prohibits:

- racking in when the LV plug is not connected
- disconnection of the LV plug if the circuit breaker is in the racked-in position.



LV plug connection

# Description of functions

## RI stored energy operating mechanism

### Wiring diagram



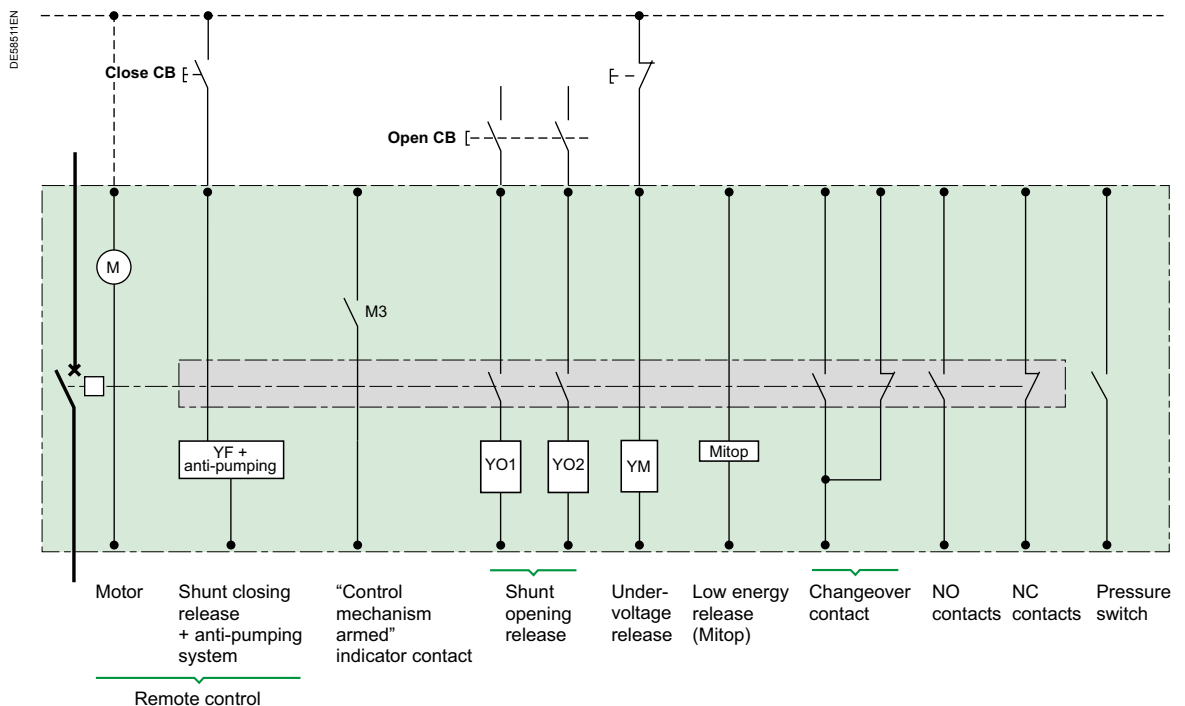
### Operation of the RI stored energy operating mechanism

This mechanism guarantees the device an opening and closing speed unaffected by the operator, for both electric and manual orders.

It carries out the O and CO cycles and is automatically recharged by a gear motor after closing. It consists of:

- the stored energy operating mechanism which stores in springs the energy required to open and close the device
- a gear motor electrical charging device with manual charging by lever (useful on loss of auxiliary supply)
- manual order devices by push buttons on the front panel of the device (red and black)
- an electrical remote closing device containing a release with an antipumping relay
- an electrical opening device containing one or more releases, for example:
  - shunt trip devices
  - Mitop, a low consumption release, used with self protection relay.
- an operation counter
- a position indication device by mechanical indicator (black and white) and a module of 14 auxiliary contacts whose availability varies according to the diagram used
- a device for indicating "charged" operating mechanism status by mechanical indicator and electrical contact
- A two thresholds pressure switch allows to monitor the gas pressure (0.1 MPa, 0,05 MPa / 1 bar, 0,5 bar, relative pressure)

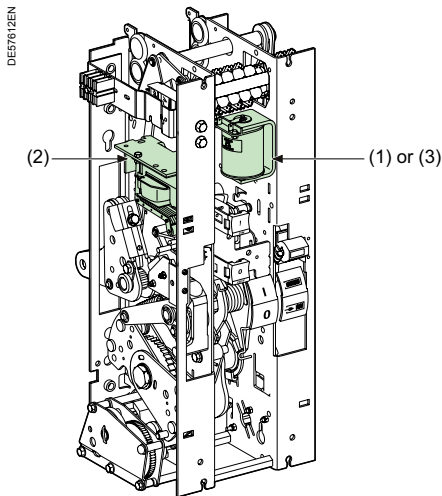
### Wiring diagram



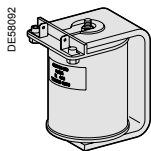


# Description of functions

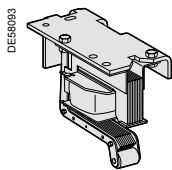
## Opening circuit



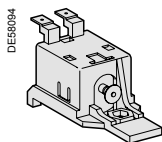
Operating mechanism



Shunt opening release (1)



Undervoltage release (2)



Low energy release (3)

### Composition

The opening circuit can be produced using the following components:

- shunt opening release (on energizing) (YO1)
- second shunt opening release (on energizing) (YO2)
- undervoltage release (YM)
- low energy release (Mitop).

Note: see the table of the releases' combinations, "Order form" page.

### Shunt opening release (YO1 and YO2)

Energizing this unit causes instant opening of the circuit breaker.

#### Characteristics

Power supply	See "Order form" page	
Threshold	V AC	0.85 to 1.1 Ur
	V DC	0.7 to 1.1 Ur
Consumption	V AC	160 VA
	V DC	50 W

### Undervoltage release (YM)

This release unit causes the systematic opening of the circuit breaker when its supply voltage drops below a value less than 35% of the rated voltage, even if this drop is slow and gradual. It can open the circuit breaker between 35% and 70% of its rated voltage. If the release unit is not supplied power, manual or electrical closing of the circuit breaker is impossible. Closing of the circuit breaker is possible when the supply voltage of the release unit reaches 85% of its rated voltage.

#### Characteristics

Power supply	See "Order form" page		
Threshold	Opening	0.35 to 0.7 Ur	
	Closing	0.85 Ur	
Consumption	Triggering	V AC	400 VA
		V DC	100 W
	Latched	V AC	100 VA
		V DC	10 W

### Low energy release (Mitop)

This specific release unit comprises a low consumption unit and is specifically used for Sepam 100LA self-powered relays. The Circuit-breaker's opening time must be adjusted with the relay to a minimum value of 45ms.

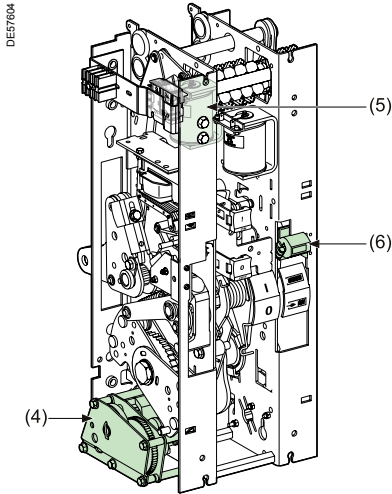
#### Characteristics

Power supply	Direct current
Threshold	0.6 A < I < 3 A

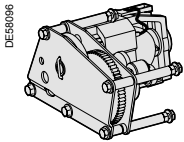
Any tripping due to the Mitop release unit is momentarily indicated by an SDE type changeover contact (option).

# Description of functions

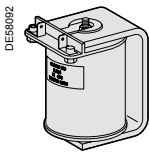
## Remote control



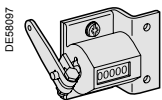
Operating mechanism



Electrical motor with gearing (4)



Shunt closing release (5)



Operation counter (6)

### Function

In its basic version, the circuit breaker comprises a remote control mechanism for remote circuit breaker opening and closing.

### Composition

The remote control mechanism comprises:

- an electrical motor with gearing
- a shunt closing release (YF) combined with an anti-pumping device
- an operation counter.

### Electrical motor with gearing (M)

The electrical motor carries out the automatic rearming of the stored energy unit as soon as the circuit breaker is closed. This allows the instant reclosing of the device after opening. The arming lever is only used as a backup operating mechanism

in the case of the absence of the auxiliary power supply. The M3 contact indicates the end of arming operations.

#### Characteristics

Power supply	See "Order form" page	
Threshold	V AC/V DC	0.85 to 1.1 Ur
Consumption	V AC	380 VA
	V DC	380 W

### Shunt closing release (YF)

This release allows the remote closing of the circuit breaker when the operating mechanism is armed.

#### Characteristics

Power supply	See "Order form" page	
Threshold	V AC	0.85 to 1.1 Ur
	V DC	0.85 to 1.1 Ur
Consumption	V AC	160 VA
	V DC	50 W

The shunt closing release is combined with an anti-pumping relay that enables priority to be given to opening in the case of a permanent closing order.

This thus avoids the device being caught in an uncontrolled opening-closing cycle.

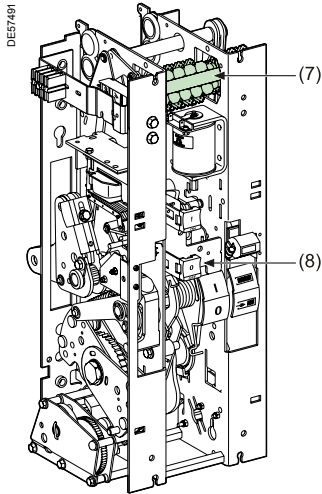
### Operation counter

The operation counter is visible on the front panel.

It displays the number of switching cycles (CO) that the device has carried out.

# Description of functions

## Indication and locking/interlocking



Operating mechanism



Auxiliary contacts (7)

### “Open/closed” auxiliary contacts

The number of contacts available depends on the options chosen on the operating mechanism.

In the basic configuration, the circuit breaker’s operating mechanism comprises a total of:

- 6 normally closed contacts (NC)
- 7 normally open contacts (NO)
- 1 changeover contact (CHG).

The usage procedure for auxiliary contacts is given in the following table:

Options		
	NC contact	NO contact
Remote control	1	1
Shunt opening release (each one) YO1/YO2	0	1
Undervoltage release YM	0	0
Low energy release (Mitop)	0	0

In order to know the final number of available contacts, you must deduct the total number of contacts included in the circuit breaker (6 NC + 7 NO + 1 CHG), the number of contacts used given in the table above.

E.g.: a circuit breaker equipped with a remote control and a shunt trip unit has the following available contacts:  
6 NC + 5 NO + 1 CHG.

With a undervoltage release instead of the shunt trip, this circuit breaker would have the following available contacts:  
6 NC + 6 NO + 1 CHG.

Shunt opening release combination				
	1st release	Shunt opening release YO1	Undervoltage release YM	Mitop
2nd release				
Without		6NC + 5NO + 1CHG	6NC + 6NO + 1CHG	6NC + 6NO + 1CHG
Shunt opening release YO2		6NC + 4NO + 1CHG		
Undervoltage release YM		6NC + 5NO + 1CHG		
Mitop		6NC + 5NO + 1CHG	6NC + 6NO + 1CHG	

Contacts characteristics			
Rated current			10 A
Breaking capacity	AC	220 V ( $\cos \varphi \geq 0.3$ )	1 A
	DC	110/220 V ( $L/R \leq 0.02$ s)	0.3 A

# Description of functions

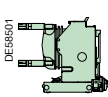
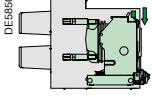
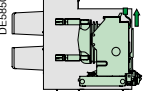
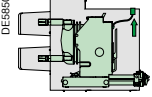
## Safety functions

This table describes the safety functions available on the withdrawable version of the LF circuit breaker.

### How to use the table

Each of the boxes describes the functional status of each circuit breaker position and the associated parts:

- Possible status
- Possible status, impossible operation
- Impossible status

Parts		Circuit breaker positions					
							
		Removed	Disconnected	Test position			Service
1 - Cradle			Fool-proof protection <sup>(1)</sup> Anti-drop <sup>(2)</sup>				
		No opening shutters					
		Shutters padlocking possible					
2 - LV plug	Disconnected			Door closing impossible	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Connected	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		No unplugging <sup>(5)</sup>		
3 - Circuit breaker	Closed		Auto-discharge function <sup>(3)</sup>		No racking-in	<input checked="" type="checkbox"/>	No racking-out
	Open					No closing	
		Open position circuit breaker locking available <sup>(3)</sup>					
4 - Switchboard door	Open				No racking-in	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Closed				No door opening <sup>(4)</sup>		
5 - Earthing switch	Open					No earthing switch closing	
	Closed				No racking-in	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

(1) This protection mechanism ensures that the performance levels of the circuit breaker correspond with those of the cassette.

(2) Device that prevents the circuit breaker from dropping when extracted from the cassette. The device can be either unlocked manually or when the extraction jig is put in position.

(3) Option.

(4) Interlocking device to be fitted to the cubicle door.

(5) Because the door is closed.

LF SF6 Circuit Breaker  
up to 17.5 kV  
Withdrawable version

# Dimensions

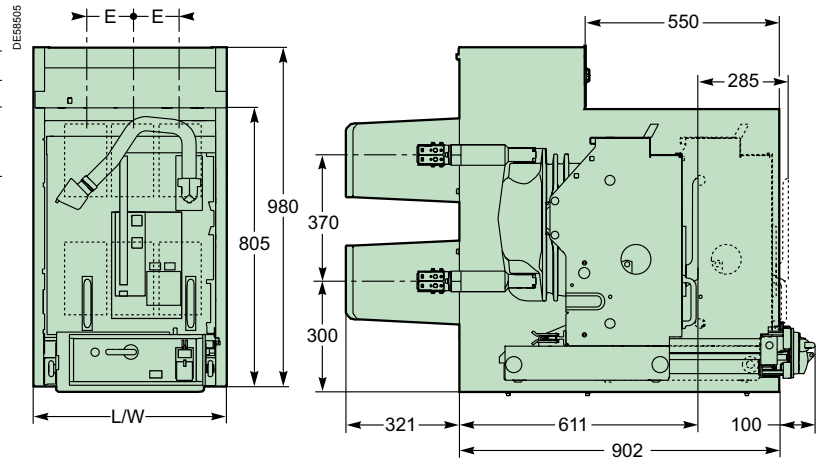
LF1, LF2, LF3 circuit breakers

## Device

### Basic withdrawable

C.B./Cassette	LF1/MC1	LF2/MC2	LF3/MC3
L/W	556	686	886
E (phase to phase)	145	185	240
Weight (kg) *	248	297	344 (1250A) 363 (2500A) 445 (3150A)

\*Maximum values, depending on ratings and options



# Order Forms

# Contents

---

<b>LF fixed version</b>	<b>40</b>
<b>LF withdrawable version</b>	<b>41</b>

---

# LF1, LF2, LF3 fixed

## Order Form

Only one of the boxes (ticked  or filled  by the needed value) have to be considered between each horizontal line.

Green box  corresponds to none priced functions.

<b>Basic fixed circuit breaker</b>		Quantity	<input type="text"/>
Rated voltage $U_r$		(kV)	<input type="text"/>
Impulse voltage $U_p$		(kVbil)	<input type="text"/>
Short-circuit current $I_{sc}$		(kA)	<input type="text"/>
Rated current $I_r$		(A)	<input type="text"/>
Frequency	50 Hz <input checked="" type="checkbox"/>	60 Hz	<input type="checkbox"/>
Colour for push buttons and indicators	<b>IEC standard</b>		<b>ANSI standard</b>
Push buttons open/close:	Red/black <input checked="" type="checkbox"/>	Red/green <input type="checkbox"/>	Green/red <input type="checkbox"/>
Indicator open/close:	Black/white <input checked="" type="checkbox"/>	Green/red <input type="checkbox"/>	
Operating mechanism charged/discharged:	White/yellow <input checked="" type="checkbox"/>	Charged/Discharged <input type="checkbox"/>	

### Circuit breaker options

**1st opening release** (see possible choices in combination table below)

Shunt opening release **YO1**

24 Vdc <input checked="" type="checkbox"/>	30 Vdc <input checked="" type="checkbox"/>	48 Vdc <input checked="" type="checkbox"/>	110 Vdc <input checked="" type="checkbox"/>	125 Vdc <input checked="" type="checkbox"/>	220 Vdc <input checked="" type="checkbox"/>	48 Vac (50 Hz) <input checked="" type="checkbox"/>	110 Vac (50 Hz) <input checked="" type="checkbox"/>	220 Vac (50 Hz) <input checked="" type="checkbox"/>	120 Vac (60 Hz) <input checked="" type="checkbox"/>	240 Vac (60 Hz) <input checked="" type="checkbox"/>
--	--	--	---	---	---	--	---	---	---	---

**2nd opening release** (see possible choices in combination table below)

Shunt opening release **YO2**

24 Vdc <input type="checkbox"/>	30 Vdc <input type="checkbox"/>	48 Vdc <input type="checkbox"/>	110 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>
---------------------------------	---------------------------------	---------------------------------	----------------------------------	----------------------------------	----------------------------------	---	--	--	--	--

Undervoltage release **YM**

24 Vdc <input type="checkbox"/>	30 Vdc <input type="checkbox"/>	48 Vdc <input type="checkbox"/>	110 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>
---------------------------------	---------------------------------	---------------------------------	----------------------------------	----------------------------------	----------------------------------	---	--	--	--	--

Mitop (not available with seismic version)

Without contact  With contact

**Remote control**

Electrical motor **M**

24...32 Vdc <input type="checkbox"/>	48...60 Vdc/ac <input type="checkbox"/>	110...127 Vdc/ac <input type="checkbox"/>	220...250 Vdc/ac <input type="checkbox"/>
--------------------------------------	---	---	---

Shunt closing release **YF**

24 Vdc <input checked="" type="checkbox"/>	30 Vdc <input checked="" type="checkbox"/>	48 Vdc <input checked="" type="checkbox"/>	60 Vdc <input checked="" type="checkbox"/>	110 Vdc <input checked="" type="checkbox"/>	125 Vdc <input checked="" type="checkbox"/>	220 Vdc <input checked="" type="checkbox"/>	48 Vac (50 Hz) <input checked="" type="checkbox"/>	110 Vac (50 Hz) <input checked="" type="checkbox"/>	220 Vac (50 Hz) <input checked="" type="checkbox"/>	120 Vac (60 Hz) <input checked="" type="checkbox"/>	240 Vac (60 Hz) <input checked="" type="checkbox"/>
--	--	--	--	---	---	---	--	---	---	---	---

Low voltage wiring connection

Male plug (1.2 m) <input type="checkbox"/>	Female socket (2 m) <input type="checkbox"/>
--	--

Locking C.B. in open position

Flat <input type="checkbox"/>	Tubular <input type="checkbox"/>
-------------------------------	----------------------------------

Seismic version (consult us)

Support frame

Leaflets language

French <input checked="" type="checkbox"/>	English <input type="checkbox"/>
--	----------------------------------

**Different releases combinations**

Shunt opening releases YO1/YO2	1			2	1	1
Undervoltage release YM		1			1	1
Mitop			1		1	1



Only one of the boxes (ticked  or filled  by the needed value) have to be considered between each horizontal line.

Green box  corresponds to none priced functions.

### Basic withdrawable circuit breaker

Quantity	<input type="text"/>		
Rated voltage $U_r$	(kV) <input type="text"/>		
Impulse voltage $U_p$	(kVbil) <input type="text"/>		
Short-circuit current $I_{sc}$	(kA) <input type="text"/>		
Rated current $I_r$	(A) <input type="text"/>		
Frequency	50 Hz <input checked="" type="checkbox"/>	60 Hz <input type="checkbox"/>	
Colour for push buttons and indicators	IEC standard		ANSI standard
Push buttons open/close:	Red/black <input checked="" type="checkbox"/>	Red/green <input type="checkbox"/>	Green/red <input type="checkbox"/>
Indicator open/close:	Black/white <input checked="" type="checkbox"/>	Green/red <input type="checkbox"/>	
Operating mechanism charged/discharged:	White/yellow <input checked="" type="checkbox"/>	Charged/Discharged <input type="checkbox"/>	

### Circuit breaker options

#### 1st opening release (see possible choices in combination table below)

Shunt opening release **YO1**

24 Vdc <input checked="" type="checkbox"/>	110 Vdc <input type="checkbox"/>	220 Vdc <input checked="" type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>
30 Vdc <input checked="" type="checkbox"/>	125 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input checked="" type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>
48 Vdc <input checked="" type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	110 Vac (50 Hz) <input checked="" type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>

#### 2nd opening release (see possible choices in combination table below)

Shunt opening release **YO2**

24 Vdc <input type="checkbox"/>	110 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>
30 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>
48 Vdc <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>

Undervoltage release **YM**

24 Vdc <input type="checkbox"/>	110 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>
30 Vdc <input type="checkbox"/>	125 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>
48 Vdc <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>

Mitop (not available with seismic version)

Without contact  With contact

#### Remote control

Electrical motor **M**

24...32 Vdc <input checked="" type="checkbox"/>	110...127 Vdc/ac <input type="checkbox"/>
48...60 Vdc/ac <input type="checkbox"/>	220...250 Vdc/ac <input type="checkbox"/>

Shunt closing release **YF**

24 Vdc <input checked="" type="checkbox"/>	60 Vdc <input type="checkbox"/>	220 Vdc <input type="checkbox"/>	220 Vac (50 Hz) <input type="checkbox"/>
30 Vdc <input checked="" type="checkbox"/>	110 Vdc <input type="checkbox"/>	48 Vac (50 Hz) <input checked="" type="checkbox"/>	120 Vac (60 Hz) <input type="checkbox"/>
48 Vdc <input checked="" type="checkbox"/>	125 Vdc <input type="checkbox"/>	110 Vac (50 Hz) <input type="checkbox"/>	240 Vac (60 Hz) <input type="checkbox"/>

Seismic version (consult us)

Leaflets language

French  English

#### MC cassette

MC cassette type	MC1 <input type="checkbox"/>	MC2 <input type="checkbox"/>	MC3 <input type="checkbox"/>
Rated short circuit current $I_{sc}$	$\leq 40$ kA <input type="checkbox"/>		50 kA <input type="checkbox"/>
Rated current $I_r$	1250 A <input type="checkbox"/>	2500 A <input type="checkbox"/>	3150 A <input type="checkbox"/>

#### MC cassette accessories

Racked in/out position contact	6 NO, 6 NC <input type="checkbox"/>		
Pictogram	of the circuit breaker <input type="checkbox"/>	of the earthing switch <input type="checkbox"/>	
Circuit breaker spring mechanism discharge	<input type="checkbox"/>		
Extraction table	Quantity		<input type="text"/>
Extra handle	Quantity		<input type="text"/>
Door with hinge, windows and pictogram	MC1 <input type="checkbox"/>	MC2 <input type="checkbox"/>	MC3 <input type="checkbox"/>

*Different releases combinations*

Shunt opening releases <b>YO1/YO2</b>	1	2	1	1
Undervoltage release <b>YM</b>	1	1	1	1
Mitop			1	1

# Services

# Contents

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<b>Schneider Electric services</b>	<b>44</b>
<b>Separated components</b>	<b>46</b>

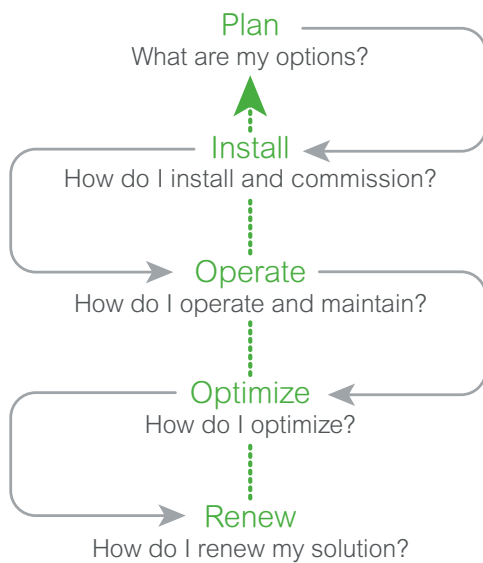
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How can you cut costs and improve performance at the same time?

When it comes to your electrical distribution infrastructure, the answer is straightforward: get professional expertise.

## Life Cycle Services

DE-408943



When it comes to your electrical distribution installation, we can help you:

- Increase productivity, reliability, and safety
- Mitigate risk and limit downtime
- Keep equipment up to date and extend lifespan
- Cut cost and increase savings
- Improve your return on investment

## CONTACT US!

[www.schneider-electric.com/b2b/en/services/](http://www.schneider-electric.com/b2b/en/services/)

## Plan

Schneider Electric helps you to plan the full design and execution of your solution, looking at securing your process and optimising your time:

- **Technical feasibility studies:** Accompany customer to design solution in his given environment.
- **Preliminary design:** Accelerate turn around time to come to a final solution design.

## Install

Schneider Electric will help you to install efficient, reliable and safe solutions based on your plans.

- **Project Management:** Designed to help you complete your projects on time and within budget.
- **Commissioning:** Ensures your actual performance versus design, through on site testing & commissioning, tools & procedures.

## Operate

Schneider Electric helps you maximise your installation uptime and control your capital expenditures through its services offering.

- **Asset Operation Solutions:** The information you need to increase safety, enhance installation training performance, and optimise asset maintenance and investment.
- **Advantage Service Plans:** Customised services plans which cover preventive, predictive and corrective maintenance.
- **On site Maintenance services:** Extensive knowledge and experience in electrical distribution maintenance.
- **Spare parts management:** Ensure spare parts availability and optimised maintenance budget of your spare parts.
- **Technical Training:** To build up necessary skills and competencies in order to properly operate your installations in safety.

## Optimise

Schneider Electric propose recommendations for improved safety, availability, reliability & quality.

- **MP4 Electrical Assessment:** Define improvement & risk management program.

## Renew

Schneider Electric extends the life of your system while providing upgrades. Schneider Electric offers to take full responsibility for the end-of-life processing of old electrical equipments.

- **ECOFIT™:** Keep up to date & improve performances of your electrical installations (LV,MV, Protection Relays...).
- **MV product End of life:** Recycle & recover outdated equipment with end of life services.

## Frequency of maintenance intervention

Schneider Electric equipment manufacturers recommend a schedule for maintenance activities to extend Electrical Distribution equipment performance over time. Frequencies under normal/healthy operation (minor equipment criticality and optimal environmental conditions) can be generally defined as follows:

Maintenance	Min. freq. <sup>(1)</sup>	Who		
		Manufacturer	Certified Partner	End user
Exclusive	every 4 years	■		
Advanced	every 2 years	■	■	
Light	every 1 year	■	■	■

(1) Recommended under normal operating conditions (minor equipment criticality and optimal environmental conditions). However, this recommended frequency should be increased according to a) the level of criticality (low, major, critical) / b) the severity of environment conditions (i.e. corrosive, naval, offshore) following recommendations of Manufacturer's services.

# ProDiag Breaker

## Diagnosis of MV and LV Circuit Breakers



### What is ProDiag Breaker?

ProDiag Breaker is a Schneider Electric diagnosis tool. ProDiag Breaker compares the mechanical and electrical parameters measured during the full operation of circuit breakers with the data collected from our production facilities. This allows detecting possible failure in advance. It measures, records and displays on a screen the key electrical parameters in MV and LV circuit breakers, relating to opening, closing and springloading operations.

All this data is automatically compared with the criteria for the circuit breaker designated in the software, which indicates which values are within the acceptable range, which are on the limit and which are outside it.

Two tests are always performed on each circuit breakers, one at minimum voltage and one at nominal voltage. A written report is generated and provided by Schneider Electric so that the customer can use it as a tool to define the necessary corrective action (maintenance, repair or replacement).

ProDiag Breaker is part of ProDiag preventive maintenance plan. Evaluation of circuit breakers using ProDiag Breaker includes:

- Evaluation of the operating mechanism.
- Measurement and comparison of the actual contact resistance with that specified by the manufacturer.
- Measurement and comparison of the insulation resistance.
- Evaluation of the general circuit breaker conditions based on the captured data.

Moreover, analysis of the ProDiag Breaker time/ travel curve combined with the current curve of the coil and phase contact detects possible faults, such as:

- Worn out latches and operating mechanisms.
- Faulty coils.
- Mechanical wear and tear and hardening of lubricating grease.
- Defective shock absorbers.
- Defective simultaneous contact operation (opening/closing).

Some maintenance programmes involve dismantling the circuit breaker mechanism to check its condition. ProDiag Breaker using signals captured from the circuit breaker operation, reduces maintenance costs compared with programs which check the circuit breakers manually.

### Where can ProDiag Breaker reduce costs?

- ProDiag Breaker significantly reduces the time taken to identify potential faults in a circuit breaker, using operational analysis rather than inspection and mechanical re-sets.
- The software analyses the captured data and identifies the specific problem area.
- A device's normal operating life is increased by timely diagnostics of when and what repairs are necessary.
- The tool comprises both hardware and software, resulting in a highly efficient predictive maintenance program.

### ProDiag Breaker Objectives

Your priority is to enhance the reliability of your installation:

- to ensure its continuity of service,
- to minimize the time for maintenance & repair
- to perform maintenance
- Only on the equipment requiring it and only when necessary (conditional preventive maintenance)

### Results

ProDiag Breaker provides a report of the complete nature of the circuit breaker, detailing: closing / opening time, contact simultaneity, bounce and resistance, mechanical closing and opening forces.

This report enables any required maintenance to be targeted and time in order to optimize the customer's maintenance plan.



# Separated components

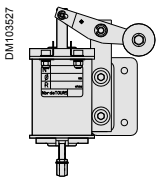
The following components can be ordered separately and can be adapted or replaced by the customer.

## Auxiliaries

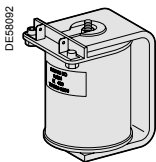
Shunt opening release		YO1 or YO2
24 Vdc		889705BL
30 Vdc		889705BL
48 Vdc		889705BJ
60 Vdc		889705BG
110 Vdc		889705BE
125 Vdc		889705BD
220 Vdc		889705BB
48 Vac	50 Hz	SPK0041SF1
110 Vac	50 Hz	889705BL
220 Vac	50 Hz	889705BH
120 Vac	60 Hz	889705BK
240 Vac	60 Hz	889705BH



Shunt opening release - Seismic version		YO1	YO2
24 Vdc		SPK0003SF	SPK0011SF
30 Vdc		SPK0008SF	SPK0016SF
48 Vdc		SPK0004SF	SPK0012SF
60 Vdc		SPK0021SF	SPK0022SF
110 Vdc		00891486FE	00891487FE
125 Vdc		SPK0005SF	SPK0013SF
220 Vdc		SPK0006SF	SPK0014SF
48 Vac	50 Hz	SPK0007SF	SPK0015SF
110 Vac	50 Hz	SPK0008SF	SPK0016SF
220 Vac	50 Hz	SPK0009SF	SPK0017SF
120 Vac	60 Hz	SPK0010SF	SPK0018SF
240 Vac	60 Hz	SPK0009SF	SPK0017SF

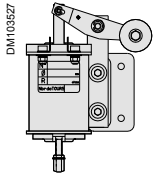


Shunt closing release YF		Anti pumping Relay	Closing Release
24 Vdc		MV261207	889705AL
30 Vdc		MV261208	889705AK
48 Vdc		MV261209	889705AH
60 Vdc		MV261210	889705AG
110 Vdc		MV261211	889705AD
125 Vdc		MV261212	889705AD
220 Vdc		MV261213	889705AA
48 Vac	50 Hz	MV261215	889705AP
110 Vac	50 Hz	MV261216	889705AL
220 Vac	50 Hz	MV261218	889705AH
120 Vac	60 Hz	MV261216	889705AL
240 Vac	60 Hz	MV261218	889705AH
Zelio (RXM) relay adaptation kit for RI *		MV261246	



## Auxiliaries (cont.)

Shunt closing release YF Seismic version		Anti pumping Relay	Closing Release
	24 Vdc	MV261207	00891485FL
	30 Vdc	MV261208	SPK0019SF
	48 Vdc	MV261209	00891485FH
	60 Vdc	MV261210	SPK0020SF
	110 Vdc	MV261211	SPK0001SF
	125 Vdc	MV261212	SPK0001SF
	220 Vdc	MV261213	00891485FB
	48 Vac 50 Hz	MV261215	SPK0002SF
	110 Vac 50 Hz	MV261216	00891485FL
	220 Vac 50 Hz	MV261218	00891485FH
	120 Vac 60 Hz	MV261216	00891485FL
	240 Vac 60 Hz	MV261218	00891485FH



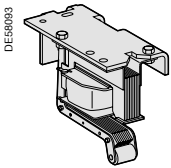
DM103527

Zelio (RXM) relay adaptation kit for RI \*

MV261246

### Undervoltage release YM

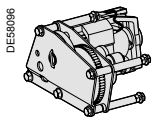
	24 Vdc	889772AB
	30 Vdc	889772AC
	48 Vdc	889772AE
	60 Vdc	889772AF
	110 Vdc	889772AH
	125 Vdc	889772AJ
	220 Vdc	889772AM
	48 Vac 50 Hz	889773AQ
	110 Vac 50 Hz	889773AU
	220 Vac 50 Hz	889773AX
	120 Vac 60 Hz	889773AU
	240 Vac 60 Hz	889773AX



DE56093

### Electrical motor & Gear reducer (Ametek) (after 12/1999)

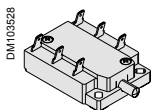
	24... 32 Vdc	51072122A1
	48... 60 Vac/dc	51072122B1
	110... 127 Vac/dc	51072122C1
	220... 250 Vac/dc	51072122D1



DE56096

### End of charging

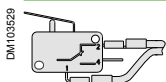
	contact M1, M2, M3	AAV85908
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DM103528

### Micro switch SE & SQ

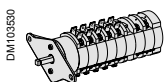
	contact SE & SQ	730734A
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DM103529

### Auxiliary contacts

	8NO + 8NC (after 2012)	MV261239
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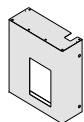
DM103530

\* : to be ordered in case of POK or APE relay type replacement

## Accessories (fixed version)

### Cover

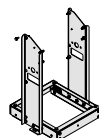
DM103531



LF1	00889520FA
LF2	00889520FB
LF3	00889520FC

### CB support frame

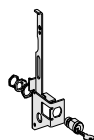
DM103532



LF1	00889810FA
LF2	00889810FB
LF3	00889810FC

### Locking, interlocking

DE69099

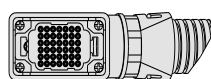


Open position circuit-breaker locking (without lock)	888516A
Flat lock	AAV86887
Tubular lock	AAV86892

## LV connection (fixed version)

### Male plug & lead

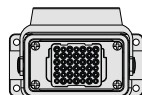
DM103534



LF1/LF2	L=1,2M	MV261070
LF3	L=1,2M	MV261074

### Female plug & lead

DM103533

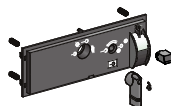


All types	L=2M	MV261071
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## Accessories (withdrawable version)

### Front cover + red push button kits for w/o truck

DM103546



All types	MV261241
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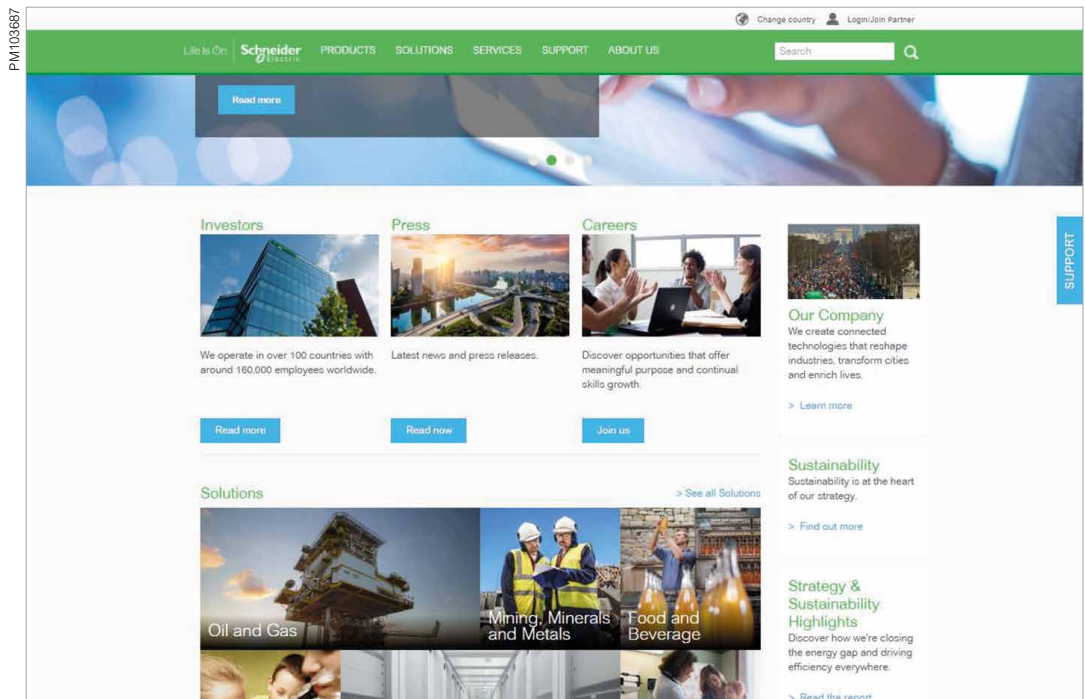
# TOOLS

## schneider-electric.com

This international web site allows you to access all the Schneider Electric solutions and product information via:

- Comprehensive descriptions
- Range datasheets
- A download area
- Product selectors

You can also access information dedicated to your business and contact your Schneider Electric country support.





# TOOLS

## Web selector

This site allows you to access the Schneider Electric products in just two clicks via a comprehensive range of datasheets, with direct links to:

- Complete libraries: technical documents, catalogs, FAQs, brochures
- Selection guides from the e-catalog
- Product discovery sites and their animations

You will also find illustrated overviews, news to which you can subscribe, and a list of country contacts

## Training

Training allows you to acquire the expertise (installation design, work with power on, etc.) to increase efficiency and improve customer service.

The training catalog includes beginner's courses in electrical distribution, knowledge of MV and LV switchgear, operation and maintenance of installations, and design of LV installations to give a few examples.

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[www.schneider-electric.com](http://www.schneider-electric.com)

30, May, 2018

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